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# Challenges in parameterization of shallow convection on the kilometre-scale grids

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A scale-aware stochastic approach is developed to parameterize shallow cumulus clouds on the kilometre-scale model grids. It is based on the stochastic subsampling of the cloud number and cloud-base mass flux distributions of shallow cumulus clouds. As a result of this sampling the distribution of the total mass flux in model columns is scale-adaptive, with a shape that changes from a normal-like on the coarse grids toward a long-tailed distribution on kilometre scales. We test the stochastic parameterization in a realistic case of a shallow convective day on the Fifth of May 2013 over Germany using the ICON model on resolutions from 1 to 10 km. The stochastic model improves the representation of convection and clouds compared to the deterministic scheme, but also compared to the simulation without shallow and deep convection parameterizations. The stochastic sampling introduces variability from the subgrid scales that acts on the model dynamics and changes the structure and strength of the modelled convectively induced secondary circulations.