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Linking the Lusi mud eruption dynamics with regional and global seismic activity: a statistical analysis.

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The 29th May 2006, gas water and mud breccia started to erupt at several localities along the Watukosek fault system in the Sidoarjo Regency in East Java Indonesia. The most prominent eruption site, named Lusi, is still active and the emitted material now covers a surface of nearly 7 km2, resulting in the displacement of $\sim$ 60.000 people (up to date). Due to its social and economic impacts, as well as its spectacular dimensions, the Lusi eruption still attracts the attention of international media and scientists. In the framework of the Lusi Lab project (ERC grant nº 308126), many efforts were made to develop a quasi-constant monitoring of the site and the regional areas.

Several studies attempted to predict the flow rate evolution or ground deformation, resulting in either overestimating or underestimating the longevity of the eruption. Models have failed because Lusi is not a mud volcano but a sedimentary hosted hydrothermal system that became apparent after the M6.3 Yogyakarta earthquake. Another reason is because such models usually assume that the flow will decrease pacing the overpressure reduction during the deflation of the chamber. These models typically consider a closed system with a unique chamber that is not being recharged. Overall the flow rate has decreased over the past ten years, although it has been largely fluctuating with monthly periods of higher mud breccia discharge. Monitoring of the eruption has revealed that numerous anomalous events are temporally linked to punctual events such as earthquakes or volcanic eruptions. Nevertheless, the quantification of these events has never been investigated in details.

In this study, we present a compilation of anomalous events observed at the Lusi site during the last 10 years. Using Monte Carlo simulations, we then statistically compare the displacement, recorded at different seismic stations around Lusi, with the regional and global earthquakes catalogue to test the probability that an earthquake striking the coast of Java affects the plumbing system at Lusi and triggers anomalous events.