

Applied FORMOSAT-3/COSMIC on observing atmospheric temperature changes caused by volcanic eruptions

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Volcanic eruptions are often along with fiery magma, hot dense gases and powerful explosive energy. Those materials injected into atmosphere might cool tropospheric temperature and warm the temperature of bottom of stratosphere but sometimes the phenomenon was exactly opposite or mixture. This study focused on 8 volcanic eruptions, the explosive indexes of which were 4 during 2008 to 2011 and analyzed the temperature-related data from radio occultation observations of FORMOSAT-3/COSMIC (F3/C). It individually investigated the temporal latitude-altitude and longitude-altitude variances atmospheric temperatures from northeastern, northwestern, southeastern and southwestern of volcanos before and after the eruptions. This study also observed the image from Moderate resolution Imaging Spectroradiometer (MODIS) on NASA terra satellite to see where the volcanic plum extended. Results apparently show that 3 events had cooling troposphere and warming bottom of stratosphere and 2 events were just the opposite. One of the rest events was mixture case and the other one of the rest was without apparent variances in temperature. Cooling troposphere and warming bottom of stratosphere caused by stratospheric aerosols that reduced sunlight reaching troposphere and absorbed radiation at the bottom of stratosphere. The consequence opposite to above was caused by that volcanos erupted hot and high density gases into troposphere and adiabatic expansion happened during the top of troposphere and bottom of stratosphere. Moreover, in mixture case, area with more volcanic ash showed decreasing temperature in the troposphere and increasing temperature at the bottom of stratosphere. Area with less volcanic ash showed increasing temperature in the troposphere and decreasing temperature at the bottom of stratosphere.

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