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DMS atmospheric concentrations and sulphate aerosol indirect radiative forcing: a sensitivity study to the DMS source representation and oxidation

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Abstract. The global sulphur cycle has been simulated using a general circulation model with a focus on the source and oxidation of atmospheric dimethylsulphide (DMS). The sensitivity of atmospheric DMS to the oceanic DMS climatology, the parameterisation of the sea-air transfer and to the oxidant fields have been studied. The importance of additional oxidation pathways (by O_3 in the gas- and aqueous-phases and by BrO in the gas phase) not incorporated in global models has also been evaluated. While three different climatologies of the oceanic DMS concentration produce rather similar global DMS fluxes to the atmosphere at 24-27 Tg S yr^{-1}, there are large differences in the spatial and seasonal distribution. The relative contributions of OH and NO_3 radicals to DMS oxidation depends critically on which oxidant fields are prescribed in the model. Oxidation by O_3 appears to be significant at high latitudes in both hemispheres. Oxidation by BrO could be significant even for BrO concentrations at sub-pptv levels in the marine boundary layer. The impact of such refinements on the DMS chemistry onto the indirect radiative forcing by anthropogenic sulphate aerosols is also discussed.

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