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Detecting volcanic SO_2 emissions with the Infrared Atmospheric Sounding Interferometer

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Sulphur dioxide (SO_2) emissions are one of the many hazards associated with volcanic activity. Close to the volcano they have negative impacts on human and animal health and affect the environment. Further afield they present a hazard to aviation (as well as being a proxy for volcanic ash) and can cause global changes to climate. These are all good reasons for monitoring gas emissions at volcanoes and this monitoring can also provide insight into volcanic, magmatic and geothermal processes. Advances in satellite technology mean that it is now possible to monitor these emissions from space. The Infrared Atmospheric Sounding Interferometer (IASI) on board the European Space Agency's MetOp satellites is commonly used, alongside other satellite products, for detecting SO_2 emissions across the globe. A fast linear retrieval developed in Oxford separates the signal of the target species (SO_2) from the spectral background by representing background variability (determined from pixels containing no SO_2) in a background covariance matrix. SO_2 contaminated pixels can be distinguished from this quickly, facilitating the use of this algorithm for near real time monitoring and for scanning of large datasets for signals to explore further with a full retrieval. In this study, the retrieval has been applied across the globe to identify volcanic emissions. Elevated signals are identified at numerous volcanoes including both explosive and passive emissions, which match reports of activity from other sources. Elevated signals are also evident from anthropogenic activity. These results imply that this tool could be successfully used to identify and monitor activity across the globe.