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Modelling Oceanographic Coastal Currents in Small-scale and Large-scale Laboratory Experiments

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Laboratory experiments simulating gravity-driven oceanographic coastal surface currents are discussed. The current height, its width and its propagation velocity are investigated. The analysis of results from two complementing studies on substantially different spatial scales and in different parameter regimes is presented for the first time. One study was conducted in a small rotating tank with diameter 1 m while the second used the world's largest rotating turntable at the Coriolis Facility (Grenoble) with its 13-metre diameter tank. Dimensional analysis yields a set of non-dimensional parameters which are used to develop a geostrophic model. The data analysis reveals that the model enables collapsing all corresponding results from small-scale and large-scale experiments onto single curves for the first time. Very good agreement between experiments and model is found in the geostrophic regime. The data show how the model gradually becomes less appropriate as ageostrophic experimental conditions are approached.

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