



## Geyser Interaction: Two examples from El Tatio, Chile

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Geysers are eruptive hot springs that episodically discharge steam, liquid water, and non-condensable gases. While hot springs are abundant in geothermal areas, geysers are uncommon and they require special conditions of water supply, heat flow, and fractures and/or porous rocks. Despite more than 200 years of study, there are still open questions about how and why geysers erupt: How is geyser cycle influenced by other adjacent and distant thermal sources? Are hot springs and geyser connected through permeable pathways? Why do only a few hot springs erupt as geysers?

We conducted two week-long field studies of geyser interactions in the El Tatio geyser field, Chile during Oct. 2012 and Oct. 2014. We found two different cases: geyser-pool interaction and geyser-geyser interaction. In the first case, we documented how the water level of the pool varies as the geyser eruption evolves. Measured temperature in the geyser conduit has a repeatable pattern, when it reaches boiling the eruption occurs. In contrast, the temperature in the adjacent pool is constant and never reaches the boiling point, suggesting that heat is supplied only to the geyser conduit. Pressure in the geyser conduit and pool have a similar evolution over time so that the side pool acts as a barometer for the conduit. The geyser-geyser interaction was documented in 2014. A geyser with long eruption intervals (1-3 hours) changes the behavior of a short-interval geyser (c.a. 10 minutes). When the long-interval geyser erupts, the short-interval geyser stops erupting. When the eruption of the long-interval geyser becomes less vigorous, the short-interval geyser resumes its eruptions with shorter intervals. During the week of measurements in 2012, we did not observe the short-interval geyser erupting. At that time, the eruption of the long-interval geyser was regular (4 hours and 40 minutes, ref 1). We thus infer that the geyser-geyser interaction made the eruption cycle chaotic.

Geyser-pool and geyser-geyser interactions imply hydrologic connectivity. These pathways may be complicated, and evolve over time.

### References

(1) Namiki et al. 2014