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Influence of changed stratospheric aerosol loadings on cirrus cloud formation

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In the absence of visible progress in emission reductions, implementation of artificial methods that could change the climate and weather patterns in order to stop or reverse the global warming effects became one of the main topics nowadays. Several geoengineering proposals are invented, attracting attention of politicians, scientists and engineers and bringing out different opinions longing for a deeper insight into the benefits of such schemes, as well as possible side effects and unintended consequences.
We focused on the inclusion of sulfuric acid distributions as representative for the upper troposphere including possible impact of stratospheric aerosols mixed into the troposphere via tropopause folds or stratospheric intrusions (trajectory studies using ECMWF data). Here, we also currently investigate the possible influence of changed stratospheric aerosol loadings by geoengineering projects (e.g. Budyko, 1977, Crutzen, 2006) on the formed cirrus clouds.
For the stratospheric aerosol contributions (SO2 continuous loading of 1 MT per year and 5 MT per year) we use the output from a 2D aerosol model (Weisenstein et al., 2007). Additionally a 'realistic' tropospheric aerosol mode is superimposed (Minikin et al., 2003). Investigations are carried out using a bulk microphysical box model (Spichtinger and Gierens, 2009, Spichtinger and Cziczo, 2010).
The results of this conceptual study suggest that an enhancement of sulphuric acid in the upper troposphere region may impact the ice crystal number concentrations in cirrus clouds formed via homogeneous nucleation. The global impact can not be estimated, but on the local level, this could lead to change of cloud lifetime and thickness. It would further influence the albedo and radiative properties of cirrus clouds, i.e. modifying the net warming impact of cirrus clouds.

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