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Quantifying Subsurface Biogeochemical Variability in a High Altitude Watershed During Winter Isolation

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Shallow subsurface microbial and geochemical processes in watersheds are dynamic and responsive to seasonal and long-term environmental change. At high elevation or latitude, such changes may occur during winter months when normal sampling is impossible, impractical, unsafe, or may actually alter the processes being studied. Yet accurate modeling of biogeochemical parameters in the subsurface requires sampling that captures events and persistent cold climate trends. Gaps in current models exist where data have not been collected during extended snow or ice covered periods. Our exploratory study will test the hypothesis that during snow cover in the East River (ER) watershed, episodic excursions of microbial community structure and biogeochemical processes and concentrations will fluctuate from values extrapolated from pre- and post- snow time periods. Elemental and microbial cycles will remain active in the aquifer long after the surface has been covered with snow. Melt events will stimulate biogeochemical processes. Our goal is to demonstrate that data collected through these periods will fill gaps and improve reactive transport models of biogeochemical processes in watersheds. We are coordinating with ongoing studies at the ER site especially those that using reactive transport modeling to frame the biogeochemical processes occurring in the watershed. We describe preliminary work conducted to place the specially designed samplers into the East River and the Shumway well in early November 2017 so that sampling over the winter months can begin.