

Ground deformation associated with the eruption of Lumpur Sidoarjo mud volcano, east Java, Indonesia

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Ground deformation associated with the eruption of Lumpur Sidoarjo mud volcano between 2006 and 2011 has been investigated from Synthetic Aperture Radar images. Marked subsidence has been observed to the west of, as well as around, the vent. Line-of-sight changes in the both areas decayed since the middle of 2008 with a time constant of 1.5-2.5 years, implying that the ongoing eruption won't last long. This uniform decay time indicates that the western part is connected to the eruption center since the middle of 2008 to form a system with station-ary geometry. Our observation that the decay started later to the west than around the vent suggests that the subsidence to the west has been triggered by the mud eruption. A simple modeling suggests that 1) the conduit needs to be narrower at depth than at the surface, 2) the effective rigidity of the mud needs to be lower than that estimated from the drilled sample, or both to explain the observed decay constant of the deformation.

Keywords: Mud volcano, Ground deformation, Synthetic Aperture Radar, Time-series analysis