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Stochastic Advection for eddy parameterisation in Primitive Equation Models

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A major challenge of modern ocean modelling is how to represent in ocean models small-scale features with length scales smaller than the grid spacing. It is known that small scale eddies are important for maintaining Western boundary currents such as the Gulf Stream and Kuroshio; it is therefore of great importance that these are well represented in any global ocean model. The small scales are often parameterised by viscosity closures or GM parameterisations. The Stochastic Advection by Lie Transport (SALT) method is a propsed alternative which is defined so as to preserve important physical properties of the flow solution. Stochasticity is introduced into the fluid dynamical variational principle so that the resulting Euler-Poincaré equations give a stochastic version of the fluid equations which maintain a Kelvin circulation theorem and conservation of potential vorticity. The stochastic terms are then tuned using empirical orthogonal functions obtained from fine-grid model runs in order to capture the small-scale effects. This method has been shown to be effective for quasigeostrophic models and the 2D Euler equations. Here we present an application to the Finite volumE Sea-ice Ocean Model (FESOM2.0), a primitive equation model; we show preliminary results from this implementation.