

EGU22-10458

<https://doi.org/10.5194/egusphere-egu22-10458>

EGU General Assembly 2022

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Correlation of Wind Speed and Eruption Frequency of Strokkur Geyser, Iceland

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A geyser is a multiphase geothermal feature that exhibits frequent, jetting eruptions of hot water and non-condensable gases such as CO₂. In Iceland it was noted that Strokkur geyser erupts at regular intervals. Following single eruptions the typical waiting time is for example 3.7 ± 0.9 min. However, we noted that single eruptions are sometimes followed by an up to 7 min long gap and are the first ones to investigate this in the context of the weather at Strokkur.

A local broadband seismic network at Strokkur geyser, Iceland recorded more than 300000 eruptions during 2017-2018 and 2020-2021. The hourly weather data was acquired from the Hjardarland meteorological station at a few kilometers distance from Strokkur maintained by the Icelandic Meteorological Office. First we calculate the waiting time after eruptions and to make it comparable with the hourly weather data we calculate hourly means. First we used a simple pearson correlation to calculate the correlation in different time windows. As the time window increased the correlation between the waiting time and wind speed increased. No substantial increase in the correlation coefficients was visible for window lengths of more than 8 hours. So we chose an 8 hour long time window for the further analysis. We compare the averaged waiting time after eruptions, with wind speed, temperature, air pressure and humidity. To understand the relation more deeply, we plot each weather parameter vs. the waiting time average and fit linear and quadratic functions to the data. We find a strong correlation with the wind speed and minor anticorrelation with temperature and humidity. After calculating residuals the results indicate that there is a quadratic relation between the waiting time and wind speed. This highlights the sensitivity of the pool geyser with respect to environmental factors interfering with the heat balance of the system.