# Satellite-based detection of volcanic sulphur dioxide

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Volcanic eruptions can emit large quantities of rock fragments and fine particles (ash) into the atmosphere, as well as several gases, including sulphur dioxide (SO2). The rock fragments and ash are a major natural hazard not only to the local population, but also to the infrastructure in the vicinity of volcanoes and for aircrafts.

Volcanic eruptions and outgassing are the most important natural sources of SO2. Stratospheric sulphur dioxide remains for weeks in place and sulphuric aerosol is mostly responsible for cooling the atmosphere, as it was observed after the Pinatubo eruption in 1991. Tropospheric sulphur dioxide has a relatively short life time of a few days, but it is the initial atmospheric component that is transformed to sulphuric acid and responsible for the "acid rain" phenomenon.

The volcanic ejects are also a hazard to aviation. The ash can clog an aircraft sensor, it can limit the view of its pilots, and it can melt in the engines, as a result of which the engines may fail. SO2 is dissolved in water droplets to form sulphuric acid, which is corrosive and can create sulphate deposits in the engines.

Satellite remote sensing of volcanic SO2 provides a unique global and systematic way of detecting and tracking volcanic gas plumes and their evolution in near-real time, and thus provides additional information for authorities to take appropriate measures. The new generation of atmospheric remote sensing sensors allows the accurate detection of volcanic SO2 plumes.

We briefly describe the methodology used for the determination of SO2 concentrations and volcanic plume height from UV/Visible measurements by current and future satellite-based instruments: GOME (aboard ERS-2), SCIAMACHY (ENVISAT), OMI(EOS-AURA) and GOME-2 (MetOp). The combination with a state-of-the-art particle-dispersion model and a trajectory model makes it possible to forecast volcanic gas plumes..

The main focus of this paper is the retrieval of SO2 using GOME and SCIAMACHY measurements during the major eruptions of selected volcanoes in South and Central America during the last decade.

Finally the perspectives for the operational $SO_2$ monitoring on a global scale using satellite data and the issues related to the near-real time retrieval and delivery of $SO_2$ data are discussed.