

Identifying the Source of LUSI water

Abstract by Maité Faubert

The LUSI (Lumpur Sidoarjo) mud eruption is ongoing since May 2006 in the Sidoarjo District in East Java, Indonesia. From a hydrogeological point of view, the possibility of a newly born deep hydrothermal system is the most plausible hypothesis. The present work investigates the configuration of the deep groundwater system through two dimensional numerical modeling and geochemical literature and field data.

We have conducted a set of geochemical analyses of the LUSI waters in order to establish the parameters for numerical modeling. Major ions analysis has shown that the water from LUSI is enriched in most elements and in particular in Na, Cl and Li with low Mg and K. Dating using ^3H and ^{14}C isotopes has been conducted. The ^3H results give an age prior to the 1950s and ^{14}C results give an age of around 16,000 years. We used stable isotopes to trace the source of the water molecules. Water geochemistry (elemental and isotopic) highlights illitization of the clays present in the Upper Kalibeng Formation, seawater mixing and water of volcanic origin mixing. The Li enrichment suggests contribution from hydrothermal and seawater mixing. Comparison of various parameters indicates that the erupted LUSI water is a mix of fluids originating from different levels and formations comprising meteoric fluids, dehydration fluids, seawater entrapped fluids, and hydrothermal fluids.

The Kujung formation, situated around 4 km deep, has very good permeability and could conduct the amount of water necessary for the large outflow observed at surface. The Arjuno-Welirang volcanic complex, situated at 20 km SW of LUSI, could offer the hydraulic gradient necessary for the erupted fluids. The geochemical characterization of these fluids will be used to constrain the numerical model of the LUSI hydraulic system.