EVALUATING SOLUTE SOURCES IN THE UPPER GILA RIVER, NM

Pavel Vakhlamov¹, Laura J. Crossey, Cliff N. Dahm, V. Acuña and A. S. Ali

¹ pavel.vakhlamov@gmail.com

The Gila River in southwestern New Mexico is one of the last free flowing rivers in North America. It exhibits a great range of hydrochemical variability across spatial and temporal scales in response to changes in precipitation and temperature. Previous work indicates that during times of monsoonal precipitation, temporal variability in water chemistry of streams in the Gila watershed is largely affected by surface runoff due to variability in landscape cover features, as well as size of the catchment. However during base flow regimes, spring inputs of various magnitudes are the dominant drivers of solute concentrations and variability in this system. There are several influencing factors effecting base flow solute concentrations. In the Gila River, as in many perennial rivers of the American Southwest, deep groundwater and geothermal inputs are determined to be primary contributing sources of solutes. Such waters derive their compositions from being conducted through fault and fracture networks created by tectonic processes. Our primary objective is to quantify contributions of deep water and geothermal inputs to surface water chemistry of the upper Gila stream network and determine annual variability of solute fluxes by utilizing a combination of methods including continuous water quality monitoring sensors and campaign sampling. Preliminary results exhibit substantial spatial variability evident by progressive downstream increases in solute concentrations. We report results of a 120 kilometer reach of the upper Gila River, from Gila Springs to Bill Evans Lake. This is an area of major geologic sources of saline water input into the system. Regional climate change scenarios predict a reduction in precipitation including effects on snowpack melt and runoff contribution to the Gila system. This will significantly increase the occurrence of base flow regime leading to higher salinity. Such conditions are projected to apply stress on a wide range of ecological communities and have negative consequences for water quality for downstream users. Reported results indicate that at times of base flow conditions end member concentrations of solutes and regulated contaminants exceed primary and secondary national drinking water standards. Detailed study of water chemistry of geologic water inputs in the upper Gila watershed provides crucial baseline information for determining the response to climate change and data to distinguish geologic solute concentrations from anthropogenic contributions to the system.

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