

Charging and discharging of geysers investigated with geophysical methods.

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Context

Geysers are fascinating natural processes characterised by a subtle equilibrium between vapor and liquid fluids (Hurwitz and Manga, 2021). While being studied for centuries (Descloizeaux, 1847; Munby, 1902), little is still known about the charging and discharging dynamics of such systems. The architecture of the shallow plumbing system of geysers is also little understood. Despite the multiple conceptual models and the laboratory experiments proposed over the years), geysers feature a large variety of eruptive cycles that may be affected by external forcing. Remote earthquakes, swinging weather conditions and tidal changes are only few of the factors that have been proposed to be able to modify geysering regimes (Hurwitz, 2008). Additionally, multiple geysers are often found across the same hydrothermal field but their eruptive behavior is suggested to be driven by local physical conditions.

Objectives and Methods

Methods: Seismology, geoelectrics, and dataloggers

Objectives: Understand charging and discharging processes driving geysering eruptions

This MSc project will use geophysical methods (e.g. electromagnetics, seismology, and UAV) to shed light on the charging and discharging processes driving geysering. This field-oriented study will collect and process data to investigate what affects geyser eruptions and will have the objective of imaging the hydrothermal field hosting geysers. According to the logistic conditions and to the site accessibility the candidate will select one of the very few hydrothermal systems hosting geysers (i.e. either in Iceland, Chile, Africa, United States, New Zealand or Russia) and will collect data to conduct this geophysical study. The outcome of this study will contribute towards a better understanding of charging and discharging dynamics of geysers and will help investigating the dynamics of open-conduit volcanic systems.

Literature

- Descloizeaux, A. (1847). LX. Physical and geological observations on the principal Geysirs of Iceland. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 30(203), 391–409. DOI: 10.1080/14786444708645417
- Munby, A. (1902). A model geyser. *Nature*, 65(247).
- Hurwitz, S., Manga, M., et al. (2021) Why study geysers? *Eos*, 102, DOI: 10.1029/2021EO161365
- Hurwitz, S., Kumar, A., Taylor, R., & Heasler, H. (2008). Climate-induced variations of geyser periodicity in Yellowstone National Park, USA. *Geology*, 36(6), 451–454. DOI: 10.1130/G24723A.1

Strokkur Geyser, Iceland at sunset. Geysers cyclically erupt at regular intervals but it is yet not clear why multiple eruptions may occur at times.



Choice of orientation:

- 1) Dynamic earth, geological hazard