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Superparameterised convection in the EMAC model

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Clouds in large-scale circulation models are often not well represented due to the large grid box size of these models. Especially convective clouds with a typical extension of a few kilometres only are subgrid-scale compared to the grid box size of the host models. To overcome this scale discrepancy in the chemistry climate model EMAC, a superparameterisation has been implemented, i.e. a cloud resolving model handling both large-scale as well as convective clouds.

The gain for the substantial increase in computational costs is an increase in performance for the global precipitation distribution, especially in the tropics. Furthermore, the diurnal cycle of convective activity is much better represented by the superparameterisation compared to traditional convection schemes. We also provide results on the total water budget, e.g. integrated liquid and ice water as well as the partitioning between the two phases, which substantially differs between parameterised and superparameterised convection due to the explicit treatment of cloud microphysical processes in the latter scheme. Especially, this partitioning has implications for the atmospheric radiation budget and consequently also surface temperatures.