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Monitoring Volcanic Emissions with a GEO-LEO Fusion Approach

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We demonstrate the spatial-temporal fusion of CrIS and TROPOMI with VIIRS and ABI to enhance delineation of the emissions of the Cumbre Vieja volcano eruptions on La Palma in the Canary Islands for two days in October 2021. Changes in SO2 and ash plumes are studied using the fusion approach. In sounder and imager data fusion, sounder low resolution depiction of volcanic emissions (e.g. SO2 and ash) can be transferred to imager high resolution (through spatial fusion). When further connecting LEO products to time sequences of GEO imager radiances, a GEO-like perspective of atmospheric changes in time can be created (through temporal fusion). More generally, products from any hyperspectral sounding instrument such as AIRS, IASI and CrIS or from a trace gas detection instrument like TROPOMI, when paired with LEO imager (e.g., MODIS, AVHRR, VIIRS) or GEO imager (e.g., ABI, AHI, soon FCI) measurements, can be enhanced to reveal more spatial detail and - in the case of GEO imagers - also more temporal detail.