Natural Salinization of the Jemez River, New Mexico: an Insight From Trace Metal Geochemistry

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The Jemez River (JR), a tributary of the Rio Grande, receives thermal water input from the geofluids of the Valles Caldera (VC), an active, high-temperature (≤ 300 °C), liquid-dominated geothermal system. We focus on a ~50-km portion of the northern JR, spanning a segment from the East Fork JR headwaters to the town of San Ysidro. Previous decadal work during low-flow conditions (~10-20 cfs) has characterized significant major-solute contributions from two outflow expressions of the VC, Soda Dam Springs and Jemez Hot Springs, and two major tributaries, Rio San Antonio and Rio Guadalupe. Generally, there is a net ~500 ppm increase from above the thermal springs to the end of the study reach. This research extends the suite of measured dissolved elemental species by including trace metals (like As, Pb, and U). We discern between conservative behavior, marked by changes in downstream concentrations exclusively attributed to mixing, and non-conservative behavior, which may be a result of removal processes such as co-precipitation and adsorption. To identify and understand these potential secondary reactions, we supplement solute chemistry data with spatial surveys of physiochemical parameters (pH, dissolved oxygen, temperature, oxidation-reduction potential, and turbidity) with regular 1-km spacing and denser (50-m) sampling along sites with complete aqueous chemistry.

Keywords:

aqueous geochemistry, Valles Caldera, geothermal

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