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# The aerosol-climate model ECHAM5-HAM

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Abstract. The aerosol-climate modelling system ECHAM5-HAM is introduced. It is based on a flexible microphysical approach and, as the number of externally imposed parameters is minimised, allows the application in a wide range of climate regimes. ECHAM5-HAM predicts the evolution of an ensemble of microphysically interacting internally- and externally-mixed aerosol populations as well as their size-distribution and composition. The size-distribution is represented by a superposition of log-normal modes. In the current setup, the major global aerosol compounds sulfate (SU), black carbon (BC), particulate organic matter (POM), sea salt (SS), and mineral dust (DU) are included. The simulated global annual mean aerosol burdens (lifetimes) for the year 2000 are for SU: 0.80 Tg(S) (3.9 days), for BC: 0.11 Tg (5.4 days), for POM: 0.99 Tg (5.4 days), for SS: 10.5 Tg (0.8 days), and for DU: 8.28 Tg (4.6 days). An extensive evaluation with in-situ and remote sensing measurements underscores that the model results are generally in good agreement with observations of the global aerosol system. The simulated global annual mean aerosol optical depth (AOD) is with 0.14 in excellent agreement with an estimate derived from AERONET measurements (0.14) and a composite derived from MODIS-MISR satellite retrievals (0.16). Regionally, the deviations are not negligible. However, the main patterns of AOD attributable to anthropogenic activity are reproduced.

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