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Monitoring and Characterizing the Geysering and Seismic Activity at the Lusi Mud Eruption Site, East Java, Indonesia

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The Lusi eruption began on May 29, 2006 in the northeast of Java Island, Indonesia, and to date is still active. Lusi is a newborn sedimentary-hosted hydrothermal system characterized by continuous expulsion of liquefied mud and breccias and geysering activity. Lusi is located upon the Watukosek fault system, a left lateral wrench system connecting the volcanic arc and the bakarc basin. This fault system is still periodically reactivated as shown by field data.
In the framework of the Lusi Lab project (ERC grant n° 308126) we conducted several types of monitoring. Based on camera observations, we characterized the Lusi erupting activity by four main behaviors occurring cyclically: (1) Regular activity, which consists in the constant emission of water and mud breccias (i.e. viscous mud containing clay, silt, sand and clasts) associated with the constant expulsion of gas (mainly aqueous vapor with minor amounts of CO_2 and CH4) (2) Geysering phase with intense bubbling, consisting in reduced vapor emission and more powerful bursting events that do not seem to have a regular pattern. (3) Geysering phase with intense vapor and degassing discharge and a typically dense plume that propagates up to 100 m height. (4) Quiescent phase marking the end of the geysering activity (and the observed cycle) with no gas emissions or bursts observed.
To investigate the possible seismic activity beneath Lusi and the mechanisms controlling the Lusi pulsating behaviour, we deployed a network of 5 seismic stations and a HD camera around the Lusi crater. We characterize the observed types of seismic activity as tremor and volcano-tectonic events. Lusi tremor events occur in 5-10 Hz frequency band, while volcano tectonic events are abundant in the high frequencies range from 5 Hz until 25 Hz.
We coupled the seismic monitoring with the images collected with the HD camera to study the correlation between the seismic tremor and the different phases of the geysering activity.

Key words: Lusi mud eruption, geysering activity, seismic activity