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# Towards operational use of satellite SO2 measurements in a volcano observatory

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Along with monitoring of seismic activity and ground deformation, the measurement of volcanic gas emissions and composition plays a key role in the surveillance of active volcanoes and the mitigation of volcanic hazards. Volcanic gas emissions also potentially impact the environment, human health and climate, providing further motivation for study. Currently, volcano observatories typically employ ground-based or airborne techniques to monitor volcanic gas emissions, mainly sulfur dioxide ($SO_2$) fluxes and its ratios over other species (e.g., $CO_2$, $H_2S$). However, in recent years there have been significant breakthroughs in satellite observations of passive volcanic $SO_2$ emissions, including high-resolution ultraviolet (UV) measurements from the Tropospheric Monitoring Instrument (TROPOMI) on the Sentinel-5 Precursor (S5P) satellite, and the development of long-term records of volcanic $SO_2$ degassing from the Ozone Monitoring Instrument (OMI) on NASA's Aura satellite. Satellite measurements offer some advantages over traditional gas monitoring techniques, e.g., synoptic coverage of large regions, relative immunity to variations in wind direction, and ability to map the spatial extent and dispersion of volcanic $SO_2$ plumes with applications for health hazard mitigation. Although these satellite datasets are potentially valuable for active volcano monitoring and as a supplement to other gas monitoring techniques, significant barriers remain to their use at many volcano observatories, particularly in low-income countries. Notably, the increasing volume of satellite datasets (NASA's database is bigger than 3 petabytes) and the demands of data processing represent challenges to their operational use at observatories with limited internet connectivity or computational capacity. Here, we present an ongoing effort to develop open-source Python software to access and process $SO_2$ data directly through NASA's Earthdata portal Application Processing Interface (API), in order to streamline the satellite $SO_2$ data processing workflow for a volcano observatory. By allowing server-side satellite data subsetting around the volcano of interest, this API greatly reduces the processing burden and only requires an internet connection to the NASA server hosting the required datasets (including S5P/TROPOMI, Aura/OMI and many others). We present some examples of software output and potential applications. Our current goal is to deploy and test the software for operational use in a volcano observatory.