Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Fall characteristics of snowflakes in clouds: settling of complex non-spherical particles in quiescent fluid[1] CHRISTOPHER WESTBROOK, Department of Meteorology, University of Reading, MARK MCCORQUODALE[2], Department of Civil Engineering, University of Nottingham — The fall characteristics of ice particles in clouds is of fundamental importance to simulating their microphysical evolution in numerical models, and to interpretation of in-situ and remote-sensing observational data. Yet remarkably little is understood about this problem. While much is known about how spheroids, discs etc sediment through fluids there is a critical lack of data about the types of particle which prevail in the atmosphere where irregular polycrystals and aggregates are the norm. To solve this problem we present results from a comprehensive series of experiments where analogues of natural snowflakes have been created using a 3D printer, and dropped in glycerine solutions. The falling analogues were tracked in 3D space over time using multiple cameras, and their orientation and trajectory reconstructed digitally. We find that many irregular particles are (despite their high complexity) extremely stable, adopting a preferred orientation (which, unexpectedly, is often Reynolds-number dependent), but rotate steadily around a vertical axis as they fall, tracking out a spiral trajectory and how the drag is sensitive to porosity. We also present data from new experiments using volumetric PIV to retrieve 3D velocity fields, providing further insight into the problem.

[1]supported by Natural Environment Research Council grant
[2]previously Department of Meteorology, University of Reading

Christopher Westbrook
Department of Meteorology, University of Reading

Date submitted: 31 Jul 2020 Electronic form version 1.4