

Extreme Hydrometeorological Event From Multi-Day Mesoscale Convective Thunderstorms over the Santa Catalina Mountains, Arizona

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Over the last week in July, 2006, a perfect set of atmospheric conditions aligned to produce record floods and an unprecedented number of debris flows in the Santa Catalina Mountains. The activity culminated in an extreme hydrometeorological event on July 31, 2006. During the week prior to the extreme event, an upper-level area of low pressure meandered over the northwestern part of New Mexico. This system along with several underlying mesoscale features generated widespread heavy rainfall over southeastern Arizona. The most significant of which occurred after midnight on July 31. A strong and widespread complex of thunderstorms developed over the Mogollon Rim in central Arizona in a deformation zone that formed on the back side of the upper-level low, as a strong Pacific trough and associated jet streak approached extreme northwest Arizona from Nevada and California. Very high atmospheric moisture, (values greater than 1.50mm) coupled with cooling aloft generated a mesoscale thunderstorm complex that moved southeast into the Tucson basin. These thunderstorms interacted with a low to mid-level zone of atmospheric instability to create an initial area of thunderstorms across the Tucson metropolitan area just after midnight. These storms exhibited a cold cloud top structure with tops as cold as -72C. A second burst of thunderstorms and heavy rain developed over the Santa Catalina Mountains near dawn. This activity showed a warm top cloud structure, with the heaviest rain under warming cloud tops and values warming to -55C to -60C. A strong low level southwesterly jet from 15-20kt developed with a significant upslope component over the south face of the Santa Catalina Mountains, advecting moist and unstable air into the merging storms.

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