EGU24-9253, updated on 15 Mar 2024
https://doi.org/10.5194/egusphere-egu24-9253
EGU General Assembly 2024

The impact of model resolution on variability in a coupled land atmosphere model

Oisín Hamilton[1,2], Jonathan Demaeyer[1], Anupama Xavier[1,2], and Stéphane Vannitsem[1]
[1]Royal Meteorological Institute of Belgium, Climate Dynamics, Belgium (oisin.hamilton@meteo.be)
[2]Life Sciences, Université catholique de Louvain, Louvain la Neuve, Belgium (oisin.hamilton@uclouvain.be)

Reduced order quasi-geostrophic land-atmosphere coupled models display qualitatively realistic mid-latitude atmosphere behaviour, meaning that such models can produce typical atmospheric dynamical features such as atmospheric blocking. At the same time, due to a low number of degrees of freedom, they are still simple enough to allow for analysis of the system dynamics. These features mean that these models are well suited to investigating bifurcations in atmospheric dynamics, and use a dynamical systems approach to better understand the corresponding atmospheric behaviour.

This project introduces a symbolic python workflow for using the flexible land-atmosphere (qgs, 2020) spectral model with the continuation software AUTO. This work builds on the results of Xavier et al. (2023) to understand how the model variability and predictability is impacted by the model resolution. We also use bifurcation diagrams to better understand how parameters such as atmosphere-land friction impact the atmospheric blocking, and in turn the model atmosphere predictability. This is done for a range of model resolutions to investigate how the number of degrees of freedom impacts both the realism of the model, but also the structures found in the dynamics.

Demaeyer, Jonathan & De Cruz, Lesley & Vannitsem, S.: qgs: A flexible Python framework of reduced-order multiscale climate models. Journal of Open Source Software. 5. 2597. 10.21105/joss.02597, 2020.

Xavier, A. K., Demaeyer, J., and Vannitsem, S.: Variability and Predictability of a reduced-order land atmosphere coupled model, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2023-2257, 2023.