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A geophysical and geochemical investigation of the Kalang-Anyar mud volcano, Indonesia.

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The northeast Java region is a sedimentary basin as well as a promising hydrocarbon province. Like other similar setting, the region is characterized by diffused mud volcanism and degassing sites. In the Sidoarjo province extends the Watukosek Fault system that connects the Javanese Arjuno-Welirang Volcanic arc to the back-arc basin in North East Java. Along this fault systems can be identified several mud volcanoes including the spectacular Lusi mud eruption site. Approximately 40 km NE of Lusi is located the Kalang Anyar mud volcano that was target for a multidisciplinary study to understand its activity as well as the plumbing system. We combined geoelectrical, gas sampling and mapping studies and seismic monitoring.

The geoelectrical data show low resistivity values (< 1 ohm.m) in the regions surrounding the mud vents until 120 m deep. Profile 1 covers the most part of the mud volcanic edifice and points out that the region of low resistivity around the vents reaches a maximum width of approximately 250 m. Overall, the three profiles held consistent results.

The gas were sampled from the main vent revealing the presence of mixed as well as thermogenic methane suggesting that the more active seeps are deep rooted and connect to thermogenic methane reservoirs.

CH₄ and CO₂ flux profiles were conducted through the active crater area and extending towards the outskirts. Results shows anomalous high values of the gasses in the summit region revealing a methane dominated diffused degassing throughout the structure.

The seismic data show a drumbeat signal in the high-frequency range (i.e. between 5 Hz and 30 Hz) occurring on all the seismic stations. The signal is most pronounced on the seismic station closer to the most active emission vent. Such seismic signal is seen at regular intervals varying from about 40 s to 120 s.