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Retention and entrainment effects: experiments and theory for porous spheres settling in sharply stratified fluids[1] SHILPA KHATRI, ROBERTO CAMASSA, CLAUDIA FALCON, RICHARD MCLAUGHLIN, JENNIFER PRAIRIE, BRIAN WHITE, SUNGDUK YU, Department of Mathematics and Department of Marine Sciences, University of North Carolina at Chapel Hill, UNC JOINT FLUIDS LAB TEAM — Marine snow, porous aggregates composed of phytoplankton, fecal pellets, sediment, detritus and other material found in the ocean, are fundamental to the carbon flux from the surface ocean to the deep ocean. Oceanographers observe that marine snow often accumulate in layers whose location are correlated with sharp density gradients in the water column. Understanding the formation and depletion of these marine layers is important to being able to accurately model the marine carbon cycle. A first step in an ongoing investigation is to study the settling of a single porous particle through ambient density gradients. We have conducted experiments to study the settling behavior of single porous spheres in sharp and linear density gradients. Experimental data are first compared to a model based on diffusive processes. Comparisons show that the model predicts accelerations of the particle but not the retention times accurately. Entrainment of less dense fluid from above is then included in the modeling, which allows retention times to be accurately captured. Entrainment shell thickness as a function of parameters will be discussed.

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Shilpa Khatri
Department of Mathematics, University of North Carolina at Chapel Hill

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