

ATS/CIRA Colloquium

*Atmospheric Science 50<sup>th</sup> Anniversary Speaker*

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## **Tropical cyclones and their role in energy transfer between the tropics and extra-tropics**

Hosted by Sue van den Heever

**Thursday, October 20, 2011**

**ATS room 101; Discussion will begin at 3:30pm  
Refreshments will be served at 3:00pm in the coffee lounge**

Moist convective systems in the tropics inject large masses of high entropy / high angular momentum air into the upper troposphere (the so called over world) inflating a "tropical tropospheric energy bubble" (TTEB). To complete the global energy cycle, the mass of air contained in the TTEB must migrate to higher latitudes where its energy can be radiated to space. Since most tropical convective activity occurs along the Inter-Tropical Convergence Zone (ITCZ) at 5-15 degrees latitude, poleward migration of the TTEB is blocked by inertial stability, that results in a "subtropical jet" (STJ) on the poleward boundary of the energy bubble.

Under certain circumstances, significant poleward excursions of high entropy tropical convective activity occur. The deep upward fluxes of entropy endemic to tropical cyclones (TCs) is one example. As TCs migrate poleward, they can produce TTEBs with sufficiently low angular momentum to directly interact with the with the PJ and the polar air mass behind the PJ. These interactions can produce what might be called an "orphaned" TTEB that is characterized by its distinct separation from the main body of the TTEB. The poleward boundary of an orphaned TTEB can produce a "super jet stream" (SSJ), having the characteristics of a STJ-PJ intersection, but along the entire boundary of the bubble. The extended 9-18 km deep tropopause fold and strong jet that results can be labeled a "super" jet streak. Direct TC-polar jet streak interactions, although less common than the simple enhancement of an STJ, lead to extreme baroclinic poleward energy surges, and seem to account for specific unusually strong baroclinic storms, or Sawyer-Elliasen surge activity, particularly in the late Fall season when the circumpolar vortex is expanding, but the tropical season lingers on.

In this talk, I will explore the energetics of how energy from a TC is transferred to and stored in a TTEB and then discuss specific instances where orphaned TTEBs have caused major baroclinic responses.