EMS Annual Meeting Abstracts
Vol. 21, EMS2024-752, 2024, updated on 08 Feb 2025
https://doi.org/10.5194/ems2024-752
EMS Annual Meeting 2024

Comparing the seasonal predictability of ENSO and the Tropical Pacific variability in EC-Earth3 at two different horizontal resolutions

Aude Carreric, Pablo Ortega, Francisco Doblas-Reyes, and Vladimir Lapin
Barcelona Supercomputing Center, Earth Sciences, Barcelona, Spain (aude.carreric@bsc.es)

Seasonal prediction is a field of research attracting growing interest beyond the scientific community due to its strong potential to guide decision-making in many sectors (e.g. agriculture and food security, health, energy production, water management, disaster risk reduction) in the face of the pressing dangers of climate change.

Among the various techniques being considered to improve the predictive skill of seasonal prediction systems, increasing the horizontal resolution of the climate models is a promising avenue. There are several indications that higher resolution versions of the current generation of climate models might improve key air-sea teleconnections, decreasing common biases of global models and improving the skill to predict certain regions at seasonal scales, e.g. in tropical sea surface temperature.

In this study, we analyze the differences in the predictive skill of two different seasonal prediction systems, based on the same climate model EC-Earth3 and initialized in the same way but using two different horizontal resolutions. The standard (SR) and high resolution (HR) configurations are based on an atmospheric component, IFS, of ~100 km and ~40 km of resolution respectively and on an ocean component, NEMO3.6, of ~100 km and ~25 km respectively. We focus in particular on the Tropical Pacific region where statistically significant improvements are found in HR with respect to SR for predicting ENSO and its associated climate teleconnections. We explore some processes that can explain these differences, such as the simulation of the tropical ocean mean state and atmospheric teleconnections between the Atlantic and Pacific tropical oceans.

A weaker mean-state bias in the HR configuration, with less westward extension of ENSO-related SST anomalies, leads to better skill in ENSO regions, which can also be linked to better localization of the atmospheric teleconnection with the equatorial Atlantic Ocean. It remains to be assessed if similar improvements are consistently identified for HR versions in other forecast systems, which would prompt their routine use in seasonal climate prediction.