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The regional aerosol-climate model REMO-HAM

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Abstract. REMO-HAM is a new regional aerosol-climate model. It is based on the REMO regional climate model and includes most of the major aerosol processes. The structure for aerosol is similar to the global aerosol-climate model ECHAM5-HAM, for example the aerosol module HAM is coupled with a two-moment stratiform cloud scheme. On the other hand, REMO-HAM does not include an online coupled aerosol-radiation nor a secondary organic aerosol module. In this work, we evaluate the model and compare the results against ECHAM5-HAM and measurements. Four different measurement sites were chosen for the comparison of total number concentrations, size distributions and gas phase sulfur dioxide concentrations: Hyytiälä in Finland, Melpitz in Germany, Mace Head in Ireland and Jungfraujoch in Switzerland. REMO-HAM is run with two different resolutions: 50 × 50 km^2 and 10 × 10 km^2. Based on our simulations, REMO-HAM is in reasonable agreement with the measured values. The differences in the total number concentrations between REMO-HAM and ECHAM5-HAM can be mainly explained by the difference in the nucleation mode. Since we did not use activation nor kinetic nucleation for the boundary layer, the total number concentrations are somewhat underestimated. From the meteorological point of view, REMO-HAM represents the precipitation fields and 2 m temperature profile very well compared to measurement. Overall, we show that REMO-HAM is a functional aerosol-climate model, which will be used in further studies.

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