



## **Was the Lusi eruption triggered by volcanic intrusions? New insights from gas geochemistry**

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The 29th of May 2006 several gas and mud eruption sites suddenly appeared along a fault in the north east of Java, Indonesia. Within a few weeks several villages were submerged by boiling mud. The most prominent eruption site was named Lusi. To date Lusi is still active and a  $\sim 7\text{km}^2$  area is covered by the burst mud breccia.

Still many unanswered questions remain. Is Lusi a mud volcano or part of a larger hydrothermal system? What is the role of the neighbouring magmatic complex in this catastrophic event? Is it possible that the Arjuno volcanic complex contributed to trigger the eruption and still feeds Lusi longlasting activity? In order to investigate more precisely the origin of the erupted gasses, we provide the results of a broad gas sampling campaign conducted at Lusi site since its birth.

Stable isotope and molecular composition results reveal that two types of fluids exist at Lusi site. 1); The first group consist of boiling  $\text{CO}_2$ -dominated fluids erupted in the crater zone. Here the gases most likely derive from the sudden depressurization and exsolution of gases originally dissolved in pore water of organic-rich sediments. The second group are colder  $\text{CH}_4$ -dominated fluids seeping from several sites in the area around the crater zone. In both cases methane has a thermogenic signature and has a composition similar to that present in one of the neighbouring shallow gas fields.

Helium sampling reveal that at Lusi site is also seeping gas originating from mantle, while the neighbouring gas field shows average crust values. These results show that the Lusi plumbing system is much deeper than what previously thought and suggest a likely connection with the neighbouring magmatic complex. This link may also explain why Lusi activity still increases after earthquakes even when occurring at significant distances. We suggest that these earthquakes likely affect the plumbing system of the magmatic chamber at depth resulting in overpressure buildup that periodically enhances Lusi eruption.