From River Mouth to Ocean Deep: Where do Sediments Sediment?

Bruce Sutherland
Depts. of Physics and of Earth and Atmospheric Sciences
University of Alberta

Through laboratory experiments, the transport, settling and resuspension of sediments in the ocean are examined. Salt water is shown to enhance flocculation of clay and hence increase their settling rate. In studies modelling river plumes, the transport down a slope of particles from hyperpycnal currents (also known as turbidity currents or, more commonly, as underwater avalanches) is shown to separate from the bottom in a stratified fluid, whose density increases with depth due to decreasing temperature and/or increasing salinity. Even for hypopycnal currents (whose particle density is so small that they advance over the ocean surface), experiments show that the particles that eventually settle through uniform-density fluid toward a sloping bottom form a turbidity current. Some of the particles from this current eventually rise again. Particle-settling from a hypopycnal current passing over a stratified fluid is further complicated by internal waves created in response to the advancing current. After finally settling, shoaling internal solitary waves can resuspend particles and carry them back up upslope. All these results suggest that the dynamics of interfacial internal waves and of gravity currents in stratified fluid play an important role in the ultimate deposition of particles.