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Variations of Precipitation, Jemez Mountains, New Mexico

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## Infiltration/Ground Water Linkages in the Southwest: Response of Shallow Ground Water to Interannual Variations of Precipitation, Jemez Mountains, New Mexico

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Hydraulic gradients, residence times and the hydrochemistry of shallow ground water are linked to the episodic precipitation and recharge events characteristic of the arid southwest. In this region, the amount of precipitation, and corresponding biomass, is dependant upon altitude with greater frequency and duration in the montane highlands and less in the desert lowlands. Results from a four-year study at the Rio Calaveras research site in the Jemez Mountains of northern New Mexico show a strong correlation between the physical and hydrochemical properties of shallow ground water and variations of seasonal precipitation and infiltration. For example, the water table shows a dramatic response to snowmelt infiltration during years of abundant snow pack (El Niño) and diminished response during years of reduced snow pack (La Niña). The chemical structure of shallow ground water is also affected by the precipitation regime, primarily by variations in the flux of reductants (organic carbon) and oxidants (dissolved oxygen) from the vadose zone to the water table. Generally, oxic conditions persist during spring snowmelt infiltration shifting to anoxic conditions as biotic and abiotic processes transform dissolved oxygen. Other redox-sensitive constituents (ferrous iron, manganese, sulfate, nitrate, and nitrite) show increasing and decreasing concentrations as redox fluctuates seasonally and year-to-year. The cycling of these redox sensitive solutes in the subsurface depends upon the character of the aquifer materials, the biomass at the surface, moisture and temperature regime of the vadose zone, and frequency of infiltration events.

In order to fully understand the complex linkages between precipitation, infiltration and shallow ground water, we are in the process of establishing monitoring stations along an east-to-west transect across the Jemez Mountains from the Rio Grand Valley to the San Juan Basin. Synoptic observations along the Jemez transect will be used to develop a conceptual model providing insight into the linkage between precipitation, hydrology and subsurface biogeochemistry at different elevations. Data from 1995 to 1998 at two locations (Rio Calaveras and the Pajarito Plateau) are presented to show how shallow ground water responds to variations in precipitation at different elevations along the transect. These two locations differ by only 400 meters in elevation and are approximately 30 km apart but have different precipitation, infiltration and vegetation regimes. Differences are determined by the pattern of infiltration and runoff, character of solute transported to the upper aquifer, geomorphologic structure of the topography and the structure of the ecosystem.

1. Chapman Conference on Semiarid Landscapes
2. Poster

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4. No
5. None