

Bingham Mine Cold-Air Pool Structure and Evolution

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Background: A National Science Foundation-supported research program called the Persistent Cold-Air Pool Study (PCAPS) will be conducted in the Salt Lake Valley in 2010-2013, with a major field experiment in the Salt Lake Valley during the period 1 December 2010 - 7 February 2011. This experiment is supported by the National Center for Atmospheric Research, which will be bringing wind-profiling radars, a lidar, and 7 flux-towers (surface energy budget stations) that will be located throughout the Salt Lake Valley, including two proposed sites on Kennecott property. Other federal and state agencies are also participating in this major experiment. The goals of the program are to gain a better understanding of the persistent, wintertime inversions in the Salt Lake Valley through observations, analysis and modeling, to provide a long-term climatology of these inversions, to gain information that can improve the forecasting of the Salt Lake City inversion, and to investigate its role in valley air quality.

Proposal: We propose an add-on to the NSF-supported work that will examine inversions in the Bingham Canyon Mine and their relationship to the Salt Lake Valley inversion. For this work, we would place a line of temperature data loggers from the floor of the mine up to the ridgeline and a line of temperature data loggers on the outside of the mine descending into the Salt Lake Valley. A wind-profiling lidar would also be placed at a location with power access within the mine that would continuously measure wind profiles in and above the mine. The data from these weather instruments would be analyzed in parallel with data from the larger NSF program, affording research opportunities for our graduate students and gaining new knowledge on inversions inside the Bingham Canyon Mine, the factors that affect them, and their relationship with the Salt Lake Valley inversion.

Schedule: If possible, the temperature data loggers and lidar would be purchased and installed before 1 December 2010 and would be operated through April 2011. If the lidar delivery is delayed beyond 1 January 2011, we would make additional lidar and data logger observations in the mine during winter 2011-12, if requested by Kennecott, although this would not allow as complete a comparison with the Salt Lake Valley inversion. Access to the mine will be necessary for instrument installation and data will be downloaded through site visits at approximately monthly intervals. A tethered balloon would be operated from the floor of the mine several times, during both day and night, to verify that the surface-based temperature data loggers are a good proxy for free-air soundings within the mine. Data analysis will follow the field study period and continue through year 3, supporting a half-time post-doctoral researcher and half-time graduate student. The post-doctoral researcher and graduate student will be guided by Dr. Whiteman. Annual progress reports summarizing field observations, analyses, findings and status of research will be submitted on 15 December 2011 and 15 December 2012 and a comprehensive report would follow within two months of the end of the project. Kennecott's technical supervisor is encouraged to request the inclusion of analyses of special interest to Kennecott in these reports.

Research: The data collected are expected to lead to the publication of research papers and student's masters theses. The data will thus be publicly available, along with all other data from the PCAPS experiment.