Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19704

Exploring the Potential Correlation between Fluid Evolution and Seismicity through Dissolved Gas Monitoring in Thermal Water

SÉBASTIEN GIROUD[1], MATTHIAS BRENNWALD[1], DR. YAMA TOMONAGA[1] AND ROLF KIPFER[2]

[1]Eawag, Swiss Federal Institute of Aquatic Science and Technology

[2]Institute of Geochemistry and Petrology, Swiss Federal Institute Technology ETHZ

Presenting Author: sebastien.giroud@eawag.ch

The relationship between seismic activity and dissolved gas concentrations in geological fluids remains a contentious issue and is hotly debated. Although some correlations between changes in gas composition and seismicity have been identified, these often rely on observations of occasional events rather than long-term time series. Due to the lack of systematic assessments, it is difficult and complex to establish a causal connection between changing gas dynamics and earthquakes [1].

To address the possible relation of gas dynamics in terrestrial fluids and active seismicity, a portable gas equilibrium membrane-inlet mass spectrometer (miniRUEDI, [2]) was purposely deployed in a seismically active region of Switzerland. There, the Lavey-les-Bains hot springs discharge geothermal fluids with temperatures ranging between 50 °C and 65 °C. The instrument determined dissolved gas concentrations for over a year at high-frequency intervals of approximately 6 minutes, providing quasi-continuous measurements of He, Ar, Kr, N_2, O_2, H_2, CH_4, and CO_2. The extensive dataset of more than 40’000 gas measurements generated by this study represents a critical experimental basis to evaluate the possible causal link between gas evolution in geological fluids and seismicity.

[1] Toutain et Baubron (1999), *Tectonophysics, **304**, 1-27*

[2] Brennwald et al. (2016), *ES&T, **50**, 13455-13463*