

# **Inter-basin Transport, Canyon Circulations, and Lake Breezes: Atmospheric Mixing and Air Mass Exchange Processes and their Effect on Pollution Concentrations in Utah's Salt Lake Valley**

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## **ABSTRACT**

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The Salt Lake Valley and other densely populated topographic basins in Utah and throughout the world suffer from prolonged pollution episodes during wintertime that are associated with persistent cold air pools (PCAPs). PCAPs develop when high pressure systems and subsidence temperature inversions trap colder air and anthropogenic pollutants in topographic basins. The feedback between meteorological and chemical processes in PCAPs has received increasing attention in recent years.

While atmospheric mixing and transport processes are generally suppressed under the statically stable atmospheric conditions of PCAPs, some thermally and synoptically driven processes still work to modulate pollution concentrations within and along the edges of the PCAPs. In this presentation we summarize observational evidence for these processes from a variety of field observations conducted in the recent winters. During these experiments, we used a Doppler wind LiDAR, SoDARs, ceilometers, radiosondes, and pseudo-vertical temperature profiles to monitor the evolution of the vertical structure of the pollution layer, and we leverage the availability of state and University operated air quality monitors to investigate the effect of a variety of meteorological processes on particulate air pollution concentrations.

The processes investigated include (1) canyon circulations through Red Butte and Parleys Canyons, two tributary canyons of different size entering the Salt Lake Valley; (2) lake breeze circulations from the Great Salt Lake (GSL); (3) synoptically forced air mass exchanges with the atmosphere over the GSL that can lead to "lake recharges", a phenomenon when highly polluted air residing over the GSL is bleeding back into the Salt Lake Valley, and (4) inter-basin exchanges between the Utah Valley and Salt Lake Valley.