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Development and applications of a stochastic convective parameterization for a smooth transition to cloud resolving scales that includes aerosol interactions

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With the increasing availability of computing power many numerical weather prediction models now run at computational grids with resolution of dx < 10km, "gray scales" for convective parameterizations, where convective clouds may be resolved as well as unresolved. In addition Air Quality Research and Forecast (AQRF) models have continuously increasing complexity and can treat the interactions of aerosol and cloud microphysics. In this paper we will describe a new convective parameterization that allows for both, a smooth transition to cloud resolving scales as well as a parameterized interaction of aerosols with cloud microphysics (aerosol indirect effect). The parameterization also includes options for the transport of chemical constituents, wet deposition, and some aqueous phase chemistry. The parameterization is a modification of the Grell and Dvenyi (2002) scheme, and is used in version of the Weather Research and Forecast model (WRF and WRF-Chem), the Brazilian Regional Atmospheric Modeling system (B-RAMS) and the global Flow following finite volume Icosahedral Model (FIM and FIM-Chem).