Geophysical Research Abstracts,
Vol. 11, EGU2009-9812, 2009
EGU General Assembly 2009

Alpine Valley Flows and Cold Pools during T-REX

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Coherent Doppler lidar data and sodar/RASS profiles are used to study the evolution of nocturnal flows and cold pools in an alpine valley. Owens Valley, California was the site of the Terrain-Induced Rotor Experiment (T-REX) carried out during the months of March and April of 2006. The main objective of this experimental campaign was the observation of mountain wave and rotor activity in the lee of the Sierra Nevada Mountains. However, the opportunity existed during non-rotor events to focus on the stable boundary layer, as well as the creation and depletion of cold air pools. The unique local topography, set between two large and nearly parallel mountain ranges, offered the opportunity to study diurnal flow phenomena in an idealized valley setting. ASU deployed its coherent Doppler lidar during T-REX, in addition to a flux tower and a sodar/RASS. The presence of a second scanning coherent Doppler lidar situated near the ASU Doppler lidar, provided the opportunity to utilize a dual Doppler retrieval technique ("virtual towers") which was developed during the Joint Urban Dispersion Experiment (JU2003). The second Doppler lidar was deployed and operated by the Deutsches Zentrum fur Luft- und Raumfahrt (DLR). Wind directions are frequently along the valley during more quiescent conditions, and several examples are given. In one case, there was a significant night-time drainage flow occuring with wind velocity magnitudes greater than 10m/s on vertical profiles obtained through dual-Doppler analysis. For this case, the velocity profile evolved gradually from a relatively smooth vertical velocity profile to a vertical velocity profile characterized by several local maxima. A low-level jet was seen below 500 m above ground level. Regarding cold pools during T-REX, some differences are noted with the classical expectations due to the complexity of the flow configuration considered here. In particular, classical cold pool destruction scenarios do not usually take into account valley flows which are perpendicular to the slope flows. Different IOP's display different levels of synoptic effect; for example, little synoptic influence is observed during EOP 2. Effects of a growing convective boundary layer with a subsiding stable boundary layer and the presence of intrusions are presented.