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Grain-resolving simulations of settling cohesive sediment BERNHARD VOWINCKEL, University of California Santa Barbara (UCSB), JADE WHITHERS, The University of Queensland, UCSB, ECKART MEIBURG, PAOLO LUZZATTO-FEGIZ, UCSB — Cohesive sediment is ubiquitous in natural environments such as rivers, lakes and coastal ecosystems. For this type of sediment, we can no longer ignore the short-range attractive forces that result in flocculation of aggregates much larger than the individual grain size. Hence, understanding the complex dynamics of the interplay between flocculated sediment and the ambient fluid is of prime interest for managing aquatic environments, although a comprehensive understanding of these phenomena is still lacking. In the present study, we address this issue by carrying out grain-resolved simulations of cohesive particles settling under gravity using the Immersed Boundary Method. We present a computational model formulation to accurately resolve the process of flocculation. The cohesive model is then applied to a complex test case. A randomly distributed ensemble of 1261 polydisperse particles is released in a tank of quiescent fluid. Subsequently, particles start to settle, thereby replacing fluid at the bottom of the tank, which induces a counter flow opposing the settling direction. This mechanism will be compared to experimental studies from the literature, as well as to the non-cohesive counterpart to assessthe impact of flocculation on sedimentation.

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