Geophysical Research Abstracts, Vol. 8, 00436, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00436

Increases in sulfate burden from a doubled CO2 experiment with an interactive sulfur cycle using an ensemble from climateprediction.net

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Due to the high solubility of sulfate in water, changes to the hydrological cycle may play an important role in determining the amount of sulfate the atmosphere can hold. Coupled atmosphere – thermodynamic (slab) ocean models have shown that increasing carbon-dioxide concentrations can increase the amount of precipitation as a global mean. Increasing precipitation (if all other factors remain the same) might be expected to reduce the amount of sulfate in the atmosphere. A set of experiments were run using HadSM3 with an interactive sulfur cycle and introduced a perturbed physics, boundary condition and initial condition ensemble using climateprediction.net and public PC's. The results of the ensemble indicated an increase in both precipitation and sulfate burden when doubling CO_2 (with unchanged sulfur emissions). This presentation aims to show the likely mechanisms leading to an increase in the amount of sulfate in the atmosphere when CO_2 levels are increased and whether they may be applicable to the real world.