Contribution ID: **16** Type: **Talk**

Design of a Runge-Kutta based time-stepping algorithm for the NEMO ocean model

Tuesday, 28 January 2020 15:00 (30 minutes)

The NEMO ocean model is currently based on the Leapfrog scheme that provides a good combination between simplicity and efficiency for low-resolution global simulations. However, this scheme is subject to difficulties that question its relevance at high-resolution : the necessary damping of its computational mode, e.g. via a Robert-Asselin filter, affect stability and increases amplitude and phase errors of the physical mode ; because it is unconditionally unstable for diffusive processes, monotonicity or positive-definiteness comes at a substantial cost and complication.

The evolution toward a 2-level time stepping for the 3-dimensional baroclinic mode based on a Runge-Kutta scheme is studied. The scheme is designed to aim for a good compromise between accuracy and stability jointly for advection, internal gravity-waves propagation and treatment of Coriolis. The analysis is first conducted at the level of the Shallow-Water Equations. Both space and time dimensions are discretized, to allow for a more accurate estimate of amplitude and phase errors. The analysis is then extended to the Primitive Equations, handled with a mode-splitting technique between the 3-dimensional baroclinic and the 2-dimensional barotropic modes. Idealized test-cases illustrate the benefits associated to the revised time-stepping compared to the original Leapfrog.

Do you need an official invitation letter?

Primary author: DUCOUSSO, Nicolas

Co-authors: LEMARIÉ, Florian (Inria, Univ Grenoble-Alpes); MADEC, Gurvan (French National Centre for Scientific Research); DEBREU, Laurent (Inria, Univ Grenoble-Alpes)

Presenter: DUCOUSSO, Nicolas

Track Classification: COMMODORE conference