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Instabilities in sediment-laden systems PETER BURNS, ECKART MEIBURG, UCSB — When a layer of particle-laden fresh water is placed above clear, saline water, both Rayleigh-Taylor and double-diffusive instabilities may arise. In the absence of salinity, the dominant parameter is the ratio of the particle settling velocity to the viscous velocity scale. As long as this ratio is small, particle settling has a negligible influence on the instability growth. However, when the particles settle more rapidly than the instability grows, the growth rate decreases inversely proportional to the settling velocity. In the presence of a stably stratified salinity field, this picture changes dramatically. An important new parameter is the ratio of the height of the nose region that contains both salt and particles to the thickness of the salinity interface. If this ratio is small (large) the dominant instability mechanism will be double-diffusive (Rayleigh-Taylor) dominant. In contrast to situations without salinity, particle settling can have a destabilizing effect and significantly increase the growth rate. Scaling laws obtained from the linear stability results are seen to be consistent with experimental observations and theoretical arguments put forward by other authors.

Peter Burns
UCSB

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