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Stratospheric impacts of the Hunga volcanic eruption: Overview and the importance of satellite measurements

On January 15, the Hunga volcano in the south west Pacific erupted injecting material into the stratosphere to altitudes up to or higher than 30 km. Estimates are that it injected 0.4 Tg of sulfur dioxide into the stratosphere and 150 Tg of water vapour. The sulfur mass injected was much smaller than that from the 1991 Mt. Pinatubo eruption, but the water injection was unprecedented over the satellite era.

Achieving a solid understanding of processes and impacts of this massive eruption on the chemistry and dynamics of the stratosphere have required a multi-pronged approach, using in situ measurements, satellite measurements and global modeling. There had not previously been in situ measurements made in a volcanic plume immediately after the eruption. The location of the Maïdo climate observatory 8000 miles to the west of the eruption coupled with the prevailing winds allowed collection of fresh plume measurement by balloon instruments, enabling a further understanding of microphysical processes and chemical processes in the fresh plume. Geostationary cloud images allowed estimation of the height of the eruption, while measurements from the Microwave Limb Sounder, the Ozone Mapping and Profiling Suite and CALIOP gave a global picture of plume motion and allowed estimations of the amount of material injected. Constraining modelling efforts with those critical measurements allowed estimation of downstream climate impacts.

Current limb satellite instruments were critical to understanding both short- and longer-term impacts of the Hunga eruption. They were used both for estimating global impacts, as well as to direct timing for making in situ measurements. In this presentation I will give a brief overview of some of the wealth of information we have learned from both satellite and in situ measurements of the material injected into the stratosphere by the Hunga eruption.

Topic

Atmospheric composition (Earth and planets), chemistry and transport

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