

Isotopic variability in water vapor over New Mexico: implications for water vapor transport

Mel Strong and David S. Gutzler
University of New Mexico
Albuquerque, New Mexico

Potential sources of water vapor over New Mexico include the Pacific Ocean, Gulf of California, and Gulf of Mexico. At the University of New Mexico, we have begun a multiyear survey of the isotopic composition of atmospheric water vapor in an effort to understand the exact moisture pathways into New Mexico. After developing a new technique for extracting water vapor from atmospheric air samples and analyzing for deuterium content, air samples have been collected on the roof of the UNM geology building one to three times a day since April 1 2005. Air has also been collected in an ultralight aircraft at ~300 meter increments up to ~3 km above ground level in an effort to construct vertical profiles of the isotopic composition of water vapor in the troposphere. The data from the first 20 months of the study are reported here with our initial interpretations. Large isotopic variations are observed in both the daily rooftop time series and within single vertical profiles. Within vertical profiles, systematic variations in the isotopic composition of water vapor rarely correlate with any conventional measurements made by weather balloons, suggesting that the isotopes are revealing structures in the lower atmosphere not previously observed. Reverse-calculated trajectory models suggest that the observed isotopic variations in the spring are due to changes in advection. The springtime moisture source for central New Mexico oscillates between different oceanic sources in as little as 24 hours while vertical bands of water vapor with distinctive isotopic values imply that New Mexico can receive moisture from multiple sources simultaneously.

FORECASTING AND QUANTITATIVE PRECIPITATION ESTIMATION