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# Towards improving the formation of drizzle in marine stratiform clouds

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Due to their proximity to the surface and their vast expanse over global oceans, marine stratus and stratocumulus induce a net cooling towards the Earth's radiative budget. These low clouds are very susceptible to changes in meteorological and environmental conditions such that the amount of formed precipitation, although small, may be altered significantly. The formation of drizzle is highly dependent on the onset of the collision-coalescence process, which is related to the concentration of cloud condensation nuclei (CCN) and/or turbulence, but has also been recognised to feed back onto both microphysics and dynamics of the cloud. The three-way interaction of cloud microphysics, dynamics and precipitation formation in marine stratiform clouds is complex and has a significant impact on the clouds radiative properties.

To achieve a more physical representation of the droplet spectrum in low clouds an additional drizzle drop class with radii between 25-100 $\mu$m is introduced to the traditionally existing classes of cloud liquid water and rain. The idea is to improve the microphysical, but possibly also dynamical or thermodynamical, mechanisms responsible for the precipitation onset. A new parameterization to describe the collision-coalescence processes between three drop classes has been developed based on the stochastic collection equation and solved for truncated moments. For polluted environments specifically, i.e. high CCN concentrations, where precipitation formation may be retarded, the additional drizzle drop class improves the evolution of the drop spectrum and possible influences of giant CCN such as large sea salt aerosols towards enhancing the collision-coalescence process.

Results comparing the new parameterization to a resolved spectral description of the microphysics within a 1D kinematic cloud model revealed to be very promising for different CCN concentrations and vertical updraft regimes. Furthermore, with the goal of improving marine stratiform clouds on a global scale, the effects of the new parameterization with the prognostic treatment of precipitation is investigated in the general circulation model ECHAM5-HAM will also be presented. In addition, the radiative effect of the drizzle drop class can be taken into account for the latter case.