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Barotropic-baroclinic splitting for a multilayer shallow water model

The classical shallow water equations have a limited range of application because they cannot model vertical effects. The multilayer approach allows to recover some vertical variations of the flow. The computational costs grows with the number of layers, which is often around 50 in ocean simulations. When the spatial or temporal scales are large, a strategy should be employed to reduce the computational cost.

In this contribution we focus on the barotropic-baroclinic splitting which is frequently employed in (numerical) ocean models. The fastest barotropic gravity waves are treated in a vertically averaged manner. The slower baroclinic dynamic is fully multidimensional but has much larger time step. We will present the splitting, its numerical analysis and several testcases illustrating the gain in computational cost and accuracy. This is a joint work with Sophie Hörnschemeyer (IGPM, RWTH Aachen University- and Jacques Sainte-Marie (Inria Paris/LJLL Sorbonne Université)

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