Abstract Submitted
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A simplified approach for the direct numerical simulations of continuous turbidity currents[1] MARIANO CANTERO, University of Illinois at Urbana-Champaign, S. BALACHANDAR, University of Florida, ALESSANDRO CANTELLI, CARLOS PIRMEZ, Shell Oil, GARY PARKER, University of Illinois at Urbana-Champaign — This work presents Direct Numerical Simulations of sediment-laden channel flows driven by the excess density of the suspended sediment, which provides a simplified model of a turbidity current. The main findings are: 1)The presence of sediment breaks the symmetry of the flow about the center plane due to self-stratification, which results in an average sediment concentration that declines in the upward-normal direction, and an average velocity profile that is skewed towards the bottom. 2)Self-stratification damps turbulence, particularly near the bottom wall. Two regimes are observed, one in which the flow remains turbulent but the level of turbulence is reduced, and another in which the flow relaminarizes near the bed. 3)The analysis allows the determination of a criterion for the break between these two regimes, in terms of an appropriately defined dimensionless settling velocity. Although the analysis reported here is not performed at the scale of large oceanic turbidity currents, the implication of flow relaminarization is of considerable importance even for swift oceanic turbidity currents.

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