Volcanic and anthropogenic contributions to stratospheric aerosol changes from 2000 to 2009

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Major volcanic explosive eruptions can significantly perturb stratospheric aerosol. However, a persistent background aerosol layer is present in the stratosphere even during periods without large explosive eruptions, as was the case during the last decade. Observational data indicates that the stratospheric aerosol layer was actually increasing during this timeframe. Since variations of the stratospheric aerosol can have long-term climate effects, it is important to understand the underlying causes for such a variation. Two potential sources for this increase have been suggested, namely numerous volcanic eruptions which have occurred during this period, and the growth of anthropogenic SO2 emissions in Asia. We present results from a study which we performed with the global chemical transport model GOCART in conjunction with observations from both satellite-based instruments (OMI, CALIOP, SAGE II) and ground-based lidar data (MPLNET, EARLINET). In our analysis, we assess the relative contributions of volcanic and anthropogenic SO2 emissions to the stratospheric aerosol loading and its variability from 2000 to 2009.