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Wave Capture and Wave-vortex Duality

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New and unexpected results are presented regarding the nonlinear interactions between a small-scale wavepacket and a large-scale mean flow, with an eye towards internal wave dynamics in the atmosphere. These are to do with an unusual wave breaking scenario termed ‘wave capture’, which differs significantly from the standard wave breaking scenarios due to critical layers or mean density decay. We focus on the very peculiar wave-mean interaction scenario that accompanies wave capture. We present examples of these interactions in 2d shallow water and in the 3d Boussinesq system. Specifically, we point out an analogy between slow wavepackets and vortex dipoles that shows a peculiar and apparently so-far unrecognized ‘wave-vortex duality’, which throws a new light on the relation between wave dissipation and mean-flow forcing.

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