Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10883, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10883
EGU General Assembly 2008

Insights into the structure of atmospheric rotors

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During the Terrain-induced Rotor Experiment (T-REX) in spring 2006, highly turbulent flows in atmospheric rotors in the lee of the Sierra Nevada were probed by the University of Wyoming King Air aircraft. In situ thermodynamic and kinematic data was obtained on rotor and wave structures over Owens Valley in a number of research missions in strong lee-wave conditions. Sufficiently strong signal returns from the Wyoming Cloud Radar (WCR) were granted by the presence of ice particles within different types of clouds associated with the wave/rotor system, including mountain cap clouds over the Sierra crest, "spill over" clouds over the eastern Sierra slopes as well as roll clouds over Owens Valley. In a selected number of missions, returns from the roll clouds permitted dual-Doppler analyses of air motions within the upper part of the rotor circulation. In situ measurements by the UW King Air are used to examine the range of different flow structures over Owens Valley, including trapped lee waves, low-level wave breaking, and hydraulic jumps and their relationship to attendant strongly turbulent flow regions within Owens Valley. Doppler analyses of remote sensing data from the WCR reveal a wealth of fine-scale structures within the roll clouds. High-resolution real-data COAMPS simulations are used to provide further insight into the evolution and structure of the flow field over the Sierra Nevada and Owens Valley, including waves and rotors.