Crustal deformation and lava flow associated with the 2022 Mauna Loa (Hawaii) volcanic eruption using interferometric and polarimetric analysis of EOS-04 and Sentinel-1 SAR data

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Mauna Loa volcano (Hawaii) is the world's largest subaerial volcano. Interferometric analysis of ISRO's EOS-04 and ESA's Sentinel-1 SAR images provided a detailed view on the surface deformation associated with the 2022 Mauna Loa volcano eruption. Co-eruptive InSAR analysis of Sentinel-1 data revealed Line-of-Sight deformation of ±50 cm along the NE and SW rift zones. The complex bipolar deformation pattern in ascending and descending tracks suggests vertical and horizontal deformation associated with the sub-surface magma ascent and spreading respectively. InSAR analysis of EOS-04 data revealed concentric interferometric fringes east of the caldera. This near-circular deformation lobe (~ –13 cm) could be interpreted either as post-eruptive volcanic deflation or topographically correlated atmospheric artefact. Polarimetric and coherence based analysis revealed extensive lava flow along the SW and NE rifts (~15 km) and further towards the north along a topographic channel for about 16 km. Polarimetric radar analysis of a fresh lava flow channel associated with the NE rift zone revealed a transition between smooth pāhoehoe and rough a'a flow textures along its current extent. The present study demonstrates the interferometric and polarimetric capabilities of EOS-04 satellite for geophysical applications.

Keywords: EOS-04, InSAR, lava flow, Mauna Loa volcano, polarimetry, surface deformation.

and Kohala, located in Hawaii represents the youngest segments of the seamount chain (Figure 1).

Mauna Loa, the world's largest Holocene volcano, is a shield volcano that rises to 4167 m above sea level and about 10 km above the ocean floor. Mauna Loa volcano has a prominent summit caldera called the Moku'āweoweo and two elongated rift zones: the northeast rift zone (NERZ) and the southwest rift zone (SWRZ). These rift zones hosted repeated dike intrusion and spreading, causing

