Geophysical Research Abstracts
Vol. 18, EGU2016-9270-1, 2016
EGU General Assembly 2016

Geochemical surveys in the Lusi mud eruption

Alessandra Sciarra (1), Adriano Mazzini (2), Giuseppe Etiope (1), Salvatore Inguaggiato (3), Alwi Hussein (4), and Soffian Hadi J. (4)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy (alessandra.sciarra@ingv.it), (2) Centre for Earth Evolution and Dynamic (CEED) University of Oslo, Norway, (3) Istituto Nazionale di Geofisica e Vulcanologia, Palermo, Italy, (4) BPLS, Surabaya, Indonesia

The Lusi mud eruption started in May 2006 following to a 6.3 M earthquake striking the Java Island. In the framework of the Lusi Lab project (ERC grant n° 308126) we carried out geochemical surveys in the Sidoarjo district (Eastern Java Island, Indonesia) to investigate the gas bearing properties of the Watukosek fault system that crosses the Lusi mud eruption area. Soil gas (222Rn, CO_2, CH4) concentration and flux measurements were performed 1) along two detailed profiles ($\sim$ 1km long), trending almost W-E direction, and 2) inside the Lusi embankment (about 7 km2) built to contain the erupted mud.
Higher gas concentrations and fluxes were detected at the intersection with the Watukosek fault and the antithetic fault system.
These zones characterized by the association of higher soil gas values constitute preferential migration pathways for fluids towards surface. The fractures release mainly CO_2 (with peaks up to 400 g/m2day) and display higher temperatures (up to 41°C). The main shear zones are populated by numerous seeps that expel mostly CH4. Flux measurements in the seeping pools reveal that φCO_2 is an order of magnitude higher than that measured in the fractures, and two orders of magnitude higher for φCH4.
An additional geochemical profile was completed perpendicularly to the Watukosek fault escarpement (W-E direction) at the foots of the Penanngungang volcano. Results reveal CO_2 and CH4 flux values significantly lower than those measured in the embankment, however an increase of radon and flux measurements is observed approaching the foots of the escarpment.
These measurements are complemented with a database of $\sim$350 CH4 and CO_2 flux measurements and some soil gas concentrations (He, H2, CO_2, CH4 and C2H6) and their isotopic analyses (δ13C–CH4, δD–CH4 and δ13C–CO_2). Results show that the whole area is characterized by diffused gas release through seeps, fractures, microfractures and soil degassing. The collected results shed light on the origin of the seeping gases.

Statistical analyses over the 7 km2 area allowed us to estimate the full amount of gas currently released. Flux estimates from the crater zone suggest an order of magnitude higher than those measured from the surrounding region.