Preliminary morpho-structural analyses of the summit craters of Etna, in the last 4 Years, based on data extracted through SfM technique

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Morphological changes of the summit craters of active volcanoes are of pivotal interest in volcano monitoring because they could be the consequences of volcanic activities and represent the prelude of dangerous events.

Several methodologies have been used during the years in the volcanological monitoring, starting from ground measurements and remote sensing techniques such as aerial observation and satellite data analysis. However, in the last decade UAVs have emerged in monitoring active volcanoes. In fact, they represent tools of indisputable value due to their relatively low cost, speed in mission planning, repeatability of surveys for data acquisition and increased operator safety.

During the last 4 Years we performed 15 UAVs surveys and 3 from helicopter to monitor the four summit craters of ETNA. The acquired data have been processed through structure-from-motion photogrammetric software to extract DEMs and orthomosaics with resolution ranging between 5 and 20 cm. A multi-temporal comparison of the extracted data has been successively performed on a GIS platform with the final aims of performing morpho-structural analyses of Etna summit craters, identifying areas of structural weakness, that could indicate areas of possible lateral collapses, and computing volume balances between gained and lost volumes.

The presented elaborations could help to quantify the hazard related to Etna summit eruptive activity and to mitigate the risk on an area visited by several tourists, especially in summer time.