Hydrothermal discharge from the El Tatio basin, Atacama, Chile

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Highlights:

1. Geothermal heat flow to the surface is 120 to 170 MW
2. Approximately 220 L/s of thermal fluids are discharged
3. Thermal waters are meteoric in origin and recharged tens of km from El Tatio

Abstract

El Tatio in northern Chile is one of the best-studied geothermal fields in South America. However, there remain open questions about the mass and energy budgets, water recharge rates and residence time in the subsurface, origin of dissolved solutes, and processes affecting the phase and chemical composition of groundwater and surface water. We measured and sampled surface manifestations of the geothermal system (geysers perpetual spouters, mud pools/volcanoes, and non-eruptive hot springs) and meteoric water. From the isotopic composition we infer that the thermal water has a meteoric origin that is different from the composition of local meteoric water. The absence of detectable tritium in thermal waters indicates that most of the recharge occurred pre-1950. Boiling and steam separation from the deep reservoir appear to be the main subsurface processes affecting the thermal fluids. A large amount of heat is lost to