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Natural trace element salinization of the Jemez River, New Mexico by geothermal springs and major tributaries

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**Natural Trace Element Salinization of the Jemez River, New Mexico by geothermal springs
and major tributaries**

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The Jemez River (JR), a tributary of the Rio Grande, is in north-central New Mexico within the Jemez Mountains, which houses the active, high-temperature (≤ 300 °C), liquid-dominated Valles Caldera geothermal system (VC). This work focuses on the northern portion of the JR, spanning a reach from the East Fork JR to the town of San Ysidro. Previous decadal work during low-flow or baseflow conditions (~ 10 - 20 cfs) has identified and 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. There is generally a net ~ 500 -ppm increase from below Soda Dam to the end of the study segment.

The distribution of concentrations of twenty-four trace metals from recent Fall 2017 sampling are defined by a range from ‘ultra-trace’ levels (0.1-1 ppb) to measurements as much as 1 ppm. A set of elements (e.g., As, Li, Rb, Ba, Ti) follows the same downstream behavior of major ions, which is characterized by an increase in concentrations at each inflow and the observed greatest contribution (as much as an order of magnitude) is at Soda Dam. Another group (e.g., U, Al, Fe, Mn, Se) shows complex downstream patterns, which may be a result of non-conservative processes, such as precipitation/dissolution, sorption, and complexation. We attempt to resolve these potential in-stream processes with high-resolution (regular 1-km spacing with interspersed 50-m intervals around sites with complete chemistry) spatial surveys of temperature, dissolved oxygen, pH, oxidation-reduction potential, and turbidity.