

Ground deformation of mud volcanoes in Azerbaidzhan detected by InSAR and estimation of the pressure source

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Interferometric synthetic aperture radar (InSAR) allows us to observe a wide area and two-dimensional information of Earth's surface without the need for ground-based measurement tools with a precision on the order of a few centimeters. The purpose of this study is to detect ground deformation of mud volcanoes in Azerbaijan by InSAR and to estimate the depth and volume change of the pressure source using a Mogi model (Mogi, 1958).

Azerbaijan, located on the western edge of the Caspian Sea in Central Asia, is one of the most abundant countries in term of the population of mud volcanoes over the land. We use the SAR images derived from ALOS/PALSAR and ALOS-2/PALSAR-2 launched by JAXA in 2006 and respectively. As a result, we could detect surface deformation mostly uplifting signals at more than 10 mud volcanoes. These observations indicate that the mud volcanoes around the studied areas are active. We noticed two mud especially large volcanoes in Azerbaijan, Ayaz-Akhtarma mud volcano and Akhtarma-Pashali mud volcano. Benedetta et al. (2014) also detected the pre-eruptive ground deformation of these mud volcanoes, using ENVISAT/ASAR C-band SAR data for descending pairs that, span from 2003 to 2005. Although the ground displacement at both volcanoes were 20 cm and 4.5 cm for the two years, subsequent movement was not clear. We report the ground displacements both mud volcanoes, using ALOS data for ascending and ALOS-2 data for ascending and descending tracks, respectively. The detected interferograms indicated that the maximum line of sight (LOS) changes were -13cm/yr. Based on the Mogi model, our preliminary estimate of the depth and volume changes are 400 m and $1.0 \times 10^5 \text{ m}^3$, respectively.

Keywords: InSAR, Mogi model, Azerbaijan