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Enhancement of coalescence due to droplet inertia in turbulent clouds STEVEN KRUEGER, University of Utah, ALAN KERSTEIN, Sandia National Laboratories — In the Explicit Mixing Parcel Model of mixing effects on cloud-droplet evolution, turbulent advection of fluid is implemented by permutations ("triplet maps") of the fluid cells in chosen segments of the 1D domain, each representing an individual eddy. This captures motions as small as the smallest turbulent eddies (Kolmogorov microscale), but there is important droplet-inertia phenomenology, such as droplet clustering that increases droplet collision rates, at much smaller scales. We have developed and demonstrated a 3D triplet map for droplets (and an associated drag-law representation) that captures clustering behaviors at small Stokes numbers St (such as those of cloud droplets). There is excellent agreement between our results (for radial distribution functions and collision kernels) at small St and direct-numerical-simulation (DNS) results that omit gravity, and good agreement with DNS results that include gravity. We are currently testing an extension of our model that is intended to broaden its applicability to higher St, and we are using a collision-detection algorithm to simulate coalescence.

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