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Phase relaxation of a cloud water droplet ensemble undergoing turbulent mixing[1] BIPIN KUMAR, TU Ilmenau, Germany, RAYMOND A. SHAW, Michigan Tech, USA, JOERG SCHUMACHER, TU Ilmenau, Germany — The understanding of the entrainment and mixing of clear (subsaturated) with cloudy air at the boundary of a cloud is still far from being complete. Mixing is determined by the ratio of two time scales: the mixing time and the phase relaxation time, which can be combined as a Damköhler number. The phase relaxation time is connected with the water phase change and thus changes in the cloud water droplet size distribution and their number density. The mixing time of the advecting turbulent flow is determined by the size and velocity of the turbulent eddies. Here, we will outline a direct numerical simulation model that couples the Eulerian description of the velocity and water vapor fields with a Lagrangian ensemble of cloud water droplets. The simulations resolve a small cubic fraction of the cloud and simulate a homogeneous isotropic turbulent flow. Turbulence properties at larger scales are taken from field measurements of the helicopter-based measurement platform ACTOS. Cloud water droplets can grow and shrink, as determined by the advected vapor concentration field that sets the local supersaturation at the droplet position. First results of our direct numerical simulations are presented.

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Bipin Kumar
TU Ilmenau, Germany

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