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Capturing the bottom boundary layer in finite element ocean models

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The goal of this work is to develop and compare numerical discretizations that explicitely take into account the logarithmic behaviour of the velocity field in the oceanic bottom boundary layer. This is achieved by discretizing the governing equations by means of the finite element method and either enriching or modifying the set of shape functions used to approximate the velocity field. The first approach is based on the extended finite element formalism and requires additional "enriched" degrees of freedom near the bottom. The second approach amounts to using logarithmic shape functions in the bottom element instead of the usual linear ones. Both approaches are compared with analytical and classical finite element solutions in the case of rotating and non-rotating bottom boundary layer flows.

Reference

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