CABARET Approach for Numerical Advection

• The recent results are in the manuscript (submitted to *Ocean Modelling*) by Sergey Karabasov, Pavel Berloff, and Vasily Goloviznin.

• Nonlinear advection for momentum, heat, salt, potential vorticity, and passive tracers:

$$\frac{\partial c}{\partial t} + u\frac{\partial c}{\partial x} + v\frac{\partial c}{\partial y} \;=\; diabatic\;\; terms \qquad (1)$$

• Ocean models always aim to solve (1) on the coarsest possible grid and at the largest possible Reynolds number. This raises the following issues for the numerical advection scheme:

— Accuracy;

— Efficiency.

• The CABARET (*Compact Accurately Boundary Adjusting high-REsolution Technique*) approach is based on several important ideas:

— *Lagrangian property*, i.e., approximation of the entire material derivative;

— *Low dispersion and dissipation* errors;

— *Non-oscillatory property*, i.e., enforcing maximum principle on the solution;

— *Compact stencil*, i.e., adaptive and low-cost.

• As the first step, we successfully implemented CABARET in the eddy-resolving quasi-geostrophic ocean model.