INVESTIGATION OF SURFACE DEFORMATIONS WITH ALOS PALSAR-1, ENVISAT ASAR AND TERRASAR-X IMAGES BY USING SBAS, PS AND DINSAR ANALYSES: A CASE STUDY OF THE NEMRUT VOLCANO AND ITS SURROUNDINGS

ID No: 220

Önder KAYADİBİ[1], Mehmet KESKİN[2], Beliz AKSOY[1]

[1] General Directorate of Mineral Research and Exploration, Remote Sensing and GIS Division, Turkey. e-mail: okayadibi@gmail.com

[2] İstanbul University, Faculty of Engineering, Department of Geological Engineering, Turkey

ABSTRACT

The Nemrut volcano is one of a dozen active volcanoes in our country that are likely to erupt in the future. Our aim in this study is to investigate the surface deformations such as subsidence, uplift and mass flows in the Nemrut caldera and its surroundings by using SAR interferometry (InSAR) with ALOS Palsar-1, Envisat ASAR and TerraSAR-X SAR images. InSAR analyses of SAR images have shown that the Nemrut Caldera has lost the ability to erupt and subside slowly into its magma chamber. In the small scoria cone area around the Kantaşı, where the least eruption in 1443 occurred, SBAS analysis of ALOS Palsar-1 reveals the uplift at a rate up to ~7 cm (generally the line of sight (LOS) displacement values ranging between ~2 cm and ~5 cm) and LOS velocity at a rate up to ~8 mm/year (generally LOS velocity values ranging between ~1.5 mm/year and ~5 mm/year). This probably indicates a hot and viscous magma mass still rising under this scoria cone. ALOS Palsar-1 SBAS analysis also show that the region which is from western of volcano towards Muş plain uplifts. The uplift rate reachs a rate up to ~10 cm (generally LOS displacement values ranging between ~1 cm and ~6.5 cm). The LOS velocity reachs a rate up to ~10 mm/year (generally LOS velocity values ranging between ~1 mm/year and ~5 mm/year). It is observed that the uplift rate in the western slope of the caldera is higher than that of the Muş plain. Even though the middle of the Muş basin have apparently been collaped among the faults limiting the basin, the eastern part of the basin adjacent to the Nemrut volcano uplifts. The reason of uplift may possibly be due to the upwelling/emplacement of a magma mass in the crust at shallow depth. The InSAR results of SAR images indicate that the eruptive center of the Nemrut volcanism may shift westward in the future towards the eastern termination of the Muş plain adjacent to the volcano.

Key words: Nemrut stratovolcano, surface deformation, SAR, ALOS Palsar-1, interferometry, differential interferometry (DInSAR), persistent scatterers (PS), small baseline subset (SBAS), interferometric SAR (InSAR)