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## Model calculations of the contribution of tropospheric SO<sub>2</sub> to the stratospheric aerosol layer

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*The stratospheric aerosol layer is important for stratospheric chemistry, climate change and in geo-engineering. Yet the processes governing the transport of sulfur to the stratosphere are poorly quantified. We present model calculations of the chemistry of sulfur dioxide (SO<sub>2</sub>) and its transport to the stratosphere and perform numerous sensitivity runs to assess the range of uncertainty of these calculations. The transport model is based on backward trajectories from the ATLAS model driven by ECMWF ERA 5. A simplified chemical box model constrained by CAMS data is used to calculate the SO<sub>2</sub> chemistry. Sensitivity experiments explore the sensitivity to changes in OH, H<sub>2</sub>O<sub>2</sub>, DMS, cloud water, cloud pH value and in the driving analysis data. Input parameters were varied and their differences have been explored. The effect of El Nino and La Nina on SO<sub>2</sub> transport was investigated. The SO<sub>2</sub> reaching the stratosphere was quantified and the sources in the troposphere were determined. The model's results were compared to POSIDON Aircraft measurements.*