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# Simulation of the indirect aerosol effect with the ECHAM5-HAM aerosol climate model

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The interaction of aerosols and clouds plays an important role for the global aerosol distribution as well as for the cloud distribution and cloud microphysical properties. Changes in cloud distribution and cloud radiative properties (indirect aerosol effects) in turn affect the global radiation balance. However, the magnitude of these effects remains highly uncertain.

The ECHAM5-HAM aerosol-climate model predicts the size distribution, composition, and mixing state of the major global aerosol compounds. The standard cloud scheme of ECHAM5 GCM has been extended by a prognostic treatment of cloud droplets and ice crystals. We use a semi-empirical activation scheme linking the simulated size distribution of hygroscopic aerosol to the number of activated aerosol particles. This set-up allows for a robust mechanistic treatment of the aerosol-cloud interaction for long-term simulations on a global scale. Results from a 24-year simulation, according to the Atmospheric Model Intercomparison Project II protocol, are presented. We analyse simulated aerosol and cloud parameters and evaluate the derived measures for the indirect aerosol effects with satellite observations from the AVHRR, MODIS, and POLDER instruments. The analysis allows constraining the uncertainty of the simulated indirect aerosol effects.