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Entrainment in a density-driven current flowing down a rough slope in a rotating fluid[1] CLAUDIA CENEDESE, Woods Hole Oceanographic Institution, LUISA OTTOLENGHI, CLAUDIA ADDUCE, University of Roma Tre
— Dense oceanic overflows mix with surrounding waters along the descent down the continental slope. The amount of entrainment dictates the final properties of these overflows, and thus is of fundamental importance to the understanding of the formation of deep water masses. We will discuss laboratory experiments investigating the influence of bottom roughness on entrainment in a dense current flowing down a sloping bottom in a rotating homogeneous fluid. The bottom roughness has been idealized by an array of cylinders. Both spacing (sparse vs. dense configuration) and height of the roughness elements compared with the height of the current have been varied. The presence of roughness elements has been observed to enhance entrainment for low values of the Froude number (Fr). This suggests that if a dense current is vigorously entraining via shear-induced entrainment at the interface between the dense and ambient fluids (i.e. large Fr) the additional entrainment occurring via the turbulence generated by roughness elements at the bottom boundary is negligible. However, for low Fr, when the entrainment at the interface between the dense and ambient fluids is low, the additional entrainment due to bottom roughness elements dominates. As in the case of a smooth bottom, we observed a strong dependence of the entrainment on the Reynolds number. Furthermore, density measurements indicate that stratification within the dense current is enhanced when the roughness elements occupy a large portion of the current, especially for the dense roughness configuration.

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