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Fluid flow modeling at the Lusi mud eruption, East java, Indonesia.

Marine Collignon (1), Daniel Schmid (2), and Adriano Mazzini (1)

(1) Centre for Earth Evolution and Dynamics, University of Oslo, Norway (marine.collignon@geo.uio.no), (2) Physics of Geological Processes, University of Oslo, Norway

The 29th of 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, named Lusi, is still active and covering a surface of nearly 7 km2, resulting in the displacement of $\sim$ 30 000 people.

Although the origin and the chemical composition of the erupted fluids have been documented, the mechanical and physical properties of the mud are poorly constrained, and many aspects still remain not understood. Very little is known about the internal dynamics of the Lusi conduit(s).

In this study, conducted in the framework of the Lusi Lab project (ERC grant n°308126) we use both analytical and numerical methods to better understand the flow dynamics within the main conduit and to try to explain the longevity of the edifice. The 2D numerical model considers a vertical conduit with a reservoir at its base and solves the stokes equations, discretized on a finite element mesh. Although, three phases (solid, liquid and gas) are present in nature, we only consider the liquid phase. The solid phase is treated as rigid particles in suspension in the liquid. The gaseous phase (methane and carbon dioxide) is treated in an analytical manner using the equations of state of the H_2O-CO_2 and H_2O-CH4 systems.

Here, we discuss the effects of density, viscosity, gas concentration and clasts concentration and size on the dynamics of the flow in the conduit as well as implications of the conduit stability.