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Observations of plumes from the 2019 Raikoke eruption with the Infrared Atmospheric Sounding Interferometer (IASI)

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Raikoke, a remote volcano in the Kuril Islands, erupted on the 21st June 2019. The eruption injected significant quantities of SO₂ into the atmosphere along with volcanic ash. These plumes have been studied with tools developed for the Infrared Atmospheric Sounding Interferometer (IASI) by the Earth Observation Data Group (EODG) at the University of Oxford. IASI is a hyperspectral sensor onboard of three meteorological satellites (Metop A, B and C). Each instrument obtains near global coverage twice a day and has a spectral range which includes sensitivity to both SO₂ and ash: making them useful for studying the Raikoke plumes. A fast linear SO₂ retrieval was first applied to flag pixels with elevated amounts of SO₂. With this tool it was possible to follow the Raikoke plume as it circulated the northern hemisphere above 30 degrees, with parts of the plume still visible around 2 months after the eruption took place. Next an iterative SO₂ retrieval was used to quantify the amount and height of the SO₂ in each pixel. In the first few days after the eruption took place, very high column amounts are recorded, in some cases exceeding 600 DU. Using this retrieval, a preliminary estimate of 1.6 Tg was obtained for the total amount of SO₂ emitted (measured on the 23rd of June). Height information from this technique shows that there were probably multiple injection heights during the eruption and that SO₂ was emitted into both the troposphere and stratosphere. The tropospheric plume remains visible for just a few days after the eruption, while the stratospheric portion of the plume persists for several weeks.