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Refining a PDF cloud scheme for the ICON-GCM using super-large-domain LES results

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Cloud schemes, which rely on probability density functions (PDFs) to describe the subgrid-scale variability of thermodynamic state variables, were first proposed decades ago. In early 2000 Adrian Tompkins developed a scheme based on a beta distribution of total water which he implemented into the ECHAM atmospheric general circulation model. Tompkin's approach was revisited and heavily revised by Vera Schemann from 2010-2013 enabling negative as well as positive skewness of the total water PDF, avoiding unphysical cloud water evaporation, and improving the ECHAM cloud fraction in subsaturated grid cells. In this talk we explore how super-large-domain LES experiments, conducted as part of the ongoing HD(CP)2 project, can help us further develop, calibrate, and refine the PDF scheme which we are currently implementing into the ICON-GCM. Resolved clouds in these domains come in all shapes and sizes, allowing us to quantify the impact of parametrization design choices under a wide range of realistic conditions.