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Geophysical and soil degassing observations at the Kalang Anyar mud volcano, East Java.

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The East Java back arc basin is characterized by the presence of several mud erupting systems aligned along a major crustal discontinuity striking NE-SW and along a E-W oriented anticline. The most investigated of these geological phenomena is Lusi, a sediment-hosted hydrothermal system developed upon the Watukosek fault system that extends from the nearby volcanic arc. Kalang Anyar mud volcano is located along the same NE-trending lineament approximately 40 km NE of Lusi. The crater zone of this mud volcano is characterized by sparsely distributed gas and mud seepage sites that are more abundant in the central part.

This study investigates Kalang Anyar mud volcano combining a multidisciplinary approach to constrain its activity and shed light on the seismic signals generated at depth. The acquisition of geoelectrical profiles across the structure was coupled with spontaneous potential measurements, gas flux survey, and seismic monitoring.

Geoelectrical data show low resistivity values (< 1 ohm.m) in the regions surrounding the mud vents until 120 m deep. The region of low resistivity around the vents reaches a maximum width of approximately 250 m. Overall, the correlation of the three geoelectrical profiles show consistent results, in agreement with spontaneous potential measurements. Gas flux profiles indicate that the regions around the focused seepage sites are characterized by more intense soil gas release of methane and, in smaller amounts, carbon dioxide. Similarly to other mud volcanoes the seismic data show a drumbeat signal in the high-frequency range (i.e. between 5 Hz and 30 Hz). The signal is present on all the seismic stations and it is strongly attenuated on the stations deployed in the marginal part of the mud volcano edifice. Such seismic signal is seen at regular intervals varying from about 40 s to 120 s.