

Monitoring and Modeling the Surface Deformation around Mud Volcano of Sidoarjo, East Java, Indonesia

Hasanuddin Z. Abidin¹, Heri Andreas¹, Masyhur Irsyam², Benjamin Sapiie³, Teguh P. Sidiq⁵, Irwan Gumilar¹, Prihadi Sumintadiredja³, Bambang P. Istadi⁴

¹Geodesy Research Group, Institute of Technology Bandung, Jl. Ganesha 10, Bandung, Indonesia, ²Geotechnical Research Group, Institute of Technology Bandung, Indonesia, ³Applied Geology Research Group, Institute of Technology Bandung, Indonesia, ⁴Energi Mega Persada., Jl. Jend. Gatot Subroto 42, Jakarta, Indonesia, ⁵Earthquake Research Institute, Tokyo University, Tokyo, Japan

E-mail: hzabidin@gd.itb.ac.id

On May 29th 2006 the mud volcano started to erupt in the sub-district of Porong, in Sidoarjo, East Java, Indonesia. An almost continuous eruption of a mud, water and gas mix has occurred since then and has triggered vertical and horizontal ground displacements around it. The surface deformation phenomena around the mud volcano has been monitored since June 2006 using several geodetic techniques, namely GPS surveys, GPS continuous system, Leveling and InSAR. In the early development of mud volcano, the observed vertical and horizontal rates up to about 4 cm/day and 1 cm/day respectively, were observed around the mud volcano area. Nowadays, about seven years after the eruption, the observed surface deformation is showing an exponential decay pattern, with the rates of about several mm-cm/year. Deformation source modeling suggested that surface deformation occurred due to the combination of the near surface and subsurface collapses of the overburden due to outflow of mud from the subsurface, and loading from weight of mud and man-made dykes. The model also predicted that after about 20 year, the surface deformation will reach the negligible level which is less than 1 mm/year.