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# Attribution of different volcano eruptions to injected $SO_2$ from satellite data and implications for radiative forcing calculated by a comprehensive CCM

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Volcanic eruptions have important radiative effects on climate through impacts on the stratospheric aerosol layer. They have been estimated by analyzing satellite data for anomalies in stratospheric $SO_2$ concentration and aerosol extinction. For this work we used the data of different satellites: MIPAS, GOMOS, OMI and TOMS to cover the time period 2002-2012. It is important to use multiple satellite data sources to compensate for data gaps of individual sensors. The result is a list of about 150 volcanic eruptions (small to medium) that reach the stratosphere directly or by transport from the upper troposphere. Some eruptions have only a regional effect while other $SO_2$ plumes are transported globally. This depends on injection height, latitude, season and circulation patterns (e.g. monsoon). Because of dispersion and advection it is difficult to identify single eruptions in a 2D data field with monthly zonal means, therefore, it is important to use 3D data fields. We find that a temporal resolution of about 5 days and a spatial resolution of 60 degrees longitude and 10 degrees latitude is a good compromise to have sufficient coverage. The volcanic $SO_2$ data in different complexity were used in transient simulations with the atmospheric chemistry circulation model EMAC. It is demonstrated that the neglect of smaller eruptions or the application of only the MIPAS data set significantly underestimates volcanic radiative forcing.