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Using 3D-printed analogues to understand the aerodynamics of atmospheric ice particles[1] MARK MCCORQUODALE, CHRIS WESTBROOK, University of Reading — Parameterisations representing the aerodynamics of ice particles in the atmosphere are required for weather and climate models. However, the aerodynamics of natural ice particles is poorly understood on account of the substantial variability in both shape and Reynolds number of particles that occur within the atmosphere. We report results from a laboratory study in which the aerodynamics of 3D-printed "analogues" of ice particles are investigated. Particles fall through a 1.8m tall column of quiescent viscous liquid at Reynolds numbers matching those of snowflakes in the atmosphere, between approximately 5 and 5000. Free-falling analogues are recorded using a system of synchronised digital cameras, which facilitate the digital reconstruction of the trajectory of the particles. We use this data to test commonly used parameterizations of the drag coefficient of natural ice crystals, and find that the drag coefficient is typically under-predicted at large Reynolds numbers (Re>200), leading to predicted fall speeds being overestimated, by as much as a factor of 2. We identify that the reduced accuracy of existing parameterizations at high Reynolds number is associated with the onset of unsteady motions as the particle falls.

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