1 | SCIENTIFIC FEASIBILITY OF CLIMATE ENGINEERING IDEAS

Model simulations of the potential for stratospheric ozone loss under conditions of enhanced water vapour and sulphate aerosol

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Solar radiation management through stratospheric sulphate aerosols would lead to enhanced surface area densities of stratospheric aerosol. It has been suggested that together with enhanced water vapour, convectively injected into the stratosphere, this aerosol could lead to increased risks of ozone loss, potentially substantially enhancing UV dosage levels in summer over populated areas (Anderson et al., Science, 2012). It has also been suggested to conduct a stratospheric controlled perturbation experiment to allow a better assessments of these risks associated with SRM to be made (Dykema et al., Phil. Transact., 2014).

Here we report on results of a three-dimensional model study addressing the issue. We use the Chemical Lagrangian model of the Stratosphere (CLaMS), a three-dimensional chemistry transport model, which is well suited for the description of stratospheric mixing and for the preservation of transport barriers (like the tropopause) in simulations. Further CLaMS simulates the full stratospheric chemistry, including the heterogeneous chemistry on cold sulphate aerosol. We will present preliminary results for the impact of enhanced water vapour and sulphate aerosol on the stratospheric ozone in summer. These results will also allow and assessment of the benefits and potential problems of the proposed stratospheric experiment.