

# TIME-VARIATION OF HYDROTHERMAL DISCHARGE AT SELECTED SITES IN THE WESTERN UNITED STATES: IMPLICATIONS FOR MONITORING

## Abstract and Associated Data Sets

[Ingebritsen, S.E.](#), Galloway, D.L., Colvard, E.M., Sorey, M.L., and Mariner, R.H.

U.S. Geological Survey, Menlo Park, California 94025

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## Abstract

We compiled time series of hydrothermal discharge consisting of 3,593 chloride- or heat-flux measurements from 24 sites in the Yellowstone region, the northern Oregon Cascades, Lassen Volcanic National Park and vicinity, and Long Valley, California. At all of these sites the hydrothermal phenomena are believed to be as yet unaffected by human activity, though much of the data collection was driven by mandates to collect environmental-baseline data in anticipation of geothermal development. The time series average 19 years in length and some of the Yellowstone sites have been monitored intermittently for over 30 years. Many sites show strong seasonality but few show clear long-term trends, and at most sites statistically significant decadal-scale trends are absent. Thus, the data provide robust estimates of advective heat flow ranging from ~130 MW in the north-central Oregon Cascades to ~6,100 MW in the Yellowstone region, and also document Yellowstone hydrothermal chloride and arsenic fluxes of 1,740 and 15 to 20 g/s, respectively. The discharge time series show little sensitivity to regional tectonic events such as earthquakes or inflation/deflation cycles. Most long-term monitoring to date has focused on high-chloride springs and low-temperature fumaroles. The relative stability of these features suggests that discharge measurements done as part of volcano-monitoring programs should focus instead on high-temperature fumaroles, which may be more immediately linked to the magmatic heat source.

*Keywords:* Monitoring, Time series, Hot springs, Fumaroles

## Electronic data sets

Two data sets are an integral part of this report. These data sets are available as Portable Document Format (PDF) files. They include full details of all measurements from high-chloride spring ([highclspringdat.PDF](#)) and fumarolic areas ([acidsulfatedat.PDF](#)), metadata with complete descriptions of the sites and methods, and basic time-series plots for each site. We cite these documents in support of some particular points in the report; interested readers can use them to do their own complementary analyses. An index at the beginning of each document facilitates cross-referencing with text, figures, and tables.