



Hydrothermal waves: transient geysering eruptions at the Lusi eruption site, Indonesia.

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Lusi is a sediment-hosted hydrothermal system in East Java, Indonesia, erupting hydrothermal fluids at about 100°C. The fluids include a mixture of gas and water originating mostly from the exsolution of magmatic and biotic volatiles and from the dehydration of a thick sedimentary sequence heated by a magmatic body at depth.

Lusi's eruptive activity features various regimes including quiescent periods, bubbling and intense vapour degassing. The regular geysering activity is sometimes interrupted by enhanced hydrothermal processes during which boiling mud breccia is more violently discharged from the eruptive vents. This results in what we define as "hydrothermal waves". This phenomenon consists in sudden flooding lasting from several minutes to several hours. Hydrothermal waves are characterised by almost instantaneous temperature peaks marked by high frequency seismic signals. Sharp peaks of CH₄ and CO₂ concentrations also distinguish the discharged fluids. Hydrothermal waves may be directly linked to the injection in the shallow plumbing system of (deeply derived) CH₄- and CO₂-rich batches of fluids. Preliminary observations seem to indicate that external factors such as tides and atmospheric pressure and temperature variations may affect the generation of hydrothermal waves. Our findings point out the effects caused by subtle variations in fluid-chemistry changes at depth and describe processes taking place at a new-born geysering system.