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Synergy of optical and infrared satellite data to forecast lava flow hazards during the Christmas 2018 Etna eruption

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On December 24, 2018 a new flank eruption started at Mt Etna. It was preceded by an intense seismic swarm and accompanied by sustained activity at the summit craters. The eruptive fracture fed a lava flow field spreading in the eastern flank of the volcano (Valle del Bove area). By using satellite remote sensing techniques and lava flow forecasting models a rapid response during this effusive crise was provided. We processed multispectral satellite data (VIIRS, SLSTR, MODIS, SEVIRI) and modeled the lava flow emplacement to forecast the associated hazards. Satellite-derived effusion rate estimates were used as input to run lava flow simulations. We also used as topographic base a digital elevation model updated to July 2016 computed from Pleiades satellite images. We promptly showed that the flows didn′t represent a threat to proximal villages. Subsequent ASTER, Sentinel 2 and Landsat 8 images acquired on 26 and 27 December complemented the field observations for tracking the flow front position and adding considerable data on lava flow advancement to validate the results of the numerical simulations. The integration of satellite data and modeling offers great promise in providing a unified and efficient system for global assessment and prompt response to effusive eruptions, including (i) the current state of the effusive activity, (ii) the possible evolution of the lava flow field, and (iii) its potential impact.