GEOCHEMICAL PARAMETERIZATION OF KARSTIC FLUID FLOW IN THE BEAR RIVER RANGE, UTAH

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ABSTRACT

Subsurface fluid flow dynamics in karst systems bear implications for hydrologic resources and transport of environmental contaminants. Karst processes in carbonate units result in dissolution of bedding planes and structures and are thought to split fluid flow into fast (channelized) and slow (diffuse) components. Accordingly, traditional Darcian models are disqualified in these settings and flow mechanics become difficult to parameterize. A composite geochemical approach including major ions, stable, and radiogenic isotopes will strengthen understanding of karst systems and parameterize flow paths, residence times, and source areas. The Bear River Range of northern Utah constitutes a classic alpine karst aquifer whose water budget bears significant implications for policies in adjacent Cache Valley urban centers. Prior geochemical studies are few and have focused either on quick flowing groundwater or qualitative interpretation of sparse geochemical data. A multi-attribute investigation such as this will provide a more rigorous and comprehensive parameterization subject to multiple angles of validation. Results will aid fluid flow characterization in other alpine karst and paleokarst environments with applications spanning contaminant persistence, hydrocarbon migration, and groundwater movement. In particular, the presence or lack of diffuse flow in karst systems will bear upon storage capacity and residence times critical to understanding groundwater availability and quantity in aquifers devoid of wells. In conjunction with an ongoing discharge measurement campaign, these data will also parameterize a local conceptual model for mountain block recharge to the adjacent Cache Valley principal aquifer system.

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