

Satellite Remote Sensing of Volcanic Clouds During the First Week of Atmospheric Residence

William I Rose, Gregg JS Bluth, I M Watson (Department of Geological Engineering & Sciences, Michigan Technological University, Houghton, MI 49931 USA; ph. 906 487-2367; fax 906 487 3371; email: raman@mtu.edu)

Satellite-based infrared and ultraviolet multispectral remote sensors provide valuable sequential data on the first week of atmospheric residence of volcanogenic gases and particles. We have a data archive (TOMS, AVHRR, GOES) of about two decades which covers eruptions with a wide variety of scale and eruptive style which provided the basis for development of algorithms for quantitative study of eruptions. This provides an important synoptic study tool for eruptions and their atmospheric impact. We have discovered numerous new features of volcano/atmosphere interactions, including excess releases of sulfur, dynamic separations of ash and SO₂, ice-rich volcanic clouds and evidence for rates of various chemical reactions in volcanic clouds. Currently we can get information on the mass of SO₂, and the particle size and mass of fine (diameter 1-15 μm) ash, particulate sulfate and ice in volcanic clouds. We have constructed data sets which map and quantify the changes in volcanic clouds over periods of a few hours to several days. The use of data from MODIS has been beneficial because of the comprehensive nature of this sensor. I will discuss in detail MODIS-based results from the Feb 2000 Hekla eruption and the Feb 2001 Cleveland (Alaska) eruption.

The increased resolution of satellite sensors (eg ASTER) means that passive emissions may soon be within the range of these studies. This improvement could eventually help us forecast eruptions.