Upper-level Mesoscale Disturbances on the Periphery of Closed Anticyclones

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Closed anticyclones (CAs) in the upper troposphere over continental regions in the warm season provide an important link between weather and climate on intraseasonal time scales. Given that CAs can persist for a good part of a typical 90-day warm season, the positive (negative) surface temperature (rainfall) anomalies associated with them can determine the overall seasonal temperature (rainfall) anomalies for a given region. A less appreciated aspect of CAs is that high-impact severe weather events can occur in conjunction with migratory upper-level disturbances that traverse: 1) the poleward periphery of CAs, typicall over the northern Great Plains, where strong deep-layer shear in the flanking jet and high convective available potential energy (CAPE) is often present, and 2) the equatorward periphery of CAs, along the Gulf Coast and over the southwest U.S., where deep tropical moisture, moderate CAPE and moderate shear is often abundant, particularly after the onset of the southwest monsoon.

The purpose of this presentation is to discuss how CAs provide one avenue for understanding links between weather and climate on intraseasonal time scales. This task will be accomplished through an examination of a global CA climatology, with a particular emphasis on warm season continental CAs and through case studies of continental CAs that were associated with significant heat waves. In particular, the structure and evolution of heat wave-related continental CAs over the US during July 1995 and July 2006 will be compared and contrasted. Particular attention will be paid to the behavior of transient upper-level mesoscale disturbances and their impact on the development of organized severe convection over: (1) the northern Great Plains, (2) the Gulf Coast states, and (3) the southwest U.S. during monsoon season.