APPENDIX

COMPARISON OF RESEARCH AND TEACHING EFFICIENCES OF ALL UNITS IN THE UA COLLEGE OF SCIENCE

College of Science
FY2009 Budget, ICR, SCH and Majors

								Undergraduate Only								
		A	B	C	D	E	A+D+E	F	G	H	I	J	K	G+I+K	C+G+I+K/A	G+I+K/A
Department	Fall State FTE	Perm State Budget including Temp Funding	ICR Return to University	ICR Return to College	ICR Return to Department	Summer Session Dist	Total Department Budget	Total SCH	SCH * $187	Total Majors	Majors * $620	Total Degrees	Degrees * $1500	Total Instruction	College ICR$+SCH$+ MAJOR$+DEGREE$/ Perm State Budget incl Temp	Total Instruction/ Perm State Budget incl Temp
Astronomy	101.63	7,769,559	8,398,146	1,567,306	1,023,230	15,987	8,808,776	9,074	1,696,838	131	81,220	4	6,000	1,784,058	0.43	22.96%
Atmospheric Sciences	16.35	1,127,485	725,998	158,197	115,484	6,877	1,249,846	5,571	1,041,777	-	-	-	-	1,041,777	1.06	92.40%
Biosphere 2	-	-	16,785	4,112	3,002	-	3,002	232	43,384	-	-	-	-	43,384	0.00	0.00%
Chemistry/Biochemistry	138.90	9,253,525	4,281,929	1,026,343	709,093	195,200	10,157,818	34,699	6,488,713	1,061	657,820	63	94,500	7,241,033	0.89	78.25%
Cognitive Science	8.83	514,646	92,726	16,638	9,456	-	524,102	554	103,598	-	-	-	-	103,598	0.23	20.13%
Computer Science	32.85	2,595,474	895,553	393,610	379,932	31,018	3,006,424	6,695	1,251,965	255	158,100	62	93,000	1,503,065	0.73	57.91%
Dean's Office	21.26	1,295,041	5,209	10,162	10,162		1,305,203	550	102,850	76	47,120	11	16,500	166,470	0.14	12.85%
Ecology/Evolutionary Biology	47.91	3,653,074	1,121,778	267,041	194,940	14,351	3,862,366	10,186	1,904,782	1,242	770,040	98	147,000	2,821,822	0.85	77.25%
Geosciences	48.11	3,437,598	1,016,676	215,791	157,527	24,653	3,619,779	9,901	1,851,487	170	105,400	18	27,000	1,983,887	0.64	57.71%
Hydrology/Water Resources	19.51	1,820,866	1,423,919	348,879	211,295	-	2,032,161	592	110,704	21	13,020	7	10,500	134,224	0.27	7.37%
Mathematics	102.30	8,363,138	1,210,064	252,966	179,479	285,979	8,828,596	44,354	8,294,198	669	414,780	56	84,000	8,792,978	1.08	105.14%
Molecular/Cellular Biology	44.79	2,428,073	1,791,817	325,835	234,875	24,110	2,687,058	6,990	1,307,130	933	578,460	148	222,000	2,107,590	1.00	86.80%
Neuroscience	-	1,420,594	723,676	183,674	83,674	788	1,505,056	366	68,442	-	-	-	-	68,442	0.18	4.82%
Physics	65.88	4,422,416	1,004,836	247,772	177,374	63,397	4,663,187	12,802	2,393,974	270	167,400	20	30,000	2,591,374	0.64	58.60%
Planetary Sciences	35.85	3,008,502	5,068,955	1,262,478	921,609	315	3,930,426	5,347	999,889	-	-	-	-	999,889	0.75	33.24%
Psychology	59.74	3,723,672	1,082,196	254,796	203,176	141,709	4,068,557	29,901	5,591,487	3,612	2,239,440	436	654,000	8,484,927	2.35	227.86%
Speech/Hearing Sciences	20.64	1,601,843	495,789	121,563	88,995	18,867	1,709,705	4,314	806,718	476	295,120	65	97,500	1,199,338	0.82	74.87%
Tree-Ring Laboratory	12.77	1,069,340	255,200	63,070	45,369	-	1,114,709	2,171	405,977	-	-	-	-	405,977	0.44	37.97%
College of Science Total	**777.32**	**57,504,846**	**29,611,252**	**6,720,233**	**4,748,673**	**823,252**	**63,076,771**	**184,299**	**34,463,913**	**8,916**	**5,527,920**	**988**	**1,482,000**	**41,473,833**	**0.84**	**72.12%**
University	**5,728.06**	**589,553,400**	**79,104,766**	**19,846,778**	**59,257,988**	**-**	**648,811,388**	**762,682**	**142,621,534**	**36,678**	**22,740,360**	**5,914**	**8,871,000**	**174,232,894**	**0.33**	**29.55%**

College of Science

FY2010 Budget, ICR, SCH and Majors

								Undergraduate Only								
		A	B	C	D	E	A+D+E	F	G	H	I	J	K	G+I+K	C+G+I+K/A	G+I+K/A
Department	State FTE	Perm State Budget including Temp Funding	ICR Return to University	ICR Return to College	ICR Return to Department	Summer Session Dist	Total Department Budget	Total SCH (Fall 2009 & Spring 2010)	SCH * $168	Total Majors (Fall 2009 & Spring 2010)	Majors * $1566	Total Degrees (Fall 2009 & Spring 2010)	Degrees * $891	Total Instruction	College ICR$+SCH$+MAJOR$+DEGREE$/ Perm State Budget incl Temp	Total Instruction/ Perm State Budget incl Temp
Astronomy	88.51	6,669,994	8,045,419	1,451,373	1,020,936	17,829	7,708,759	11,691	1,964,088	200	313,200	6	5,346	2,282,634	0.56	34.22%
Atmospheric Sciences	12.41	964,799	630,775	142,371	103,930	1,329	1,070,058	5,757	967,176	-	-	-	-	967,176	1.15	100.25%
Biosphere 2	-	-	115,132	19,709	12,767	-	12,767	-	-	-	-	-	-	-	0.00	0.00%
Chemistry/Biochemistry	94.53	8,796,514	4,484,167	1,061,549	772,758	144,810	9,714,082	43,505	7,308,840	1,316	2,060,856	74	65,934	9,435,630	1.19	107.27%
Cognitive Science	8.40	486,097	250,672	32,838	23,972	-	510,069	75	12,600	-	-	-	-	12,600	0.09	2.59%
Computer Science	26.12	2,545,014	1,022,823	410,628	288,214	13,441	2,846,669	7,967	1,338,456	1,016	1,591,056	66	58,806	2,988,318	1.34	117.42%
Dean's Office	23.09	1,341,640	41,718	9,908	9,908	-	1,351,548	-	-	254	397,764	-	-	397,764	0.30	29.65%
Ecology/Evolutionary Biology	35.39	3,402,463	1,210,097	283,657	207,069	14,158	3,623,690	12,592	2,115,456	1,245	1,949,670	72	64,152	4,129,278	1.30	121.36%
Geosciences	35.04	3,264,558	953,651	222,515	142,188	14,299	3,421,045	17,033	2,861,544	238	372,708	16	14,256	3,248,508	1.06	99.51%
Hydrology/Water Resources	19.01	1,670,447	1,127,193	271,627	184,602	6,086	1,861,135	2,108	354,144	62	97,092	1	891	452,127	0.43	27.07%
Mathematics	96.27	8,507,260	1,041,635	249,625	177,102	270,628	8,954,990	46,662	7,839,216	1,185	1,855,710	71	63,261	9,758,187	1.18	114.70%
Molecular/Cellular Biology	24.73	2,492,758	1,393,579	315,034	226,977	25,119	2,744,854	13,393	2,250,024	1,051	1,645,866	112	99,792	3,995,682	1.73	160.29%
Neuroscience	16.36	1,308,749	771,247	193,231	141,059	1,016	1,450,824	928	155,904	-	-	-	-	155,904	0.27	11.91%
Physics	41.79	4,009,445	988,186	241,901	155,602	44,186	4,209,233	15,321	2,573,928	397	621,702	16	14,256	3,209,886	0.86	80.06%
Planetary Sciences	28.89	1,524,758	4,445,989	1,095,816	807,940	591	2,333,289	4,594	771,792	-	-	-	-	771,792	1.22	50.62%
Psychology	31.56	3,197,716	828,767	203,933	148,870	224,866	3,571,452	36,599	6,148,632	4,244	6,646,104	385	343,035	13,137,771	4.17	410.85%
Speech/Hearing Sciences	20.63	1,654,289	513,958	122,453	68,006	14,078	1,736,373	6,585	1,106,280	660	1,033,560	-	-	2,139,840	1.37	129.35%
Tree-Ring Laboratory	14.02	997,763	235,467	62,785	45,834	-	1,043,597	1,357	227,976	-	-	-	-	227,976	0.29	22.85%
College of Science Total	**616.75**	**52,834,264**	**28,100,475**	**6,390,953**	**4,537,733**	**792,436**	**58,164,433**	**226,167**	**37,996,056**	**11,868**	**18,585,288**	**819**	**1,228,500**	**57,809,844**	**1.22**	**109.42%**
University	**5,532.17**	**589,553,400**	**81,307,760**	**19,846,778**	**61,460,982**	**-**	**651,014,382**	**933,199**	**174,508,213**	**36,103**	**22,383,860**	**3,450**	**5,175,000**	**202,067,073**	**0.38**	**34.27%**

College of Science
FY2011 and FY2012 Budget, ICR, SCH and Majors

								Undergraduate						Grad/GIDP			
		A	B	C	D	E	A+D+E	F	G	H	I	J	K	L	G+I+K+L	C+G+I+K+L /A	G+I+K+L/A
Department	Grant Expenditures FY2011	Perm State Budget including Temp Funding FY2012	ICR Return to University FY2011	ICR Return to College FY2011	ICR Return to Department FY2011	Summer Session Dist FY2011	Total Department Budget	Total SCH FY2012	SCH * $159.51	Total Majors FY2012	Majors * $1524.80	Total Degrees FY2012 Fall Only	Degrees * $805.46	Grad $ + GIDP $ FY2011	Total Instruction	College ICR$+Total Instruction/ Perm State Budget incl Temp	Total Instruction/ Perm State Budget incl Temp
Astronomy	76,611,030	7,175,600	8,604,075	1,688,639	1,206,773	17,829	8,400,202	10,242	1,633,701	74	112,835	-	-	180,441	1,926,978	0.50	26.85%
Atmospheric Sciences	2,551,910	922,450	778,400	191,861	140,059	1,329	1,063,838	4,817	768,360	-	-	-	-	114,890	883,250	1.17	95.75%
Biosphere 2	2,202,508	-	271,806	31,679	21,505	-	21,505	276	44,025	-	-	-	-	-	44,025	0.00	0.00%
Chemistry Biochemistry	15,945,523	8,431,318	4,175,275	1,020,987	743,358	144,810	9,319,486	39,486	6,298,412	593	904,206	19	15,304	676,876	7,894,798	1.06	93.64%
Cognitive Science	93,685	423,088	31,022	12,098	8,832	-	431,920	1,126	179,608	-	-	-	-	1,965	181,573	0.46	42.92%
Computer Science	1,865,752	2,430,403	495,068	189,321	137,323	13,441	2,581,167	8,215	1,310,375	515	785,272	38	30,607	369,657	2,495,911	1.10	102.70%
Ecology/Evolutionary Biology	5,911,619	3,410,663	1,241,217	291,829	213,035	14,158	3,637,856	10,269	1,638,008	637	971,298	21	16,915	161,916	2,788,136	0.90	81.75%
Flandrau Science Center	13,644	261,421	4,153	1,038	758	-	262,179	-	-	-	-	-	-	-	-	0.00	0.00%
Geosciences	5,764,368	3,513,347	1,175,637	273,267	199,485	14,299	3,727,131	12,147	1,937,568	135	205,848	5	4,027	396,232	2,543,675	0.80	72.40%
Hydrology/Water Resources	4,541,232	2,043,508	1,141,910	261,322	182,157	6,086	2,231,751	1,345	214,541	38	57,942	1	805	244,715	518,004	0.38	25.35%
Mathematics	5,566,769	7,977,222	984,512	294,326	209,733	270,628	8,457,583	52,018	8,297,391	456	695,309	11	8,860	268,411	9,269,971	1.20	116.21%
Molecular/Cellular Biology	5,680,390	2,275,533	1,317,383	291,477	209,780	25,119	2,510,432	11,269	1,797,518	445	678,536	34	27,386	202,893	2,706,333	1.32	118.93%
Neuroscience (GIDP, MBB)	2,349,153	1,504,840	685,706	169,761	123,926	1,016	1,629,782	1,921	306,419	165	251,592	-	-	44,954	602,965	0.51	40.07%
Physics	5,153,474	3,933,391	1,167,392	289,342	208,235	44,186	4,185,812	13,341	2,128,023	194	295,811	6	4,833	259,455	2,688,122	0.76	68.34%
Planetary Sciences	18,209,500	3,006,235	4,691,213	1,181,259	862,319	591	3,869,145	2,935	468,162	-	-	-	-	155,020	623,182	0.60	20.73%
Psychology	3,153,973	3,529,121	693,537	183,941	134,277	224,866	3,888,264	31,676	5,052,639	2,112	3,220,378	119	95,850	159,463	8,528,329	2.47	241.66%
Science Administration	10,292	2,355,144	699	7,589	7,589	-	2,362,733	49	7,816	67	102,162	-	-	-	109,978	0.05	4.67%
SISTA	3,050,580	110,000	357,981	274,453	199,469	-	309,469	3,337	532,285	66	100,637	-	-	-	632,922	8.25	575.38%
Speech/Hearing Sciences	2,371,817	1,880,835	550,630	121,897	88,985	14,078	1,983,898	5,152	821,796	324	494,035	22	17,720	530,632	1,864,183	1.06	99.11%
Tree-Ring Laboratory	1,272,558	1,029,505	285,205	66,790	48,757	-	1,078,262	1,444	230,332	-	-	-	-	1,343	231,675	0.29	22.50%
College of Science Total	162,319,777	56,213,624	29,252,821	6,842,876	4,946,355	792,436	61,952,415	211,065	33,666,978	5,821	8,875,861	276	222,307	3,768,863	46,534,009	0.95	82.78%
University	507,853,101	618,061,800	88,097,543	20,400,700	-	-	706,159,343	806,469	128,639,870	36,103	55,049,854	3,450	2,778,837	28,459,567	214,928,129	0.38	34.77%

College of Science
FY2012 Budget, ICR, SCH and Majors

							Undergraduate						Grad/GIDP			
	A	B	C	D	E	A+D+E	F	G	H	I	J	K	L	G+I+K+L	C+G+I+K+L /A	G+I+K+L/A
Department	Perm State Budget including Temp Funding FY2012	ICR Return to University FY2012	ICR Return to College FY2012	ICR Return to Department FY2012	Summer Session Dist FY2012	Total Department Budget	Total SCH FY2012	SCH * $159.51	Total Majors FY2012 (Fall 2011)	Majors * $1524.80	Total Degrees FY2012 Fall Only	Degrees * $805.46	Grad $ + GIDP $ FY2011	Total Instruction	College ICR$+Total Instruction/ Perm State Budget incl Temp	Total Instruction/ Perm State Budget incl Temp
Astronomy	7,175,600	8,392,840	2,131,424	1,150,891	18,675	8,345,166	10,242	1,633,701	89	135,936	-	-	180,441	1,950,078	0.57	27.18%
Atmospheric Sciences	922,450	660,300	222,837	126,825	18,462	1,067,737	4,817	768,360	-	-	-	-	114,890	883,250	1.20	95.75%
Biosphere 2	-	470,743	42,068	26,957	-	26,957	276	44,025	-	-	-	-	-	44,025	0.00	0.00%
Chemistry Biochemistry	8,431,318	3,429,797	1,168,291	636,262	129,458	9,197,038	39,486	6,298,412	637	971,054	19	15,304	676,876	7,961,645	1.08	94.43%
Cognitive Science	423,088	21,445	3,171	2,172	-	425,260	1,126	179,608	-	-	-	-	1,965	181,573	0.44	42.92%
Computer Science	2,430,403	577,799	207,449	118,645	26,702	2,575,750	8,215	1,310,375	497	757,475	38	30,607	369,657	2,468,114	1.10	101.55%
Ecology/Evolutionary Biology	3,410,663	1,092,473	339,806	182,316	16,457	3,609,436	10,269	1,638,008	686	1,046,501	21	16,915	161,916	2,863,340	0.94	83.95%
Flandrau Science Center	261,421	8,094	3,328	2,661	-	264,082	-	-	-	-	-	-	-	-	0.01	0.00%
Geosciences	3,513,347	1,012,771	298,698	169,160	18,087	3,700,594	12,147	1,937,568	127	194,153	5	4,027	396,232	2,531,980	0.81	72.07%
Hydrology/Water Resources	2,043,508	875,571	246,065	138,859	8,604	2,190,971	1,345	214,541	41	61,754	1	805	244,715	521,816	0.38	25.54%
Mathematics	7,977,222	1,019,666	354,803	203,227	264,478	8,444,927	52,018	8,297,391	421	642,292	11	8,860	268,411	9,216,954	1.20	115.54%
Molecular/Cellular Biology	2,275,533	968,775	262,700	168,780	32,480	2,476,793	11,269	1,797,518	386	588,009	34	27,386	202,893	2,615,805	1.26	114.95%
Neuroscience (GIDP, MBB)	1,504,840	448,921	144,566	81,645	-	1,586,485	1,921	306,419	165	251,592	-	-	44,954	602,965	0.50	40.07%
Physics	3,933,391	1,051,234	335,111	192,185	77,558	4,203,134	13,341	2,128,023	154	234,911	6	4,833	259,455	2,627,221	0.75	66.79%
Planetary Sciences	3,006,235	6,232,000	1,825,956	1,137,604	138	4,143,977	2,935	468,162	-	-	-	-	155,020	623,182	0.81	20.73%
Psychology	3,529,121	608,648	227,225	123,966	226,076	3,879,163	31,676	5,052,639	2,056	3,134,745	119	95,850	159,463	8,442,696	2.46	239.23%
Science Administration	2,355,144	-	-	-	-	2,355,144	49	7,816	130	198,224	-	-	-	206,040	0.09	8.75%
SISTA	110,000	871,986	317,811	170,306	1,368	281,674	3,337	532,285	41	62,258	-	-	-	594,542	8.29	540.49%
Speech/Hearing Sciences	1,880,835	732,579	189,336	115,890	13,406	2,010,131	5,152	821,796	288	438,624	22	17,720	530,632	1,808,772	1.06	96.17%
Tree-Ring Laboratory	1,029,505	348,558	121,039	68,204	-	1,097,709	1,444	230,332	-	-	-	-	1,343	231,675	0.34	22.50%
College of Science Total	56,213,624	28,824,200	8,441,684	4,816,555	851,949	61,882,128	211,065	33,666,978	5,717	8,717,526	276	222,307	3,768,863	46,375,674	0.98	82.50%
University	618,061,800	87,382,609	20,590,793	-	-	705,444,409	806,469	128,639,870	36,103	55,049,854	3,450	2,778,837	28,459,567	214,928,129	0.38	34.77%

College of Science
FY2013 Budget, ICR, SCH and Majors

							Undergraduate						Grad/GIDP			
	A	B	C	D	E	A+D+E	F	G	H	I	J	K	L	G+I+K+L	C+G+I+K+L/A	G+I+K+L/A
Department	Perm State Budget including Temp Funding FY2013	ICR Return to University FY2013	ICR Return to College FY2013	ICR Return to Department FY2013	Summer Session Dist FY2013	Total Department Budget	Total SCH FY2013	SCH * $159.51	Total Majors FY2013	Majors * $1524.80	Total Degrees FY2013	Degrees * $805.46	Grad $ + GIDP $ FY2011	Total Instruction	College ICR$+Total Instruction/ Perm State Budget incl Temp	Total Instruction/ Perm State Budget incl Temp
Astronomy	5,877,947	7,333,343	1,795,310	1,171,156	19,559	7,068,662	8,452	1,348,179	89	135,936	8	6,444	180,441	1,670,999	0.59	28.43%
Atmospheric Sciences	941,463	656,353	164,012	134,082	28,114	1,103,659	4,314	688,126	-	-	-	-	114,890	803,016	1.03	85.29%
Biosphere 2	-	578,633	138,990	45,847	-	45,847	226	36,049	-	-	-	-	-	36,049	0.00	0.00%
Chemistry Biochemistry	8,473,216	2,891,431	715,323	437,969	97,987	9,009,172	41,796	6,666,880	637	971,054	97	78,130	676,876	8,392,939	1.07	99.05%
Cognitive Science	359,593	-	-	2,517	-	362,110	694	110,700	-	-	-	-	1,965	112,665	0.31	31.33%
Computer Science	1,815,894	668,712	166,473	135,939	37,907	1,989,740	9,147	1,459,038	497	757,475	100	80,546	369,657	2,666,716	1.56	146.85%
Ecology/Evolutionary Biology	3,471,527	1,140,237	265,495	176,634	22,088	3,670,249	10,459	1,668,315	686	1,046,501	92	74,102	161,916	2,950,834	0.93	85.00%
Flandrau Science Center	249,515	14,947	3,737	2,728	-	252,243	-	-	-	-	-	-	-	-	0.01	0.00%
Geosciences	3,376,637	781,598	176,773	175,207	28,075	3,579,919	12,601	2,009,986	127	194,153	24	19,331	396,232	2,619,701	0.83	77.58%
Hydrology/Water Resources	1,987,167	979,084	242,746	170,911	3,059	2,161,137	2,050	326,996	41	61,754	5	4,027	244,715	637,492	0.44	32.08%
Mathematics	8,333,235	886,389	190,963	163,269	341,625	8,838,129	54,014	8,615,773	421	642,292	110	88,601	268,411	9,615,076	1.18	115.38%
Molecular/Cellular Biology	2,396,681	792,048	185,081	125,630	27,813	2,550,124	12,577	2,006,157	383	583,434	141	113,570	202,893	2,906,054	1.29	121.25%
Neuroscience (GIDP, MBB)	1,534,105	431,271	107,780	79,958	-	1,614,063	1,977	315,351	118	179,911	-	-	44,954	540,216	0.42	35.21%
Physics	3,610,581	987,654	245,199	179,440	77,689	3,867,710	13,676	2,181,459	154	234,911	26	20,942	259,455	2,696,766	0.81	74.69%
Planetary Sciences	2,693,765	7,495,350	1,862,554	1,359,665	-	4,053,430	2,873	458,272	-	-	-	-	155,020	613,292	0.92	22.77%
Psychology	3,652,405	689,267	161,995	127,764	194,597	3,974,766	29,788	4,751,484	2,056	3,134,745	534	430,116	159,463	8,475,807	2.36	232.06%
Science Administration	1,945,740	-	-	-	-	1,945,740	1,062	169,400	130	198,224	9	7,249	-	374,873	0.19	19.27%
SISTA	759,378	627,497	156,561	115,036	4,816	879,230	3,903	622,568	41	62,212	-	-	-	684,779	1.11	90.18%
Speech/Hearing Sciences	1,838,225	686,150	158,074	109,349	14,333	1,961,907	6,059	966,471	288	438,624	91	73,297	530,632	2,009,024	1.18	109.29%
Tree-Ring Laboratory	1,038,196	375,226	90,387	78,399	-	1,116,595	2,211	352,677	-	-	-	-	1,343	354,020	0.43	34.10%
College of Science Total	54,355,270	28,015,190	6,827,453	4,791,500	897,662	60,044,432	217,879	34,753,879	5,667	8,641,225	1,237	996,354	3,768,863	48,160,321	1.01	88.60%
University	618,061,800	86,321,603	29,280,229	-	-	704,383,403	838,911	133,814,694	30,664	46,755,751	6,813	5,487,599	28,459,567	214,517,610	0.39	34.71%

FACULTY BIOSKETCHES

Tenure-track faculty:

Avellano, Betterton, Castro, Dominguez, Mullen[1], Ritchie, Zeng

Emeritus faculty:

Herman[2], Krider[3]

Joint faculty

Cole, Comrie, Hirshboeck, Overpeck, Restrepo, Showman, Shuttleworth, Sorooshian, Winter

Lecturers

Weidman[4], Ward[4]

Research faculty

Conant, Cummins, Serra, Sprigg

[1]For personal health and family reasons, Mullen has doubled the teaching load and decreased research activities, leading to a short biosketch

[2]Without research activities during this period, Herman's biosketch is not included

[3]Krider was a regular faculty for part of the APR period, and he remains active in research after reitrement

[4]With teaching as their primary job, Weidman and Ward's biosketches are short

TENURE-TRACK FACULTY

Biographical Sketch: Avelino F. Arellano, Jr.

A. Professional Preparation

Duke University	Environment	Ph.D.	2005
National University of Singapore	Civil and Envi Engineering	M.Engg.	2000
University of the Philippines	Mining Engineering,	B.S.	1992

B. Appointments

2010-date Assistant Professor, Department of Atmospheric Sciences, University of Arizona, Tucson, Arizona

2005-2010 Project Scientist (2007-2010) and Postdoctoral Fellow (2005-2007), National Center for Atmospheric Research, Boulder, Colorado

2000-2005 Teaching/Research Assistant, Duke University, Durham, North Carolina

C. Research Interests

Data assimilation; atmospheric chemistry and composition; chemical transport modeling and data analysis; remote sensing; biogeochemical cycles

D. Honors and Awards

- NASA Group Achievement for ARCTAS field campaign
- NASA Group Achievement for INTEX-B field campaign

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Silva, S., A.F. Arellano, and H. Worden (2013), Towards anthropogenic combustion emission from space-based analysis of urban CO_2/CO sensitivity, Geophys. Res. Lett., doi: 10.1002/grl.50954.
- Youn, J.S., Z. Wang, A. Wonaschutz, A. Arellano, E.A. Betterton, and A. Sorooshian (2013), Evidence of aqueous secondary organic aerosol formation from biogenic emissions in the North American Sonoran Desert, Geophys. Res. Lett., 40, 3468-3472, doi:10.1002/grl.50644.
- Worden, H. M., D.P. Edwards, M.N. Deeter, D. Fu, S.S. Kulawik, J.R. Worden, and A. Arellano (2013), Averaging kernel prediction from atmospheric and surface state parameters based on multiple regression with MOPITT CO and TES-OMI O_3 multispectral observations, Atmos. Meas. Tech., 6, 1633-1646, doi:10.5194/amt-6-1633-2013.
- Hyers, E.J., J. Wang, and A. Arellano (2012), Biomass Burning - Observations, Modeling, and Data Assimilation, Bull. Am. Meteorol. Soc., 93(1), ES10-ES14, doi: 10.1175/BAMS-D-11-00064.1.
- Friedli, H.R., A.F. Arellano, Jr., F. Geng, C. Cai and L. Pan (2011), Measurements of atmospheric mercury in Shanghai during September 2009, Atmos. Chem. Phys., 11, 3781-3788, doi:10.5194/acp-11-3781-2011.
- Arellano Jr., A. F., P. G. Hess, D. P. Edwards, and D. Baumgardner (2010), Constraints on black carbon aerosol distribution from Measurement Of Pollution In The Troposphere (MOPITT) CO, Geophys. Res. Lett., 37, L17801, doi:10.1029/2010GL044416.
- Pfister, G. G., L.K. Emmons, D.P. Edwards, A. Arellano, G. Sachse, and T. Campos, (2010), Variability of springtime transpacific pollution transport during 2000–2006: the INTEX-B mission in the context of previous years, Atmos. Chem. Phys., 10, 1345-1359.
- Friedli, H., A.F. Arellano, S. Cinnirella, and N. Pirrone, (2009), Initial estimates of mercury emissions to the atmosphere from global biomass burning, Environ. Sci. Technol., 43, 3507-3513.
- Edwards, D.P., A.F. Arellano, and M.N. Deeter, (2009), A satellite observation system simulation experiment for carbon monoxide in the lowermost troposphere, J. Geophys. Res.,114, D14304, doi:10.1029/2008JD011375.
- Malmberg, A., A. Arellano, D. Edwards, N. Flyer, D. Nychka and C. Wikle, (2009), Interpolating fields of carbon monoxide data using a hybrid statistical-physical model, The Annals of Applied Statistics, 2(4), 1231-1248, doi:10.1214/08-AOAS168.

- Anderson, J.L., T. Hoar, K. Raeder, H. Liu, N. Collins, R. Torn and A. Arellano, (2009), The Data Assimilation Research Testbed: A community data assimilation facility, Bull. Am. Meteorol. Soc., 90(9),1283-1296.
- Arellano, A.F., K. Raeder, J. Anderson, P. Hess, L. Emmons, D. Edwards, G. Pfister, T. Campos, and G. Sachse, (2007), Evaluating model performance of an ensemble-based chemical data assimilation system during INTEX-B field mission, Atmos. Chem. Phys., 7, 5695-5710.
- Bian, H., M. Chin, S.R. Kawa, B. Duncan, A. Arellano, and P. Kasibhatla, (2007), Sensitivity of global CO simulations to uncertainties in biomass burning sources, J. Geophys. Res., 112, D23308, doi:10.1029/2006JD008376.

E2. Books and Book Chapters

- Friedli, H., A.F. Arellano, S. Cinnirella, and N. Pirrone, (2009), Mercury Emissions from Global Biomass Burning: Spatial and Temporal Distribution, in Mercury Fate and Transport in the Global Atmosphere, eds. N. Pirrone and R. Mason, Spinger, New York, p. 193-220.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Arellano, A.F., (2013), Towards Seamless Prediction of Atmospheric Composition Using Ensemble-based Data Assimilation, Traversing New Terrain in Meteorological Modeling Air Quality and Dispersion, UC Davis, Davis, CA, 10-12 Sep.
- Arellano, A.F., (2013), Towards Seamless Prediction of Chemical Weather, SIAM Student Chapter, Program in Applied Mathematics, University of Arizona, Tucson, AZ, 25 Mar.
- Arellano, A.F., (2013), Towards Seamless Prediction of Chemical Weather, 2013 Alaska Weather Symposium, University of Alaska, Fairbanks, AK, 12-13 Mar (Keynote).
- Arellano, A.F., and D.P. Edwards (2012), GEOCAPE CO, Atmospheric Composition Observation System Simulation Experiments (OSSE) Workshop, European Centre for Medium Range Forecast, Reading, UK, 22-24 Oct.
- Arellano, A.F., (2011), The Air We Breathe in the Midst of a Changing World, University of Arizona Science Connections, Science Café, Cushing St., Arizona, 8 Nov.
- Arellano, A.F., (2011), Toward seamless prediction of chemical weather, University of Arizona ADVANCE Sustainable Technology Data Blitz, Biosphere2, Arizona, 16 Apr.
- Arellano, A.F., (2010), Exploiting Satellite CO Data for NWP, NASA Science Community Workshop on Polar Orbiting IR and MW Sounders, Greenbelt, Maryland, 1-2 Nov.
- Arellano, A.F., (2010), Exploring the potential of an ensemble-based data assimilation system as a tool for studies related to tropospheric composition, Japan Agency for Marine-Earth Science and Technology Seminar, 1-9 Mar.
- Arellano, A.F., (2007), Data Assimilation for Tropospheric CO, NCAR/IMAGe Summer Graduate Workshop on Data Assimilation for the Carbon Cycle, Boulder, CO, 8-13 Jul.

G. Contributed Presentations (Jan 2007-present)

- Seventeen (17) presentations as the lead author; twelve (12) presentations as a co-author.

H. Current Grants/Contracts

Note that ``Percent Effort" is indicative of my group's share of work on the grant.

- "Top-Down Estimates of the Changes in State-Level CO Emissions in the United States and Its Implications to Verifying Emissions of Fossil-Fuel CO2 and Other Constituents", NASA Atmospheric Chemistry and Modeling and Analysis Program (ACMAP), $368,892, 9/15/13-9/14/16, % Effort: 100%, Principal Investigator

- "Estimating carbon flux and storage: constraint of the Community Land Model using observations at different temporal scales", DOE Office of Biological and Environmental Research, $970,020, 8/1/13-2/28/16, % Effort: 30%, Co-Investigator.
- "Impact of Total Column Water Vapor Measurements on Short-to-Medium Range Forecasts of North American Monsoon Precipitation", NSF Large-Scale Dynamics Program, $482,592, 6/1/13-5/31/16, % Effort: 30%, Co-Investigator.
- "A framework for Regional-Scale Atmospheric Composition Observation System & Simulation Experiments", NASA Atmospheric Chemistry and Modeling and Analysis Program (ACMAP), $745,650, 4/1/11-3/31/14, % Effort: 30%, Co-Investigator.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Member, Proposal Review Panel, NOAA and NASA
- Member, Editorial Board, Frontiers in Atmospheric Science
- Contributor, Data Assimilation Research Testbed, NCAR, Boulder, CO
- Contributor, Part B: Mercury of the Task Force on Hemispheric Transport of Air Pollution (HTAP) Draft Report
- Co-Chair, NCAR Early Career Scientist Assembly (ECSA) Junior Faculty Forum on Future Scientific Directions 2010, 13-15 Jul, NCAR, Boulder, CO

I2. University, College, Department

- Coordinator, UA Department of Atmospheric Science (ATMO) Seminar Series (2010-2013)
- Member, UA Graduate Interdisciplinary Program (GIDP) in Remote Sensing and Spatial Analysis
- Member, Proposal Review Panel, UA Water Environmental and Energy Solutions Grants Program

I3. Local/Community

- Gave lectures on atmospheric sciences (UA Science Connections, UA ADVANCE)

J. Synergistic Activities

(i) Software Development/Value-added Retrievals: Contributed to a) the development and improvements of the Data Assimilation Research Testbed community software package, b) frontier applications of NASA/Terra MOPITT CO retrievals

(ii) Major Community Support: Participated in two NASA-led field missions; Member, Science Definition team for the Phase 1 of NASA Carbon Monitoring System (CMS)

(iii) Major Teaching Innovation: Developed a new course on data assimilation for students in Earth sciences; Taught an online course on remote sensing

Biographical Sketch: Eric A. Betterton

A. Professional Preparation

University of the Witwatersrand	Chemistry	Ph.D.	1983
University of Natal	Chemistry	B.Sc.Hons	1975
University of Natal	Chemistry & Applied Chemistry	B.Sc.	1974

B. Appointments

1988-date	Head and Director (2007-present), Professor (2000 - present), Associate Professor (1994-2000, Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
1987-1988	Assistant Professor, California State University, Northridge
1985-1987	Research Fellow, California Institute of Technology, Pasadena

C. Research Interests

My research in the laboratory and in the field is focused on environmental pollutants, especially those found in the air and water that might affect people. For example, I study toxic metals in airborne dust, and the chemistry of rain and snow.

D. Honors and Awards

- University Distinguished Professor Award, 2013
- Professor Leon and Pauline Blitzer Award for Excellence in the Teaching of Physics and Related Sciences, March 2012
- UA at the Leading Edge Recognition, for cutting-edge research, March 2012

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Youn, J. –S., Z. Wang, A. Wonaschütz, A. Arellano, E. A. Betterton, and A. Sorooshian (2013). Evidence of aqueous secondary organic aerosol formation from biogenic emissions in the North American Sonoran Desert, *Geophys. Res. Lett*., *40*, doi:10.1002/grl.50644.
- Sorooshian, A., Csavina, J., Shingler, T., Dey, S., Brechtel, F., Sáez, E., Betterton, E. (2012), Hygroscopic and Chemical Properties of Aerosols collected near a Copper Smelter: Implications for Public and Environmental Health, Environmental Science and Technology, 46, 9473-9480.
- Janae Csavina, Jason Field, Mark P. Taylor, Song Gao, Andrea Landázuri, Eric A. Betterton, A. Eduardo Sáez (2012), A Review on the Importance of Metals and Metalloids in Atmospheric Dust and Aerosol from Mining Operations, Science of the Total Environment, 433, 58-73.
- Theresa Foley, Eric A. Betterton*, Ann Marie A. Wolf (2012), Ambient PM_{10} and metal concentrations measured in the Sunnyside Unified School District, Tucson, Arizona; J. Arizona-Nevada Academy of Science, 43, 67-76.
- Theresa Foley, Eric A. Betterton*, Robert Jacko, John Hillery, Lake Michigan air quality: the 1994 to 2003 LADCO Project (2012), Atmos. Environ., 45, 3192-3202.
- J. Csavina, A. Landázuri, A. Wonaschütz, K. Rine, P. Rheinheimer, B. Barbaris, W. Conant, A.E. Sáez and E.A. Betterton (2011), Metal and Metalloid Contaminants in Atmospheric Aerosols from Mining Operations, Journal of Water Air and Soil Pollution, 221, 145-157.
- Sorooshian, A. Wonaschutz A., Jarjour Elias G.; Bryce I. Hashimoto, Bret A. Schichtel, Eric A. Betterton; An aerosol climatology for a rapidly growing arid region (southern Arizona): Major aerosol species and remotely sensed aerosol properties (2011). J. Geophysical Research – Atmospheres, 116, 20 pp. DOI: 10.1029/2011JD016197.
- Eric A. Betterton, Joe Lowry, Robin Ingamells, Brad Venner (2010), Kinetics and Mechanism of the Reaction of Sodium Azide with Hypochlorite in Aqueous Solution, J. Haz. Materials, 182, 716-722.

- Willinger M, Rupp E, Barbaris B, Gao S, Arnold R, Betterton E, Sáez AE, Thermocatalytic destruction of gas-phase perchloroethylene using propane as a hydrogen source (2009), J Hazard. Mater., Jan 23. PMID: 19217713.
- Rupp, Erik C., Betterton, Eric A. Arnold, Robert G. Saez, A. Eduardo (2009), Interaction of Perchloroethylene with Cerium Oxide in Three-Way Catalysts, Catalysis Letters, 132, 153-8.
- Gao, S.; Rupp, E.; Bell, S.; Willinger, M.; Foley, T.; Barbaris, B.; Saez, A. E.; Arnold, R. G.; Betterton, E. (2008), Mixed Redox Catalytic Destruction of Chlorinated Solvents in Soils and Groundwater. In Environmental Challenges In The Pacific Basin; Annals of the New York Academy of Sciences, Vol. 1140, pp 435-445. PMID: 18991945
- Örbay, O.; Gao, S.; Barbaris, B.; Rupp, E.; Saez, E.; Arnold, R. G.; Betterton, E. A., Catalytic dechlorination of gas-phase perchloroethylene under mixed redox conditions (2008), Applied Catalysis B-Environmental, 79, (1-2), 43-52. PMID: 19234593

E2. Books and Book Chapters

None.

E3. Other Scholarly Activities (e.g., patents)

- U.S. Provisional Patent Application No.: *61/820,797*. For: Solar Irradiance Measurement System and Weather Model Incorporating the Results of Such Measurement. Filed: May 8, 2013.

F. Invited Talks (Jan 2007-present)

- Eric A. Betterton, Dust Sampling and Decoding Results into Regulatory Framework, Center for Environmentally Sustainable Mining, Tucson, April 24, 2013.
- Eric A. Betterton, Airborne Particulate Matter. What it is and Why it Matters. UA College of Public Health Student Seminar, April 24, 2013.
- E. A. Betterton, Mine Tailings: Enumeration and Remediation, US EPA CLU-In webinar, January 11, 2012. http://www.clu-in.org/conf/tio/tailings/
- Eric A. Betterton; Janae L. Csavina; Jason P. Field; Andrea C. Landázuri; Omar Felix Villar; Kyle P. Rine; A. Eduardo Sáez; Jana Pence; Homa Shayan; Mike Stovern ; MacKenzie Russell, Atmospheric Aerosols from Mining Operations in Hayden and Dewey-Humboldt, AZ, US EPA, Live at 9, San Francisco, December 2011.
- E. A. Betterton , J. Csavina A.E. Sáez,, A. Landázuri, O. Felix, A. Wonaschutz, W. Conant, B. Barbaris, K. Rine, J. Pence, H. Shayan, J. Field, Characterizing Atmospheric Aerosols from Mining Operations, U.S. EPA National Association of Remedial Project Mangers (NARPM) Annual Training Program, Kansas City, May 2011.
- Eric Betterton, Jason Field, Kyle Rine, Jana Pence, Homa Shayan, Eduardo Sáez, Janae Csavina, Andrea Landazuri , Monica Ramirez, Superfund-Related Partnerships, U.S. EPA National Association of Remedial Project Mangers (NARPM) Annual Training Program, Kansas City, May 2011.

G. Contributed Presentations (Jan 2007-present)

- Twenty-three (23) presentations as a co-author.

H. Current Grants/Contracts

- Betterton, Cronin, Leuthold co-Is, Solar forecasting technology, UA Tech Launch Arizona, Proof of Concept Grant, $50k, October 2012.
- Betterton & Leuthold, co-Is, Tucson Electric Power, Solar energy forecasting, $70,000. January 2013.
- Betterton (PI), WEES, Computer Cluster: 672 Cores; $50,000
- Betterton (PI), NIH/NIEHS, 2011, $40,000. Organize an expert panel workshop: Airborne Mineral Dust Contaminants: Impacts on Human Health and the Environment, held in Tucson, May 20-21, 2013. http://superfund.pharmacy.arizona.edu/content/airborne-mineral-dust-contaminants

- Betterton (PI), Supplemental support for Airborne Mineral Dust Contaminants Workshop, UA Lowell Institute for Mineral Resources, $5k
- Betterton (PI), Supplemental support for Airborne Mineral Dust Contaminants Workshop, UA Water Sustainability Program, UA Renewal Energy Network, $5k
- Betterton (PI) UA Renewable Energy Network, 2011, $60,000. Experimental determination of spectral aerosol optical depth in Tucson.
- Betterton (PI) 10/1/2008 – 9/30/2011 EPA, $360,000 Pollution Prevention (P2) Grant
- Betterton (PI), Sáez, Conant, 2010 – 2014 NIH/NIEHS Superfund, $1.2M, Characterization of Wind Blown Dust from Tailings and other Mining Operations in the Southwestern United States
- Betterton (PI) 2011-2011, U. Arizona Initiative for Development of Online Programs $50k Bachelor of Applied Science (Meteorology).

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Member, UCAR Board of Trustees, 2012-present.
- UCAR, Members Nominating Committee, Oct 2009-2010.
- American Geophysical Union, Chair, Committee on Public Affairs, 2008-2010.
- American Institute of Physics, Advisory Committee for Public Policy July 1, 2009-June 30, 2012.
- National Academy National Research Council, Research Associateship Program Review Panels Chair, 2005-2009.
- National Academy National Research Council, Jefferson Science Fellows program, ongoing.

I2. University, College, Department

- UA NASA Space Grant Executive Committee – ongoing.
- University Strategic Planning and Budget (SPBAC) committee, elected 2006; re-elected 2009.
- University Radiation Safety Committee, 2005-present; elected Chair 2012.
- Rhodes, Marshall, and Fulbright, Scholarships: UA Interview panels - ongoing.
- Member, UA Superfund executive committee - ongoing.
- Astronaut Scholarship Foundation review panel (UA) March, 2011.

I3. Local/Community

- Chair, Pima County Environmental Quality Advisory Council; 2013-present.
- Member, Sonoran Environmental Research Institute, Community Advisory Board, 2007-present.

J. Synergistic Activities

- Consulting
    - Pima County Department of Environmental Quality – Rosemont Copper air quality impacts.
    - ITSI Gilbane Corp. – ASARCO Hayden airborne lead study.

Biographical Sketch: Christopher L. Castro

A. Professional Preparation

Colorado State University	Atmospheric Science	Ph.D.	2005
Colorado State University	Atmospheric Science	M.S.	2000
Pennsylvania State University	Meteorology with Highest Distinction	B.S.	1997

B. Appointments

2006-date Associate Professor (2012-present) and Assistant Professor (2006-2012), Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona, USA.

1997-2006 Postdoctoral Fellow (2005-2006), and Graduate Research Assistant (1997-2005), Department of Atmospheric Science, Colorado State University, Fort Collins, Colorado, USA.

1996-1997 Student Protégé, Significant Opportunities in Atmospheric Research and Science (SOARS) Program, University Corporation for Atmospheric Research, National Center for Atmospheric Research, Boulder, Colorado, USA.

C. Research Interests

Regional atmospheric modeling and dynamical downscaling, climate variability and change, numerical weather prediction, the North American monsoon, synoptic and mesoscale meteorology, hydrometeorology, organized convection and severe weather, and land-atmosphere interactions.

D. Honors and Awards

- National Aeronautics and Space Administration (NASA), Earth System Science Fellowship (2000-2003)
- Evan Pugh Scholar Award, Pennsylvania State University (1997)
- Jerome N. Berhmann Award, Department of Meteorology, Pennsylvania State University (1997)
- Pennsylvania State University Diversity Scholarship (1993-1997)

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers (in descending chronological order by year)

- Ciancarelli, B., C.L. Castro, C. Woodhouse. F. Dominguez, H. Chang, C. Carrillo, and D. Griffin, 2013. Dominant patterns of US warm season precipitation variability in a fine resolution observational record, with a focus on the southwest. *Int. J. Climatol*., DOI: 10.1002/joc.3716.
- Griffin, D., C.A. Woodhouse, D.M. Meko, D.W. Stahle, H.L. Faulstich., C. Carrillo, R. Touchan, C.L. Castro, and S.W. Leavitt, 2013. North American monsoon precipitation reconstructed from tree-ring latewood, *Geophys. Res. Lett*, doi:10.1002/grl.50184.
- Woodhouse, C.A., D.M. Meko, D. Griffin, and C.L. Castro, 2013. Tree rings reveal multi-season drought variability in the lower Rio Grande Basin, USA. *Water Resour. Research*, doi:10.1002/wrcr.20098.
- Castro, C.L., H. Chang, F. Dominguez, C. Carrillo, J. Kyung-Schemm, H-M.H. Juang, 2012. Can a Regional Climate Model Improve the Ability to Forecast the North American Monsoon? *J. Climate*, 25, 8212-8237.
- Dominguez, F., E. Rivera, D.P. Lettenmaier, and C.L. Castro, 2012. Changes in winter precipitation extremes for the western United States under a warmer climate as simulated by regional climate models. *Geophys. Res., Lett*, 39, L05803, doi:10.1029/2011GL050762.
- Minjarez-Sosa, C.M., C.L. Castro, K.L. Cummins, E.P. Krider, and J. Waissmann, 2012. Toward Development of Improved QPE in Complex Terrain Using Cloud-to-Ground Lightning Data: A Case Study for the 2005 Monsoon in Southern Arizona. *J. Hydrometeor*., 13, 1855-1873.

- Wi, S., F. Dominguez, M. Durcik, J. Valdes, H.F. Diaz, and C.L. Castro, 2012. Climate change projection of snowfall in the Colorado River Basin using dynamical downscaling. *Water Resour. Res*., 48, W05504, doi:10.1029/2011WR010674.
- Leavitt,S., C.A. Woodhouse, C.L. Castro, W.E. Wright, D.M. Meko, R. Touchan, D. Griffin, and B. Ciancarelli, 2011. The North American monsoon in the U.S. Southwest: Potential for investigation with tree-ring carbon isotopes. *Quarternary International*, 235, 101-107.
- Zeng, X., M. Barlage, C. Castro, and K. Fling, 2010. Comparison of land-precipitation coupling strength using observations and models. *J. Hydrometeor.,* 11, 980-995.
- Bieda III, S.W., C.L. Castro, S.L. Mullen, A. Comrie, and E. Pytlak, 2009. The Relationship of Transient Inverted Upper-Level Troughs to Variability of the North American Monsoon System. *J. Climate*, 22, 4213-4227.
- Castro, C.L., A.B. Beltrán-Przekurat, and R.A. Pielke, Sr., 2009. Spatiotemporal variability of precipitation, modeled soil moisture and vegetation greenness in North American within the recent observational record. *J. Hydrometeor*., 10, 1355-1378.
- Switanek, M.B., P.A. Troch, and C.L. Castro, 2009. Improving Predictions of Climate Variability and Water Availability at the Catchment Scale. *J. Hydrometeor.*, 10, 152-1533.
- Troung, N.M., T.T. Tien, R.A. Pielke, Sr., C.L. Castro, and G. Leoncini, 2009. A modified Kain-Fritsch Scheme and its application for simulation of an extreme precipitation event in Vietnam. *Mon. Wea. Rev*., 137, 766-789.
- Weiss, J.L., C.L. Castro, and J.T. Overpeck, 2009. Distinguishing Pronounced Droughts in the Southwestern U.S.A.: Seasonality and Effects of Warmer Temperatures *J. Climate*, 22, 5918-5932.
- Lyon, S.W., F. Dominguez, D.J. Gochis, N.A. Brunsell, C.L. Castro, F.K. Chow, Y. Fan, D. Fuka, P.A. Kucera, S.W. Nesbitt, N. Salzmann, J. Schmidli, P.K. Snyder, A.J. Teuling, T.E. Twine, S. Levis, J.D. Lundquist, G.D. Salvucci, A.M. Sealy, and M.T. Walter, 2008. Coupling Terrestrial and Atmospheric Water Dynamics to Improve Prediction in a Changing Environment. *Bull. Amer. Meteor. Soc*., 89, 1275-1279.
- Rockel, B., C.L. Castro, R.A. Pielke, Sr., H. von Storch, and G. Leoncini, 2008. Dynamical downscaling: Assessment of model system dependent retained and added variability for two different regional climate models . *J. Geophys. Res.*, 113, D21107, doi:10.1029/2007JD009461.
- Castro, C.L., R.A. Pielke, Sr., and J.O. Adegoke, 2007. Investigation of the Summer Climate of the Contiguous U.S. and Mexico Using the Regional Atmospheric Modeling System (RAMS). Part I: Model Climatology (1950-2002). *J. Climate*, 20, 3866-3887.
- Castro, C.L., R.A. Pielke, Sr., J.O. Adegoke, S.D. Schubert, and P.J. Pegion, 2007. Investigation of the Summer Climate of the Contiguous U.S. and Mexico Using the Regional Atmospheric Modeling System (RAMS). Part II: Model Climate Variability. *J. Climate*, 20, 3888-3901.
- Pielke Sr., R.A., D. Stokowski, J.-W. Wang, T. Vukicevic, G. Leoncini, T. Matsui, C. Castro. D. Niyogi, C.M. Kishtawal, A. Biazar, K. Doty, R.T. McNider, U. Nair, and W.K. Tao, 2007. Satellite-based model parameterization of diabatic heating. *EOS*, Vol. 88, 8, 20 February, 96-97.

E2. Books and Book Chapters

- Cayan, D, M. Tyree, K.E. Kunkel, C. Castro, A. Gurshonov, J. Barsugli, A.J. Ray, J. Overpeck, M. Anderson, B. Rajagopalan, I. Rangwala, and P. Duffy, 2013: Future Climate: Projected Average, Chapter 6 of *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Change Assessment*. A report by Southwest Climate Alliance. G. Garfin, A. Jardine, R. Merideth, M. Black, and S. Leroy, Eds., Washington, DC: Island Press.
- Gurshunov, A., J. Overpeck, K. Guirguis, D. Cayan, M. Dettinger, C. Castro, R.E. Schwartz, M. Anderson, A.J. Ray, J. Barsugli, R. Cavazos, and M. Alexander, 2013: Future Climate: Projected Extremes, Chapter 7 of *Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Change Assessment*. A report by Southwest Climate Alliance. G. Garfin, A. Jardine, R. Merideth, M. Black, and S. Leroy, Eds., Washington, DC: Island Press.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Castro, C.L, 2012. Can a regional climate model improve the ability to forecast the North American monsoon? *National Center for Environmental Prediction, Climate Test Bed Seminar Series*. Camp Springs, Maryland, USA, March 19.
- Castro, C.L., 2011. Use of Dynamical Downscaling to Improve Regional Climate Change Projections in the Southwest U.S. *National Water Resources Association Meeting*. Tucson, Arizona, USA, 17 November.
- Castro, C.L., 2011. ¿Cómo se pueden mejorar las proyecciones del cambio climático y las mediciones ambientales en el Caribe? (In Spanish) [English translation: How can climate change projections and environmental monitoring be improved in the Caribbean?] Presented at *Second Joint Technical Meeting of the Pan American Institute for Geography and History*. Panama City, Panama, 15-17 June.
- Castro, C.L, 2011. Use of Dynamical Downscaling to Improve Regional Climate Change Projections in the Southwest U.S. *Workshop on Water Management and Climate Change in Northern Arizona*. Northern Arizona University, Flagstaff, Arizona, USA, 8 June.
- Castro, C.L., F. Dominguez, and H. Chang, 2011. Creating dynamically downscaling seasonal climate forecast and climate change projection information for the North American Monsoon region suitable for decision making purposes (invited). *25th Conference on Hydrology, 91st American Meteorological Society Annual Meeting*, Seattle, Washington, USA, 22-27 January.
- Castro, C.L. 2011. Creating dynamically downscaled seasonal climate forecast and climate projection information for the North American Monsoon region suitable for decision making purposes. *International Workshop on Dynamic Downscaling*. Tsukuba City, Ibaraki, Japan, 18-20 January.
- Castro, C.L., 2010. ¿Cómo se pueden mejorar las proyecciones del cambio climático y las mediciones ambientales en el Caribe? (In Spanish) [English translation: How can climate change projections and environmental monitoring be improved in the Caribbean?]. Invited presentation at FUNGLODE (National Environmental Agency of the Dominican Republic), sponsored by the U.S. Department of State. Santo Domingo, Dominican Republic, 14 Oct.
- Castro, C.L. 2010. Towards Improvement of Climate Change Projections and Environmental Monitoring in the Caribbean Region. Invited presentation at the University of the West Indies, sponsored by the U.S. Department of State. Kingston, Jamaica, 12 Oct.
- Castro, C.L., and C.Minjarez, 2010. Ground based GPS Receiver Network to Study the North American Monsoon. *Workshop Towards a Unified GPS Network in Mexico*. Puerto Vallarta, Jalisco, Mexico, 20-22 September.
- Castro, C.L., 2010. On the appropriateness of spectral nudging in regional climate models. Invited seminar. Arizona State University. Tempe, Arizona, USA, 7 April.
- Castro, C.L., 2010. ¿Qué se necesita para mejorar los pronósticos estacionales y las proyecciones del cambio climático del monzón norteamericano? (In Spanish) [English translation: What is necessary to improve seasonal forecasts and climate change projections of the North American monsoon?] Invited Seminar. University of Sonora. Hermosillo, Sonora, Mexico, 26 February.
- Castro, C.L., 2010. What is necessary to improve seasonal climate forecasts and climate change projections of the North American Monsoon? Invited presentation. Southeast Arizona chapter of the American Meteorological Society (SEACAMS), Tucson, Arizona, USA, 18 February.
- Castro, C.L., 2010. On the appropriateness of spectral nudging in regional climate models (invited presentation). *International Workshop on Dynamic Downscaling Over Japan*. Tsukuba City, Ibaraki, Japan, 25 – 27 January.
- Castro, C.L., 2009. ¿Qué se necesita para mejorar los pronósticos estacionales y las proyecciones del cambio climático del monzón norteamericano? (In Spanish) *Pan American Institute for Geography*

and History. 11th Consultation Meeting of the Commission on Geophysics, Technical Session. Quito, Ecuador, October 27.

- Castro, C.L., 2009. The North American Monsoon. It's What Makes Summer Weather Interesting in Arizona. Presented at: 1) *University of Arizona Biosphere 2 Science Saturdays*. Oracle, Arizona, October 10, and 2) *University of Arizona Mount Lemmon Discovery Days*. Mt. Lemmon, Arizona, USA, July 25.
- Castro, C.L., 2008. Use of Emerging Applications of the Weather Research and Forecasting Model to Investigate the North American Monsoon. Department of Hydrology and Water Resources Seminar, University of Arizona, Tucson, Arizona, USA. Nov. 19.
- Castro, C.L., F. Dominguez, S. Bieda III, M. Crimmins, G. Thomas, A. Ellis, and A. Thomas, 2008. Arizona Drought Monitoring Sensitivity and Verification Analyses. Project results and future directions. Presented to the Arizona Drought Monitoring and Technical Committee. Tempe, Arizona, USA, Sep. 26.
- Castro, C.L., 2008. 2008 Monsoon Outlook Post-Validation. *Climate Science Applications Program and Climate Assessment for the Southwest Web Briefing.* Tucson, Arizona, USA, July 30.
- Castro, C.L., 2008. An Overview of the North American Monsoon and Seasonal Outlook for 2008. *Climate Science Applications Program and Climate Assessment for the Southwest Web Briefing.* Tucson, Arizona, USA, June 4.
- Castro, C.L., 2008. Large Scale Influences on North American Monsoon Variability and Potential for Improved Seasonal Predictability. 10th North American Monsoon Experiment Science Working Group Meeting. Miami, Florida, USA, March 27.
- Castro, C.L., F. Dominguez, S. Bieda III, M. Crimmins, G. Garfin, and A. Ellis, 2008. Arizona Drought Monitoring Sensitivity and Verification Analyses. Presented at the Arizona Department of Water Resources. Phoenix, Arizona, USA. February 20.
- Castro, C.L., 2007. Investigación del Clima del Verano: Estudio con un modelo atmosférico regional (In Spanish). Presented at the University of Sonora, Department of Physics, Hermosillo, Sonora, Mexico, November 9.
- Castro, C.L., 2007. Use of Regional Atmospheric Modeling to Address Climate Variability and Change in Arizona. Presented at: 1) University of Arizona, Department of Chemical and Environmental Engineering, Tucson, Arizona, October 16; 2) Arizona State University, Department of Mechanical and Aerospace Engineering, Tempe, Arizona, USA, November 28.

G. Contributed Presentations (Jan 2007-present)

- Nineteen (19) presentations as the lead author; fifty-two (52) presentations as a co-author.

H. Current Grants/Contracts

Note that ``Percent Effort'' is indicative of my group's share of work on the grant.

- "Colorado River Basin Streamflow projection under IPCC CMIP5 scenarios: from the global to basin scale using an integrated dynamic modeling approach", United States Geological Survey (USGS), Department of the Interior (DOI) grant, with matching funding from United States Bureau of Reclamation (USBR), Salt River Project (SRP), and Central Arizona Project (CAP), $172,895 (USGS-DOI), Match funding: $80,000 (USBR), $50,000 (SRP), $40,000 CAP, 9/2013-9/2015, Percent Effort: 60%, Principal Investigator
- "Impact of Total Column Water Vapor Measurements of Short- to Medium- Range Forecasts of North American Monsoon Precipitation", National Science Foundation (NSF) grant, $482,591, 4/2013-4/2015, Percent Effort: 10%, Co-Principal Investigator
- "Incorporating Climate Information and Stakeholder Engagement in Groundwater Resource Planning and Management", National Oceanic and Atmospheric Administration (NOAA) grant, $251,544, 4/2012-4/2014, Percent Effort: 13%, Co-Principal Investigator

- "Assessing climate change impacts for DoD installations in the Southwest United States during the warm season", Strategic Environmental Research and Development Program (SERDP) grant, $645,869, 3/2012-3/2015, Percent Effort: 100%, Principal Investigator
- "Collaborative Research: Processes and Patterns in the North American Monsoon Macrosystem", National Science Foundation (NSF) grant, $2,297,560, 7/2011-7/2016, Percent Effort: 12%, Co-Principal Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Contributing lead author, Southwest Climate Change Assessment (published 2013)
- U.S. Representative to Geophysics Commission, Pan American Institute for Geography and History (2009-2012)
- Conference Session Chair, Regional Climate Modeling and/or Downscaling of Climate Variability and Change for Local Scale Assessment, 26th Conference on Hydrology, American Meteorological Society Annual Meeting, New Orleans, Louisiana, USA (2012)
- Proposal reviewer for National Oceanic and Atmospheric Administration (NOAA), Office of Global Programs, National Science Foundation, Austrian Science Fund, U.S. Bureau of Reclamation (USBR), Environmental Production Agency (EPA), and National Aeronautic and Space Administration (NASA).
- Reviewer for numerous professional journals focused to the atmospheric sciences and related fields, including *Journal of Climate*, *Journal of Atmospheric Sciences*, *Journal of Geophysical Research—Atmospheres*, *Geophysical Research Letters*, *International Journal of Climatology*, *Journal of Applied Meteorology*, *Journal of Hydrometeorology*, *Global and Planetary Change*, *Climate Dynamics*, *Meteorologische Zeitschrift*, *Monthly Water Review*, *Journal of Hydrology*, and *EOS*.

I2. University, College, Department

- University Faculty Senate (2012-present)
- SEES Tier I course committee (2011)
- Sabbatical proposal reviewer, College of Science (2011)
- Contributed to North American monsoon exhibit at Flandrau Science Center (2011)
- Proposal review committee, Graduate Incentives for Growth (GIGA) Awards, Graduate College
- Local organizing committee, *35th National Weather Association Meeting*, Tucson, Arizona, Oct. 2-7, 2010.
- Faculty search committee member for assistant professor position in the area of phenoclimatology through the School of Natural Resources (2009-2010).
- Member of Science Steering Committee of Climate Dynamics and Hydrometeorology Center (CDHC) (2008-present)
- Contributed to planning and establishment of new graduate program in Hydrometeorology (2009-11).
- Curriculum committee, Department of Atmospheric Sciences (2007-2009). Chair since 2009.
- Faculty member, Climate and Global Change Minor Program, University of Arizona, (Fall 2006-present)

I3. Local/Community

- Provided sworn expert witness testimony in case *State of Arizona vs. James Ray* (2013)
- Provided training for the use of the Weather Research and Forecasting Model for operational weather forecasting by the Colombian Air Force (2012)
- Interviews to NHK Broadcasting Corporation (Japan) in production of documentary on North American Monsoon (summer 2011)
- U.S. Department of State, Invited speaker to countries of Jamaica and Dominican Republic on the subject of climate change in the Caribbean
- Presenter, Southeast Arizona Chapter of the American Meteorological Society (2010)

- Local media interviews or citations: KTVK-3 (Phoenix), KGUN-9 ABC News (Tucson), KOLD-13 CBS News (Tucson), KUAT-6 PBS (Tucson) program *Arizona Illustrated*, *Arizona Republic*, *Tucson Citizen*, *Arizona Daily Star*, *Prescott Daily Courier*.

J. Synergistic Activities

(i) Improving seasonal forecasts for the warm season: We have demonstrated a methodological approach to improve the accuracy of U.S. warm season seasonal forecasts by dynamical downscaling of the Climate Forecast System (CFS) global seasonal forecast model. This work was performed in collaboration with NOAA National Center for Environmental Prediction (NCEP), Climate Prediction Center (CPC) and Environmental Modeling Center (EMC).

(ii) Water resource projection the regional and local scale: We are working in collaboration with the major water resource providers in the Southwest (CAP, USBR, and SRP) and colleagues in the Department of Hydrology to provide dynamically climate change projection information (considering select CMIP3 and CMIP5 models) for water resource projection in through the Colorado River Basin.

(iii) Contributions to Weather Research and Forecasting model: Our group has conducted research that has resulted in improved model parameterizations for convection schemes and land surface models (accounting for urbanization and dynamic vegetation)

(iii) Engagement of local operational weather forecasting community: In the scope of funded projects, our group works closely with the National Weather Service, Tucson Office, and the 25th Operational Weather Squadron at Davis-Monthan Air-Force base. We strive to incorporate their real-time operational forecast practices in our research methodologies, for example in characterizing severe weather during the North American Monsoon.

Biographical Sketch: Francina Dominguez

A. Professional Preparation

University of Illinois, Urbana-Champaign	Civil and Environmental Engineering	Ph.D.	2006
University of Illinois, Urbana-Champaign	Civil and Environmental Engineering	M.S.	2003
Universidad de los Andes, Bogota, Colombia	Civil Engineering	B.S.	1999

B. Appointments

2009-date	Assistant Professor. Department of Atmospheric Sciences, University of Arizona, Tucson, Arizona; courtesy appointment in Department of Hydrology and Water Resources
2008-09	Research Assistant Professor. Department of Civil Engineering and Engineering Mechanics. University of Arizona, Tucson, Arizona
2007-09	Associate Research Scientist. Department of Hydrology and Water Resources. University of Arizona, Tucson, Arizona
2001-06	Research Assistant. Department of Civil and Environmental Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois

C. Research Interests

Hydroclimatology, Land-Atmosphere Interactions, Precipitation Recycling, Climate Change, Dynamical and Statistical Downscaling, Surface Hydrology, Regional Climate Modeling, Atmospheric Isotopic Water Tracers, Extreme Hydrologic Events

D. Honors and Awards

- 2010 NCAR Early Career Scientist Assembly (ECSA) award, NCAR 2010 summer.
- 2009 Best Paper of the Environmental Modeling and Software Society (for Mahmoud et al. 2009)
- 2007 Outstanding Student Paper Award, American Geophysical Union, 2007 Fall Meeting
- 2007 CUAHSI 2007 Early Career Fellowship Award
- 2006 Glenn & Helen Stout Award. University of Illinois at Urbana-Champaign
- 2005 Outstanding Student Paper Award, American Geophysical Union, 2005 Fall Meeting
- 2003 NASA Earth Systems Science (ESS) Fellowship (2003 – 2006)

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Pizarro, R., P. Garcia-Chevesich, R. Valdes, F. Dominguez, F. Hossain, P. Ffolliott, C. Olivares, C. Morales, F. Balocchi, P. Bro, 2013: Inland water bodies in Chile can locally increase rainfall intensity. J. Hydrol. V: 481 pp: 56-63 DOI: 10.1016/j.jhydrol.2012.12.012
- Serrat-Capdevila, A., J. B. Valdes, F. Dominguez and S. Rajagopal, 2013: Characterizing the water extremes of the new century in the US South-west: a comprehensive assessment from state-of-the-art climate model projections, International Journal of Water Resources Development, 29:2, 152-171, DOI: 10.1080/07900627.2012.721717
- Tripathi, O. P., and F. Dominguez, 2013: Effects of spatial resolution in the simulation of daily and subdaily precipitation in the southwestern US, J. Geophys. Res. Atmos., 118, doi:10.1002/jgrd.50590.
- Ciancarelli, B., C. L. Castro, C. Woodhouse, F. Dominguez, H. Chang, C. Carrillo and D. Griffin, 2013: Dominant patterns of US warm season precipitation variability in a fine resolution observational record, with focus on the southwest. Int. J. Climatol. DOI: 10.1002/joc.3716
- Gimeno, L., A. Stohl, R. M. Trigo, F. Dominguez, K. Yoshimura, L. Yu, A. Drumond, A. M. Durán-Quesada and R. Nieto, 2012: Oceanic And Terrestrial Sources Of Continental Precipitation. Rev. Geophys. 50, RG4003 / 2012

- Castro, C., H. Chang, F. Dominguez, C. Carrillo, J. Kyung-Schemm, and H. Juang, 2012: Can a regional climate model improve the ability to forecast the North American Monsoon? J. Climate. doi:10.1175/JCLI-D-11-00441.1, in press.
- Gao, Y., L. R. Leung, E. P. Salathé Jr., F. Dominguez, B. Nijssen, and D. P. Lettenmaier (2012) Moisture flux convergence in regional and global climate models: Implications for droughts in the southwestern United States under climate change, Accepted in Geophys. Res. Lett.
- Wi, S., F. Dominguez, M. Durcik, J. Valdes, H. F. Diaz, and C. L. Castro (2012), Climate change projection of snowfall in the Colorado River Basin using dynamical downscaling, Water Resour. Res., 48, W05504, doi:10.1029/2011WR010674.
- Mishra, V., F. Dominguez, and D. P. Lettenmaier (2012), Urban precipitation extremes: How reliable are regional climate models?, Geophys. Res. Lett., 39, L03407, doi:10.1029/2011GL050658.
- Dominguez, F., E. Rivera, D. P. Lettenmaier, and C. L. Castro (2012), Changes in winter precipitation extremes for the western United States under a warmer climate as simulated by regional climate models, Geophys. Res. Lett., 39, L05803, doi:10.1029/2011GL050762.
- H. Ajami, T. Meixner, F. Dominguez, J. Hogan, T. Maddock III (2011), Seasonalizing Mountain System Recharge in Semi-Arid Basins-Climate Change Impacts. Ground Water. DOI: 10.1111/j.1745-6584.2011.00881.x (online first)
- J. Cañon, F. Dominguez and J. Valdes (2011), Vegetation Responses To Precipitation And Temperature: A Spatiotemporal Analysis Of Ecoregions In The Colorado River Basin. Int. J. Remote Sens. DOI:10.1080/01431161.2010.507259
- J. Cañon, F. Dominguez and J. Valdes (2011), Downscaling Climate Variability Associated With Quasi-Periodic Climate Signals: A New Statistical Approach Using MSSA. J. of Hydrology. V. 398 (1-2), pp. 65-75
- DeAngelis, F. Dominguez, Y. Fan, A. Robock, M. D. Kustu, and D. Robinson (2010), Observational Evidence Of Enhanced Precipitation Due To Irrigation Over The High Plains Of The US. J. Geophys. Res. V. 115 No: D15115
- Bark, R. H., B. G. Colby, and F. Dominguez (2009). Snow Days? Snowmaking Adaptation And The Future Of Low Latitude, High Elevation Skiing In Arizona, USA . Climatic Change DOI: 10.1007/s10584-009-9708-x
- Dominguez, F. and J. Cañon and J. Valdes (2009). IPCC-AR4 Climate Simulations For The Southwestern US: The Importance Of Future ENSO Projections. Climatic Change DOI: 10.1007/s10584-009-9672-5
- Dominguez, F. and J. C. Villegas and D. D. Breshears (2009). Spatial Extent Of The North American Monsoon: Increased Cross-Regional Linkages Via Atmospheric Pathways. Geophys. Res. Lett., 36, L07401, doi:10.1029/2008GL037012
- Dominguez, F. and P. Kumar (2008). Precipitation Recycling Variability And Ecoclimatological Stability -- A Study Using NARR Data. Part I: Central USA Plains. J. Climate. V. 21 No. 20 5165–5186
- Dominguez, F., P. Kumar, and E. R. Vivoni, 2008, Precipitation Recycling Variability And Ecoclimatological Stability -- A Study Using NARR Data. Part II: North American Monsoon Region. J. Climate. V. 21 No. 20 5187–5203
- Mahmoud, M, (and 20 other authors including F. Dominguez), 2008 A Formal Framework For Scenario Development In Support Of Environmental Decision Making, Environ. Modell. Softw. V. 24 No.7 Pp. 798-808
- Lyon, S., F. Dominguez (and 19 other authors), 2008. Coupling Terrestrial And Atmospheric Water Dynamics To Improve Prediction In A Changing Environment, Bulletin American Meteorological Society. V. 89, No. 9, 1275–1279

E2. Books and Book Chapters

- Zeng, X., and F. Dominguez, 2013: The Planetary Boundary Layer (which will be a chapter in a numerical weather prediction book to be published in 2013).

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Dominguez, F., Rivera-Fernandez, E. *Changes in winter precipitation extremes for the Western United States.* NARCCAP Users Meeting, April 2012. Boulder, Colorado
- Dominguez, F. Land-Atmosphere Interactions: *Two Ways of Looking at Extreme Events* University of Washington, Department of Atmospheric Sciences and Department of Civil Engineering Joint Seminar. February 2012. Seattle, Washington
- Dominguez, F., Rivera-Fernandez, E. Castro, C.L., Zhang, X. (2010), *Future extreme precipitation events in the Southwestern US: climate change and natural modes of variability*. 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec
- Dominguez, F., Gochis, D. J., Harley, P.C., Turnipseed, A. and Hu, J. (2010), *Transpiration and Evaporation measurements in a Mountain Ecosystem using Real-Time Field-Based Water Vapor Isotopes* 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec.
- Dominguez, F. June 2010. *Dynamically Downscaled Climate Projections For Ecohydrological Applications Over The Southwest*. 3rd USGS Modeling Conference: Understanding and Predicting for a Changing World. Broomfield, CO.
- Dominguez, F. Can Regional Climate Models Improve *Warm Season Forecasts in the North American Monsoon Region?* December 2009, USDA Tucson, AZ
- Dominguez, F. *Who Benefits from Evaporation from the Southwest?* October 2009, Biosphere 2, Tucson, AZ
- Dominguez, F. *Land-Atmosphere Interactions in the Southwest: It's a two-way street* ASU Ecosystems Engineering seminar, Global Institute of Sustainability, Phoenix, AZ, October 2009
- Dominguez, F. *New Dynamic Precipitation Recycling Model and the Relocation of Terrestrial Moisture Through Atmospheric Pathways*. Cátedra de Climatología Agrícola, Facultad de Agronomía, Universidad de Buenos Aires (video conference). May 2008.
- Dominguez, F., P. Kumar, E. R. Vivoni. *Precipitation Recycling: a Mechanism for Hydroclimatological Stability in the North American Monsoon Region*, American Geophysical Union. May 22-25, 2007. Acapulco, Mexico.

G. Contributed Presentations (Jan 2007-present)

- Ten presentations as the lead author.

H. Current Grants/Contracts

Note that ``Percent Effort" is indicative of my group's share of work on the grant.

- PEER co-PI with Julio Canon as lead PI: Tracking The Impacts Of Variability And Climate Change On Tropical Wetlands: The Evolution Of Two Andean Lakes And A Floodplain Cienagas In Colombia. [01/01/12 – 01/01/14]
- European Union co-PI with H. Gupta as lead PI. Award: A Scientific Basis For Urban Water Planning Under Climate Change (SWAN-Sustainable Water ActioN: Building Research Links Between EU And US. Award $554,510 [01/01/12-12/31/15].
- NSF co-PI with Russell K. Monson as lead PI. Award: Collaborative Research: Processes and Patterns in The North American Monsoon Macrosystem Award: $2,949,061 [04/01/2011 – 03/31/2016]
- NSF co-PI with Thomas Meixner as lead PI. Award: Collaborative Research – Climate and Population Change and Thresholds of Peak Ecological Water: Integrated Synthesis for Dryland Rivers. Award: $636,455 [01/01/11 – 12/31/13]

- DOE Lead PI with co-PI Christopher Castro and Dennis Lettenmaier Hydrologic Extremes In A Changing Climate: How Much Information Can Regional Climate Models Provide? Award: $540,000 [08/01/09 – 07/31/11] (no cost extension)
- NSF Lead PI with Yingfan Reinfelder Collaborative Research: The Amazon Groundwater and Its Impact on Evapotranspiration and the Climate of South America Award: $225,813 [07/01/10 – 06/30/13]
- NSF Co-PI with Professor Christopher Castro (UA) as lead PI. Use Of Regional Atmospheric Modeling To Improve Short And Long-Term Forecasting Capability Of The North American Monsoon System Award: $375,000 [07/01/08 – 06/30/11]
- Water, Environmental and Energy Solutions (WEES) co-PI with Sandy Dall'erba as lead PI. The Impact of Climate Change on Arizona's Agriculture: the Ricardian Approach Revisited. Award 39,999 [08/15/11-06/30/12].
- Faculty Exploratory Research Grant (FERG) Lead PI with Sandy Dall'erba and Yolande Serra as Co-PI The Impact of Climate Change on Farm Production Across the US Award: $9,998 [07/01/11 – 06/30/12].
- UA Water Sustainability Program Lead-PI with Co-PIs Hoshin Gupta and Peter Troch Intelligent Correction Of Future Climate Projections In The Salt And Verde River Basins For Water Resource Applications Award : $49,000K [01/01/11 – 06/30/11]
- UA Water Sustainability Program co-PI with Christopher Castro as lead PI Further development of dynamically downscaled climate change projection information for water resource decision making in the Southwest U.S. Award : $46,000K [01/01/11 – 06/30/11]
- SAHRA Center Directed Initiatives Lead-PI with Co-PI Yuquiong Liu (UA). Do We Need Regional Climate Models To Simulate The Future Hydrology Of The Southwest? Award : $15K [07/01/08 – 06/30/08]

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- 2012-present Associate Editor Journal of Hydrometeorology
- 2012, AMS 92nd Annual Meeting. Session Organizer Regional Climate Modeling and/or Downscaling of Climate Variability and Change for Local Scale Assessment with C. L. Castro, R. Leung, D. Lettenmaier New Orleans, LA, January 2012
- 2011, AGU Fall Annual Meeting. Session Organizer Climate Extremes 4. Scales, Implications, and Adaptation with A. Ganguly, V. Mishra, San Francisco, CA, December 2011
- 2011, AMS 91st Annual Meeting. Session Organizer Regional Climate Modeling to Improve Climate Variability and Change Projections at the Local Scale, with R. Leung, D. Lettenmaier. Seattle, Washington, January 2011
- 2011, Biogeosphere-Atmosphere Stable Isotope Network (BASIN) 2011 Meeting. Meeting Organizing Committee The Roles of Stable Isotopes in Water Cycle Research with T. Dawson, B. Vaughn, G. Bowen, K. Tu, D. Noone, J. Miller, D. Williams, M. McCabe. Keystone, Colorado, April 2011
- 2010, Unidata Users Committee, Boulder, Colorado
- 2009, SAHRA Annual Meeting. Session Organizer Downscaling and Climate Models for Water Management Applications with C. Castro. Tucson, Arizona, September 2009.
- 2007, NCAR Workshop on Coupling terrestrial and atmospheric water dynamics to improve predictability in a changing environment, with S. Lyon and D. Gochis. Boulder, Colorado, July 2007.
- Manuscript Reviews for the following journals: Water Resources Research, Journal of Hydrometeorology, Geophysical Research Letters, Journal of Climate, Hydrological Sciences Journal, Hydrology and Earth System Sciences, Journal of Geophysical Research, Journal of Arid Environments, International Journal of Climatology, Applied Climatology, Hydrological Processes, Frontiers in Ecology and the Environment

- Proposal Reviews for the following organizations: National Science Foundation, Department of Energy, Environment Research Council (UK), Netherlands Organisation for Scientific Research NOW. Proposal for the Planetary Boundaries Freshwater Cycle.

I2. University, College, Department

- Global Change Executive Minor Committee (2013-present)
- Co-Director of the Hydrometeorology MS and PhD Program (2011-present)
- Executive Committee (2009 – present): UA Hydrometeorology MS and PhD Program
- Search Committee (2010-2011): UA Hydrology and Water Resources Department Head Search

I3. Local/Community

- Science Café: The Challenges of Monsoon Science – September 14, 2010
- International School of Tucson, Science Club, How hot does it get inside your car? – August 28, 2010

J. Synergistic Activities

(i) Major Teaching Innovation: Have set up the website and unified requirements for the Hydrometeorology M.S. and Ph.D. Degree Program at the Univ. of Arizona, which is the first such program in the United States.

(ii) Major Efforts for Awards for Underrepresented Groups: part of the 2013 AGU committee to search possible AGU awardees among underrepresented groups.

(iii) Major Efforts for Education for Underrepresented Groups: main advisor for Arelis Rivera, a Bridges to Doctoral Awardee for underrepresented groups.

Biographical Sketch: Steven L Mullen

A. Professional Preparation

University of Washington	Atmospheric Sciences	Ph.D	1985
University of Washington	Atmospheric Sciences	M.S.	1979
California State Polytechnic University	Mathematics	B.S. Honors	1975

B. Appointments

1991-date	Professor (2001 - present), Associate Professor (1995), Assistant Professor (1991) Department of Atmospheric Sciences, University of Arizona
1987-1990	Assistant Professor (1987-1990), Department of Atmospheric and Oceanic Sciences, University of Michigan
1985-1986	Poctdoctoral Fellow, National Center for Atmospheric Research

C. Research Interests

Probabilistic quantitative precipitation forecasting (PQPF), probabilistic forecasting of precipitation type, hydrometeorological applications of NWP output, estimation of predictability limits, construction of "mixed" ensemble systems, calibration of ensemble output.

D. Honors and Awards

None.

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Wandishin, M. S., D. J. Stensrud, S. L. Mullen, L. J. Wicker, 2010: On the predictability of mesoscale convective systems: three-dimensional simulations. *Mon. Wea. Rev.*, 138, 863-885.
- Wandishin, M. S. and S. L. Mullen, 2009: Multiclass ROC Analysis. *Wea. Forecasting,* 24, 530-547.
- Wandishin, M. S., D. J. Stensrud, S. L. Mullen, L. J. Wicker, 2008: On the predictability of mesoscale convective systems: two-dimensional simulations. *Wea. Forecasting,* 23, 773-785.
- Kursinski, A., and S. L. Mullen, 2008: Spatio-temporal variability of hourly precipitation over the eastern contiguous U.S. from Stage IV multisensor analyses. *J. Hydrometeor.*, 3-21.
- Yuan, H., X. Gao, S. L. Mullen, S. Sorooshian, J. Dun, and H.-M. Juang, 2007: Calibration of probabilistic quantitative precipitation forecasts with an artificial neural network. *Wea. Forecasting*, 1287-1303.
- Yuan, H., S. L. Mullen, X. Gao, S. Sorooshian, J. Dun, and H.-M. Juang, 2007: Short-range probabilistic quantitative precipitation forecasts over the Southwest United States by the RSM ensemble system. *Mon. Wea. Rev.*, 135, 1685-1698.

E2. Books and Book Chapters

None.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Mullen, S.L.: Member Size, Resolution and Mixed Model Issues. First Annual NUOPC Workshop. 17-19 August 2010, Boulder, CO.

G. Contributed Presentations (Jan 2007-present)

None.

H. Current Grants/Contracts

None.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

None.

I2. University, College, Department

- Head, Department of Atmospheric Sciences (until June 2007)
- Faculty Search Committees, Department of Atmospheric Sciences (when needed)
- Outstanding Undergraduate Student Award Committee, College of Science (2007-present)
- Outstanding Undergraduate Researcher Award Committee, College of Science (2007-present)
- Teaching Award Committee, College of Science (2007-present)

I3. Local/Community

- Tours of Department upon request.

J. Synergistic Activities

(i) Joint Professor, Department of Hydrology and Water Resources, University of Arizona

Biographical Sketch: Elizabeth A. Ritchie

A. Professional Preparation

Monash University	Meteorology	Ph.D.	1995
Monash University	Applied Mathematics	B.Sc. (Hons)	1988

B. Appointments

2006 - present	Professor, (2012-present) and Associate Professor (2006-2011) Dept. of Atmospheric Sciences, University of Arizona, Tucson AZ. Joint Professor, Dept. of Electrical and Computer Engineering, University of Arizona, Tucson AZ
2005 –2006	Associate Professor, Departments of Electrical and Computer Engineering and Earth and Planetary Sciences, University of New Mexico, Albuquerque, NM 87131.
2004 –2005	Research Associate Professor, Department of Earth and Planetary Sciences, University of New Mexico.
2001 – 2004	Research Associate Professor (2003-2004) and Research Assistant Professor (2001-2002), Department of Electrical and Computer Engineering, University of New Mexico.
1997 – 2001	Research Assistant Professor, Department of Meteorology, Naval Postgraduate School, CA.
1995 – 1996	Post-doctoral Fellow, Department of Meteorology, Pennsylvania State University, PA.

C. Research Interests

Process studies of tropical cyclone structure, intensity change, genesis, and extratropical transition. Remote sensing and signal-processing techniques for diagnosing and predicting tropical cyclogenesis, intensity, and the extratropical transition of tropical cyclones. Impact of tropical cyclones on precipitation in the semi-arid Southwest U.S. Impacts of extreme TC landfall events. High resolution weather forecast modeling applied to fire weather and snow storm prediction in the SW U.S.

D. Honors and Awards

- Distinguished Achievement in Science Education Award, UA College of Science, 2012.
- Max A. Eaton Prize, American Meteorological Society, 1993.
- Goup Achievement Award , National Aeronautics and Space Administration, 2002.
- Group Achievement Award, National Aeronautics and Space Administration, 2011.
- 2nd place poster award at the AMS 9th Conference on Artificial Intelligence and its Applications to the Environmental Sciences, 23-27 Jan, 2011.

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Wood, K. M., and E. A. Ritchie, 2013: An updated climatology of tropical cyclone impacts on the southwestern United States. *Mon. Wea. Rev., (In Press).* Doi: http://dx.doi.org/10.1175/MWR-D-13-00078.1.
- Gutzler, D. S., K. M. Wood, E. A. Ritchie, A. V. Douglas, and M. D. Lewis, 2013: Interannual variability of tropical cyclone activity along the Pacific coast of North America, *Atmósfera*, 26, *149-162.*
- Ritchie, E. A., G. Valliere-Kelley, M. F. Piñeros, and J. S. Tyo, 2012: Improved tropical cyclone intensity estimation using infrared imagery and best track data. *Wea. Forecasting.* 27, 1264–1277.
- Wood, K. M., and E. A. Ritchie, 2012: The unique behavior and precipitation pattern associated with Tropical Storm Ignacio (1997). *Mon. Wea. Rev.,* 140, 3347–3360.
- Felker, S. R., B. LaCasse, J. S. Tyo, and E. A. Ritchie, 2011: Forecasting Post-Extratropical Transition Outcomes for Tropical Cyclones Using Support Vector Machine Classifiers. *J. Atmos. Oceanic Tech.,* 28, 709-719.
- Piñeros, Miguel F., Elizabeth A. Ritchie, J. Scott Tyo, 2011: Estimating Tropical Cyclone Intensity from Infrared Image Data. *Wea. Forecasting*, 26, 690–698.

- Ritchie, E. A., K. M. Wood, D. S. Gutzler, and S. R. White, 2011: The Influence of Eastern Pacific Tropical Cyclone Remnants on the Southwestern United States. *Mon. Wea. Rev.*, 139, 192–210.
- Kofron, D. E., E. A. Ritchie, and J. S. Tyo, 2010a: Determination of a consistent time for the extratropical transition of tropical cyclones Part I: Examination of Existing Methods for Finding "ET-time". *Mon. Wea. Rev*., 138, 4321-4343.
- Kofron, D. E., E. A. Ritchie, and J. S. Tyo, 2010b: Determination of a consistent time for the extratropical transition of tropical cyclones Part II: Potential Vorticity Metrics. *Mon. Wea. Rev*. 138, 4344-4361.
- Piñeros, M. F., E. A. Ritchie, and J. S. Tyo 2010: Detecting tropical cyclone genesis from remotely-sensed infrared image data. *IEEE Trans. Geosciences and Remote Sensing Letters*, 7, 826-830.
- Gutzler, D. S., L. N. Long, J. Schemm, S. Baidya Roy, M. Bosilovich, J. C. Collier, M. Kanamitsu, P. Kelly, D. Lawrence, M.-I. Lee, R. Lobato S., B. Mapes, K. Mo, A. Nunes, E. A. Ritchie, J. Roads, S. Schubert, H. Weil, and G. J. Zhang, 2009: NAMAP2: Atmospheric simulations of the 2004 North American Monsoon. *J. Climate*, 22, 6716-6740.
- Leary, L. A., and E. A. Ritchie, 2009: Lightning flash rates as an indicator of tropical cyclone genesis in the eastern North Pacific. *Mon. Wea. Rev.*, 137, 3456–3470.
- Piñeros, M. F., E. A. Ritchie, and J. S. Tyo 2008: Objective measures of tropical cyclone structure and intensity change from remotely-sensed infrared image data. *IEEE Trans. Geosciences and remote sensing*. 46, 3574-3580.
- Demirci, O., J. S. Tyo, and E. A. Ritchie, 2007: Spatial and spatiotemporal projection pursuit techniques to predict the extratropical transition of tropical cyclones. *IEEE Trans. Geosciences and remote sensing.* 45, 418-424.
- Ritchie, E. A., and R. L. Elsberry, 2007: Simulations of the extratropical transition of tropical cyclones: Phasing between the upper-level trough and tropical cyclone. *Mon. Wea. Rev.*, 135, 862–876.
- Ritchie, E. A., and W. M. Frank, 2007: Interactions between simulated tropical cyclones and an environment with a variable Coriolis parameter. *Mon. Wea. Rev.*, 135, 1889-1905.

E2. Books and Book Chapters

None.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Ritchie, E. A., 2010: *(Invited)* Topic 1.2: Inner Core Impacts. Topic Chairman and Rapporteur Reports of the Seventh WMO International Workshop on Tropical Cyclones IWTC-VII. The 7th International Workshop on Tropical Cyclones (IWTC-VII), Saint-Gilles les bains, La Réunion, France, 14 – 20 November, 2010.

G. Contributed Presentations (Jan 2007-present)

- Fifteen (15) presentations as the lead author; twenty-five (25) presentations as a co-author (with students leading); two (2) presentations as a co-author (not with students leading).

H. Current Grants/Contracts

- "Investigating environmental causes of tropical cyclone size and structure change", National Science Foundation (NSF) grant, $353,657 10/2013 – 09/2016, Percent Effort: 100%, Principal Investigator
- "Using satellite-based remotely-sensed data to determine tropical cyclone size and structure characteristics", Office of Naval Research (ONR) grant, $349,560, 01/2013 – 12/2015, Percent Effort: 100%, Principal Investigator

- "Eastern North Pacific Tropical Cyclones: their large-scale patterns, variability, and impacts on the southwestern U.S. region", National Science Foundation (NSF) grant, $150,057, 11/2011-10/2013, Percent Effort: 100%, Principle Investigator
- "Understanding the microphysical properties of developing cloud clusters during TCS-08", Office Naval Research (ONR) grant, $419,217, 02/2008 – 01/2013, Principle Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Elected Councilor, American Meteorological Society, 2013-present.
- Elected Member, University Corporation for Atmospheric Research (UCAR) President's Advisory Committee on University Relations (PACUR), 2011 – present.
- Chair, NASA Earth Science 2013 Senior Review, 2013 (Panel Member 2009, 2011).
- Chair, Recommendations committee, WMO IWTC- VII, St. Denis, La ReUnion 2010.
- Member, Joint Hurricane Test bed (JHT) Steering Committee, 2008 – present.
- Member, NASA Hurricane Science Research Program Science Team, 2008 – 2011.
- Chair, American Meteorological Society's Scientific and Technological Activities Committee (STAC) on Tropical Meteorology and Tropical Cyclones, 2008 – 2011.
- Editor, Monthly Weather Review, 2007 – 2010.
- Organizer, Special Symposium (AMS Annual Meeting, Seattle, WA 2011) 2010 - 2011.

I2. University, College, Department

- Member, University of Arizona Committee of Eleven, 2012 – present.
- Director of Graduate Studies, Department of Atmospheric Sciences, 2009 – present.
- Chair, ATMO curriculum Committee, 2007 – 2009.
- ATMO Faculty Associate, UA ADVANCE, 2007 – 2008.

I3. Local/Community

- Co-organizer, National Association of Geoscience Teachers (NAGT) webinar series for early-career faculty.
- Co-organizer, Adopt-A-School Volunteer Outreach to Tucson Elementary Schools, 2011-present.
- Co-organizer, Hollinger Elementary Science Fair, 2011-present.
- Leader, Early Career Workshop (NSF), College of William and Mary, Williamsburg, VA 2009-2011.
- Gave lectures on atmospheric sciences (including hands-on experiments) to students at K-12 schools throughout the years. Ran "weather" booths at TUSD school science nights, 2008, 2009, 2011.
- Local media interviews or citations: KVOA-4 NBC News (Tucson), KOLD-13 CBS News (Tucson), 2010 - 2012.

J. Synergistic Activities

(i) Technique Development for Operational Centers: Our tropical cyclone (TC) intensity estimator and genesis predictor are being evaluated at the Joint Typhoon Warning Center for use as part of their suite of techniques for TC forecasting.

(ii) Major Advisory Reports: Chair of the NASA Earth Science Senior Review (2013); Co-author of the NASA Earth Science Senior Review (2009, 2011); Reviewer of the National Research Council (NRC) Report: Weather Services for the Nation: Becoming Second to None (2012).

(iii) Major Teaching Innovation: Co-led the effort to create the online BAS in Meteorology for USAF and USN personnel at the Univ. of Arizona.

(iv) Major Field Experiment: PI for the Office of Naval Research (ONR) Tropical Cyclone Structure (TCS-08) field experiment, 2008; Mission Scientist/Aircraft Mission Scientist for the NASA Genesis and Rapid Intensification Processes (GRIP) field experiment, 2010.

Biographical Sketch: Xubin Zeng

A. Professional Preparation

Colorado State University	Atmospheric Science	Ph.D.	1992
Chinese Academy of Sciences	Meteorology	M.S.	1987
University of Nanjing	Atmospheric Physics	B.S.	1984

B. Appointments

2008-date Founding Director, Climate Dynamics and Hydrometeorology Center (CDHC)
2009-2011 Founding Co-Director, ATMO/HWR Hydrometeorology M.S. and Ph.D. Program
1994-date Professor (2004 - present), Associate Professor (2000-2004), and Research Assistant Professor (1994-2000), Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
1988-1994 UCAR Climate System Modeling Project Postdoctoral Associate (1992-1994) and Graduate Research Assistant (1988-1992), Department of Atmospheric Sciences, Colorado State University, Fort Collins, Colorado

C. Research Interests

Land-atmosphere-ocean interface processes, climate modeling, hydrometeorology, remote sensing, nonlinear dynamics, global value-added data development, and model improvements for weather, climate, and hydrometeorological studies

D. Honors and Awards

- Honorary Commander, 25th Operational Weather Squadron, Davis-Monthan Air Force Base, Tucson, AZ, January 2012- December 2014
- Fellow, American Meteorological Society, 2011
- Galileo Circle Fellow, the highest recognition awarded by the UA College of Science, 2011
- Elected member, Council (2010-2013) and its Executive Committee (2011-2013) of the American Meteorological Society (AMS)
- Member, National Academies Board on Atmospheric Sciences and Climate (BASC), 2008-2014
- Corresponding Member, China Science Center of the International Eurasian Academy of Sciences (2008)
- Overseas Assessor, Chinese Academy of Sciences (CAS), appointed by CAS President, 2004-2007
- Visiting Fellow, European Centre for Medium-Range Weather Forecasts (ECMWF), Reading, United Kingdom, July 2004
- Honorary research professor, International Center for Climate and Environmental Sciences (ICCES), Institute of Atmospheric Physics, Chinese Academy of Sciences, 2003
- The Editor's Award, American Meteorological Society, 1999
- UCAR Climate System Modeling Project (CSMP) Post-Doctoral Associate 1992-1994

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Niu, G.Y., C. Paniconi, P. A. Troch, R. L. Scott, M. Durcik, X. Zeng, T. Huxman, and D. C. Goodrich, 2013: An Integrated Modeling Framework of Catchment-Scale Ecohydrological Processes: 1. Model Description and Tests Over an Energy-Limited Watershed. *Ecohydrology*, 6, doi: 10.1002/eco.1362.
- Rosolem, R., W.J. Shuttleworth, M. Zreda, T. E. Franz, X. Zeng, S.A. Kurc, 2013: The Effect of atmospheric water vapor on neutron count the cosmic-ray soil moisture observing system. *J. Hydrometeor.*, doi: 10.1175/JHM-D-12-0120.1.
- Wang, A., and X. Zeng, 2013: Development of global hourly 0.5-degree land surface air temperature datasets. *J. Climate*, in press.

- de Goncalves, L. G. G., 30 other coauthors, and X. Zeng, 2013: Overview of the Large-Scale Biosphere-Atmosphere Experiment in Amazonia Data Model Intercomparison Project (LBA-DMIP). *Agri. Forest Meteor.*, in press.
- Shao, P., X. Zeng, K. Sakaguchi, R.K. Monson, and X.D. Zeng, 2013: Terrestrial carbon cycle - climate relations in eight CMIP5 earth system models. *J. Climate*, in press.
- Stillman, S., X. Zeng, W. James Shuttleworth, D.C. Goodrich, C.L. Unkrich, and M. Zreda, 2013: Spatiotemporal Variability of Summer Precipitation in Southeastern Arizona, *J. Hydrometeor*., in press.
- Geil, K. L., Y. L. Serra, and X. Zeng, 2013: Assessment of CMIP5 Model Simulation of the North American Monsoon System. *J. Climate*, in press.
- Shao, P., X. Zeng, D.J.P. Moore, and X.D. Zeng, 2013: Soil microbial respiration from observations and earth system models. Ecology Letters, in press.
- Niu, G.-Y., P. A. Troch, C. Paniconi, R. L. Scott, M. Durcik, X. Zeng, T. Huxman, D.C. Goodrich, and J. Pelletier, 2013: An integrated model framework of catchment-scale ecohydrological processes: 2. the role of water subsidy by overland flow on vegetation dynamics in a semi-arid catchment, *Ecohydrology*, in press.
- Zeng, X., and A. Wang, 2012: What Is Monthly Mean Land Surface Air Temperature? *Eos Trans*., 93 (15), 156.
- Zeng, X., Z. Wang, and A. Wang, 2012: Surface skin temperature and the interplay between sensible and ground heat fluxes over arid regions. *J. Hydrometeor*., 13, 1359-1370, doi: 10.1175/JHM-D-11-0117.1.
- Zeng, X., K.L. Kiviat, K. Sakaguchi, and A.M.A. Mahmoud, 2012: A toy model for monthly river flow forecasting. *J. Hydrology*, 452-453, 226-231, doi: 10.1016/j.jhydrol.2012.05.053.
- Franz, T., M. Zreda, T. P. A. Ferre, R. Rosolem, C. Zweck, S. Stillman, X. Zeng, and W. J. Shuttleworth, 2012: Measurement depth of the cosmic-ray soil moisture probe affected by hydrogen from various sources. *Water Resour. Res*., 48 (8), doi: 10.1029/2012WR011871.
- Zreda, M., C. Zweck, W.J. Shuttleworth, X. Zeng, C. Zweck, D. Desilets, T. Franz, and R. Rosolem, 2012: COSMOS: COsmic-ray Soil Moisture Observing System. *Hydrol. Earth Syst. Sci*., 16, 4079-4099. doi:10.5194/hess-16-4079-2012.
- Rosolem, R., H. V. Gupta, W. J. Shuttleworth, L. G. G. de Goncalves, and X. Zeng, 2012: Towards a Comprehensive Approach to Parameter Estimation in Land Surface Parameterization Schemes. *Hydrological Processes*, 26, doi: 10.1002/hyp.9362.
- Sakaguchi, K., X. Zeng, and M. Brunke, 2012: The Hindcast Skill of the CMIP Ensembles for the Surface Air Temperature Trend. *J. Geophys. Res*., 117, D16113, doi:10.1029/2012JD017765.
- Zheng, W., H. Wei, Z. Wang, X. Zeng, J. Meng, M. Ek, K. Mitchell, and J. Derber, 2012: Improvement of Land Surface Skin Temperature in the NCEP GFS Model and Its Impact on Satellite Data Assimilation. *J. Geophys. Res.-Atmospheres*, 117, D06117, doi:10.1029/2011JD015901.
- Wang, A., and X. Zeng, 2012: Evaluation of multi-reanalysis products with in situ observations over the Tibetan Plateau. *J. Geophys. Res.-Atmospheres*, 117, doi:10.1029/2011JD016553.
- Decker, M., M. Brunke, Z. Wang, K. Sakaguchi, X. Zeng, and M.G. Bosilovich, 2012: Evaluation of the Reanalysis Products from GSFC, NCEP, and ECMWF Using Flux Tower Observations. *J. Climate*, 25, doi: http://dx.doi.org/10.1175/JCLI-D-11-00004.1.
- Sakaguchi, K., X. Zeng, and M. Brunke, 2012: Temporal and Spatial Scale Dependence of IPCC AR4 Climate Models in Simulating the Surface Temperature Trend in the 20th Century. *J. Climate*, 25, doi: http://dx.doi.org/10.1175/JCLI-D-11-00106.1.
- Brunke, M., Z. Wang, X. Zeng, M. Bosilovich, and C.-L. Shie, 2011: An assessment of the uncertainties in ocean surface turbulent fluxes in 11 reanalysis, satellite-derived, and combined global data sets. *J. Climate*, 24, 5469-5493, doi: 10.1175/2011JCLI4223.1.
- Sakaguchi, K., X. Zeng, B. Christoffersen, N. Coupe, S. Saleska, and P. Brando, 2011: An Evaluation of National Center for Atmospheric Research Community Land Model 3.5 with Three

Biogeochemical Models Under Natural and Drought Scenarios in an East-Central Amazon Forest. *J. Geophys. Res.-Biogeosci.*, 116, G01029, doi:10.1029/2010JG001477.

- Lawrence, D., K. W. Oleson, M. G. Flanner, P. E. Thornton, S. S. Swenson, P. J. Lawrence, X. Zeng, L. Yang, S. Levis, K. Sakaguchi, G. B. Bonan, and A. G. Slater, 2011: Parameterization improvements and functional and structural advances in Version 4 of the Community Land Model. *J. Adv. in Modeling Earth Systems (JAMES)*, 3, doi: 10.1029/2011MS000045.
- Wang, A., and X. Zeng, 2011: Sensitivities of terrestrial water cycle simulations to the variations of precipitation and air temperature in China. *J. Geophys. Res.-Atmospheres*, 116, D02107, doi:10.1029/2010JD014659.
- Rosolem, R., W. J. Shuttleworth, X. Zeng, S. R. Saleska, and T. E. Huxman, 2010: Land surface modeling inside the Biosphere 2 Tropical rainforest biome. *J. Geophys. Res.-Biogeos*., 115, G04035, doi:10.1029/2010JG001443.
- Brunke, M. A., S. P. de Szoeke, P. Zuidema, and X. Zeng, 2010: A comparison of ship and satellite measurements of cloud properties with global climate model simulations in the southeast Pacific stratus deck. *Atmos. Chem. Phys*., 10, 6527-6536, doi:10.5194/acp-10-6527-2010.
- Wang, Z., X. Zeng, and M. Decker, 2010: Improving the snow processes in the Noah land model. *J. Geophys. Res.*, 115, D20108, doi:10.1029/2009JD013761.
- Zeng, X., M. Barlage, C. Castro, and K. Fling, 2010: Comparison of land-precipitation coupling strength using observations and models. *J. Hydrometeor*., 11, 980-995.
- Zeng, X., 2010: What is the atmosphere effect on the earth's surface temperature? *Eos Trans*., 91 (15), 134-135.
- Zeng, X., 2010: Reply to Comments on "What is the atmosphere's effect on earth's surface temperature?", *Eos Trans*., 91 (46), 432.
- Zeng, X. and M. Decker, 2010: Reply to Gerrit H. de Rooij (2010)'s Comment on Zeng and Decker (2009). *J. Hydrometeor*., 11, 1051-1054. doi: 10.1175/2010JHM1199.1.
- Wang. Z., and X. Zeng, 2010: Evaluation of snow albedo in land models for weather and climate studies. *J. Appl. Meteor. Clim*., 49, 363-380..
- Zhang, S., X. Zeng, W. Zhang, and M. Barlage, 2010: A revised covariance method for estimates of deep-layer soil moisture. *J. Hydrometeor*., 11, 219-227.
- Decker, M., and X. Zeng, 2009: Impact of modified Richards equation on global soil moisture simulation in the Community Land Model (CLM3.5). *Journal of Advances in Modeling Earth Systems*, 1, Art. #5, 22 pp., doi:10.3894/JAMES.2009.1.5.
- Sakaguchi, K., and X. Zeng, 2009: Effects of soil wetness, plant litter, and under-canopy atmospheric stability on ground evaporation in the Community Land Model (CLM3.5). *J. Geophys. Rev.-Atmospheres*, 114, D01107, doi:10.1029/2008JD010834.
- Huxman, T., P. Troch, J. Chorover, D. Breshears, S. Saleska, J. Pelletier, X. Zeng, and J. Espeleta, 2009: The hills are alive: Interdisciplinary earth science at Biosphere 2. *Eos Trans*., 90(14), doi:10.1029/2009EO140003.
- Wang, A. and X. Zeng, 2009: Improving the treatment of vertical snow burial fraction over short vegetation in the NCAR CLM3. *Adv. Atmos. Sci*., 26, 877-886. doi: 10.1007/s00376-009-8098-3.
- Zeng, X., and M. Decker, 2009: Improving the numerical solution of soil moisture-based Richards equation for land models with a deep or shallow water table. *J. Hydrometeor.*, 10, 308-319. doi: 10.1175/2008JHM1011.1.
- Brunke, M.A., X. Zeng, V. Misra, and A. Beljaars, 2008: Integration of a prognostic sea surface skin temperature scheme into weather and climate models. *J. Geophys. Res.-Atmospheres*, 113, D21117, doi:10.1029/2008JD010607.
- Misra, V., L. Marx, M. Brunke, and X. Zeng, 2008: The equatorial Pacific cold tongue bias in a coupled climate model. *J. Climate*, 21, 5852-5869.
- Wang, Z., and X. Zeng, 2008: Snow albedo's dependence on solar zenith angle from in situ and MODIS data. *Atmos. Oceanic Sci. Lett.*, 1, 45-50.

- Yang, F., K. Mitchell, Y.-T. Hou, Y. Dai, X. Zeng, Z. Wang, and X. Liang, 2008: Dependence of land surface albedo on solar zenith angle: observations and model parameterizations. *J. Appl. Meteor. Clim.*, 47, 2963-2982.
- Zeng, X.D., X. Zeng, and M. Barlage, 2008: Growing temperate shrubs over arid and semiarid regions in the NCAR Dynamic Global Vegetation Model (CLM-DGVM). *Global Biogeochemical Cycles*, 22, GB3003, doi: 10.1029/2007GB003014.
- Zeng, X., and A. Wang, 2007: Consistent Parameterization of Roughness Length and Displacement Height for Sparse and Dense Canopies in Land Models. *J. Hydrometeor*., 8, 730-737.
- Wang, Z., X. Zeng, and M. Barlage, 2007: MODIS BRDF-based land surface albedo parameterization for weather and climate models. *J. Geophys. Res.-Atmospheres*, 112, D02103, doi: 10.1029/2005JD006736.
- Zeng, X. D., and X. Zeng, 2007: Transition and pattern diversity in arid and semiarid grassland: A modeling study. *J. Geophys. Res.-Biogeosciences*, 112, G04008, doi:10.1029/2007JG000411.

E2. Books and Book Chapters

- Zeng, X., and F. Dominguez, 2013: The Planetary Boundary Layer (which will be a chapter in a numerical weather prediction book to be published in 2013).
- Niu, G.Y., and X. Zeng, 2012: The Earth System Model, Modeling the land component of. Book Chapter of the Encyclopedia of Sustainability Science and Technology, R.A. Meyers, Ed., doi: 10.1007/978-1-4419-0851-3.
- Zreda, M., X. Zeng, J. Shuttleworth, C. Zweck, T. Ferre, T. Franz, R. Rosolem, D. Desilets, S. Desilets, and G. Womack, 2011: Cosmic-Ray Neutrons, An Innovative Method for Measuring Area-Average Soil Moisture. GEWEX News, 21 (3), 6-10 (plus front and back covers), August 2011 Issue.
- Shuttleworth, W.J., Zreda, M., Zeng, X., Zweck, C., and Ferre, P.A., 2010: The COsmic-ray Soil Moisture Observing System (COSMOS): a non-invasive, intermediate scale soil moisture measurement network. Proceedings of the British Hydrological Society Third International Symposium: "Role of Hydrology in Managing Consequences of a Changing Global Environment", Newcastle University, Newcastle, United Kingdom, 19-23 July 2010. ISBN: 1 903741 17 3, p. 757-763.
- AMS Council (including X. Zeng), 2010: The 2009 AMS member Survey – A summary of findings and response to members. Bull. Amer. Meteor. Soc., 91, 657-673.
- Oleson, K. W., D. M. Lawrence, G. B. Bonan, M.G. Flanner, E. Kluzek, P.J. Lawrence, S. Levis, S.C. Swenson, P.E. Thornton, A. Dai, M. Decker, R. Dickinson, J. Feddema, C. Heald, F. Hoffman, J.-F. Lamarque, N. Mahowald, G.-Y. Niu, T. Qian, J. Randerson, S. Running, K. Sakaguchi, A. Slater, R. Stockli, A. Wang, Z.-L. Yang, X.D. Zeng, and X. Zeng, 2010: Technical Description of version 4.0 of the Community Land Model (CLM), NCAR Technical Note (NCAR/TN-478+STR), pp. 257.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Zeng, X., 2013: Global land-atmosphere interactions: Observations, modeling, and data assimilation. Meteorological Administration of Qinghai Province, Xining, Qinghai, China, 1 July 2013.
- Zeng, X., A. Wang, S. Stillman, and K. Geil, 2013: Temperature and precipitation across the weather climate interface. Second China-U.S. Symposium on Meteorology: Severe Weather and Regional Climate Variability and Predictability. 25-27 June 2013, Qingdao, China.
- Zeng, X., 2013: Urban Meteorology: Forecasting, Monitoring, and Meeting Users' Needs. Panel discussion. Association of American Geographers (AAG) Annual Meeting, 12 April 2013, Los Angeles, CA.

- Zeng, X., 2013: Treatment of Soil, Water, and Ecosystem in Weather and Climate Studies. Department of Soil, Water and Environmental Science (SWES) Colloquium, University of Arizona, Tucson, AZ, 4 February 2013.
- Zeng, X., 2012: Global surface temperature: model improvement, dataset development, and quantification of greenhouse gas effect. Department of Atmospheric Sciences Seminar, University of Arizona, Tucson, AZ, 8 November 2012.
- Snow, J. T. and X. Zeng, 2012: Urban Meteorology: Forecasting, Monitoring, and meeting Users' Needs. National Academies Board on Atmospheric Science and Climate (BASC) national webinar on the NRC Report with the above title. 26 June 2012.
- Zeng, X., 2012: Surface temperature: model improvement, dataset development, and IPCC model evaluation. Institute Seminar, Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, 4 June 2012.
- Zeng, X., and coauthors, 2011: Soil moisture distribution at WGEW and SRER based on COSMOS probes, conventional sensors, and a simple model. The Research Insights in Semiarid Ecosystems (RISE) Symposium, Tucson, AZ, 29 October 2011.
- Zeng, X., 2011: A personal journey in interdisciplinary research: from atmosphere to land, to ocean, and back to atmosphere. Department of Atmospheric Science, University of Illinois, Urbana-Champaign, Illinois, 1 April 2011.
- Zeng, X., 2011: What is the Atmospheric Greenhouse Effect? UA/NASA space grant program brown bag lunch seminar, Tucson, Arizona, 11 March 2011.
- Zeng, X., 2010: A personal journey in interdisciplinary research: from atmosphere to land, to ocean, and back to atmosphere. NASA Goddard Global Modeling and Assimilation Office (GMAO), Greenbelt, Maryland, 30 November 2010.
- Zeng, X., 2010: What is the Atmospheric Greenhouse Effect? University of Arizona Honors College Colloquium (for honor students) on Earth and Environment, Tucson, Arizona, 20 October 2010.
- Zeng, X., 2010: A personal journey in interdisciplinary research: from atmosphere to land, to ocean, and back to atmosphere. Department of Atmospheric Science, University of Washington, Seattle, Washington, 8 October 2010.
- Zeng, X., 2010: The role of land processes in intraseasonal variability. CLIVAR AAMP and YOTC MJO Task Force: Monsoon intraseasonal variability modeling workshop. Busan, South Korea, 15-17 June 2010.
- Zeng, X., 2010: Recent progress in land-atmospheric interaction studies: Science, technology, and education. Chinese Academy of Meteorological Science, Beijing, China, 30 April 2010.
- Fifteen other invited talks from 2007-2010

G. Contributed Presentations (Jan 2007-present)

- Twenty-six (26) presentations as the lead author; fifty-seven (57) presentations as a co-author.

H. Current Grants/Contracts

Note that ``Percent Effort" is indicative of my group's share of work on the grant.

- "Collaborative Research: Processes and Patterns in the North American Monsoon Macrosystem", National Science Foundation (NSF) grant, $2,949,061, 5/2011 – 4/2016, Percent Effort: 20%, Co-Principal Investigator
- “Collaborative Research: Improving decadal prediction of Arctic climate variability and change using a regional Arctic system model (RASM)”, Department of Energy (DOE) Grant, $377,929 9/2011 − 8/2015, Percent Effort: 100%, Principal Investigator
- “Collaborative Project: Development of hybrid 3-D hydrological modeling for the NCAR Community Earth System Model (CESM)”, Department of Energy (DOE) Grant, $761,725, 09/2011 – 08/2014, ercent Effort: 40%, Principal Investigator

- "Sustainable Water ActioN: Building Research Links Between EU and US (SWAN)", EU 7th Framework Programme grant, 405,075 Euros, 4/2012 – 3/2015, Percent Effort: 10%, Senior Participant
- "Improving the Understanding and Modeling of Land Processes in the Community Climate System Model (CCSM4.0)", National Science Foundation (NSF) grant, $541,246, 5/2010-4/2014, Percent Effort: 100%, Principal Investigator
- ``Integrated Evaluations and Applications of the MERRA Reanalysis Data over Northern High Latitudes", NASA/MAP grant, $732,000, 7/2009 - 6/2013, Percent Effort: 100%, Principal Investigator
- "Global Land-Atmosphere-Ocean Interface Process Studies by Integrating the MERRA Reanalysis with Satellite and In situ Data", NASA/MAP grant, $720,000, 1/2014 − 12/2017, 1 month/year, Percent Effort: 80%, Principal Investigator
- "Development of a High-Resolution Global Soil Depth Dataset", NASA Terrestrial Ecology grant, $264,630, 7/2013 - 6/2015, 0.36 month/year, Percent Effort: 30%, Co-Principal Investigator
- "Evaluation and Improvement of Land Surface States and Parameters to Increase Assimilation of Surface-Sensitive Channels and Improve Operational Forecast Skill", NOAA JCSDA grant, $243,058, 8/2013 -- 7/2015, 0.36 month/year, Percent Effort: 40%, Co-Principal Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Elected Member, Executive Committee of the American Meteorological Society (AMS), 2011-2013
- Elected Member, Council (governing body) of the American Meteorological Society (AMS), 2010-2013
- Co-Chair, NSF/AGS Community Workshop and White Paper on lower-atmosphere observing facilities (LAOF) for climate studies, 2012-2013
- Co-Chair, NRC Committee on Urban Meteorology: Forecasting, Monitoring, and Meeting End Users' Needs, 2011-2012
- Member, National Academies Board on Atmospheric Sciences and Climate (BASC), 2008-2014
- Editor, Advances in Atmospheric Sciences, 2009-2014
- Member, National Research Council (NRC) Committee on Progress and Priorities of US Weather Research and Research-to-Operations Activities, 2009 - 2010
- Member, International CLIVAR Asian-Australian Monsoon Panel, 2009-2012
- Chair, First COSMOS Workshop, 15 December 2009, San Francisco, CA
- Member, Advisory Board ,of The Edge - a book series addressing environmental science, law, and policy at the University of Arizona Press, 2008-present
- Member, U.S. CLIVAR Process Studies and Model Improvement (PSMI) Panel (2007-2010), including preparing the evaluation report, representing the PSMIP, of the Intra-Americas Study of Climate Processes (IASCLIP) Science and Implementation Plan, 2008
- Panel Member, NASA Earth Science Senior Review of almost all of NASA's current Earth-observing satellite missions, 2007
- Member, Organizing Committee of the 4th Symposium on Southwest Hydrometeorology, Tucson, AZ, 20-21 September 2007
- Member, NRC Committee on Archiving and Accessing Environmental and Geospatial Data at NOAA (2006-2007)
- Reviewer, 41 different national and international professional journals

I2. University, College, Department

- Founding Director, Climate Dynamics and Hydrometeorology Center (CDHC), 2008-present
- Founding Co-Director, Hydrometeorology M.S. and Ph.D. Degree Program, 2009-2011

- Coordinator, Development of the strategy and white paper for pursuing a possible UA-NOAA partnership, 2007-2010 (including the submission of a White Paper to the NOAA Climate Program Office with 15 UA faculty members in May 2009)
- Member, University Distinguished Professors selection committee, 2008-2010 (appointed by Provost Meredith Hay)
- Member, Advisory Committee of the TRIF Water, Environmental and Energy Solutions (WEES) Initiative at UA (2012-2013)
- Member, UA Institute of the Environment Faculty Advisory Committee, 2009-2011
- Member, Evaluation Committee of the APR of UA Department of Civil Engineering and Engineering Mechanics (2013-2014)
- Chair, Departmental Academic Program Review (APR) Self-Study Committee (2013-2014)
- Chair, Departmental Faculty Promotion and Tenure Committee (2007, 2009-present; member, 2008-due to sabbatical)
- Chair, Faculty search committee in data assimilation (2010)
- Coordinator, Preparation, submission, and revision of the package for the authorization and planning for the joint ATMO/HWR hydrometeorology M.S. and Ph.D. degree, 2007-2009
- Member, The Interdepartmental Strategic Hire Committee, 2008

I3. Local/Community

- Gave lectures on atmospheric sciences (including hands-on experiments) to students at K-12 schools throughout the years
- UA news release on our paper (Sakaguchi et al. 2012), September 2012
- Interviewed by Chuck George at KOLD Channel 13 in Tucson on monsoon, June 2012
- Interviewed by John Patrick at KVOA Channel 4 in Tucson on monsoon, May 2012
- Interviewed by Arizona Daily Wildcat on climate change and buffelgrass in November 2011
- Interviewed by a French Reporter on climate change and Biosphere 2, May 2011
- Interviewed by the China Central Television on climate change and Biosphere 2, May 2011
- Interviewed by the National Geographic's "X-Ray Earth" documentary on the role of modeling in Biosphere 2 science, August 2010
- UA news release and local TV station website (KVOA) coverage of the COSMOS project, September 2009
- Helped organize the Biosphere 2 Saturday Science Talk, Fall 2009
- Interviewed by an Associated Press (AP) reporter on the Hydrometeorology M.S. and Ph.D. Degree Program, July 2008
- UA news release on the Hydrometeorology M.S. and Ph.D. Degree Program, July 2008

J. Synergistic Activities

(i) Model and Value-Added Data Development: Our value-added data and model improvements over land and ocean have been implemented in numerous weather and climate models (e.g., NCAR CESM, NCEP, ECMWF); Coordinated the development of the Common Land Model (CLM).

(ii) Major Advisory Reports: Co-chair of the NRC Report on Urban Meteorology (2012); Co-chair of the NSF/AGS Community Workshop and White Paper on Observing Facilities for Climate Research (2012); Co-author, NASA Earth Science Senior Review (2007).

(iii) Major Teaching Innovation: Led the effort in setting up the Hydrometeorology M.S. and Ph.D. Degree Program at the Univ. of Arizona, which is the first such program in the United States.

(iv) Major Prior Grant: Co-Principal Investigator of the NSF project ``COsmic-ray Soil Moisture Observing System (COSMOS)" ($5.45M, 9/2009-8/2013) that set up a preliminary national network over U.S. and followed by national networks in other countries.

Biographical Sketch: Philip Krider

A. Professional Preparation

University of Arizona	Ph.D. (Physics)	1969
University of Arizona	M.S. (Physics)	1964
Carleton College	B.A. (Physics)	1962

B. Appointments

1971- present	Professor Emeritus (01/09 – present); Professor 6/80-01/09; Associate Professor (7/75-5/80); Assistant Professor (9/73-6/75); and Assistant Research Professor (4/71-6/75) in the ATMO/IAP at the University of Arizona.
6/86–7/95	Head/Director of the ATMO/ IAP, University of Arizona, Tucson, Arizona
9/69–4/71	National Research Council Resident Research Associate, NASA Manned Spacecraft Center, Houston, Texas

C. Research Interests

Lightning, Atmospheric Electricity, Atmospheric Physics, Cosmic Ray Physics

D. Honors and Awards

- Alumnus of the Year Award, College of Science, University of Arizona, November, 2012.
- Distinguished Achievement Award, Carleton College Alumni Association, June 2012.
- Karl Berger Award, "For distinguished achievements in the science and engineering of lightning research, developing new fields in theory and practice, modelling and measurements," 30th International Conference on Lightning Protection (ICLP), Cagliari, Italy, September 13-17, 2010 (with M.A. Uman).
- Space Flight Awareness Team Award, NASA Kennedy Space Center, 8/10 (with others).
- Fellow, Galileo Circle, College of Science, University of Arizona, 12/08.
- Special Session at 20th International.Lightning Detection Conf. in honor of EPK, Tucson, AZ, 4/08.
- NASA Certificate of Recognition "For the creative development of … Volume-Averaged, Height-Integrated Radar Reflectivity (VAHIRR)," 2/08.
- Blitzer Award for Excellence in Teaching of Physics and Related Sciences, Department of Physics, University of Arizona, 1/08.
- Participant, Benjamin Franklin Tercentenary Celebration, Philadelphia, PA, January 17, 2006.
- Franklin Lecture, Fall Meeting, American Geophysical Union, San Francisco, CA, 12/04
- NASA Group Achievement Award, Kodiak Star Mission Integrated and Launch Team, 6/02
- Conference Medal, International Conference on Lightning and Static Electricity (ICOLSE), Toulouse, France, 6/99
- Fellow, American Geophysical Union, 1/97
- President, International Commission on Atmospheric Electricity, IAMAS/IUGG, 6/92–6/99
- College of Science Career Teaching Award, U. Arizona, 1992
- NASA Group Achievement Award, Galileo Probe Spacecraft Development Team, 1992
- Member, NAS/NRC Panel on Weather Support for Space Operations, 1987–88
- Fellow, American Meteorological Society, 1/87
- AMS Award for Outstanding Contributions to Advancement of Applied Meteorology, 1/85
- Co-Chair, Panel on The Earth's Electrical Environment, NAS/NRC Geophysics Study, 1982–86
- EMC Transactions Prize Paper Award (with M. A. Uman), IEEE, 1982
- Sigma Xi; Sigma Pi Sigma

E. Publications and Scholarly Work (Jan 2007-present)

<u>E1. Peer-Reviewed Papers</u>

- Mason G. Quick, and E. Philip Krider, "Optical power and energy radiated by natural lightning," *J. Geophys. Res.-Atmospheres, 118*, 1–12, doi:10.1002/jgrd.50182, 2013.

- Minjarez-Sosa, C. M., C. L. Castro, K. L. Cummins, E. P. Krider, J. Waissman, "Toward Development of Improved QPE in Complex Terrain Using Cloud-to-Ground Lightning Data: A Case Study for the 2005 Monsoon in Southern Arizona," *J. Hydromet., 13*, 1855-1873, doi: 10.1175/JHM-D-11-0129.1, December, 2012.
- Saba, M.M.F, W. Schulz, T.A. Warner, L.Z. S. Campos, C. Schumann, E.P.Krider, K.L. Cummins, and R.E. Orville, High-speed video observations of positive lightning flashes to ground, *J. Geophys.Res., 115*, D24201, doi:10.1029/2010JD014330, 2010.
- Saraiva, A.C.V.,M. M. F. Saba, O. Pinto Jr., K. L. Cummins, E. P. Krider, and L. Z. S. Campos, A comparative study of negative cloud-to-ground lightning characteristics in São Paulo (Brazil) and Arizona (United States) based on high-speed video observations, *J. Geophys. Res., 115*, D11102, doi:10.1029/2009JD012604, 2010
- Wilson, J. G., K. L. Cummins, and E. P. Krider, Small negative cloud-to-ground lightning reports at the NASA Kennedy Space Center and Air Force Eastern Range, *J. Geophys. Res., 114*, D24103, doi:10.1029/2009JD012429, 2009; Correction: *115*, D07199, doi:10.1029/2010JD013974, 2010.
- Stall, C. A., K. L. Cummins, E. P. Krider, and J. A. Cramer, Detecting Multiple Ground Contacts in Cloud-to-Ground Lightning Flashes, *J. Atmos. Oceanic Tech., 26*, 2392-2402, 2009.
- Saba, M. M. F., L. Z. S. Campos, E. P. Krider, and O. Pinto, Jr., High-speed video observations of positive ground flashes produced by intracloud lightning, *Geophys. Res. Lett.*, 36, L12811, doi:10.1029/2009GL038791, 2009.
- Fleenor, S. A., C. J, Biagi, K. L. Cummins, E. P. Krider, X.-M. Shao, Characteristics of Cloud-to-Ground Lightning in Warm-Season Thunderstorms in the Great Plains, *Atmospheric Research*, *91*, 332-352, January 2009.
- Saba. M. M. F., K. L. Cummins, T. A. Warner, E. P. Krider, Z. S. Campos, M. G. Ballarotti, O. Pinto, Jr., and S. A. Fleenor, "Positive Leader Characteristics from High-Speed Video Observations," *Geophys. Res. Lett.*, Vol. 35, L07802, doi:10.1029/2007GL033000, 2008, 01 April 2008.
- Koshak, W. J., E. P. Krider, N. Murray, and D. J. Boccippio, "Lightning Charge Retrievals: Dimensional Reduction, LDAR Constraints, and a First Comparison with LIS Satellite Data," *J. Atmos. Ocean. Tech.*, Vol. 24, No. 11, 1817-1838, November 2007.
- Dye, J. E., M. G. Bateman, H. J. Christian, E. Defer, C. A. Grainger, W. D. Hall, E. P. Krider, S. A. Lewis, D. M. Mach, F. J. Merceret, J. C. Willett, and P. T. Willis, "Electric Fields, Cloud Microphysics, and Reflectivity in Anvils of Florida Thunderstorms," *J. Geophys. Res.-Atmospheres*, Vol. 112, D11215, doi:10.1029/2006JD007550, 15 June 2007.
- Biagi, C. J., K. L. Cummins, K. E. Kehoe, and E. P. Krider, "NLDN Performance in Southern Arizona, Texas, and Oklahoma in 2003-2004," *J. Geophys. Res.– Atmospheres*, Vol. 112, No. D5, D05208, doi10.1029/2006JD007341, 9 March 2007.

E2. Books and Book Chapters

- Krider, E. P., "Benjamin Franklin and Lightning Rods," Chapter 1 in *Lightning Protection* edited by V. Cooray, London: IEE Press, 2009.

E3. Other Scholarly Activities (e.g., patents)

- Willett, J.C., and F.J. Merceret, Editors, E.P. Krider, J.E. Dye, T.P. O'Brien, W.D. Rust, R.L. Walterscheid, J.T. Madura, and H.J. Christian, "Rationales for the Lightning Flight-Commit Criteria," NASA/TP—2010–216291, October, 2010, 250 pp.
- Merceret, F.J. and J.C. Willett, Editors, H.J. Christian, J.E. Dye, E.P. Krider, J.T. Madura, T.P. O'Brien, W.D. Rust, and R.L. Walterscheid, "A History of the Lightning Launch Commit Criteria and the Lightning Advisory Panel for America's Space Program," NASA/SP-2010-216283, August, 2010, 234 pp.
- Walterscheid, R. L., J. C. Willett, E. P. Krider, L. J. Gelinas, G. W. Law, G. S. Peng, R. W. Seibold, F. S. Simmons, P. F. Zittel, "Triggered Lightning Risk Assessment for Reusable Launch Vehicles at

Four Regional Spaceports," Final Report, U. S. Department of Transportation Contract DTRT57-05-D-30103, Task 13A, Aerospace Corporation Report No. ATR-2010(5487)-1, April 30, 2010.

- Krider, E. P., Review of *The Callendar Effect*, by James Rodger Fleming, *Earth Sciences History*, *26* (2), 385-387, December 2007.
- Collins, J., J. Cruse, R. Harris, M. Hieb, E. P. Krider, J. Meadows, B. Mills, J. Scott, and R. Wooten, "Report of Investigation into the Sago Mine Explosion which Occurred January 2, 2006, Upshur County, West Virginia, West Virginia Office of Miners' Health, Safety, and Training (released January, 2007), http://www.wvminesafety.org/sagointerviews.htm.

F. Invited Talks (Jan 2007-present)

- P. Krider, "Franklin, Ingen-Housz, and Protecting Gunpowder From Lightning in the 18th Century," 31st International Conference on Lightning Protection, Vienna, Austria, 2-7 September 2012.
- P. Krider, "Recent Advances in Lightning Research," Fourth Conference on the Meteorological Applications of Lightning Data, AMS Annual Meeting, Phoenix, AZ, 11-15 January 2009 (with K. L. Cummins, M. M. F. Saba, and T. A. Warner)
- E. P. Krider, "Lightning – A Striking Phenomenon," Opening Address, 20th International Lightning Detection Conference (ILDC), Tucson, AZ, 21-23 April 2008.
- E. P. Krider, "Lightning and Benjamin Franklin," Centre for Research in the Arts, Social Sciences, and Humanities, Cambridge University, UK, 2 March 2007.

G. Contributed Presentations (Jan 2007-present)

- Twenty-one (21) presentations.

H. Current Research Grants/Contracts

- "An Investigation of the Power and Energy Budgets of Natural and Triggered Lightning Strokes," Subcontract UF-EIES-1005015-UAZ from the U. Florida, under DoD NIMBUS Program ($200K, 3-yrs).

I. Major Service (Jan 2007-present)

None

J. Synergistic Activities

None

JOINT FACULTY

Biographical Sketch: Julia Ellen Cole

A. Professional Preparation

Lamont-Doherty Geological Observatory of Columbia University, Geological Sciences,		Ph.D.	1992
Lamont-Doherty Geological Observatory, Columbia University, Geological Sciences,		M.Ph.	1991
Lamont-Doherty Geological Observatory, Columbia University, Geological Sciences,		M.A.	1987
Brown University	Geology/Biology,	Sc.B. with honors	1985

B. Appointments

1999-present	Assistant, Associate, and Full Professor, Department of Geosciences, University of Arizona, Tucson
2004-present	Joint Associate and Full Professor, Dept of Atmospheric Sciences, University of Arizona, Tucson

C. Research Interests

My research group focuses on understanding past environmental change, highlighting regions and systems with substantial ecological or human impacts. Most of this work emphasizes drought in semiarid regions and the variability of tropical oceans and their influence.

D. Honors and Awards

- Fellow, ARC Centre of Excellence in Climate System Science, Univ. Melbourne, 2013
- Honorary faculty, University of Melbourne School of Earth Sciences, 2013
- Udall Fellowship in Environmental Science and Policy, 2012
- Google Science Communications Fellow, 2011
- Kavli Fellow, NRC Frontiers of Science, 2008
- Leopold Leadership Fellow in environmental policy and communication, 2008

E. Publications and Scholarly Work (Jan 2007-present; out of over 50 total)

- Ault, T., J. E. Cole, J. Overpeck, G. T. Pederson, S. St. George, B. Otto-Bliesner, C. Woodhouse, and C. Deser 2013: The continuum of hydroclimate variability in western North America during the past millennium. In press, *Journal of Climate.*
- Conroy, J. L., J. T. Overpeck, J. E. Cole, K.-B. Liu, L. Wang, and M. N. Ducea (2013), Dust and temperature influences on glaciofluvial sediment deposition in southwestern Tibet during the last millennium, *in press, Global and Planetary Change*.
- Ault, T.R., J.E. Cole, and S.L. St. George (2012) The amplitude of decadal to multidecadal variability in precipitation simulated by state-of-the-art climate models. Geophys. Res. Lett. 39, L21705, doi:10.1029/2012GL053424.
- Thomas, A.L.; K. Fujita; Y. Iryu; E. Bard; G. Cabioch; G. Camoin; J.E. Cole; P. Deschamps; N. Durand; B. Hamelin; K. Heindel; G.M. Henderson; A.J. Mason; H. Matsuda; L. Ménabréaz; A. Omori; T. Quinn; S. Sakai; T. Sato; K. Sugihara; Y. Takahashi; N. Thouveny; A.W. Tudhope; J. Webster; H. Westphal; Yusuke Yokoyama (2012) Assessing subsidence rates and paleo water-depths for Tahiti reefs using U-Th chronology of altered corals. Marine Geology 295-298, pp. 86-94.
- Thompson, D. M., T. R. Ault, M. N. Evans, J. E. Cole, and J. Emile-Geay (2011), Comparison of observed and simulated tropical climate trends using a forward model of coral $\delta^{18}O$, Geophys. Res. Lett., 38, L14706, doi:10.1029/2011GL048224.
- Bush, M.B., Colinvaux, P.A., Steinitz-Kannan, M., Overpeck, J.T., Sachs, J., Cole, J.E., Collins, A., Conroy, J.L, Restrepo, A., and Zhang, Z. 2010. Forty years of paleoecology in the Galápagos. *Galapagos Research*. 55-61
- Truebe, S.A., Ault, T.R., and Cole, J.E. 2010. A forward model of cave dripwater $\delta^{18}O$ and application to speleothem records. IoP Conference Series: Earth and Environmental Science 9 (1): doi: 10.1088/17551315/9/1/012022.

- Wagner, J. D., J. E. Cole, J. W. Beck, P. J. Patchett, G. M. Henderson, H. R. Barnett (2010), Moisture variability in the southwestern US linked to abrupt glacial climate change, *Nature Geosciences*, *3*(2), 110-114.
- Conroy, J. L., J. T. Overpeck, J. E. Cole, and M. Steinitz-Kannan (2009), Variable oceanic influences on western North American drought over the last 1200 years, *Geophysical Research Letters*, *36*(L17703).
- Shanahan, T. M., J.T. Overpeck, K.J. Anchukaitis, J.W. Beck, J.E. Cole, D.L. Dettman, J.A. Peck, C.A. Scholz, and J.W. King (2009). Atlantic Forcing of Persistent Drought in West Africa. *Science* 324, 377-380.
- Ault, T.R., J.E. Cole, M.N. Evans, H. Barnett, A.W. Tudhope, N. Abram, B.K. Linsley (2009) Intensified decadal variability in tropical climate during the late 19th century. *Geophysical Research Letters* 36, LO8602, doi: 10.1029/2008GL036924
- Conroy, J.L., A. Restrepo, J.T. Overpeck, M. Steinetz-Kannan, J.E. Cole, M.Bush, P.A. Colinvaux (2009). Unprecedented recent warming of surface temperatures in the eastern tropical Pacific Ocean. *Nature Geosciences* 2, 46-50.
- Abram, N., M.K. Gagan, J.E.Cole, W.Hantoro, M. Mudelsee (2008). Coral evidence for a recent intensification of the Indian Ocean Dipole. *Nature Geosciences* 1, 849 – 853.
- Conroy, J.L., J.T. Overpeck, J.E. Cole, M. Steinetz-Kannan, *T.R. Shanahan (2008) Abrupt changes in eastern tropical Pacific climate during the Holocene. *Quaternary Science Reviews* 27, 1166-1180.
- Wagner, A.J., T.P. Guilderson, N.C. Slowey, J.E. Cole (2009). Pre-bomb surface water radiocarbon of the Gulf of Mexico and Caribbean as recorded in hermatypic corals. *Radiocarbon* 51 (3), pp. 947-954.
- Overpeck, J.T. and J.E. Cole. (2008). The rhythm of the rains. *Nature* 451, 1061-1063. (News and Views)
- Fleitman, D, R.B. Dunbar, M. McCulloch, M. Mudelsee, M. Vuille, T. McClanahan, J. Cole, S. Eggins (2007). East African soil erosion recorded in a 300 year old coral colony from Kenya. *Geophysical Research Letters* 34, L04401, doi:10.1029/2006GL028525.
- Overpeck, J.T. and J.E. Cole (2007). Lessons from a distant monsoon. *Nature* 445, 270-271. (News and Views)

F. Invited Talks (Jan 2007-present)

- University of Melbourne Dept. of Earth Sciences, 2013
- University of Melbourne Dept. of Geography, 2013
- University of Adelaide, 2013
- University of Newcastle, 2013
- Monash University, 2013
- Australian Institute of Marine Sciences, 2013
- University of Western Australia, 2013
- Australia National University, 2013
- Australian Meteorology annual meeting and Oceanography Society, Jan 2013, Invited Clarke Lecture
- Climate Adaptation Futures, Tucson. May 2012. Session organizer and speaker
- Swedish Academy of Sciences, Bert Bolin Symposium on climate change. May 2012. Invited speaker.
- Third Conference on Biodiversity and Management of the Madrean Archipelago, May 2012. Invited speaker.
- Scripps Institute of Oceanography, 2012
- National Park Service, 2011 (webinar on the oceans and climate change)
- NOAA Climate Research Board, 2011 (webinar on megadrought risk)
- Northern Illinois University, 2011

- Paleoclimate Model Intercomparison Proj. Workshop on Tropical Variability, Villefranche-Sur-Mer, Sept. 2011. Invited speaker.
- Amer. Geophysical Union fall meetings, San Francisco CA, December 2007, 2008, 2010, 2011. Invited speaker.
- CIFAR workshops on Human-Environment Interactions: Oct. 2010, May and Dec 2011 (4 invited presentations)
- CCSM Users workshop, Breckenridge CO, June 2010. Invited speaker
- Charles Darwin Station, Galapagos, Ecuador, 2006 and 2010 (in Spanish)
- DISCCRS mentor presentation, 2010
- GLOBEC steering committee meeting, lunchtime speaker, 2009
- Five-College lecture series, Holyoke, MA, 2009
- University of Wisconsin, Geology Department, April 2008
- University of New Mexico, Program in Interdisciplinary Biological and Biomedical Sciences, March 2008.
- IODP Workshop: Initial Results, Expedition 310. Tahiti, November 7-11, 2007.
- American Geophysical Union Joint Assembly, Acapulco Mexico, May 2007.

G. Contributed Presentations (Jan 2007-present)

NA

H. Current Grants/Contracts

- *NSF EaSM2.* Collaborative Research on Quantifying and Conveying the Risk of Prolonged Drought in Coming Decades. Co-I with Overpeck and Liverman; collaborative with NCAR. UA portion $1,572,714 (Nov. 1, 2012-Oct. 31, 2017).
- *NSF Atmospheric Sciences (Climate and Global Dynamics):* Drought risk and low-frequency hydroclimatic variability in CMIP5 simulations. $29,999. With Co-I Dr. Toby Ault. *6/1/2011-6/30/13.*
- *NSF, Paleoclimate Perspectives on Climate Change.* Mechanisms of hydroclimatic variability in the Southwest US: new high-resolution speleothem records of past drought. $400,603 (sole PI, 7/1/09-6/30/13).
- *NOAA*: Reconciling trends in equatorial Pacific SST and salinity: implications for ENSO mechanisms, $360,000 (Sole PI; July 1, 2008-June 30, 2013).

I. Major Service (Jan 2007-present)

I1. Professional/Scientific (* denotes current activity)

- *AAAS Climate Science Panel
- *CLIVAR working group on ENSO Diversity
- *Energy and Climate Partners for the Americas fellow, US Department of State, 2011-present
- *Board member, Pinhead Institute, a community science-education organization in SW Colorado
- NRC Committee on Challenges and Opportunities for International Science at the USGS
- Proposal review panels for NSF (2010) and NOAA (2009)
- NOAA Climate Change Task Force, Coral Reef Conservation program (2008-2009)
- Proposal review panels for NOAA, NSF (2009-2010)
- Scientific Steering Committee for CCSM-3, National Center for Atmospheric Research, 2006-2008
- Councillor for Paleoclimatology, American Quaternary Association

I2. University, College, Department (* denotes current activity)

- *Chair, Nominations Committee, Geosciences
- *Academic Program Review Committee, Geosciences
- *Executive Committee, Global Change Interdisciplinary Minor
- *Steering Committee, Center for Hydrometeorology and Climate Dynamics

- Mentor for Carson Scholars (interdisciplinary environmental fellows), 2012
- Search committee for department head, 2012
- Chair, Promotion and Tenure committee, 2011
- Graduate admissions committee, several years
- Undergraduate policy committee (I led the development of a new major track in Earth System Science), 2007-11
- Chair's advisory Committee, Geosciences Department
- Chair, search committee for spousal hire, 2010-2011.
- Chair, search committee, Climate Dynamics, 2009-10
- University Committee on Conciliation, 2007-10

I3. Local/Community

- Interviews with local media (most recently: Tucson Green Times cover story, Sept 2010; Fox-11 Focus 30-min live-to-tape interview on Aug. 25 2010; AZ Daily Star science section and interviews with Tom Beal and Tony Davis)
- Work with Union of Concerned Scientists on "Curious for Life" campaign, 2010 (www.ucsusa.org/assets/documents/wote_ads/Julia_Cole_Ad.pdf)
- Panelist for discussion on "The Water is Rising," a Pacific dance performance at UAPresents.
- Advise Climate Communication Inc.
- NPR Interviews on climate change in the Southwest – June 2007 (Morning Edition and All Things Considered)
- Panel discussion of "An Inconvenient Truth" shown through Campus Climate Challenge (2007), and of "Sizzle: A Global Warming Comedy" at the Loft (2010).
- NPR interview on abrupt climate change (2007) – Morning Edition
- UA College of Science Global Change Lecture Series – Speaker on the Oceans and Global Change (2006; 2008).

J. Synergistic Activities

NA

Biographical Sketch: Andrew C. Comrie

A. Professional Preparation

University of Cape Town	Geography	B.Sc. 1984
University of Cape Town	Atmospheric Science	B.Sc.(Honours) 1985
University of Cape Town	Environmental & Geographical Science	M.Sc. 1988
The Pennsylvania State University	Geography	Ph.D. 1992

B. Appointments

2012-present	Senior Vice President for Academic Affairs & Provost, University of Arizona
2006-2012	Associate Vice President for Research & Dean of the Graduate College, University of Arizona.
2005-present	Professor, School of Geography and Development, University of Arizona Joint appointments: Atmospheric Sciences, Public Health
1999-2005	Associate Professor, Geography and Regional Development, University of Arizona
1992-1999	Assistant Professor, Geography and Regional Development, University of Arizona

C. Research Interests

Climate and disease/health, synoptic climatology, urban and regional air quality climatology, climate variability and change in the Southwest United States, North American monsoon climatology, techniques for mapping climate and environmental information.

D. Selected Honors & Awards

- Phi Beta Kappa, Honorary member, 2013.
- Honored Faculty Award, Graduate Interdisciplinary Programs, University of Arizona, 2012.
- Excellence in Mentoring Award, Honors College, University of Arizona, 2011.
- Special Contribution to American Indian Education Award, University of Arizona American Indian Alumni Club, 2007.
- Research Professorship, University of Arizona, Social and Behavioral Sciences Research Institute, 2000.
- Faculty Appreciation Award, Business and Public Administration Student Council, University of Arizona, 1997.
- Visiting Fellow, Udall Center for Studies in Public Policy, University of Arizona, 1996-1997.

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Ray, A.J., Garfin, G.M., Wilder, M., Vásquez-León, M., Lenart, M. & Comrie, A.C., 2007: Applications of monsoon research: Opportunities to inform decisionmaking and reduce regional vulnerability. *Journal of Climate* 20, 1608–1627.
- Comrie, A.C., 2007: Climate change and human health. *Geography Compass* 1, 325–339.
- Tamerius, J., Wise, E.K., Uejio, C.K., McCoy, A., and Comrie, A.C., 2007: Climate and human health: synthesizing environmental complexity and uncertainty. *Stochastic Environmental Research and Risk Assessment (SERRA)* 21, 601-613.
- Kolivras, K.N. and Comrie, A.C., 2007: Regionalization and variability of precipitation in Hawaii. *Physical Geography* 21, 76-96.
- Comrie, A.C. and Glueck, M.F., 2007: Model sensitivity for assessing climatologic effects on the risk of acquiring coccidioidomycosis. *Annals of the New York Academy of Sciences* 1111, 83–95.
- Bieda III, S.W., Castro, C.L., Mullen, S.L., Comrie, A.C. and Pytlak, E., 2009: The relationship of transient upper-level troughs to variability of the North American monsoon system. *Journal of Climate* 22, 4213-4227.
- Comrie, A.C., 2010: Nietzsche's challenge to physical geography. *ACME: An International E-Journal for Critical Geographies* 9 (1), 34-46.

- Morin, C.W. and Comrie, A.C., 2010: Modeled response of the West Nile virus vector *Culex quinquefasciatus* to changing climate using the dynamic mosquito simulation model. *International Journal of Biometeorology* 54, 517-529, doi: 10.1007/s00484-010-0349-6.
- Delgado, S., Neyra, R.C., Machaca, V.Q., Juarez, J.A., Chu, L.C., Verastegui, M., Apaza, G.M., Bocángel, C.D., Tustin, A.W., Sterling, C.R., Comrie, A.C., Naquira, C., del Carpio, J.C., Gilman, R., Bern, C. and Levy, M., 2011. A history of Chagas disease transmission, control, and re-emergence in peri-rural La Joya, Peru. *PLoS Neglected Tropical Diseases* 5(2): e970. doi:10.1371/journal.pntd.0000970.
- Tamerius, J.D. and Comrie, A.C., 2011: Coccidioidomycosis incidence in Arizona predicted by seasonal precipitation. *PLoS ONE* 6(6): e21009. doi:10.1371/journal.pone.0021009.
- Uejio, C.K., Kemp, A. and Comrie, A.C. 2012: Climatic controls on West Nile virus and Sindbis virus transmission and outbreaks in South Africa. *Vector-Borne and Zoonotic Diseases* 12(2): 117-125. doi:10.1089/vbz.2011.0655.
- Stacy, P.K.R., Comrie, A.C. and Yool, S.R., 2012: Modeling valley fever incidence in Arizona using a satellite-derived soil moisture proxy. *GIScience & Remote Sensing* 49, 299–316, doi:10.2747/1548-1603.49.2.299.
- Scott, C.A., Robbins, P.F. and Comrie, A.C., 2012: The mutual conditioning of humans and -pathogens: implications for integrative geographical scholarship. *Annals of the Association of American Geographers* 102 (5), 977-985.
- Comrie, A.C. and McCabe, G.J., 2012: Global air temperature variability independent of sea-surface temperature influences. *Progress in Physical Geography* 37, 29-35, doi: 10.1177/0309133312460074.
- El Vilaly, A.E., Arora, M., Butterworth, M.K., El Vilaly, M.A.M., Jarnagin, W. and Comrie, A.C., 2013. Climate, environment and disease: The case of Rift Valley fever. *Progress in Physical Geography*, in press.
- Tamerius J.D., Shaman, J., Alonso, W.J., Bloom-Feshbach, K., Uejio, C., Comrie, A.C. and Viboud, C., 2013: Environmental predictors of seasonal influenza epidemics across temperate and tropical climates. *PLoS Pathogens* 9(3): e1003194. doi:10.1371/journal.ppat.1003194.
- Morin, C.W. and Comrie, A.C., 2013: Regional and seasonal response of a West Nile virus vector to climate change. *Proceedings of the National Academy of Sciences (PNAS),* www.pnas.org/cgi/doi/10.1073/pnas.1307135110.
- Morin, C.W., Comrie, A.C. and Ernst, K., 2013: Climate and dengue transmission: evidence and implications. *Environmental Health Perspectives*, DOI:10.1289/ehp.1306556.

E2. Books and Book Chapters

- Yarnal, B., Harrington, J., Comrie, A., Polsky, C. and Alqvist, O. 2009: Infrastructure for Observing Local Human-Environment Interactions. Chapter 1 in Yarnal, B. Polsky, C. and O'Brien, J. (Eds.) Sustainable Communities on a Sustainable Planet: The Human Environment Regional Observatory Project. Cambridge University Press, pp 1-12.
- Polsky, C., Comrie, A., Whitehead, J., Sorrensen, C. Butler Harrington, L.M., Lu, M., Neff, R., and Yarnal, B. 2009: Rapid Vulnerability Assessments of exposures, sensitivities, and adaptive capacities of the HERO study sites. Chapter 9 in Yarnal, B. Polsky, C. and O'Brien, J. (Eds.) Sustainable Communities on a Sustainable Planet: The Human Environment Regional Observatory Project. Cambridge University Press, pp 175-208.
- Sorrensen, C.L. and Comrie, A.C. 2009: Sonoran Desert Border Region: Urbanization and Hydroclimatic Challenges in the Sonoran Desert Border Region. Ch. 14 in Yarnal, B. Polsky, C. and O'Brien, J. (Eds.) Sustainable Communities on a Sustainable Planet: The Human Environment Regional Observatory Project. Cambridge University Press, pp 293-316.
- Yarnal, B., Harrington, J., Comrie, A., Polsky, C. and Alqvist, O. 2009: Lessons learned from the HERO Project. Chapter 15 in Yarnal, B Polsky, C. and O'Brien, J. (Eds.) Sustainable Communities on a Sustainable Planet: The Human Environment Regional Observatory Project. Cambridge University Press, pp 317-338.

- Reisen, W.K., Barker, C.M., Kramer, V.K., Caian, M., Hudspeth, W., Morain, S., Budge, A., Glass, G., Brown, H.E., and Comrie, A.C., 2012: Information and Decision Support Systems. Chapter 10 in Morain, S.A. & Budge, A.M. (Eds.) *Environmental Tracking for Public Health Surveillance*, CRC Press.
- Peters, D. P. C., Bestelmeyer, B. T., Havstad, K. M., Rango, A., Archer, S. R., Comrie, A. C., Gimblett, H. R., López-Hoffman, L., Sala, O. E., Vivoni, E. R., Brooks, M. L., Brown, J., Monger, H. C., Goldstein, J. H., Okin, G. S. and Tweedie, C. E., 2013: *Desertification of Rangelands. Climate Vulnerability: Understanding and Addressing Threats to Essential Resources*. Elsevier Inc., Academic Press, 239–258.
- Brown, H. E., Comrie, A. C., Drechsler, D. M., Barker, C. M., Basu, R., Brown, T., Gershunov, A., Kilpatrick, A. M., Reisen, W. K., & Ruddell, D. M., 2013. Chapter 15: Human Health. In: Garfin, G., Jardine, A., Merideth, R., Black, M., & LeRoy, S. (Eds.), *Assessment of Climate Change in the Southwest United States: a Report Prepared for the National Climate Assessment*. Washington, DC: Island Press, 312-339.

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- 10 invited academic presentations at universities and conferences; 12 invited administrative presentations for national and international associations.

G. Contributed Presentations (Jan 2007-present)

- 30 presentations overall, 13 as lead author and 17 as a co-author.

H. Current Grants/Contracts

- Adapting to climate variability, thresholds, and extremes in the Southwest: the Climate Assessment for the Southwest (CLIMAS). National Oceanographic and Atmospheric Administration (Co-P.I.; $3,474,906), with J. Overpeck, B. Colby, H. Hartmann, M. Wilder, G. Frisvold, C. Woodhouse et al. 2012-2017.
- Relating Diesel Exhaust Exposure to Respiratory and Immune Outcomes in Early Life. National Heart, Lung, and Blood Institute/NIH (Mentor co-P.I.; $670,325) with P. Beamer (P.I.), F. Martinez, E. Betterton, L. Gerald, D. Sherrill & A. Wright, 2011-2013.
- On the Edge: Dengue and Climate. National Institute of Allergy and Infectious Disease/NIH (Co-P.I.; $2,823,264) with K. Ernst (PI), Y. Carriere, M. Riehle & K.R. Walker, 2012-2017.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Board member, University of Arizona Foundation, 2012-present.
- Board member, Graduate Record Examination (GRE) Board (incl. service as member of Diversity, Equity & Inclusion Committee and Finance Committee), 2010-2014.
- Executive Committee Member, Association of American Universities (AAU) Association of Graduate Schools (AGS), 2010-2012.
- International Review Panelist, German Universities Excellence Initiative, German Research Foundation (DFG) & German Council of Science and Humanities (WR), 2011.
- Board member and Executive Board member (2010), Council of Graduate Schools, 2008-2010.
- National Stakeholder Advisory Committee for the Professional Science Master's Degree, 2010.
- Editor for the Americas, *International Journal of Climatology*, 2004-2012.
- Editorial Board, *The AAG Review of Books*, 2013-present.
- Editorial Advisory Board, *Progress in Physical Geography*, 2009-present.
- Editorial Board, *Environmental Science & Policy*, 2007-present.
- Editorial Board, *Annals of the Association of American Geographers*, 2006-present.

- Editorial Advisory Board of the international journal *Atmospheric Environment*, 2000-2008.

I2. University, College, Department

- Co-Chair, University Space & Capital Committee, 2012-present.
- Member, Strategic Planning and Budget Advisory Committee, 2012-present.
- Member, Search Committee, Vice President for External Relations, 2011-2012.
- Senator, Faculty Senate & Senate Executive Committee member, 2009-2010 & 2012-present.
- Chair, Search Committee, Dean of the College of Agriculture & Life Sciences, 2010-2011.
- Member, Executive Steering Committee, Mosaic Enterprise Systems Replacement Project (UAccess), 2009-2012.

I3. Local/Community

- Climate-related interviews with state and local press, radio, and television stations, multiple years.
- Visiting speaker for community service organizations, societies, K-12 schools, etc., multiple years.

J. Synergistic Activities

(i) Overall Research and Administrative Leadership: Comrie has spent 21 years at the University of Arizona building an interdisciplinary research program in climate variability and change, with particular emphasis on the connections between climate and human environmental issues including health and disease, air quality, and environmental policy. His research has been funded by many agencies including NSF, NOAA, EPA, and NASA. This support sustains graduate students and postdoctoral scientists through his Applied Climatology for Environment and Society (ACES) research laboratory. Comrie served previously as Graduate College Dean and Associate VP for Research, providing academic leadership for graduate education at the University of Arizona, as well as fostering the research and creative activities of the faculty and connecting those activities to the community. He now serves as Provost, leading the academic affairs of the entire University of Arizona. Comrie has served nationally and internationally on science and higher education committees, including the GRE Board, and as editorial board member and editor for a number of scientific journals, most recently the *International Journal of Climatology*.

Biographical Sketch: Katherine K. Hirschboeck

A. Professional Preparation

University of Arizona	Geosciences	Ph.D.	1985
University of Wisconsin - Madison	Geography	M.S.	1975
University of Wisconsin - Madison	Geography	B.S.	1973

B. Appointments

1991 – present	Associate Professor of Climatology, Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona. *Joint Appointments in*: Hydrology and Water Resources (1991 – present), School of Geography and Development (1992–present), Atmospheric Sciences (2004 – present)
1985-1991	Associate Professor (1990-1991), Assistant Professor (1985-1990) Department of Geography and Anthropology, Louisiana State University, Baton Rouge, Louisiana

C. Research Interests

Climatology and hydroclimatology of extreme events (floods and droughts), synoptic climatology, climatic variability and change, paleofloods, dendroclimatology, dendrohydrology

D. Honors and Awards (Jan 2007-present)

None.

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Glenn, E.P., Huete, A.R., Nagler, P.L., Hirschboeck, K.K. and Brown, P. 2007: Integrating Remote Sensing and Ground Methods to Estimate Evapotranspiration, *Critical Reviews in Plant Sciences* 26:3 pp 139-168.
- Hirschboeck, K.K. Future Hydroclimatology and the Research Challenges of a Post-Stationary World: *Journal of Contemporary Water Research and Education.* Issue 142, Pages 4-9, August 2009
- Norman,L; Tallent-Halsell, N.; Labiosa, W.; Weber, M.; McCoy, A.; Hirschboeck, K.; Callegary, J.; van Riper, III, C. and Gray, F. 2010: Developing an Ecosystem Services Online Decision Support Tool to Assess the Impacts of Climate Change and Urban Growth in the Santa Cruz Watershed; Where We Live, Work, and Play, *Sustainability*, 2044-2069; doi:10.3390/su2072044

E2. Books and Book Chapters

- Hirschboeck, K.K. 2009: Flood flows of the San Pedro River. Pages 300-312 in Stromberg, Juliet C. and Tellman, Barbara (eds.) *Ecology and Conservation of the San Pedro River.* University of Arizona Press: Tucson, 656 pp.

E3. Other Scholarly Activities (e.g., patents)

None.

F. Invited Talks (Jan 2007-present)

- Hirschboeck, Katherine, *Some Thoughts On Developing Climate-Based Scenarios for Extreme Hydrologic Events*. Invited talk at the Annual Conference of the Universities Council on Water Resources (UCOWR) on *Hazards in Water Resources*. Boise, ID, July 25, 2007.
- Hirschboeck K.K. 2010: *A Process-Based 'Bottom-Up' Approach for Addressing Changing Flood-Climate Relationships*. Invited presentation for National Academy of Sciences, Committee on Hydrologic Sciences (COHS) Workshop Jan 5-6, 2010 Global Change and Extreme Hydrology: Testing Conventional Wisdom.
- Hirschboeck, K.K. 2010: *Connecting Flooding and Climatic Variability: What are the Missing Links?* Invited presentation for the Consortium of Universities for the Advancement of Hydrologic

Science, Inc. / CUAHSI's Second Biennial Science Meeting on Water Across Interfaces, Boulder, CO 19-21 July 2010.

- Hirschboeck, K.K. 2011: *Constraining Flood Probabilities with Hydroclimatic and Paleohydrological Information.* Invited presentation for workshop on Hydrologic Extremes and Water Management in a Warming World - California Perspectives sponsored by California Department of Water Resources Climate Assessment of the Southwest, California Nevada Applications Program (CNAP), Scripps San Diego May 19–20, 2011.
- Hirschboeck, K.K., Zamora-Reyes, D., Kim, S., Parreti N.V., 2012*: Paleo, Present and Future Floods: Insights from Flood Hydroclimatology for Identifying Flood-Climate Links on Different Time Scales*. Invited presentation for the European Geophysical Union EGU Topical Meeting on Floods and Climate: Understanding and Exploiting the Link Between Floods and Climate, Potsdam, Germany 4-5 Oct 2012.

G. Contributed Presentations (Jan 2007-present)

- Twelve (12) presentations as the lead author; nine (9) presentations as a co-author.

H. Current Grants/Contracts

- Integrating Climate Science for Decision-Support, Mitigating Risk, and Promoting Resilience Climate Assessment for the Southwest (CLIMAS) (NOAA Cooperative Agreement no. NA07OAR4310382) P.I. J. Overpeck, Co-Is: B. Colby, A. Comrie, T. Finan, G. Frisvold, G. Garfin, H. Hartmann, K. Hirschboeck, M. Wilder, D. Bathke (New Mexico portion) Funding entity: Regional Integrated Science and Assessments (RISA) NOAA, UA portion $5,682,875 (5-yr project +one-year extension, ended in 2013)

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Journal article reviewer (20); Proposal reviewer (5)

I2. University, College, Department

- Global Change Graduate Interdisciplinary Program, Chair *(University)*
- Graduate College Graduate Student Orientation Mentoring Workshop presenter *(University)*
- Re-envisioning TA-Training Graduate College Committee *(University)*
- Learning Technologies Advisory Board *(University)*
- University Classroom Technology Upgrade (CTU) Faculty Advisory Committee *(University)*
- Vice Provost for Academic Affairs' Task Force on Classroom Responders *(University)*
- Campus-wide Reliable Course Management System Group *(University)*
- Institute of the Environment Faculty Advisory Board *(University & College)*
- Institute of the Environment Carson Scholarship Planning Committee *(University & College)*
- Institute of the Environment Carson Scholarship Selection Committee *(University & College)*
- School of Earth & Environmental Science Tier One Teaching Committee *(College)*
- Post-Tenure Review Committee, Laboratory of Tree-Ring Research *(Department)*
- Curriculum Coordinator, Laboratory of Tree-Ring Research *(Department)*

I3. Local/Community

- Multiple presentations to Arizona water-providers (Salt River Project, Central Arizona Project, City of Phoenix, Arizona Water Institute Advisory Board)
- Workshop (with graduate student A. Coles) for flood risk managers with the National Weather Service, Pima County Flood Control District, and U.S. Geological Service
- Participation on the Multiagency Task Force for the Arizona Flood Warning System
- "Let's Talk Science" public lecture for Biosphere 2's Lecture series

- Board member for the University Newman Center's St. Albert the Great Forum on Theology and Science
- Presentation of multiple science outreach talks on Climate Change locally and nationally in parishes and schools as one of 21 National Catholic Climate Ambassadors appointed by the Catholic Coalition on Climate Change sponsored by the U.S. Conference of Catholic Bishops

J. Synergistic Activities

(i) Tools for Climate-Informed Flood Mitigation: Ongoing collaboration emerging from CLIMAS project to develop a database of flood hydroclimatology and paleodata for flood warning and floodplain management applications. Includes partnership with hydrologists in the U.S. Geological Survey and Maricopa County Flood Control to assess the role of mixed populations in flood frequency analysis and develop scenarios for changing flood probabilities under climate change.

(ii) Partnership with State Water Providers to Address Past, Present, and Future Water Supply in Arizona: 'A Tree-Ring Based Hydroclimatic Assessment of Synchronous Extreme Streamflow Episodes in the Upper Colorado and Salt-Verde River Basins.' Research collaboration with hydrologists of the Salt River Project and Phoenix-area water managers to assess the causes and variability of past extreme streamflow episodes for transfer into operational decision-making to address extreme drought and high flow episodes.

(iii) Invited Advisor and Contributor to State, National, and International Committees addressing Climate Change and Extreme Flooding: United States National Academy of Sciences, Committee on Hydrologic Sciences Workshop (2010); California Department of Water Resources California Nevada Applications Program (2011); European Geophysical Union Topical Meeting on Floods and Climate (2012)

Biographical Sketch: Jonathan Overpeck

A. Professional Preparation

Brown University	Geological Sciences	Ph.D.	1985
Brown University	Geological Sciences	M.Sc.	1981
Hamilton College	Atmospheric Physics	A.B.	1979

B. Appointments

2009-present – Founding *Co-Director*, Institute of the Environment, Univ. of Arizona, Tucson
2006-present – *Affiliated Faculty Member* – James E. Rogers College of Law, Univ. of Arizona, Tucson
2004-present -- *Joint Professor*, Dept. of Atmospheric Sciences, Univ. of Arizona, Tucson
1999-2008 -- *Director*, Institute For Study of Planet Earth, Univ. of Arizona, Tucson
1999-present -- *Professor*, Dept. of Geosciences, Univ. of Arizona, Tucson
1985-1999 *Post-doctoral Res. Scientist (1985-86), Associate Research Scientist* (1986-90) Lamont-Doherty Earth Observatory, Columbia University; *Head (and Founder, 1990-99),* NOAA Paleoclimatology Program, NGDC, Boulder; *Director (and Founder, 1992-99),* World Data Center for Paleoclimatogy, Boulder, Colorado; *Fellow (1990-99),* Institute for Arctic and Alpine Research, Univ. of Colorado; *Adj. Assoc. Professor (1992-00),* Dept. of Geological Sciences, University of Colorado

C. Research Interests

Climate dynamics, paleoclimatology, climate modeling, climate variability, climate change, monsoon dynamics, ENSO dynamics, drought dynamics, sea level change, climate induced vegetation change, climate adaptation, stakeholder engagement and co-production of knowledge.

D. Selected Honors and Awards

- 2013 – Visiting Fellow, Victorian Centre for Climate Change Adaptation Research (VCCCAR), University of Melbourne, Australia.
- 2013 – Visiting Scientist, ARC Centre of Excellence for Climate System Sciences, University of Melbourne, Australia.
- 2011 – Senior Fellow, US Department of State, Energy and Climate Partnership of the Americas (ECPA)
- 2009 - Elected Fellow of the American Association for the Advancement of Science (AAAS)
- 2009 – Leading Edge Researcher Award, U. Arizona Office of Economic Development
- 2008 – NOAA Oceanic and Atmospheric Research Outstanding Scientific Paper Award
- 2007 – Nobel Peace Prize – contributed in leadership role as a Coordinating Lead Author of the Fourth Assessment of the Intergovernmental Panel on Climate Change (IPCC).
- 2007 – Shared winner of Atmospheric Science Librarians International's Scientific and Technical Category for "high impact comprehensive publication" for *Climate Change 2007: The Physical Science Basis.*
- 2005 – Bjerknes Lecturer, American Geophysical Union
- 2005 – John Simon Guggenheim Fellowship Award
- 2004 – Birbal Shani Institute of Palaeobotany, Lucknow, India Prof. T.M. Harris Medal for 2004 (awarded for best Indian co-authored paper in field in 2004)
- 2001 - American Meteorological Society's Walter Orr Roberts 2001 Award
- 1999 - US Department of Commerce Gold Medal
- 1994 - US Department of Commerce Bronze Medal

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Brusca, R.C., J. Wiens, W.M. Meyer, J. Eble, K. Franklin, J.T. Overpeck and W. Moore (2013). Dramatic Response to Climate Change in the Southwest: Robert Whittaker's 1963 Arizona Mountain Plant Transect Revisited, *Ecology and Evolution* (in press).

- Vano, J.A. B. Udall, D.R. Cayan, J.T. Overpeck, L.D. Brekke, T. Das, H.C. Hartmann, H. G. Hidalgo; M. Hoerling, G. J. McCabe, K. Morino, R. S. Webb, K.Werner, D. P. Lettenmaier (2013). Understanding Uncertainties in Future Colorado River Streamflow, *Bulletin of the American Meteorology Society* (in press).
- Shanahan, T., J. A Peck, N. McKay, C. W. Heil, Jr., J. King, S. L Forman, D. L. Hoffmann, D. A Richards, J. T. Overpeck, C. Scholz, (2013). Age models for long lacustrine sediment records using multiple dating approaches - an example from Lake Bosumtwi, Ghana. *Quaternary Geochronology* 15: 47-60.
- Otto-Bliesner, B.L, Rosenbloom, N., Stone, M.J., McKay, N., Lunt, D., Brady, E.C., Overpeck, J. (2013). How well do models reproduce Last Interglacial warmth? New model-data comparisons. *Philosophical Transactions of the Royal Society B* (in press).
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- Scholz, C.A, T.C. Johnson, A.S. Cohen, J.W. King, J.A. Peck, J.T. Overpeck, M.R. Talbot, E.T. Brown, L. Kalindekafeh, P.Y.O. Amoakoi, R.P. Lyons, T.M. Shanahan, I.S. Castaneda, C.W. Heile, S.L. Forman, L.R. McHarguek, K.R. Beuning, J.Gomez, and J.Pierson (2007). East African megadroughts between 135 and 75 thousand years ago and bearing on early-modern human origins. *Proc. of the National Academy of Sciences* 104, 16416-16421.

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- Overpeck, J.T. and J.E. Cole (2007) Lessons from a distant monsoon. *Nature* 445, 270-271.
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E2. Other publications

- Rogers, J., K. Averyt, S. Clemmer, M. Davis, F. Flores-Lopez, P. Frumhoff, D. Kenney, J. Macknick, N. Madden, J. Meldrum, J. Overpeck, S. Sattler, E. Spanger-Siegfried, and D. Yates. 2013. *Water-smart power: Strengthening the U.S. electricity system in a warming world.* Cambridge, MA: Union of Concerned Scientists.
- Engel, K.H. and J.T. Overpeck (2013). Adaptation and the Courtroom: Judging Climate Science, *Michigan Journal of Environmental & Administrative Law* (in press); also see Arizona Legal Studies Discussion Paper No. 12-38 (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2185616)
- Weiss J.L, J.T. Overpeck, J.E. Cole (2012) Warmer led to drier: Dissecting the 2011 drought in the Southern U.S. *Southwest Climate Outlook* 11(3), 3-4.
- Overpeck, J.T. (2011) *Written Testimony, U.S. Senate, Committee on Energy and Natural Resources Hearing* on "Current drought conditions affecting New Mexico and the status of the reports to be issued pursuant to Sections 9503 and 9506 of the Secure Water Act regarding a review of the current scientific understanding of the impacts of climate change on water resources and an assessment of the risks associated with climate change on water resources in certain river basins." April, 27 2011.
- Overpeck, J.T. Southwest Climate Change Network (http://www.southwestclimatechange.org/) Southwest climate Blog (2010 to present, founder and frequent author).
- Miller, M and J.T. Overpeck (2010). Climate Change & The Practice of Law, *Arizona Attorney* October, 2010, 30-37.
- Brickey, C., K. H. Engel, K. Jacobs, J. Matter, D. F. Luecke, M. L. Miller, J. T. Overpeck, and B. Udall. 2010. How to Take Climate Change into Account: A Guidance Document for Judges Adjudicating Water Disputes. *Environmental Law Reporter* 40:11215-11228.
- Conroy, J.L, J.T. Overpeck and J.E. Cole. 2010. El Niño/Southern Oscillation and changes in the zonal gradient of tropical Pacific sea surface temperature over the last 1.2 ka. *IGBP PAGES News* 18: 32-34 (invited paper).
- Overpeck, J. (2009). Keep the West Vibrant with a Strong Climate Change Policy, *Southwest Hydrology* 8(2): 24-30. (invited paper).
- Climate Scientists D. Battisti, W. Easterling, C. Field, I. Fung, J.E. Hansen, J. Harte, E. Kalnay, D. Kirk-Davidoff, P. Matson, J.C. McWilliams, M. Moina, J.T. Overpeck, F.S. Rowland, J. Russell, S.R. Saleska, E. Sarachik, J.M. Wallace and S.C. Wofsy (2006) Brief of *Amici Curiae* submitted to the U.S. Supreme Court in support of U.S. EPAs regulation of greenhouse gases as pollutants.
- Overpeck, J.T. (2007). Essay on climate change, in Braasch, G. "Earth Under Fire" University of California Press, Berkeley.

E3. Other Scholarly Activities

- Overpeck, J.T. *Southwest Climate Change Network* (http://www.southwestclimatechange.org/) Southwest climate Blog (founder and frequent author).
- Twitter: *@TucsonPeck* (tweeting about issues related to climate variability, climate change, climate impacts, climate adaptation, climate solution choices - all with a primary focus on the Southwest).

F. Invited Talks (Jan 2007-present) (selected ones shown out of 102 total)

- November, 2013 – Invited Speaker, 2013 Quivira Conference, Albuquerque, NM
- November, 2013 – Invited Speaker, Ventana Canyon Golf and Racquet Club, Tucson, AZ
- September, 2013 – Invited Speaker, Climate Change Science for Southwestern Broadcast Meteorologists and Weathercasters, Tucson, AZ
- September, 2013 – Speaker and Moderator, CLIMAS IPCC AR5 WGI Panel Discussion, Tucson, AZ
- June, 2013 – Invited Speaker, LaTrobe University, Australia
- June, 2013 – Invited Speaker, University of Adelaide, Australia
- June, 2013 – Invited Speaker, University New South Wales, Sydney, Australia
- June, 2013 – Invited Speaker/Panelist, 2013 National Climate Adaptation Conference, Sydney, Australia
- June, 2013 – Invited Speaker, Australian Bureau of Meteorology Workshop "Development of a Roadmap for Enhanced Drought Monitoring and Prediction Services for Australia," Melbourne, Australia
- May, 2013 – Invited Speaker, Australian National University
- May, 2013 - Australian Bureau of Meteorology, Melbourne, Australia
- May, 2013 – Invited Speaker, Monash University, Melbourne, Australia
- May, 2013 – Invited Speaker, University of Tasmania, Australia
- May, 2013 – Invited Speaker, VCCCAR Annual Forum, Geelong, Australia
- May, 2013 – Commencement Speaker, SIAS University, China
- May, 2013 – Invited Speaker, 2013 Zhengzhou Water Conference, China
- March, 2013 – Speaker, Inner Melbourne Climate Adaptation Network, Australia
- March, 2013 – Invited Speaker, CSIRO, Aspendale, Australia
- March, 2013 – Invited Speaker, University of Melbourne, Australia
- February, 2013 – Invited Speaker, National Conference of the Australian Meteorological and Oceanographic Society (AMOS), Australia

G. Contributed Presentations (Jan 2007-present)

- More than 100

H. Current Grants/Contracts

- 2013-2018 – NOAA/USAID – "Integrating Climate Information and Decision Processes for Regional Resilience" $3,173,026 Co-PI with several others – this is a new Univ. Arizona partnership with the International Research Institute for Climate and Society at Columbia – focused on international climate adaptation)
- 2013-2017 – NSF "Collaborative Research: Understanding the Full Range of Amazon Drought and Impacts." 4 years - $433,543 (PI – pending)
- 2013-2018 – NSF "EaSM 2 Collaborative Research on Quantifying and Conveying the Risk of Prolonged Drought in Coming Decades."5 years - $1,362,189 (PI with 3 others).
- 2012-2013 – NSF "RAPID: Securing the climate, limnological and sediment data needed to understand and calibrate multi-millennial records of ENSO in the Eastern Pacific." 1 year - $35,255 (PI)
- 2012-2017 – NOAA "Adapting to Climate Variability, Thresholds, and Extremes in the Southwest: The Climate Assessment for the Southwest (CLIMAS)," 5 years - $3,476,292 (PI with 10 others).
- 2012-2015 – DOD SERDP "Climate Change Impacts and Adaptation on Southwestern DoD Facilities," 3 years – $1,300,000 (Co-PI with 4 others).
- 2011-2014 NOAA "The Climates of Southwestern North American Megadrought: Multi-Proxy, Multivariate Observations and Analysis;" 3 years - $419,268 (PI with 1 other).
- 2010-2015 – DOI/USGS – "Southwest Climate Science Center" 5 years – $3,128,439 (PI with 5 others).

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- 2012- present - Member, U.S. National Academy of Science, Board on Environmental Change and Society
- 2011-present – Member, Higher Education Climate Adaptation Committee, American College and University President's Climate Commitment, http://www.presidentsclimatecommitment.org/node/6572
- 2011- present - Member, Scientific Advisory Committee, Energy and Water in a Warming World Initiative – a partnership led by the Union of Concerned Scientists
- 2010 to present – Lead Author, Working Group 2, Chapter 4 (Terrestrial and Inland Water Systems) UN/WMO Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment.

I2. University, College, Department

- 2010 to present – Member, UA Presidential Advisory Council on Environmental Sustainability
- 2010 – Presidents Sustainability Transition Team
- 2009 to 2012 – Coordinator (with D. Liverman) of Provost's Environmental Faculty Hiring Initiative
- 2008 to 2009 – Member, Vice President for Research Advisory Council for Strategic Advancement
- 2008 – Member, Provost's Advisory Council for Strategic Advancement (committee formed to provide one report on research priorities for UA)

I3. Local/Community

- 2009 to present – member, City of Tucson Climate Change Committee (appointed by Mayor and City Council)
- 2007 to present – various public lectures

J. Synergistic Activities

- Numerous regional, national and international workshops/conferences convened:
- Service on numerous editorial boards

Biographical Sketch: Juan M. Restrepo

A. Professional Preparation

The Pennsylvania State University	Physics	Ph.D.	1992
The Pennsylvania State University	Engineering	M.S.	1987
New York University	Music	B.S.	1983

B. Appointments

2009-present	Professor (2009 - present), Associate Professor (2004-2008), and Assistant Professor (1998-2003), Department of Mathematics, Physics Department, and Department of Atmospheric Sciences, University of Arizona, Tucson, Arizona.
1995-1996	CAM/PIC Visiting Assistant Professor, Mathematics Department, UCLA. -1993-1995 ORISE Distinguished Post-doctoral Fellow, Argonne National Laboratory.

C. Research Interests

Uncertainty quantification (data assimilation, parameter estimation, sensitivity analysis, subscale parametrizations). Wave/current interactions, dissipative/dispersive tracer dynamics (oil), climate dynamics. Scientific computing, acoustics.

D. Honors and Awards

- Distinguished Post-doctoral Fellow, ORISE, DOE
- Young Investigator Award, DOE, 2003-2005

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- M. Hasson, J.M. Restrepo, J. M. Hyman, ``A Strategy for Detecting Extreme Eigenvalues Bounding Gaps in the Discrete Spectrum of Self-Adjoint Operators," Computers and Mathematics with Applications, {\bf 53}, pp 1271-1283 (2007).
- Lane, J. M. Restrepo, J. McWilliams, ``Wave-Current Interaction: A Comparison of Radiation-Stress and Vortex-Force Representations," Journal of Physical Oceanography, {\bf 37} pp.1122-1141 (2007).
- M. Restrepo, ``Wave Breaking Dissipation in a Wave-driven Circulation," {\bf 37}, Journal of Physical Oceanography, pp 1749-1763 (2007).
- Hasson, J.M. Restrepo, ``Approximating on Disjoint Intervals and its application to Matrix Preconditioning,", Complex Variables and Elliptic Equations, {\bf 52}, DOI: 10.1080/17476930701524222 (2007)
- E. Lane, J. M. Restrepo, ``Shoreface-connected Ridges under the Action of Currents and Waves," Journal of Fluid Mechanics, {\bf 582}, DOI:0.1017/S0022112007005794 (2007).
- J. M. Restrepo, ``A Path Integral Method for Data Assimilation," Physica D f23}\ , pp. 14--27 (2008).
- P. Fischer, G. Leaf, J. M. Restrepo, ``Torque Effects on the Lift and Drag of Particles in an Oscillatory Boundary Flow," Journal of Fluids Engineering, {\bf 130}, 101303, (2008)
- J. Barber, J. P. Alberding, J. M. Restrepo, T. Secomb, ``Two-Dimensional Computational Models of Red Blood Cell Motion in Microvessel Bifurcations and Flexibility Effects", 2008, Annals of Biomechanics, {\bf 36}, pp1690-1698, 2008.
- P. Krause, J. M. Restrepo, ``Lagrangian Data Assimilation Using the Kernel Diffusion Method", Monthly Weather Review, 137}, pp. 4386-4400, 2009.
- J. M. Restrepo, R. Rael, J. Hyman, "Modeling the influence of polls on elections: a population dynamics approach," Journal of Public Choice, Volume 140, pp395-420, 2009.
- J. M. Restrepo, R. Choksi, J. Hyman, Y. Jiang,``Improving the damage accumulation in a biomechanical bone remodelling model," Computer Methods in Biomechanics and Biomedical Engineering, 12}, pp341-352, 2009.

- Y. Uchiyama, J. C. McWilliams, J. M. Restrepo,"Wave-current Interaction in Nearshore Shear Instability Analyzed with a Vortex Force Formalism," Journal of Geophysical Research, C06021, doi:10.1029/2008JC005135, 2009.
- J.M. Restrepo, J. Ramirez, J.C. McWilliams, M. Banner, " Multiscale Momentum Flux and Diffusion due to Whitecapping in Wave–Current Interactions," 41}, pp 837-85, .Journal of Physical Oceanography, 2011.
- S. Schofield, J. M. Restrepo, "Stability of planar buoyant jets in stratified fluids," Physics of Fluids, 22}, 053602, doi:10.1063/1.3415493, 2010.
- D. Kurtze, J. M. Restrepo, J. Ditmann, ``Convective Adjustment in Box Models", Ocean Modelling, 34 }, pp 92-110 2010.
- B. Weir, Y. Uchiyama, E. Lane, J. M. Restrepo, J. C. McWilliams, " vortex Force Analysis of the Interaction of Rip Currents and Surface Gravity Waves", 116, C050001 Journal of Geophysical Research, 2011.
- J. M. Restrepo, D. E. Moulton, H. Uys, ``Stably Precessive Granular Sand Bars Under Steady Shearing", Physical Review E 83 , 031305, 2011.
- J. Barber, J. M. Restrepo, T. Secomb, ``Simulated Red Blood Cell Motion in Microvessel Bifurcations: Effects of Cell-Cell Interactions on Cell Partitioning," Cardiovascular Engineering and Technology, 2, pp. 349-360, doi: 10.1007/s13239-011-0064-4
- Balci, A. Mazzucato, J. M. Restrepo, G. R. Sell, "Ensemble Dynamics and Bred Vectors," Monthly Weather Review, 140, pp2308-2334, 2012.
- J.M. Restrepo, S. Venkataramani, D. Comeau, H. Flaschka, ",Defining a Trend for a Time Series Using the Intrinsic Time-Scale Decomposition," submitted, Proceedings of the Royal Society of London, Series A, 2013.

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

- Numerical Analysis, Web notes for upper level undergraduates. 4 software packages that are presently used for research: DISSP (SIR MODEL), connection coefficients (wavelets), Task Farmer (massively parallel queuing program), Grad (calculates the gradient of a program or routine exactly).
- M. Restrepo, "Did Exit Polls Elect Reagan? Did a Third Party Affect the Gore/Bush Election?," Arizona Daily Star Guest Opinion, 2012
- J. M. Restrepo, "Global Warming, Climate Change, Climate Research' invited blog for MPE2013.

F. Invited Talks (Jan 2007-present)

- AGU Annual Meeting, Invited Speaker, '12, Max-Planck Institute, Physics of Complex Systems in Dresden, '12, SACNAS, Invited Speaker, Seattle '12, AIMS Conference, Orlando '12, SIAM, Annual meeting, UQ '12, SAMSI, Invited Speaker, Methodology Workshop, UQ Year, '11, AMS John von Neumann Workshop on Multiscale Methods, '11, IMA/NSF, Invited Speaker, Uncertainty Quantification Workshop, '11, IMA/NSF, Invited Speaker, Societally-Relevant Computing Workshop, '11, SIAM Annual Conference, 2010, Invited Speaker, Conference on Climate Dynamics, '10, Blackwell-Tapia Celebration, '10, IMA/NSF, Workshop on Careers for Minorities and Women in the Mathematical Sciences, keynote speaker, '10, IMA/NSF, Invited Speaker Complex Flows workshop '10, SACNAS Annual Meeting 2008, Plenary Speaker, SIAM, 2007, Mathematical Fluid Dynamics Symposium, MSRI, Mathematical Issues in Stochastic Approaches for Multiscale Modeling, '07, AMS, 2007 Spring Western Section, Invited Speaker '07, Stochastic Dynamical Systems and Climate Dynamics, BIRS Research Station, Banff, Invited Speaker '07.
- Additionally, between 20-30 departmental colloquia, seminars in the US and Europe.

G. Contributed Presentations (Jan 2007-present)

- About a dozen presentations as the lead author; a dozen presentations as a co-author.

H. Current Grants/Contracts

- PI "Lagrangian Data Assimilation", National Science Foundation (NSF) grant, $500,00, 5/2012-4/2015, Percent Effort: 100%
- co-PI (1 of 64 Pi's), Gulf of Mexico Research Initiative, "Center for Advanced Research on Transport of Hydrocarbons in the Environment," $112.5M. Research Consortia Studying Effects of Deepwater Horizon Oil Spill on Gulf of Mexico.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Technical Advisor, NOLTA 2013 Conference, Santa Fe NM
- Organizer, Uncertainty Quantification Conference 2008, Tucson AZ
- Visiting Faculty at: Los Alamos National Laboratory, Argonne National Laboratory, ICES/UT, Aspen Institute of Physics, Warwick Mathematical Sciences, SAMSI/NSF, IMA/NSF, MSRI/NSF.

I2. University, College, Department

- Several committees in the Mathematics Department (UA): hiring, promotion and tenure, computer.
- Steering Commitee, Program in Applied Mathematics (UA).

I3. Local/Community

- Pro-bono acoustics work: Sam Hughes Elementary, Beacon Foundation, The Children's Museum, Amity Foundation. Board Member, M. Contemporary Art Tucson, Board Member, KXCI FM.

J. Synergistic Activities

NA

Biographical Sketch: Adam Showman

A. Professional Preparation

California Institute of Technology	Planetary Sciences	Ph.D.	1999
California Institute of Technology	Planetary Sciences	M.S.	1999
Stanford University	Physics	B.S.	1991

B. Appointments

2001-now Professor (2012 - present), Associate Professor (2007-2012), and Research Assistant Professor (2001-2007), Department of Planetary Sciences with Joint Appointment in the Department of Atmospheric Sciences
1999-2001 National Research Council Associate (NASA Ames Research Center)
1999 Postdoctoral Scholar (University of Louisville, Louisville, KY)

C. Research Interests

Planetary atmospheres and interiors, specifically including atmospheric dynamics, structure, and evolution of gas giant planets including Jupiter, Saturn, Uranus, Neptune, and exoplanets, with a focus on the "hot Jupiters." Atmospheric dynamics, climate, and habitability of terrestrial planets. Atmospheric dynamics and structure of brown dwarfs. Orbital, thermal, and evolutionary history and surface tectonics and geodynamics of icy satellites in the outer solar system.

D. Honors and Awards

- Fellow, American Meteorological Society, 2011

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Showman, A.P., L. Han, and W.B. Hubbard 2013. The hemispheric dichotomy of surface tectonics and heat flux on Enceladus. *Geophys. Res. Lett.*, in press.
- Perez-Becker, D. and A.P. Showman 2013. Atmospheric heat redistribution on hot Jupiters. *Astrophys. J.*, in press.
- Nikolov, N., D.K. Sing, F. Pont, A.S. Burrows, J.J. Fortney, G.E. Ballester, T.M. Evans, C.M. Huitson, H.R. Wakeford, P.A. Wilson, S. Aigrain, D. Deming, N.P. Gibson, G.W. Henry, A. Lecavelier des Etangs, A.P. Showman, A. Vidal-Madjar, and K. Zahnle 2013. HST hot Jupiter transmission spectral survey: A detection of Na and strong optical absorption in HAT-P-1b. *Mon. Not. Roy. Astron. Soc.*, in press.
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- Bland, M.T., A.P. Showman, and G. Tobie 2008. The production of Ganymede's magnetic field. *Icarus* 198, 384-399.
- Sayanagi, K.M., A.P. Showman, and T.E. Dowling 2008. The emergence of multiple robust zonal jets from freely evolving, three-dimensional stratified geostrophic turbulence with applications to Jupiter. *J. Atmos. Sci.* 65, 3947-3962.
- Showman, A.P., C.S. Cooper, J.J. Fortney, and M.S. Marley 2008. Atmospheric circulation of hot Jupiters: Three-dimensional circulation models of HD209458b and HD189733b with simplified forcing. *Astrophys. J.* 682, 559-576.
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- Showman, A.P. 2008. Extrasolar planets: A whiff of methane. *Nature* 452, 296-297.
- Han, L. and A.P. Showman 2008. Implications of shear heating and fracture zones for ridge formation on Europa. *Geophys. Res. Lett.* 35, L03202, doi:10.1029/2007GL031957.
- Mitri, G. and A.P. Showman 2008. A model for the temperature-dependence of tidal dissipation in convective plumes on icy satellites: implications for Europa and Enceladus. *Icarus* 195, 758-764.
- Mitri, G. and A.P. Showman 2008. Thermal convection in ice-I shells of Titan and Enceladus. *Icarus*, 193, 387-396.
- Bland, M.T., R.A. Beyer, and A.P. Showman 2007. Unstable extension of Enceladus' lithosphere. *Icarus*, 192, 92-105.
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- Bland, M.T. and A.P. Showman 2007. The formation of Ganymede's grooved terrain: Numerical modeling of extensional necking instabilities. *Icarus* 189, 439-456.
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- Choi, D.S., D. Banfield, P. Gierasch, and A.P. Showman 2007. Velocity and vorticity measurements of Jupiter's Great Red Spot using automated cloud feature tracking. *Icarus* 188, 35-46, doi:10.1016/j.icarus.2006.10.037.
- Sayanagi, K.M. and A.P. Showman 2007. Effects of a large convective storm on Saturn's equatorial jet. *Icarus*, 187, 520-539.
- Mitri, G., A.P. Showman, J.I. Lunine, and R.D. Lorenz 2007. Hydrocarbon lakes on Titan. *Icarus* 186, 385-394.

E2. Books and Book Chapters

- Showman, A.P., R.D. Wordsworth, T.M. Merlis, and Y. Kaspi 2013. Atmospheric circulation of terrestrial exoplanets. Invited review for the book *Comparative Climatology of Terrestrial Planets*, Univ. Arizona Press. In press.
- Showman, A.P., J.Y-K. Cho, and K. Menou 2010. Atmospheric circulation of extrasolar planets. Invited review article for the book *Exoplanets* (S. Seager, Ed.), Univ. Arizona Press, pp. 471-516.

- Del Genio, A.D., R.K. Achterberg, K.H. Baines, F.M. Flasar, P.L. Read, A. Sanchez-Lavega, and A.P. Showman 2009. Saturn atmospheric structure and dynamics. In *Saturn from Cassini-Huygens* (M.K. Dougherty, L.W. Esposito, and S.M. Krimigis, Eds.), Springer, New York. pp. 113-160.
- Barr, A.C. and A.P. Showman 2009. Heat transfer in Europa's icy shell. In *Europa* (R.T. Pappalardo, W.B. McKinnon, and K. Khurana, Eds.), Univ. Arizona Press, pp. 405-430.
- Showman, A.P., K. Menou, and J. Y-K. Cho 2008. Atmospheric circulation of hot Jupiters: a review of current understanding. In Extreme Solar Systems, Astronomical Society of the Pacific (ASP) Conference Series, Vol. 398 (D. Fischer, F.A. Rasio, S.E. Thorsett, and A. Wolszczan, Eds.), pp. 419-441.

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- October 2013: University of Chicago geosciences colloquium
- March 2013: National Astronomical Observatory of Japan (NAOJ) colloquium
- March 2013: Kobe University colloquium
- July 2012: Kavli Institute for Astronomy and Astrophysics colloquium, Peking University, Beijing, China
- April 2012: McGill University, Department of Physics colloquium
- March 2012: Institute for Advanced Study (IAS), Princeton University colloquium
- February 2012: U.C. Berkeley Department of Astronomy colloquium
- October 2011: Eidgenossische Technische Hochschule (ETH) astronomy department colloquium
- July 2011: Kavli Institute for Astronomy and Astrophysics colloquium, Peking University, Beijing, China
- July 2011: Astronomy Institute (NAOC), Beijing, China colloquium
- March 2011: University of Toronto Department of Physics colloquium
- April 2010: UCLA Earth & Space Sciences Planetology seminar
- April 2010: California Institute of Technology Planetary Sciences seminar
- March 2010: Princeton/NASA Geophysical Fluid Dynamics Laboratory (GFDL) colloquium
- March 2010: Stony Brook University School of Marine and Atmospheric Sciences colloquium
- February 2010: Lamont-Doherty Earth Observatory Division of Ocean and Climate Physics seminar
- November 2009: University of Florida, Gainesville, physics department colloquium
- October 2009: Columbia University Applied Physics and Applied Mathematics (APAM) conference
- October 2009: Columbia University Astronomy department lunchtime seminar
- July 2009: University of Nantes department of geosciences colloquium, Nantes, France
- April 2009: Harvard/Smithsonian Center for Astrophyics (CfA) Institute for Theory and Computation (ITC) colloqiuium, Cambridge, MA
- April 2008: University of Arizona Theoretical Astrophysics Program (TAP) colloquium, Tucson, AZ
- March 2008: Massachusetts Institute of Technology Earth, Atmospheric, and Planetary Sciences departmental seminar, Cambridge, MA
- April 2007: UCLA Earth & Space Sciences departmental seminar
- March 2007: Lowell observatory seminar
- February 2007: Planetary Science Institute seminar, Tucson, AZ
- February 2007: Goddard Scientific Colloquium, NASA Goddard Space Flight Center, Maryland.
- Thirty three (33) Invited Talks at Conferences

G. Contributed Presentations (Jan 2007-present)

- Twenty-three (23) presentations as lead author; approximately 90 (ninety) presentations as a co-author.

H. Current Grants/Contracts

Note that ``Percent Effort'' is indicative of my group's share of work on the grant.

- Atmospheric Dynamics of Brown Dwarfs and Directly Imaged Giant Planets. NSF Astronomy Program, 2013-2016. $344,000. 100% effort.
- Jets on the giant planets (A.P. Showman, PI). NASA Planetary Atmospheres program, 2010-2014. $448,000. 100% effort.
- The atmospheric circulation of hot Jupiters (A.P. Showman, PI), NASA Origins Program. 2012-2015. $348,794, 100% effort.
- Observational analysis of Jupiter's equatorial circulations and Oval BA (A.P. Showman, PI), NASA Jupiter Data Analysis Program, 2009-2014. $297,836. 100% effort.
- The coupled orbital and thermal evolution of Io (A.P. Showman, PI). NASA Earth & Space Science Fellowship program, 2010-2013. $90,000.
- Extrasolar storms: the physics and chemistry of evolving cloud structure in brown dwarf atmospheres (D. Apai, PI; A.P. Showman, Co-I). NASA Spitzer Space Telescope. 2013-2014. $22,500 to Showman. 10% effort.
- Life on the Edge: Planetary atmospheres in extreme environments. (H. Knutson, PI; A.P. Showman, Co-I). NASA Spitzer Space Telescope. 2011-2014. ~$40,000 to Showman. 10% effort.
- Mapping Weather on brown dwarfs (J. Radigan, PI; A.P. Showman, Co-I). NASA Spitzer Space Telescope. 2011-2014. $10,000 to Showman. 10% effort.
- The atmospheric structure of giant hot exoplanets (D. Deming, PI; A.P. Showman, Co-I). NASA Hubble Space Telescope. 2010-2013. $22,540 to Showman. 5% effort.
- An optical transmission spectral survey of hot-Jupiter exoplanetary atmospheres (D. Sing, PI; A.P. Showman, Co-I). 2012-2014. ~$100,000 to Showman. 20% effort.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Nominated and elected to the Committee of the Division of Planetary Sciences of the American Astronomical Association (2006-2009), which represents over 1200 planetary scientists internationally.
- Selected to participate in the Science Definition Team (SDT) for the NASA Jupiter System Observer (JSO) mission study (2007). For the final report see http://solarsystem.nasa.gov/multimedia/downloads/JSO Public Report FC.pdf.
- Selected to participate in Science Definition Team for the NASA Europa-Jupiter System Mission (EJSM) study, which includes the Europa orbiter as a central component. The mission was selected by NASA to be the next Outer Planets flagship mission. For the final report see http://opfm.jpl.nasa.gov/europa jupitersystemmissionejsm/.
- Participated in Ph.D. thesis defense exams for Lena Zuchowski (Oxford University, 2009) and Emily Rauscher (Columbia University, 2010).
- Participated in Telescope Allocation Committee (TAC) peer-review panels for the National Optical Astronomy Observatories (NOAO) (spring 2011, fall 2011, spring 2012, fall 2012, spring 2013) and NASA Keck time (fall 2010, spring 2011, fall 2011).
- Participated in peer review panels for NASA grant programs (on average one panel per year since 2000, including several times as chair).
- External referee for NASA Planetary-Atmospheres, NASA Origins, NASA Planetary Geology & Geophysics, NASA Exobiology, NASA Outer Planets Program, NASA Mars Data Analysis Program, NASA Postdoctoral Program, NSF atmospheric science, Netherlands Organization for Scientific Research (NWO) National Science Council, UK AURORA program, and UK Science and Technology Facilities Council (STFC).
- Reviewer (~ 58 reviews total since 2007) for Icarus 2007, 2008, 2009, 2010, 2011, 2012, 2013; Geophysical Research Letters 2007, 2008, 2009, 2011; Journal of Geophysical Research: Planets

2008, 2010; Astrophysical Journal in 2007, 2008, 2009, 2010, 2011; Astrophysical Journal Letters 2007; Astrobiology 2007, 2008; Physics of Earth and Planetary Interiors 2007; J. Atmospheric Sciences 2009,

- 2010; Quarterly J. Royal Meteorological Soc. 2009; Philosophical Transactions A 2008; Planetary & Space Science 2009, 2010; Astronomy & Astrophysics 2008, 2013; Science 2011; Nature 2007, 2008, 2009, 2010, 2011; Monthly Notices Royal Astronomical Society 2010, 2011, 2012, 2013; de Pater and Lissauer's Planetary Sciences book; Europa book (Univ. Arizona Press) 2008.

I2. University, College, Department

- 2012-2013: Graduate Admissions & Advising committee (chair), Theoretical Astrophysics Program (TAP) steering committee, pre-tenure advising committee
- 2011-2012: Graduate Admissions & Advising committee (chair); library committee (chair); organizer of Theoretical Astrophysics Program (TAP) colloquium series 2010-2011: library committee (chair); Graduate Admissions & Advising comittee; pre-tenure advising committee; curriculum committee; organizer of Theoretical Astrophysics Program (TAP) colloquium series.

I3. Local/Community

- Public lecture at the Lunar & Planetary Laboratory, University of Arizona, November 2012: "Weather and climate on planets orbiting other stars: a new frontier in planetary science."
- Public lecture at Flandrau Planetarium February 2007: "Saturn: The Ringed Planet."
- Public lecture at Kitt Peak June 2007: "Jupiter: Jewel of the Night Sky."

J. Synergistic Activities

- 19 graduate students advised to date

Biographical Sketch: W James Shuttleworth

A. Professional Preparation

Manchester University	Hydrometeorology	D. Sc.	1993
Manchester University	High Energy Nuclear Physics	Ph. D.	1971
Manchester University	High Energy Nuclear Physics	Dip. Adv, St. Sc.	1968
Manchester University	Physics	B. Sc.	1967

B. Appointments

2009-date	Regents Professor at the University of Arizona
2003-2008	Director, NSF STC for Sustainability of semi-Arid Hydrology and Riparian Areas (SAHRA), University of Arizona, USA
1997-present	Joint Professor Atmospheric Science, University of Arizona, USA
1993-present	Professor of Hydrometeorology, University of Arizona, USA
1988-1993	Head, Hydrological Processes Division, Institute of Hydrology, UK

C. Research Interests

Terrestrial hydrometeorology and evaporation from natural and agricultural land surfaces. Broader research interests include the physical processes in hydrology with some emphasis on evaporation and hydrometeorology applied to environmental change at local, regional, and global scales; the application of remote sensing methods within hydrometeorology and improving weather and climate prediction; and the micrometeorology of natural and agricultural vegetation, including improving estimates of irrigated crop water requirements.

D. Honors and Awards

- Fellow of the Royal Meteorological Society (1979)
- Fellow of the American Meteorological Society (1996)
- Fellow of the American Geophysical Union (1997)
- Lifetime Membership of British Hydrological Society (1998)
- Awarded the American Geophysical Union Hydrology Prize (2001) for "*Outstanding contributions to the science of hydrology*"
- Awarded the IAHS, UNESCO, and WMO International Hydrology Prize (2006) for "*Innovative, international leadership over more than thirty years, contributing to the growth of hydrology into a major discipline of earth system science*."
- Awarded the UNESCO Great Man-Made River International Water Prize for Water Resources in Arid Zones on behalf of the SAHRA Center (2007) for "*Remarkable scientific work on water research in deserts and other arid lands."*
- Awarded Regents Professorship at the University of Arizona (2009)
- Awarded Colorado State Hydrology Days Award (2011) "*in recognition of outstanding contributions to hydrologic science with emphasis on evaporation, hydrometeorology, and the application of remote sensing methods in hydrology*"
- Selected 2011 American Geophysical Union Hydrology Section Walter B. Langbein Lecturer
- Selected 2013 American Meteorological Society Robert E. Horton Lecturer in Hydrology

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Farahani, H.J., T.A. Howell, W.J. Shuttleworth, and W.C. Bausch, 2007: Evapotranspiration: progress in measurement and modeling in agriculture, *Transactions of the American Society of Agricultural and Biological Engineers*, 50(5), 1627-1638
- Gochis, D.J., L.Brito-Castillo, and W. J. Shuttleworth, 2007: Correlations between sea-surface temperatures and warm season streamflow in northwest Mexico. *Intl. J., Climatology*, 27, 883-901

- Rosolem, R, W.J. Shuttleworth, L.G. de Goncalves, 2008 Is the Data Collection Period of the Large-Scale Biosphere-Atmosphere (LBA) Experiment in Amazonia Representative Of Long-Term Climatology?, *J. Geophys. Res.*, 113, G00B09, doi:10.1029/2007JG000628.
- de Goncalves, L.G., Rodell, M., Houser, P., Shuttleworth, W.J., Vila, D., Larroza, E., Bottino, M.J., Herdies, D.L., Aravequia, J.A., De Mattos, J.G., and Toll, D.L. The South American Land Data Assimilation System (SALDAS) 5-Yr Retrospective Atmospheric Forcing Datasets (2009). *Journal of Hydrometeorology*, 10(4):999-1010.
- Shuttleworth, W.J, and Wallace, J.S. (2009) Calculating the water requirements of irrigated crops in Australia using the Matt-Shuttleworth approach. *Transactions of the ASABE*, 52(6): 1895-1906.
- Shuttleworth, W.J., Serrat-Capdevila, A., Roderick, M.L. and Scott, R.L. 2009 On the theory relating changes in area-average and pan evaporation. *Q. J. R. Meteorol. Soc.* 135: 1230–1247
- Blyth, E., Shuttleworth, W.J., and Harding, R. 2009 Summary of the GEWEX international symposium on global land-surface evaporation and climate. *Hydrological Processes*, 23(23):3411-3412
- Rocha, H.R., Manzi, A.O., and Shuttleworth, W.J (2009) Evapotranspiration, in *Amazonia and Global Change* (M. Keller, M. Bustamante, J. Gash, and P. Silva Dias, eds.) *Geophysical Monograph Series (18)*, 576 p, AGU Press, Washington DC.
- Blyth, E., Gash, J., Lloyd, C, Pryor, M, Weedon, G.P, and Shuttleworth, W.J. (2010) Evaluating the JULES land surface model using FLUXNET data, *Journal of Hydrometeorology*, 2010; 11: 509-519.
- Shuttleworth, W.J. (2010) Back to the basics of understanding ET. In Hydrocomplexity: new tools for solving wicked water problems Kovaks Colloquium, July 2010, *IAHS Publ. 338*: 13-31.
- *Shuttleworth W.J., Zreda M., Zeng X., Zweck C., and Ferré P.A.*, (2010) The COsmic-ray Soil Moisture Observing System (COSMOS): a non-invasive, intermediate scale soil moisture measurement network. Proceedings of the British Hydrological Society's Third International Symposium: 'Role of hydrology in managing consequences of a changing global environment', Newcastle University, 19-23 July 2010. ISBN: 1 903741 17 3.
- Rosolem, R., W. J. Shuttleworth, X. Zeng, S. R. Saleska, T. Huxman (2010) Land surface modeling inside Biosphere2 Tropical Rainforest biome, Journal of Geophysical Research - Biogeosciences, 115, G04035, doi:10.1029/2010JG001443.
- Serrat-Capdevila, A., Scott, R.L., Shuttleworth, W.J., and Valdes, J. (2011) Estimating evapotranspiration under warmer climates: Insights from a semiarid watershed. *J. Hydrology*, 399, 1-11, doi:10.1016/j.jhydrol.2010.12.021
- Rosolem, R., W. J. Shuttleworth, H. V. Gupta, L. G. G. de Goncalves, X. Zeng, and N. Restrpo-Coupe (2011) A fully multiple-criteria implementation of the Sobol′ method for parameter sensitivity analysis. Journal of Geophysical Research, 117, D07103, 18 pp, doi:10.1029/2011JD016355
- P. Weedon, G.P., S. Gome, P. Viterbo, W. J. Shuttleworth, E. Blyth, H. Österle, J. C. Adam, N. Bellouin, O. Boucher, and M. Best (2011) Assessing global potential evapotranspiration over land in the twentieth century using the WATCH Forcing Data., *J. Hydrometeorology*, 12, 823–848, doi: http://dx.doi.org/10.1175/2011JHM1369.1
- M. Zreda, W. J. Shuttleworth, X. Zeng, C. Zweck, D. Desilets, T. Franz, R. Rosolem, and T. P. A. Ferre (2012) COSMOS: The COsmic-ray Soil Moisture Observing System, *Hydrology and Earth System Science*, 16, 4079-4099, doi:10.5194/hess-16-1-2012.
- Franz, T.E, M. Zreda, T.P.A. Ferre, R. Rosolem, C. Zweck, S. Stillman, X. Zeng and W.J. Shuttleworth. 2012, Measurement depth of the cosmic-ray soil moisture probe affected by hydrogen from various sources, Water Resources Research 48, W08515, doi:10.1029/2012WR011871.
- Rosolem, R., H. V. Gupta, W. J. Shuttleworth, X. Zeng, and L. G. G. deGonçalves (2012), A fully multiple-criteria implementation of the Sobol′ method for parameter sensitivity analysis, *J. Geophys. Res., 117, D07103, doi:10.1029/2011JD016355.*
- Rosolem, R., H. V. Gupta, W. J. Shuttleworth, L. G. G. de Goncalves, X. Zeng (2012) Towards a comprehensive approach to parameter estimation in land surface parameterization schemes, Hydrological Processes, doi: 10.1002/hyp.9362

- Shuttleworth, J., R. Rosolem, M. Zreda and T.E. Franz. The COsmic-ray Soil Moisture Interaction Code (COSMIC) for use in data assimilation, Hydrology and Earth System Sciences Discussions 10, 1097-1125, doi:10.5194/hessd-10-1097-2013.
- Rosolem, R., W. J. Shuttleworth, M. Zreda, C. Zweck, T. Franz, and X. Zeng, (2012) The Effect of Atmospheric Water Vapor on the Cosmic-ray Soil Moisture Signal, *Hydrological Processes* (in press).

E2. Books and Book Chapters

- Shuttleworth, W.J., 2012. *Terrestrial Hydrometeorology*. Wiley-Blackwell, Oxford, UK (ISBN: 978-0-470-65938-0 (hardback) 978-0-470-65937-3 (paperback) 978-1-1199-5190-2 (E-book). available at: http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470659386.html

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- 2011: Colorado State Hydrology Days Lecture, "At last it is possible to measure area-average soil moisture"
- 2011: American Geophysical Union Hydrology Section Walter B. Langbein Lecture, "The emergence of terrestrial hydrometeorology"
- 2013: American Meteorological Society Robert E. Horton Lecture in Hydrology, "In the next decade we will mine the meteorological predictability associated with measured storage of atmospherically accessible water on land surfaces"

G. Contributed Presentations (Jan 2007-present)

- Thirty one (31) presentations as the lead author; sixty nine (69) presentations as a co-author.

H. Current Grants/Contracts

- Co-PIs: S. Saleska, W.J. Shuttleworth, A. Huete, S. Wofsy, M. Keller, *Title: PIRE: Carbon, Water and Vegetation Dynamics of Amazon Forests Under Climatic Variability and Change,* Agency: NSF, Amount: $2,500,000 (five-year total), Dates: 09/01/07-08/31/13
- Co-PIs: M. Zreda, W.J. Shuttleworth, X. Zeng, and C. Zweck, Agency: NSF, Title: *The COsmic-ray Soil Moisture Observing System (COSMOS),* Amount: $4,450,000 (four-year total), Dates: 01/01/09-12/31/13, Support: 1 month summer
- PI: W.J. Shuttleworth, Title: *Impact of Vegetation Phenology on Amazonian Energy, Water, and Carbon Exchanges,* Agency: NASA, Amount: $60,000 (two-year total), Dates: 09/01/10-08/31/13

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Member of the Scientific Advisory Committee for the Large-scale Biosphere-Atmosphere Experiment in Amazonia (1993-present)
- Assistant Editor, *Hydrological Sciences Journal* (1990-2008)
- Assistant Editor, *Journal of Hydrology* (1990-2008)
- Assistant Editor, *Hydrological Research* (2008-present)
- Occasional reviews of scholarly books (approximately one or two per year)
- Frequent reviews of scientific papers (approximately 20 per year) for Nature, Science, Proceedings of the Royal Society, Quarterly Journal of the Royal Meteorological Society, Water Resources Research, Journal of Hydrology, Journal of Geophysical Research, Agricultural and Forest Meteorology, Boundary Layer Meteorology, Climate Change, Journal of Arid Environments, Journal of Climate, Process Hydrology, Bulletin of the American Meteorological Society, and other scholarly journals.

I2. University, College, Department

- Executive Committee, Institute for Studies of Planet Earth (1995-2008)

- Chair, Faculty Advisory Committee to the University of Arizona Institute for the Environment (2009-2012)
- Search Committee for Head, Department of Hydrology and Water Resources (2010)
- College of Science Promotion and Tenure Committee (2010-present, Chair 2011 – present)

I3. Local/Community

- Advisor to Arizona Department of Water Resources on Nogales transborder recycled water exchange proposal, October 1996
- Sunrise Elementary School classes on "Hydrometeorology

J. Synergistic Activities

Major Teaching Innovation: Contributed to the effort in setting up the Hydrometeorology M.S. and Ph.D. Degree Program at the Univ. of Arizona, which is the first such program in the United States.

Major Prior Grant: Co-Principal Investigator of the NSF project ``COsmic-ray Soil Moisture Observing System (COSMOS)" ($5.45M, 9/2009-8/2013) that set up a preliminary national network over U.S. and followed by national networks in other countries.

Biographical Sketch: Armin Sorooshian

A. Professional Preparation

Caltech	Chemical Engineering	Ph.D.	2008
Caltech	Chemical Engineering	M.S.	2005
University of Arizona	Chemical Engineering	B.S.	2003

B. Appointments

2009-date	Assistant Professor, Department of Chemical and Environmental Engineering, courtesy appointment in Atmospheric Sciences, University of Arizona, Tucson, Arizona
2008-2009	Postdoctoral Fellow, Cooperative Institute for Research in the Atmosphere (Colorado State University and National Oceanic and Atmospheric Administration), Colorado

C. Research Interests

Surface and airborne measurements of aerosol composition, size, and water-uptake properties; aerosol-cloud-precipitation interactions; ocean-land-atmosphere interactions; cloud water and precipitation chemistry; satellite data analysis

D. Honors and Awards

- Invitee: 2013 National Academy of Engineering Frontiers of Engineering Education Symposium (Irvine, CA; 2013)
- Editors' Citation for Excellence in Refereeing for Journal of Geophysical Research-Atmospheres (2012)
- Award for Excellence at the Student Interface (2012-2013; Dept. of Chemical and Environmental Engineering)
- College of Engineering Education Faculty Fellow (2012-2014)
- Invitee and Co-Chair: National Academy of Engineering's 2012 U.S. Frontiers of Engineering Symposium (Warren, Michigan; 2012)
- Invitee: National Academy of Engineering's 2011 U.S. Frontiers of Engineering Symposium (Mountain View, California; 2011)
- Award for Excellence at the Student Interface (2010-2011; Dept. of Chemical and Environmental Engineering)
- Office of Naval Research Young Investigator Program Award (2010)

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Sorooshian, A., N. L. Ng, A. W. H. Chan, G. Feingold, R. C. Flagan, and J. H. Seinfeld (2007). Particulate organic acids and overall water-soluble aerosol composition measurements from the 2006 Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS), *J. Geophys. Res*., *112*, D13201, doi:10.1029/2007JD008537.
- Sorooshian, A., M. –L. Lu, F. J. Brechtel, H. Jonsson, G. Feingold, R. C. Flagan, and J. H. Seinfeld (2007). On the source of organic acid aerosol layers above clouds, *Environ. Sci. Technol.*, *41*, 4647-4654.
- Fountoukis, C., A. Nenes, N. Meskhidze, R. Bahreini, W. C. Conant, H. Jonsson, S. M. Murphy, A. Sorooshian, V. Varutbangkul, F. J. Brechtel, R. C. Flagan, and J. H. Seinfeld (2007). Aerosol-cloud drop concentration closure for clouds sampled during the International Consortium for Atmospheric Research on Transport and Transformation 2004 campaign, *J. Geophys. Res*., *112*, D10S30, doi:10.1029/2006JD007272.
- Surratt, J. D., J. H. Kroll, T. E. Kleindienst, E. O. Edney, M. Claeys, A. Sorooshian, N. L. Ng, J. H. Offenberg, M. Lewandowski, M. Jaoui, R. C. Flagan, and J. H. Seinfeld (2007). Evidence for organosulfates in secondary organic aerosol, *Environ. Sci. Technol.*, *41*, 517-527.
- Szmigielski, R., J. D. Surratt, R. Vermeylen, K. Szmigielski, J. H. Kroll, N. L. Ng, S. M. Murphy, A. Sorooshian, J. H. Seinfeld, and M. Claeys (2007). Characterization of 2-methylglyceric acid

oligomers in secondary organic aerosol formed from the photooxidation of isoprene using trimethylsilylation and gas chromatography/ion trap mass spectrometry, *J. Mass. Spectrom.*, *42*, 101-116.

- Murphy, S. M., A. Sorooshian, J. H. Kroll, N. L. Ng, P. Chhabra, C. Tong, J. D. Surratt, E. Knipping, R. C. Flagan, and J. H. Seinfeld (2007). Secondary aerosol formation from atmospheric reactions of aliphatic amines, *Atmos. Chem. Phys.*, *7*, 2313–2337.
- Gilardoni, S., L. M. Russell, A. Sorooshian, R. C. Flagan, J. H. Seinfeld, T. S. Bates, P. K. Quinn, J. D. Allan, B. Williams, A. H. Goldstein, T. B. Onasch, and D.R. Worsnop (2007). Regional variation of organic functional groups in aerosol particles on four U.S. East Coast platforms during ICARTT 2004, *J. Geophys. Res*. *112*, D10S27, doi:10.1029/2006JD007737.
- Ng, N. L., P. S. Chhabra, A. W. H. Chan, J. D. Surratt, J. H. Kroll, A. J. Kwan, D. C. McCabe, P. O. Wennberg, A. Sorooshian, S. M. Murphy, N. F. Dalleska, R. C. Flagan, and J. H. Seinfeld (2007). Effect of NO_x level on secondary organic aerosol (SOA) formation from the photooxidation of terpenes, *Atmos. Chem. Phys.*, 7, 5159-5174.
- Ng, N. L., A. J. Kwan, J. D. Surratt, A. W. H. Chan, P. S. Chhabra, A. Sorooshian, H. O. T. Pye, J. D. Crounse, P. O. Wennberg, R. C. Flagan, and J. H. Seinfeld (2008). Secondary Organic Aerosol (SOA) Formation from Reaction of Isoprene with Nitrate Radicals (NO_3), *Atmos. Chem. Phys.,* 8, 4117-4140.
- Moore, R. H., E. Ingall, A. Sorooshian, and A. Nenes (2008). Molar mass, surface tension, and droplet growth kinetics of marine organics from measurements of CCN activity, *Geophys. Res. Lett*., *35*, L07801, doi:10.1029/2008GL033350.
- Sorooshian, A., S. M. Murphy, S. Hersey, H. Gates, L. T. Padró, A. Nenes, F. J. Brechtel, H. Jonsson, R. C. Flagan, and J. H. Seinfeld (2008). Comprehensive airborne characterization of aerosol from a major bovine source, *Atmos. Chem. Phys., 8*, 5489-5520.
- Sorooshian, A., S. Hersey, F. J. Brechtel, A. Corless, R. C. Flagan, and J. H. Seinfeld (2008). Rapid size-resolved aerosol hygroscopic growth measurements: differential aerosol sizing and hygroscopicity spectrometer probe (DASH-SP), *Aerosol Sci. Tech*., *42*, 445–464.
- Hersey, S. P., A. Sorooshian, S. M. Murphy, R. C. Flagan, and J. H. Seinfeld (2009). Aerosol hygroscopicity in the marine atmosphere: a closure study using high-resolution, size-resolved AMS and multiple-RH DASH-SP data, *Atmos. Chem. Phys., 9*, 2543–2554.
- Murphy, S. M., H. Agrawal, A. Sorooshian, L. T. Padró, H. Gates, S. Hersey, W. A. Welch, H. Jung, J. W. Miller, D. R. Cocker, A. Nenes, H. H. Jonsson, R. C. Flagan, and J. H. Seinfeld (2009). Comprehensive simultaneous shipboard and airborne characterization of exhaust from a modern container ship at sea, *Environ. Sci. Technol., 43*, 4626-4640.
- Lance, S., A. Nenes, C. Mazzoleni, M. Dubey, H. Gates, T. A. Rissman, S. M. Murphy, A. Sorooshian, R. C. Flagan, J. H. Seinfeld, G. Feingold, and H. H. Jonsson (2009). Cloud condensation nuclei activity, closure, and droplet growth kinetics of Houston aerosol during the Gulf of Mexico Atmospheric Composition and Climate Study (GoMACCS), *J. Geophys. Res*., *114*, D00F15, doi:10.1029/2008JD011699.
- Sorooshian, A., G. Feingold, M. D. Lebsock, H. Jiang, and G. Stephens (2009). On the precipitation susceptibility of clouds to aerosol perturbations, *Geophys. Res. Lett*., *36*, L13803, doi:10.1029/2009GL038993.
- Sorooshian, A., L. T. Padró, A. Nenes, G. Feingold, A. McComiskey, S. P. Hersey, H. Gates, H. H. Jonsson, S. D. Miller, G. L. Stephens, R. C. Flagan, and J. H. Seinfeld (2009). On the link between ocean biota emissions, aerosol, and maritime clouds: airborne, ground, and satellite measurements off the coast of California, *Global Biogeochem. Cycles*, *23*, GB4007, doi:10.1029/2009GB003464.
- Lu, M. -L., A. Sorooshian, H. H. Jonsson, G. Feingold, R. C. Flagan, and J. H. Seinfeld (2009). Marine stratocumulus aerosol-cloud relationships in the MASE-II experiment: Precipitation susceptibility in eastern Pacific marine stratocumulus, *J. Geophys. Res*., *114*, D24203, doi:10.1029/2009JD012774.

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- (*Invited Submission*) Sorooshian, A., and H. Duong (2010). Ocean emission effects on aerosol-cloud interactions: Insights from two case studies, *Advances in Meteorology*, doi:10.1155/2010/301395.
- Jiang, H. L., G. Feingold, and A. Sorooshian (2010). Effect of aerosol on the susceptibility and efficiency of precipitation in trade cumulus clouds, *J. Atmos. Sci*., *67*, 3525–3540.
- Sorooshian, A., S. M. Murphy, S. Hersey, R. Bahreini, H. Jonsson, R. C. Flagan, and J. H. Seinfeld (2010). Constraining the contribution of organic acids and AMS *m/z* 44 to the organic aerosol budget: On the importance of meteorology, aerosol hygroscopicity, and region, *Geophys. Res. Lett*., *37*, L21807, doi:10.1029/2010GL044951.
- Duong, H. T., A. Sorooshian, and G. Feingold (2011). Investigating potential biases in observed and modeled metrics of aerosol-cloud-precipitation interactions, *Atmos. Chem. Phys.*, *11*, 4027–4037.
- Hersey, S. P., J. S. Craven, K. A. Schilling, A. R. Metcalf, A. Sorooshian, M. N. Chan, R. C. Flagan, and J. H. Seinfeld (2011). The Pasadena Aerosol Characterization Observatory (PACO): chemical and physical analysis of the Western Los Angeles Basin aerosol, *Atmos. Chem. Phys.*, *11*, 7417–7443.
- Partridge, D. G., J. A. Vrugt, P. Tunved, A. M. L. Ekman, D. Gorea, and A. Sorooshian (2011). Inverse modeling of cloud-aerosol interactions–Part 1: Detailed response surface analysis, *Atmos. Chem. Phys.*, *11*, 7269–7287.
- Sorooshian, A., A. Wonaschütz, E. G. Jarjour, B. I. Hashimoto, B. A. Schichtel, and E. A. Betterton (2011). An aerosol climatology for a rapidly growing arid region (Southern Arizona): Major aerosol species and remotely-sensed aerosol properties, *J. Geophys. Res*., *116*, D19205, doi:10.1029/2011JD016197.
- Wonaschütz, A., S. Hersey, A. Sorooshian, J. Craven, A. R. Metcalf, R. C. Flagan, and J. H. Seinfeld (2011). Impact of a large wildfire on water-soluble organic aerosol in a major urban setting: the 2009 Station Fire in Los Angeles County, *Atmos. Chem. Phys.*, *11*, 8257–8270.
- Duong, H. T., A. Sorooshian, J. S. Craven, S. P. Hersey, A. R. Metcalf, X. Zhang, R. J. Weber, H. Jonsson, R. C. Flagan, and J. H. Seinfeld (2011). Water-soluble organic aerosol in the Los Angeles Basin and outflow regions: Airborne and ground measurements during the 2010 CalNex field campaign, *J. Geophys. Res*., *116*, D00V04, doi:10.1029/2011JD016674.
- Partridge, D. G., J. A. Vrugt, P. Tunved, A. M. L. Ekman, H. Struthers, and A. Sorooshian (2011). Inverse modeling of cloud-aerosol interactions – Part 2: Sensitivity tests on liquid phase clouds using a Markov Chain Monte Carlo based simulation approach, *Atmos. Chem. Phys*., *12*, 2823–2847.
- Metcalf, A. R., J. S. Craven, J. J. Ensberg, A. Sorooshian, H. T. Duong, H. Jonsson, R. C. Flagan, and J. H. Seinfeld (2012). Black carbon aerosol over the Los Angeles Basin during CalNex, *J. Geophys. Res*., *117*, D00V13, doi:10.1029/2011JD017255.
- Shingler, T., S. Dey, A. Sorooshian, F. J. Brechtel, Z. Wang, A. Metcalf, M. Coggon, J. Mülmenstädt, L. M. Russell, H. H. Jonsson, and J. H. Seinfeld (2012). Characterisation and airborne deployment of a new counterflow virtual impactor inlet, *Atmos. Meas. Tech*., *5*, 1259–1269.
- Chen, Y.-C., M. W. Christensen, L. Xue, A. Sorooshian, G. L. Stephens, R. M. Rasmussen, and J. H. Seinfeld (2012), Occurrence of lower cloud albedo in ship tracks, *Atmos. Chem. Phys*., *12*, 8223–8235.
- Sorooshian, A., J. Csavina, T. Shingler, S. Dey, F. Brechtel, E. Sáez, and E. A. Betterton (2012). Hygroscopic and chemical properties of aerosols collected near a copper smelter: Implications for public and environmental health, *Environ. Sci. Technol*., *46*, 9473-9480.
- Wonaschuetz, A., A. Sorooshian, B. Ervens, P. Y. Chuang, G. Feingold, S. M. Murphy, J. de Gouw, C. Warneke, H. H. Jonsson (2012). Aerosol and gas re-distribution by shallow cumulus clouds: an investigation using airborne measurements, *J. Geophys. Res*., *117*, D17202, doi:10.1029/2012JD018089.
- Coggon, M. M., A. Sorooshian, Z. Wang, A. R. Metcalf, A. A. Frossard, J. J. Lin, J. S. Craven, A. Nenes, H. H. Jonsson, L. M. Russell, R. C. Flagan, and J. H. Seinfeld (2012). Ship impacts on the

marine atmosphere: Insights into the contribution of shipping emissions to the properties of marine aerosol and clouds, *Atmos. Chem. Phys*., *12*, 8439-8458.

- Russell, L. M., A. Sorooshian, J. H. Seinfeld, B. A. Albrecht, A., Nenes, L. Ahlm, Y. –C., Chen, M. M. Coggon, J. S. Craven, R. C. Flagan, A. A. Frossard, H. Jonsson, E. Jung, J. J. Lin, A. R. Metcalf, R. Modini, J. Mulmenstadt, G. C. Roberts, T. Shingler, S. Song, Z. Wang, and A. Wonaschutz (2012). Eastern Pacific Emitted Aerosol Cloud Experiment (E-PEACE), *Bull. Amer. Meteor. Soc.*, *94*, 709–729, doi: http://dx.doi.org/10.1175/BAMS-D-12-00015.1
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- Wonaschütz, A., M. Coggon, A. Sorooshian, R. Modini, A. A. Frossard, L. Ahlm, J. Mülmenstädt, G. C. Roberts, L. M. Russell, S. Dey, F. J. Brechtel, and J. H. Seinfeld (2013). Hygroscopic properties of organic aerosol particles emitted in the marine atmosphere, *Atmos. Chem. Phys., accepted*, 2013.
- Sorooshian, A., Z. Wang, G. Feingold, and T. S. L'Ecuyer (2013). A satellite perspective on cloud water to rain water conversion rates and relationships with environmental conditions, *J. Geophys. Res*., *118*, 6643–6650, doi:10.1002/jgrd.50523.
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- Sorooshian, A. Z. Wang, M. M. Coggon, H. H. Jonsson, and B. Ervens (2013). Observations of sharp oxalate reductions in stratocumulus clouds at variable altitudes: organic acid and metal measurements during the 2011 E-PEACE campaign, *Environ. Sci. Technol.*, *47*, 7747–7756, doi:10.1021/es4012383.
- Feingold, G., A. McComiskey, D. Rosenfeld, and A. Sorooshian (2013). On the relationship between cloud contact time and precipitation susceptibility to aerosol, *J. Geophys. Res*., *accepted.*
- Craven, J. S., A. R. Metcalf, R. Bahreini, A. Middlebrook, P. L. Hayes, H. T. Duong, A. Sorooshian, J. L. Jimenez, R. C. Flagan, and J. H. Seinfeld (2013). Los Angeles Basin Airborne Organic Aerosol Characterization during CalNex, *J. Geophys. Res., accepted.*

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- Purdue University (Earth and Atmospheric Sciences) – 2008
- University of Arizona (Chemical and Environmental Engineering) – 2008, 2011
- UCLA (Chemical and Biomolecular Engineering) – 2008
- University of Connecticut (Chemical, Materials and Biomolecular Engineering Department) – 2008
- Cooperative Institute for Research in the Atmosphere (Colorado State University) – 2008
- NOAA (Chemical Sciences Division) – 2009
- Colorado State University (Atmospheric Sciences) – 2009
- University of Arizona (Atmospheric Sciences) – 2009
- Workshop: *NASA* ACE (*Aerosol*, Clouds and Ocean Ecosystem) Workshop - August 2009)

- University of Arizona (College of Pharmacy) – 2010
- Jet Propulsion Laboratory – 2010
- City University of New York (CCNY-CUNY/NOAA CREST) - 2010
- Workshop: Telluride: "Aerosol-Cloud Chemistry"– August 2010
- 8th Annual NCAR Early Career Scientist Assembly (ECSA) Junior Faculty Forum – July 2010
- Shanghai Jiao Tong University (Shanghai, China)– March 2011
- Fudan University (Shanghai, China) – March 2011
- Beijing Normal University (Beijing, China) – March 2011
- Institute of Atmospheric Physics, Chinese Academy of Sciences (Beijing, China) – March 2011
- Workshop: Southern Oxidant and Aerosol Study (SOAS) Planning Workshop, Rutgers University – May 2011
- Workshop: Keck Institute for Space Studies (KISS) Workshop: Monitoring of Geoengineering Effects and their Natural and Anthropogenic Analogues, Caltech – November 2011
- Arizona State University (Department of Chemistry) - January 2012
- University of Arizona (Aerospace and Mechanical Engineering) – 2012
- University of Arizona (Soil, Water, and Environmental Science) – 2012
- University of Arizona (Atmospheric Sciences) – 2012
- University of Arizona (College of Public Health) – 2012
- Chapman University (School of Earth and Environmental Sciences) – 2012
- University of California-Irvine (Department of Chemistry) – 2012
- Workshop: Climate Change and California's Water Supply, UC Davis, May 2012
- University of Vienna (Physics) – 2013
- University of Washington (Atmospheric Sciences) – 2013
- Semiconductor Research Corporation Engineering Research Center for Environmentally Benign Semiconductor Manufacturing – 2013
- U.S.-IRAN Symposium on air pollution in megacities (National Academy of Sciences, Beckman Center) - 2013

G. Contributed Presentations (Jan 2007-present)

- Twenty-two (22) presentations as the lead author; thirty (30) presentations as a co-author.

H. Current Grants/Contracts

- PI, $570,012 (100%), Office of Naval Research (Marine Meteorology and Atmospheric Effects Program), Understanding the Nature of Marine Aerosols and Their Effects in the Coupled Ocean-Atmosphere System, 05/01/10 – 04/30/14
- Co-PI, $631,965 (10%), NASA (Radiation Sciences Program), Assessing the Impacts of Aerosols on Precipitation Development in Warm Clouds: A Combined Observation-Model Process Study, 01/01/10 – 12/31/13
- PI, $119,997 (100%), NSF (Physical and Dynamic Meteorology Program), Collaborative Research: Using Controlled Aerosol Perturbations to Improve Understanding of Cloud Responses for Climate, 09/01/10-08/31/14
- PI, $100,000 (100%), Office of Naval Research *(*Defense University Research Instrumentation Program), A Counterflow Virtual Impactor Inlet System for use on Aircraft Platforms to Examine Cloud Droplet Residual Particles, 06/15/11 – 06/14/12
- PI, $200,584 (100%), NASA (Research Opportunities in Space and Earth Sciences Program), Airborne Aerosol Hygroscopic Growth Measurements During the Southeast Asia Composition, Cloud, Climate Coupling Regional Study, 08/01/11 – 07/31/14
- Co-I, $796,627 (25%), NASA, Global Land-Atmosphere-Ocean Interface Process Studies by Integrating MERRA Reanalysis with Satellite and In situ Data, 01/01/13 - 12/31/16
- PI, $30,000 (100%), Superfund Research Program (NIEHS), Linking Mine Tailing Aerosol Emissions to Health Effects, 04/01/10 – 03/31/11

- Co-PI, $30,000 (50%), Water Sustainability Program, Cloud Condensation Nucleus Measurements: Addressing the Role of Aerosols in Influencing Precipitation in the Semi-Arid US Southwest, 06/01/10 – 05/31/11
- PI, $10,000 (100%), Institute of the Environment, Understanding the Link Between Giant Particles, Clouds, and the Hydrologic Cycle, 06/01/10 – 05/31/11
- PI, $10,000 (100%), University of Arizona Foundation, The Nature and Impact of Aerosols in the Southwestern USA, 06/01/10 – 05/31/11
- PI, $39,249 (100%), Water Sustainability Program, Linking Dust Aerosol and Snow Melt in the US Southwest, 07/01/11 – 06/30/12

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Reviewer Roles: NASA (two panels), NSF (10 proposals), American Chemical Society Petroleum Research Fund, Qatar National Research Fund, *Nature Geoscience, Aerosol Science and Technology, Environmental Science and Technology, Geophysical Research Letters, Journal of Geophysical Research, Atmospheric Chemistry and Physics, Atmospheric Environment, Journal of Atmospheric and Oceanic Technology, Atmospheric Measurement Techniques, Atmospheric Research, Journal of Environmental Quality, Environmental Science and Pollution Research, Journal of Applied Meteorology and Climatology, Entropy, Environmental Science: Processes & Impacts*
- American Institute of Chemical Engineers (AICHE) Environmental Division Board Member (2011-present)
- Conference Session Co-Chair (10 sessions total since 2011)

I2. University, College, Department

- Numerous Departmental Committees for Clubs and Student Studies
- Member of UA Advance Committee

I3. Local/Community

None

J. Synergistic Activities

(i) Leadership in Field Work: Participation in over 10 field campaigns since 2004 conducting aerosol-cloud measurements. Principal investigator of two airborne field campaigns with the Navy Twin Otter.

Biographical Sketch: C. Larrabee Winter

A. Professional Preparation

University of Arizona	Applied Mathematics	Ph.D.	1982
University of Arizona	Applied Mathematics	M.S.	1980
University of Arizona	Geosciences	M.S.	1976
University of Arizona	Philosophy	B.A.	1970

B. Appointments

2009-Present	Professor, Department of Hydrology and Water Resources, University of Arizona, Tucson, Arizona
2003 – 2009	NCAR, Boulder, CO, Deputy Director, Senior Scientist, Institute for Mathematics Applied to Geoscience, NCAR
1990 - 2003	Los Alamos National Laboratory, Los Alamos, NM, Science Advisor, Office of the Governor, State Capitol, Santa Fe, NM

C. Research Interests

Groundwater hydrology, pore-scale flow and transport, computational fluid dynamics, basin-scale water budgets, environmental risk assessment, water policy

D. Honors, Boards, and Awards

- SAIC Publication Prize in Mathematics, Computer Science and Operations Research, 1988
- Los Alamos National Laboratory Distinguished Performance Award, 1993
- Bronze Award, Best Story of the Year, Arizona Highways Magazine, 1997
- Phi Kappa Phi, Sigma Xi
- Member, Board, of Directors National Ecological Observatory Network (ongoing)
- Member, Advisory Committee, Institute of Arctic and Alpine Research (INSTAAR) (ongoing)

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Hyman, J., P. Smolarkiewicz, and C.L. Winter, "Pedotransfer functions for permeability: A computational study at pore scales, *Water Resources Research*, DOI: 10.1002/wrcr.20170.
- Hyman J.D., P.K. Smolarkiewicz, and C.L. Winter, Heterogeneities of flow in stochastically generated porous media, *Phys. Rev. E* 86, 056701, doi: 10.1103/PhysRevE.86.056701, 2012.
- Winter, C.L. and D.M. Tartkovsky, "Risk assessment", in *Handbook of Environmental Fluid Dynamics*, ed. by H. Fernando, Taylor & Francis Books Inc., 2012.
- Smolarkiewicz, P. and C.L. Winter, "Pores resolving simulation of Darcy flows," *J. Comp. Physics*, 229 (9), 2010.
- Winter, C.L., "Normalized Mahalanobis distance for comparing process-based stochastic models," *Stochastic Environ. Res. and Risk Assessment*, 24 (6), 2010.
- Winter, C.L. and D. Nychka, "Forecasting skill of model averages", *Stochastic Environ. Res. and Risk Assessment*, 24 (5), 2010.
- Damron, M. and C.L. Winter, "A non-Markovian model of rill erosion," *Networks in Heterogeneous Media*, 4 (4), 2009.
- Mahmoud M., et al. "A formal framework for scenario development in support of environmental decision-making," *Env. Modeling and Software*, 24 (7), 2009.
- Sviercoski, R.F., A.W. Warrick and C.L. Winter, "Two-scale analytical homogenization of Richards' equation for flows through block inclusions," *Water Resources Research*, 45, W05403, DOI: 10.1029/2006WR005598.
- Sviercoski, R.F., C.L. Winter and A.W. Warrick, "Analytical Approximation for the Generalized Laplace Equation with Step Function Coefficient," *SIAM J. Appl. Math.* 68 (5), 2008.

- Winter, C.L. and D.M. Tartkovsky, "A reduced complexity model for probabilistic risk assessment of groundwater contamination," *Water Resources Research*, 44 (6), 2008.
- Yeh, T.C., C.L. Winter, et al., "A view towards the future of subsurface characterization: CAT scanning groundwater basins," *Water Resources Researc*, 44 (3), 2008.
- Tartkovsky, D.M. and C.L.Winter, "Uncertain future of hydrogeology," *J. Hydrologic Eng.*, 13 (1), 2008.

E2. Books and Book Chapters

- Winter, C. L. and D. M. Tartakovsky, "Risk Assessment", Ch. 11, *Handbook of Environmental Fluid Dynamics*, H. J. Fernando, ISBN-13: 978-1439816691, CRC Press, pp 135-143.

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- Winter, C.L., J.M. Hyman, and Piotr Smolarkieiwcz, Pore-scale simulations of the Kozeny-Carmen Law, Frontiers in Computational Physics: Modeling the Earth System16-20 December 2012, NCAR, Boulder, CO, USA
- Winter, C.L., "A model of reduced complexity for groundwater contamination", AGU Fall Meeting, San Francisco, CA, December 18, 2009.
- Winter, C.L., "Some geometric properties of model performance", AGU Fall Meeting, San Francisco, CA, December 11, 2008.
- Winter, C.L., "Moment statistics for flow and transport in randomly stratified media," SIAM Annual Meeting, San Diego, CA, July 11, 2008.
- Winter, C.L., "Hydrologic requirements for earth system modeling," Distinguished Lecturer, Multi-Scale Processes in Earth Systems, Texas A&M, October 3, 2007.

G. Contributed Presentations (Jan 2007-present)

None

H. Current Grants/Contracts

- NSF, Construction and Operations of the National Ecological Observatory, Amount: $1, Period of Performance: 08/01/11-07/31/16, Principal Investigator
- NSF, Organizational and Project Management Support to complete the NEON Construction Ready Design and Project Execution Plan, Amount: $57,508,802, Period of Performance: 5/1/08-4/30/13, Principal Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Board Member, National Ecological Observatory Network
- Member, Advisory Committee, Institute of Arctic and Alpine Research (INSTAAR)
- Assistant Editor, Water Resources Research, AGU.

I2. University, College, Department

- Department Head, Hydrology and Water Resources, UA.

I3. Local/Community

None.

J. Synergistic Activities

- Interim CEO, National Ecological Observatory Network
- NCAR Deputy Director: Too numerous to list

LECTURERS

Biographical Sketch: Charles Weidman

A. Professional Preparation

University of Arizona	Atmospheric Sciences	Ph.D.	1982
University of Arizona	Atmospheric Sciences	M.S.	1977
New Mexico Inst. Mining & Tech.	Physics	B.S	1975

B. Appointments

1982 - 1985	Visiting foreign scientist, Centre National d'Etudes des Telecommunications, Lannion, France
1987 - ~1997	Asst. Research Scientist, Dept. Atmospheric Sciences, Univ. Az.
1997 - present	Lecturer, Dept. Atmospheric Sciences, Univ. Az.

C. Research Interests

Atmospheric electricity, remote measurements of natural and triggered lightning properties

D. Honors and Awards

None

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

None

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

None

G. Contributed Presentations (Jan 2007-present)

None

H. Current Grants/Contracts

None

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- None (other than occasional journal article reviews, and reviews of introductory weather and climate textbooks)

I2. University, College, Department

- Graduate Advisor, have served on 1 or 2 graduate committees

I3. Local/Community

- Occasional talks in local schools or to civic groups about meteorology, lightning and lightning safety

J. Synergistic Activities

Teaching: Have developed online courses for Intro. to Weather and Climate and Atmospheric Electricity courses.

Biographical Sketch: Dale Ward

A. Professional Preparation

University of Arizona	Atmospheric Science	Ph.D.	1997
University of Arizona	Atmospheric Science	M.S.	1994
Case Western Reserve University	Electrical Engineering	B.S.	1986

B. Appointments

2007-date	Lecturer, Department of Atmospheric Sciences, and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
1999-2007	Research Scientist, Department of Atmospheric Sciences, and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
1986-1992	Electrical Design Engineer, Westinghouse Electric Company, Baltimore, Maryland.

C. Teaching and Research Interests

Teaching. Challenge and encourage undergraduate, non-science majors to understand complex weather and climate issues. Continue development and improvement of online course.
Research. Remote sensing of Earth's atmosphere, remote sensing techniques and instrumentation, inversion of remotely sensed data. Member of science team developing a new active microwave remote sensing instrument called the Active Temperature, Ozone, and Moisture Microwave Spectrometer.

D. Honors and Awards

- 2007 College of Science Staff Excellence Award

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Kursinski, E. R., D. Ward, M. Stovern, A. C. Otarola, et al. Development and Testing of the Active Temperature, Ozone, and Moisture Microwave Spectrometer (ATOMMS) cm and mm wavelength occultation instrument, *Atmos. Meas. Tech.,* 2012.

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

None

G. Contributed Presentations (Jan 2007-present)

- At least twelve (12) presentations as a co-author

H. Current Grants/Contracts

- "Augmentation to ensure a successful ATOMMS demonstration and Evaluation", National Science Foundation grant ATM-0946411, $2,000,000, 10/2010-9/2014, Co-Investigator

I. Major Service (2007-present)

I1. Professional/Scientific

- Served as a peer-reviewer for several articles submitted to scientific journals.

I2. University, College, Department

None

I3. Local/Community

- Gave lectures on atmospheric sciences to fourth and fifth grade students and served to judge science fair projects at Tanque Verde Elementary school.

J. Synergistic Activities

None

RESEARCH FACULTY

Biographical Sketch: William C. Conant

A. Professional Preparation

University of California, San Diego	Scripps Institution of Oceanography	Ph.D.	2000
University of California, San Diego	Scripps Institution of Oceanography	M.S.	1996
University of California, San Diego	Physics B.S. 1992		

B. Appointments

2005-date	Research Associate Professor (2011 - present) and Assistant Professor (2005-2011), Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
2001-2005	Senior Postdoctoral Scholar (2004-2005) and Postdoctoral Scholar (2001-2004), Department of Chemical and Environmental Engineering, California Institute of Technology, Pasadena, California

C. Research Interests

Radiative processes in the climate system; Radiative forcing of climate; Aerosol physico-chemical properties; Aerosol-Cloud Interactions; Cloud-climate feedback; Ocean-atmosphere interactions; Satellite remote sensing; Aircraft field experiments.

D. Honors and Awards (Jan 2007-present)

None

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Fountoukis, C., A. Nenes, N. Meskhidze, R. Bahreini, W.C. Conant, H. Jonsson, S. Murphy, A. Sorooshian, V. Varutbangkul, F. Brechtel, R.C. Clagan, J. H. Seinfeld, Aerosol-cloud drop concentration closure for clouds sampled during the International Consortium for Atmospheric Research on Transport and Transformation 2004 campagn, *J. Geophys. Res.*, 2007.
- Lu, M.-L., W.C. Conant, H.H. Jonsson, V. Varutbangkul, R.C. Flagan, J.H. Seinfeld, The Marine Stratus/Stratocumulus Experiment (MASE): Aerosol-cloud relationships in marine stratocumulus, J. *Geophys. Res.*, 2007.
- Zhao, T.X.P., H. Yu, I. Laszlo, M. Chin, W.C. Conant, Derivation of component aerosol direct radiative forcing at the top of atmosphere for clear-sky oceans. *J. Quant. Spec. Rad. Trans.*, 2008.
- Csavina, J., A. Landazuri, A. Wonaschutz, K. Rine, P. Rheinheimer, B. Barbaris, W. Conant, A.E. Saez, E.A. Betterton, Metal and metalloid contaminants in atmospheric aerosols from minimg operations, *Water Air Soil Pollut.*, 2010.

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

None

F. Invited Talks (Jan 2007-present)

- Conant, W.C., 2007: Observational and theoretical perspectives on aerosol-cloud interactions. Gordon Conference on Radiation and Climate. July 29 – Aug 3, 2007, Colby-Sawyer College, New London, NH.

G. Contributed Presentations (Jan 2007-present)

- Johnson, N. and W. C. Conant, Diagnosing the Effects of Aerosol and Cloud Droplet Aging on Microphysical and Optical Variations in Warm Clouds, Fall AGU, 2008.

- King, C., W. C. Conant, Radiative Forcing by Tropical Cyclones in the North Atlantic, West Virginia Academy of Science's 85th Annual Meeting, April 10, 2010.
- Wonaschütz , A., W.C. Conant, E. Betterton, E. Saez, B. Barbaris, J. Csavina, K. Rine, A. Campillo, Aerosol Characterization in the Sonoran Desert of Arizona, EGU annual meeting, Vienna, Austria, Summer 2010.

H. Grants/Contracts (2007-present)

- Conant, W.C. (PI; 3.75 CM) and J. Spinhirne, Retrieval of Aerosol Optical Depth from CALIPSO Surface Returns for Aerosol Forecast Assimilation, University Center for Atmospheric Research (NSF), $80k, 2012-2013.
- Conant, W.C. (PI; 3 CM), Monitoring Arid Land Cover Change with Simulated HyspIRI Data, Agricultural Research Service (USDA), $44k, 2012.
- Conant, W.C. (PI), Solar Radiation Measurements, Cooperative Research and Development Agreement, National Renewable Energy Laboratory (DOE), $70k (stated value of equipment and services under agreement), 2011-2016.
- Betterton, E., W.C. Conant (0 SM), S Gao, and E. Saez, Characterization of Wind Blown Dust from Tailings and other Mining Operations in the Southwestern United States, Superfund Research Program (University of Arizona), $900k, 2010-2015.
- Ayyanar, R., et al (1 SM), ASTI Proposal: Arizona Solar Market and Research Tool "AzSMART", ASU (subcontract under Science Foundation Arizona), $20k, 2010.
- Maracas, G. et al. (1 SM), Photovoltaic Environmental Performance and Reliability for the Arizona-Wide Electric Grid, Science Foundation Arizona, $2,890k, 2009-2011
- Conant W. C., Solar Radiation Measurement and Modeling in the Southwestern United States, Department of Energy (NREL) (Sub-contract under DOE), $50k, 2009-2010.
- Ritchie, E.A. and W.C. Conant (co-PI, 1SM), Understanding the microphysical properties of developing cloud clusters during TC-08, Office of Naval Research, $245k, 2008-2010.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Editor, *Atmospheric Chemistry and Physics,* 2001-2009.
- Review Team Member, DOE Site Review of Pacific Northwest National Laboratory (PNNL), 2010.
- Review Team Member, NSF Site Review of UCAR/NCAR Earth Observing Laboratory (EOL), 2011
- Panelist for proposal reviews for NASA, NOAA, DOE, 2007-present.
- Peer-reviewer for Science, GRL, JGR, among other professional journals, 2007-present.

I2. University, College, Department

- Organizer, ATMO seminar series, 2007-2011.
- Member, ATMO curriculum committee, 2007-2011.
- Faculty Member, Global Change GIDP, 2007-present.

I3. Local/Community

- Gave lectures on atmospheric sciences (including hands-on experiments) to K-12 Scouting organizations

J. Synergistic Activities

(i) University of Arizona Observations of Aerosol and Solar Irradiance System (UA-OASIS): In collaboration with DOE's NREL, I operate the observing system that measures spectral and broadband solar radiation and its angular distribution, providing this quality controlled data to the community.

Biographical Sketch: Kenneth L. Cummins

A. Professional Preparation

Stanford University	Electrical Engineering	Ph.D.	1978
Stanford University	Electrical Engineering	M.S.	1975
University of California, Irvine	Electrical Engineering	B.S.	1974

B. Appointments

2005-date Research Professor, Department of Atmospheric Sciences and Institute of Atmospheric Physics, University of Arizona, Tucson, Arizona.
1989-2005 Chief Scientist / R&D Manager, Vaisala Thunderstorm Business (formerly Global Atmospherics), Tucson, Arizona
1983-1989 Staff Scientist, Nicolet Instrument Corporation, Madison, Wisconsin
1979-1983 Stanford University (79-83) Lecturer in Neurology;
Palo Alto VA Medical Center (1979-1983) Staff Scientist

C. Research Interests

The broad area of interest and expertise is the physics and phenomenology of lightning, and the use of ground-based optical and electromagnetic sensing to infer the location and physical characteristics of lightning. Recent applications include lightning interaction with terrain at all spatial scales, improvement of QPE in complex terrain, and the characteristics of lightning attachment to tall objects (e.g. towers and wind turbines).

D. Honors and Awards

- NASA Visiting Scientist, Summer 2011
- Senior Member, IEEE, 2000

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Cooray V., R. Jayarante, K. Cummins (2013), On the peak amplitude of lightning return stroke currents striking sea water, *Atmospheric Research*, accepted.
- Nag A., Rakov V., Cummins K. (2013), Positive Lightning Peak Currents Reported by the U.S. National Lightning Detection Network, *IEEE Trans EMC*, accepted.
- Honma N., K.L. Cummins, M.J. Murphy, A.E. Pifer, T. Rogers (2013), Improved lightning locations in the Tohoku region of Japan using propagation and waveform onset corrections, *IEEJ Trans. Power and Energy*, accepted.
- Minjarez-Sosa, C., C. L. Castro, K.L. Cummins, E. P. Krider, J. Waissmann (2012), Toward development of improved QPE in complex terrain using cloud-to-ground lightning data: a case study for the 2005 monsoon in southern Arizona, *J. Hydrometeorology*, doi: 10.1175/JHM-D-11-0129.1, December 2012.
- Warner T., K.L. Cummins, R.E. Orville (2012),Upward Lightning Observations from Towers in Rapid City, South Dakota and Comparison with National Lightning Detection Network Data, 2004-2010, *J. Geophys. Res*, DOI: 10.1029/2012JD018346 , October 2012.
- Bourscheidt, V., K.L. Cummins, O. Pinto, K.P. Naccarato (2012), Methods to Overcome Lightning Location Systems Performance Limitations on Spatial and temporal analysis: Brazilian Case, *J. Atmos. Ocean. Tech., v29,* doi: 10.1175/JTECH-D-11-00213.1, September 2012.
- Cummins, K.L., N. Honma, A.E. Pifer, T. Rogers (2012), M Matsumi, Improved detection of winter lightning in the Tohoku Region of Japan using Vaisala's LS700x technology, *IEEJ Transactions*, v132, doi: 10.1541/ieejpes.132.1, May 2012.
- Nag, A.,., K.L. Cummins, et al. (2011), Evaluation of US National Lightning Detection Network performance characteristics using rocket-triggered lightning data acquired in 2004-209, *Journal of Geophysical Research-Atmospheres*, *116*, 2011.

- Orville E.R., G.R.Huffines, W.R. Burrows, K.L. Cummins, (2011): The North American Lightning Detection Network (NALDN): Analysis of Flash Data – 2001-2009, *Monthly Weather Review*, 139, doi: 10.1175/2010MWR3452.1.
- Said R.K., U.S. Inan, K.L. Cummins (2010); Long-range lightning geolocaiton using a VLF radio atmospheric waveform bank, *J. Geophys. Res.*, 115, D23108, doi:10.1029/2010JD013863.
- Saba, M. M. F., W. Schulz, T. A. Warner, L. Z. S. Campos, C. Schumann, E. P. Krider, K. L. Cummins, and R. E. Orville (2010), High-speed video observations of positive lightning flashes to ground, *J. Geophys. Res.*, 115, D24201, doi:10.1029/2010JD014330, December 2010.
- Saraiva, A.C.V, M.M.F.Saba, O.Pinto, K.L. Cummins, E.P.Krider, L.Z.S.Campos (2010), A Comparative study of negative cloud-to-ground lightning characteristics in São Paulo (Brazil) and Arizona (USA) based on high-speed video observations, *J. Geophys. Res*, DOI: 10.1029/2010JD013863, June 2010.
- Wilson J G, K. L. Cummins, and E. P. Krider (2009), Small negative cloud-to-ground lightning reports at the NASA Kennedy Space Center and Air Force Eastern Range, *J. Geophys. Res.*, 114, D24103, 10.1029/2009JD012429, December 2009.
- Cummins K and Murphy M. (2009), An Overview of Lightning Locating Systems: History, Techniques, and Data Uses, With an In-Depth Look at the U.S. NLDN (2009 - invited paper), IEEE Transactions on Electromagnetic Compatibility, Vol. 51 (3), pp. 499-518, August 2009.
- Stall C, K.L. Cummins, E.P. Krider, J. Cramer (2009), Detecting Multiple Ground Contacts in Cloud-to-Ground Lightning Flashes. *Journal of Atmospheric & Oceanic Technology*, VOl. 26 (11), pp. 2392-2402, November 2009.
- Fleenor, S. A., C. J, Biagi, K. L. Cummins, E. P. Krider, X.-M. Shao (2009), Characteristics of Cloud-to-Ground Lightning in Warm-Season Thunderstorms in the Great Plains, *Atmospheric Research*, Vol. 91, pp 333-352, doi:10.1016/j.atmosres.2008.08.011.
- Pessi, A., S. Businger, K. L. Cummins, N. W. S. Demetriades, M. Murphy, B. Pifer (2009), Development of a Long-Range Lightning Detection Network for the Pacific: Construction, Calibration, and Performance , *J. Atmo. & Oceanic Tech.*, Vol. 26, pp 145-166 , doi: 10.1175/2008JTECHA1132.1.
- Lafkovici, A.; Hussein, A.M.; Janischewskyj, W.; Cummins, K.L., (2008), Evaluation of the Performance Characteristics of the North American Lightning Detection Network Based on Tall-Structure Lightning, IEEE Trans. Elecromagnetic Compatibility, Vol. 50, Aug. 2008, pp. 630 – 641.
- Saba, M.M.F, K.L. Cummins, T.A. Warner, E.P. Krider, L.Z.S Campos, M.G. Ballarotti, S.A. Fleenor, O. Pinto (2008), Positive Leader Characteristics from High-speed Video Observations, *Geophysical Research Letters*, Vol. 35, doi:10.1029/2007GL033000, April 2008.
- Biagi, C. J., K. L. Cummins, K. E. Kehoe, E. P. Krider (2007), NLDN Performance in Southern Arizona, Texas and Oklahoma in 2003-2004, *J. Geophys. Res.*, Vol. 12, D05208, dio:1029/2006JD007341.

E2. Books and Book Chapters

- Murphy. M. J. F., K. L. Cummins, R.L. Holle (2009), "Lightning Warning Systems", in *Lightning Protection*, Vernon Cooray (Ed.), INSPEC/IEE, 2010.

E3. Other Scholarly Activities (e.g., patents)

- U.S. Patent 7,804,309 "System and Methods for Soil Moisture Estimation", sole inventor, 2010

F. Recent Invited Talks (Jan 2007-present)

- "On The Relationship Between Terrain Variations and LLS-Derived Lightning Parameters", 2012International Conference on Lightning Protection (ICLP), Vienna, Austria.
- "The anatomy of lightning flashes: what they look like and why we care", SECAMS Invited Seminar, Fall 2012.

- "Improved detection of winter lightning in the Tohoku region of Japan using Vaisala's LS700x Technology", preprints, 21st International Lightning Detection Conference, Orlando, FL., 19-20 April, 2010.

G. Contributed Presentations (Jan 2007-present)

- Myers J., Cummins K., Hutchinson M., Nag A. (2012), "Lightning Attachment to Wind Turbines in Central Kansas: Video Observations, Correlation with the NLDN and in-situ Peak Current Measurements", 2012 AGU Fall Meeting, San Francisco, December 2012
- Cummins, K.L., L. Carey, et al. (2011), "GLM Proxy Data Generation: Methods for Stroke/Pulse Level Inter-comparison of Ground-based Lightning Reference Networks", *AGU Annual Winter meeting*, San Francisco, December 2011.
- Bourscheidt V., K.L. Cummins, O. Pinto, K. Naccarato," On the spatial and temporal variations of urban heat islands and their effect on thunderstorm formation", AGU Annual Winter meeting, San Francisco, December 2010.
- Cummins K.L., M.J. Murphy, J.A. Cramer, W. Scheftic, N. Demetriades, A. Nag, "Location accuracy improvements using propagation corrections: A case study of the U.S. National Lightning Detection Network", preprints, 21st International Lightning Detection Conference, Orlando, FL., 19-20 April, 2010.
- Cummins, K.L., M.M.F. Saba, W. Schulz et al., On the (mis-)Behavior of Thunderstorms at the Grand Canyon, Arizona, AGU Annual Winter meeting, San Francisco, December 2009.
- Cummins K.L., Saba, M. M. F., Krider, E. P, Warner, T.A. , Weidman, C., Campos, L.Z.S., Fleenor, S. A., Saraiva, A. C. V., A Multi-Camera High-Speed Video Study of Cloud-to-Ground Lightning in Southern Arizona – Preliminary Results, 29th International Conference on Lightning Protection, Uppsala, Sweden, June 2008.
- Cooray, V., K.L. Cummins, Propagation effects caused by stratified ground in electromagnetic fields of return strokes, 20th International Lightning Detection Conference, Tucson, Arizona, April, 2008.
- Ward, J.G., K.L. Cummins, E.P. Krider, Comparison of the KSC-ER Cloud-to-Ground Lightning Surveillance System (CGLSS) and the U.S. National Lightning Detection Network (NLDN), 20th International Lightning Detection Conference, Tucson, Arizona, April, 2008.
- Scheftic, W., K.L. Cummins, E.P. Krider, B.K. Sternberg, Wide-area soil moisture estimation using the propagation of lightning generated low-frequency electromagnetic signals, 20th International Lightning Detection Conference, Tucson, Arizona, April, 2008.

H. Current Grants/Contracts

- "National Lightning Detection Network Evaluation", K.L. Cummins (PI), Vaisala contract, 8/1/2013 thtrough 1/5/2014 - $14,783.
- "Airborne Charge and Electric Field Mapping: The University of Arizona's Role", K.L. Cummins (PI), DARPA contract, 6/2012 through 12/2013 - $118,677.
- "NASA Advisory Panel Research", K.L. Cummins (PI), NASA /KSC contract, 12/2012 through 9/2013 - $25,452.
- "Lightning Data Assessment Collaboration", NASA/MSFC contract, 6/1/2012 through 9/30/2014 - $61,400.

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Invited Member, NASA Lightning Advisory Panel (2012-present)
- Invited Member, CIGRE (international) Working group 33.01 – "Lightning" (1996 – present)
- Invited Member, IEEE WG on Lightning Protection of Distribution Systems (1995- present)

I3. Local/Community

- Gave lectures on atmospheric electricity and assisted in science fair judging to students at K-12 schools throughout the years

J. Synergistic Activities

(i) Served as doctoral committee advisor for students outside the University of Arizona:
L. Campos, Ph.D. (in process) – Brazilian Space Institute – On the Mechanisms that lead to Current Cutoff and Multiple Ground Contacts in Lightning
V. Borscheidt, Ph.D. Spring 2012 - Brazilian Space Institute - Singularities on the Spatial and Temporal Distribution of CG Lightning
Ryan Said (Ph.D. September 2009 – Stanford University Electrical Engineering - Lightning Detection and Geo-location at Long Range Using VLF Radio Atmospherics

(ii) Major Advisory Reports (committee member):
CIGRE Working Group C4.407 Report: Lightning Parameters for Engineering Applications, 2013.
CIGRE Task Force C4.404A Report: Cloud-to-ground Lightning Parameters Derived from Lightning Location Systems. 2008

(iv) Recent Funded Inter-disciplinary Research:
"Estimating the Impact of Soil Moisture Profiles and its Impact in River Flow Forecasting", J Valdes (P.I.), K.L.Cummins (co-I), et al., NOAA contract 1/1/10-12/31/11 - $125,000/year.
"Soil Moisture Estimation," K. L. Cummins (P.I.) et al., Vaisala, $89,176, 1/07 – 12/07; $67,985, 1/08 - 12/08 ; $8,000 1/10 – 8/10.

Biographical Sketch: Yolande Serra

A. Professional Preparation

Scripps Institution of Oceanography	Physical Oceanography	Ph.D.	1996
University of California San Diego	Physics/Biophysics	B.S. (Hons.)	1990

B. Appointments

06/08 – present	Associate Research Faculty, Department of Atmospheric Sciences, University of Arizona
10/04 – present	Affiliate Faculty, Institute for the Environment, University of Arizona
10/04 – 05/08	Research Scientist, Department of Atmospheric Sciences, University of Arizona
01/00 – 08/04	Research Scientist, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington
01/97 – 12/99	Postdoctoral Researcher, Department of Atmospheric Sciences, University of Washington

C. Research Interests

Tropical intraseasonal variability, tropical – extra-tropical interactions of the North American monsoon region, tropical deep convective organization and processes, GPS total column water measurement and application, regional modeling and forecasting, process-oriented evaluation of global climate and earth system models

D. Honors and Awards

None

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Geil, K. L., Y. L. Serra and X. Zeng, 2013: Assessment of CMIP5 Model Simulation of the North American Monsoon System. *J. Climate*, doi/10.1175/JCLI-D-13-00044.1, in press.
- Sheffield, J., et al., 2013a: North American Climate in CMIP5 Experiments. Part I: Evaluation of 20th Century Continental and Regional Climatology. *J. Climate*, in press.
- Sheffield, J., et al., 2013b: North American Climate in CMIP5 Experiments. Part II: Evaluation of 20th Century Intra-Seasonal to Decadal Variability. *J. Climate*, in press.
- Waliser, D., M. Moncrief, et al., 2011: The "Year" of Tropical Convection (May 2008 to April 2010) Variabilility and weather highlights. *Bull. Am. Meteorol. Soc*., 93 (8), doi:10.1175/2011BAMS3095.1.
- Mickett, J. B., Y. L. Serra, M. F. Cronin, and M. H. Alford, 2010: Resonant Forcing of Mixed Layer Inertial Motions by Atmospheric Easterly Waves in the Northeastern Tropical Pacific, *J. Phys. Oceanogr*., 40, 401-416.
- Serra, Y. L., G. Kiladis, and K. Hodges, 2010: Tracking and Mean Structure of Easterly Waves Over the Intra-Americas Sea. *J. Climate*, 23, 4823-4840.
- Serra, Y.L., G. Kiladis, and M.F. Cronin, 2008: Horizontal and Vertical Structure of Easterly Waves in the Pacific ITCZ. *J. Atmos. Sci*., 65, 1266-1284.
- Serra, Y. L., M. Cronin, and G. Kiladis, 2007: Sub-seasonal variance of surface meteorological parameters in buoy observations and reanalyses. *Geophys. Res. Lett.*, 34, L12708, doi:10.1029/2007GL029506.

E2. Books and Book Chapters

None

E3. Other Scholarly Activities (e.g., patents)

- Invited author, "Tropical Intraseasonal Oscillations and Synoptic Variability", for Volume 39 of the Annual Review of Environment and Resources, 2014.

F. Invited Talks (Jan 2007-present)

- Invited Lecturer, 18-22 March 2013, 5th Spring Course on Tropical Cyclones, La Paz, Mexico
- Invited Presenter, 6 April 2012, Economics, Law, Environment and Governance Workshop, UA.

G. Contributed Presentations (Jan 2007-present)

Twelve (12) presentations as the lead author; ten (10) presentations as a co-author.

H. Current Grants/Contracts

- Evaluation of the Tropical Storm Track Across the Intra-Americas Sea in IPCC AR5 Models and the Mechanisms of Change in a Warmer Climate, National Oceanic and Atmospheric Administration, $386,233, 2010-2014, Percent Effort: 100%, Principle Investigator
- Impact of Total Column Water Vapor Measurements on Short- to Medium-Range Forecasts of the North American Monsoon Precipitation, National Science Foundation, $482,591, 2013-2015, Percent Effort: 100%, Principle Investigator
- TLALOCNet – A continuous GPS-MET array in Mexico for atmospheric, climatic, and seismotectonic research in the Americas, National Science Foundation/Major Research Instrumentation Program, $1.5M, 2013-2017, Percent Effort: 20%., Co-Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Subject Matter Expert in "Climate Projections Research", NOAA Observing System Integrated Analysis study (NOSIA-II), 13 September 2013.
- Member, 2013-2015, COCONet Working Group, UNAVCO, Boulder, CO.
- Co-chair, 2012, Board of Oceans, Atmosphere and Climate, Association of Public and Land-grant Universities, Washington DC.
- Co-chair elect, 2010-2011, Board of Oceans, Atmosphere and Climate, Association of Public and Land-grant Universities, Washington DC.
- Contributing editor, 2008-2010, AGU Atmospheric Sciences Newsletter.

I2. University, College, Department

- Advisee, one (1) PhD student, three (3) Master's students.
- Committee Member, four (4) PhD students, seven (7) Master's students.
- Member, 2005–present, Global Change Graduate Interdisciplinary Program in Global Change, University of Arizona.
- Co-organizer, 2009-2010, Bachelor of Applied Science (Meteorology) Program, University of Arizona

I3. Local/Community

- Classroom Volunteer/Science Centers, 2012-present, Manzanita Elementary School, Catalina Foothills School District, Tucson, AZ
- Featured Scientist, 2008-present, Arizona Science Center "Meet The Scientist" Exhibit, Phoenix AZ
- Guest Speaker, 11/2009, "Let's Talk Science Series", Biosphere2, Tucson AZ

J. Synergistic Activities

(i) Climate Model Evaluation: Our studies of IPCC model historical (Geil et al. 2013) and future projections (Serra et al. 2014, in preparation) of the North American monsoon rainfall on daily time scales has made important contributions to the NOAA/MAPP CMIP5 Task Force overview papers (Maloney et al. 2013; Sheffield et al. 2013a,b) and to the "Highlights and Outstanding Questions from CMIP5 Analyses for North America" prepared by the CMIP5 Task Force that will inform the National Climate Assessment (NCA) and may contribute to a potential NCA interim report on changes in CMIP5 relative to the last NCA based on CMIP3 (ongoing work).

The CMIP5 Task Force is additionally contributing to the development of a new paradigm for evaluating global climate and earth system models using a process-oriented approach working directly with national modeling centers (NCAR, NASA, GISS, NCEP). These Climate Analysis Projects (CAPs) would be focused on incorporating diagnostic analysis into standard community diagnostic packages used by climate modeling centers, so diagnostics can be rapidly repeated across model versions. Our analysis of the NAM (Geil et al. 2013; Serra et al. 2014, in preparation) and easterly wave tracks across the East Pacific and Intra-Americas Sea (Serra and Geil, 2014, in prep) will be proposed as two such diagnostics.
(ii) Tropical Intraseasonal Variability: Crosbie and Serra (2013) has shown that the overall impact of the MJO on East Pacific cyclogenesis is to suppress storm frequency during the easterly phase of the MJO rather than enhance its activity during the westerly phase. This result will help direct investigation of tropical East Pacific multi-scale intraseasonal variability in future studies.
Seastrand et al. (2013) demonstrates an objective approach for isolating dominant physical mechansisms associated with significant monsoon events over roughly decadal time scales. This improves upon previous results which were limited to compositing on a single physical mechanism and thus (1) did not objectively determine the importance of this mechanism to NAM rainfall, or (2) necessarily capture its phase relationship to other physical processes important to the resulting NAM event.
(iii) Observational Network Innovation: The lack of a reliable observational network throughout Mexico has inhibited research, forecasting and monitoring of the North American monsoon on both sides of the boarder. The implementation of TLALOCNet will result in 37 GPS-Met stations in Mexico capable of transmitting surface meteorological and total column water data in realtime to the scientific and operational weather service communities. As part of a collaborative effort with the Universidad Nacional Autónoma de México (UNAM) and our NSF funded GPS-Met forecasting study, ten (10) GPS-Met were installed in northwest Mexico for the 2013 monsoon season to investigate the value of GPS-Met data to NAM forecasts.

Biographical Sketch: William A. Sprigg

A. Professional Preparation

Yale University	Atmospheric Science	M.Phil./Ph.D.	1970/1972
Rutgers, the State University, N.J.	Atmospheric Science	M.S.	1968
Florida State University	Meteorology	B.S.	1966

B. Appointments

1998-date Research Professor (2003 - present), Department of Atmospheric Sciences and Institute for Atmospheric Physics; Deputy Director, (1998-2003), Institute For the Study of Planet Earth, University of Arizona, Tucson, Arizona
2010-date Founding Director (2012 – present), Pan-America Center for the World Meteorological Organization Sand and Dust Storm Warning Advisory System; Distinguished Professor (2010 – present), Chapman University, Orange, California
1990-1998 Director, Board on Atmospheric Sciences and Climate, National Academy of Science/National Research Council, Washington, D.C.
1989-1990 Director, U.S. National Climate Program Office, Washington, D.C.

C. Research Interests

Implications of climate variability and change; air quality and human health; forecasting/simulating airborne pollens, dust and dust storms; national and international science policy

D. Honors and Awards

None

E. Publications and Scholarly Work (Jan 2007-present)

E1. Peer-Reviewed Papers

- Vukovic, A., M. Vujadinovic, G. Pejanovic, J. Andric, M.J. Kumjian, V. Djurdjevic, M. Dacic, A.K. Prasad, H.M. El-Askary, B.C. Paris, S. Petkovic, S. Nickovic, W.A. Sprigg, 2013: Numerical Simulation of An American Haboob; in press; *Atmos. Chem. Phys. Disc.*
- Fetouh, Y.A., H. E. Askary, M. Allali, W.A. Sprigg and M. Kafattos, 2013: Annual Patterns of Atmospheric Pollutions and Episodes over Cairo Egypt. *Adv. Met*., Vol. 2013, Article ID 984853, 11pp.
- Sprigg, W. A., B. Barbaris, S. Morain, A. Budge, W. Hudspeth, G. Pejanovic; 2008; Public Health Applications in Remote Sensing; http://spie.org/x33688.xml. ArticleID=x33688
- Yin, D., S. Nickovic, and W.A. Sprigg: 2007; The impact of using different land cover data on wind-blown desert dust modeling results in the southwestern United States. Atmospheric Environment, DOI.10.1016/j.atmosenv.2006.10.061.

E2. Books and Book Chapters

- Yin, D. and W. A. Sprigg; 2010: Modeling Airbourne Mineral Dust: A Mexico - United States Trans-boundary Perspective. Book Chapter of Southwestern Desert Resources, W.Halvorson, C. Schwalbe, and C. van Riper, III (eds), University of Arizona Press, Tucson, AZ, pp. 303-317

E3. Other Scholarly Activities (e.g., patents)

- Prior to appointments with the University of Arizona, Professor Sprigg was Architect of the U.S. National Climate Program; Principal Architect of the National Weather Service's Climate Prediction Center and Founding Director of the National Oceanic and Atmospheric Administration's Climate Program

F. Invited Talks (Jan 2007-present)

- "Challenges on Main Street;" Grand Challenges Innovations Summit (Tucson) 3/2009; "Digital Earth Contributions to Air Quality and Human Health," 6th International Symposium on Digital Earth, (Beijing) 9/2009; AAAS Annual Meeting 2008 (Boston), International Society Photogrammetry and

Remote Sensing (ISPRS) Congress 2008 (Beijing), and more than 10 additional invited talks, two to the Annual Energy Utility Environment Conference (Phoenix)

G. Contributed Presentations (Jan 2007-present)

- Approximately 30 presentations as lead author; approximately 25 presentations as co-author.

H. Current Grants/Contracts

- "Integration of Airborne Dust Prediction Systems and Vegetation Phenology to Track Pollen for Asthma Alerts in Public Health Decision Support Systems", National Aeronautics and Space Administration (NASA) grant, $674,468, 7/2009-7/2014, Percent Effort (of my group): 100%, Principal Investigator

I. Major Service (Jan 2007-present)

I1. Professional/Scientific

- Elected Member, Board on Environment and Health, American Meteorological Society (AMS), 2012 – present
- Chair, Implementation Planning Committee for the World Meteorological Organization (WMO) Sand and Dust Storm Warning Advisory and Assessment System, Geneva, 2009 – 2010
- Member, Chinese Academy of Sciences' Expert Committee for Strategic Development of the Center for Earth Observation and Digital Earth, 2011 - present
- Director, Sino-U.S. Centers for Soil and Water Conservation and Environmental Protection, University of Arizona, 2002 – 2008
- Consultant to the World Meteorological Organization, Geneva, 2008
- Chair, Climate Panel, World Federation of Scientists, 2000-2010

I2. University, College, Department

None

I3. Local/Community

- News media reported on our work, including: The (Australia) Guardian (9/2009); Der Spiegel (6/2008); Washington Post (2/2008); KUAT, Channel 6 (7/2008); Discoveries and Breakthroughs in Science, American Institute of Physics (4/2008); UNIVISION (12/2008); Austrian Public Radio (6/2009); New Hampshire Public Radio, "Word of Mouth" (10/2009); Puerto Rico live radio interview
- Lectured to local groups such as the Academy Village Senior Academy, Arizona and Pima County councils on environmental quality, and the Voyager Seminar Series

J. Synergistic Activities

(i) Model and Value-Added Data Development: Our environmental modeling system proved technology for projects with Centers for Disease Control (valley fever and Arizona haboobs) and the current NASA project (simulating/forecasting pollen plumes). It is available for education and research in climate variability and change, wildfire control, health implications of airborne particulates, highway and airline safety and many other applications.

(ii) Major Advisory Reports: "Implementation Plan for the World Meteorological Organization (WMO) Sand and Dust Storm Warning Advisory and Assessment System" and co-author and organizer of a Vatican Academy of Sciences seminar, "A Framework for Managing Climate Change," 12/2008, Rome.

(iii) Major Teaching Innovation: Established student intern program for the World Meteorological Organization (WMO) Pan-America Center for Sand and Dust Storm Warning Advisory and Assessment System (2012 – present) including partial WMO scholarships (2/yr) for students from developing countries.

(iv) Major Prior Grants: Co-Principal Investigator of NASA Grants: "Public Health Applications in Remote Sensing" ($1,157K, 2007-2009) and "Environmental Public Health Tracking Systems ($291K, 2009-2011)" that led to WMO and U.S. National Weather Service endorsement of the U.S. lead for WMO the Pan-America Center for Sand and Dust Storm Warning Advisory and Assessment System.