



Dynamic triggering of Lusi, East Java Basin

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On the 27th of May 2006, a M6.3 strike slip earthquake struck beneath Yogyakarta, Java. Forty-seven hours later a mixture of mud, breccia, and gas reached the surface near Sidoarjo, 250 km far from the epicenter, creating several mud vents aligned along a NW-SE direction. The mud eruption reached a peak of 180.000 km³ of erupted material per day and it is still ongoing. The major eruption crater was named Lusi and represents the surface expression of a newborn sedimentary-hosted hydrothermal system. Lusi flooded several villages causing a loss of approximately \$4 billions to Indonesia.

Previous geochemical and geological data suggest that the Yogyakarta earthquake may have reactivated parts of the Watukosek fault system, a strike slip structure upon which Lusi resides. The Watukosek fault systems connects the East Java basin to the volcanic arc, which may explain the presence of both biogenic and thermogenic fluids.

To quantify the effects of incoming seismic energy at Lusi we conducted a seismic wave propagation study on a geological model of Lusi's structure. A key feature of our model is a low velocity shear zone in the Kalibeng formation caused by elevated pore pressures, which is often neglected in other studies. Our analysis highlights the importance of the overall geological structure that focused the seismic energy causing elevated strain rates at depth. In particular, we show that body waves generated by the Yogyakarta earthquake may have induced liquefaction of the Kalibeng formation. As consequence, the liquefied mud injected and reactivated parts of the Watukosek fault system. Our findings are in agreement with previous studies suggesting that Lusi was an unfortunate case of dynamic triggering promoted by the Yogyakarta earthquake.