Geophysical Research Abstracts
Vol. 21, EGU2019-8510, 2019
EGU General Assembly 2019

Stochastic modeling of oceanic dynamics for ensemble forecasting

Long Li (1), Werner Bauer (1), Georg Gottwald (2), and Etienne Mémin (1)
(1) INRIA Rennes Bretagne Atlantique, FLUMINANCE, France (long.li@inria.fr), (2) University of Sydney Australia

We propose to follow a recent stochastic quasi-geostrophic model [2,3] derived from a decomposition of the flow into a resolved component and a time–uncorrelated uncertainty. This random model will be approximated by a structure-preserving discretization [1] such that it conserves several quantities; e.g. prognostic tracer, modified potential enstrophy, total energy. In the case of a simplified Rossby wave, we show that the proposed scheme preserves the magnitude and the propagation speed. Once the conservative scheme is validated, the performance on a coarse grid of a damped version of our random model will be assessed and analyzed for ensemble spread. This will be compared to the observations from a deterministic fine grid simulation. Some important criterions have been used to quantify the accuracy of ensemble forecasts prediction, such as Talagrand histogram, continuous ranked proper score, energy score, etc. The results show that the proposed random model, under both homogeneous and heterogeneous uncertainty, is more efficient compared to the randomized-initial-condition model. This may provide more benefits for data assimilation in future work.

References

[1] W. Bauer and F. Gay-Balmaz, *Towards a geometric variational discretization of compressible fluids: the rotating shallow water equations.*, Journal of Computational Dynamics, **6**, (2019).
[2] E. Mémin, *Fluid flow dynamics under location uncertainty*, Geophysical and Astrophysical Fluid Dynamics, **108**, 2, pp. 119-146 (2014).
[3] V. Resseguier, E. Mémin and B. Chapron, *Geophysical flows under location uncertainty, Part I: random transport and general models*, Geophysical and Astrophysical Fluid Dynamics, **111**, 3, pp. 149-176 (2017).

Keywords : stochastic modeling, QG turbulence, structure preserving, ensemble forecasting.