

Nonlin. Processes Geophys. Discuss., author comment AC1
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Reply on CC1

Bérendère Dubrulle et al.

Author comment on "How many modes are needed to predict climate bifurcations?
Lessons from an experiment" by Bérendère Dubrulle et al., Nonlin. Processes Geophys.
Discuss., <https://doi.org/10.5194/npg-2021-19-AC1>, 2021

Thank you for your comment. Indeed the geometry of the domain helps in reducing the dimensionality of geophysical flows: it favors the emergence of particular scales in both the oceanic and the atmospheric dynamics (e.g. The Rossby radius, or the above cited Darwin-Tahiti dipoles). The spatial component is definitely important for these phenomena as well as in laboratory turbulent experiments, such as the von Karman Flow. Our approach is to use statistical mechanics to devise spatially averaged observables which reflect the symmetry of the system (and therefore capable to take into account the spatial symmetries). In the von Karman this leads to the definition of reduced frequency and torque, in the atmosphere and the ocean to the definition of circulation indices (NAO, AO, ENSO). The "temporal cycling" with stochastic ("erratic") behavior is then useful to project all these dynamics on simple attractor. These considerations will be further expanded in a revised version of the article.

Regarding your last comment about tidal forcing, while we acknowledge the importance of the subject, we would like to underline that we are not specialists of ocean dynamics and therefore not able to answer your query, nor we believe useful to further discuss this in the present manuscript.