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Marine particle aggregate breakup in turbulent flows MATTHEW RAU, NRC Postdoctoral Fellow, Naval Research Lab, STEVEN ACKLESON, GEOFFREY SMITH, Naval Research Lab — The dynamics of marine particle aggregate formation and breakup due to turbulence is studied experimentally. Aggregates of clay particles, initially in a quiescent aggregation tank, are subjected to fully developed turbulent pipe flow at Reynolds numbers of up to 25,000. This flow arrangement simulates the exposure of marine aggregates in coastal waters to a sudden turbulent event. Particle size distributions are measured by in-situ sampling of the small-angle forward volume scattering function and the volume concentration of the suspended particulate matter is quantified through light attenuation measurements. Results are compared to measurements conducted under laminar and turbulent flow conditions. At low shear rates, larger sized particles indicate that aggregation initially governs the particle dynamics. Breakup is observed when large aggregates are exposed to the highest levels of shear in the experiment. Models describing the aggregation and breakup rates of marine particles due to turbulence are evaluated with the population balance equation and results from the simulation and experiment are compared. Additional model development will more accurately describe aggregation dynamics for remote sensing applications in turbulent marine environments.

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