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# Mixing-State Sensitivity of Aerosol Absorption in the EMAC Chemistry-Climate Model

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The modelling of aerosol radiative forcing is a major cause of uncertainty in the assessment of global and regional atmospheric energy budgets and climate change. One reason is the strong dependence of the aerosol optical properties on the mixing state of aerosol components like black carbon and sulphates.

Using the atmospheric chemistry-climate model EMAC, we study the radiative transfer assuming various mixing states. The aerosol optics code we employ builds on the AEROPT submodel which assumes homogeneous internal mixing utilising the volume average refractive index mixing rule. We have extended the submodel to additionally account for external mixing, partial external mixing and multilayered particles. Furthermore, we have implemented the volume average dielectric constant and Maxwell Garnett Mixing rule.

We present results from regional case studies employing a new column version of the aerosol optical properties and radiative transfer code of EMAC, considering columns over China, India and Africa. The regional results are complemented by global results from a simulation for the year 2005.

Our findings corroborate much stronger absorption by internal than external mixtures. Well mixed aerosol often is a good approximation for particles with a black carbon core, whereas particles with black carbon at the surface absorb significantly less. Therefore, we conclude that it is generally recommended to take the inner structure of internally mixed particles into account.