Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC2
https://doi.org/10.5194/gmd-2020-248-RC2, 2021

Comment on gmd-2020-248

Anonymous Referee #2

Referee comment on "The ENEA-REG system (v1.0), a multi-component regional Earth system model: sensitivity to different atmospheric components over the Med-CORDEX (Coordinated Regional Climate Downscaling Experiment) region" by Alessandro Anav et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-248-RC2, 2021

The paper introduces a new regional Earth system model for use in the Med-CORDEX region. The main novelty of the model is the possibility of using two different atmospheric components and different land urface schemes. In the validation part of the paper it is shown that the characteristics of the atmospheric model play an important role in the ability of the coupled model to simulate the present time climate and that different ocean biases arise depending on which atmospheric component is used. In general, the paper shows that the new model shows a performance that is comparable to the state of the art regional coupled models that contribute to Med-CORDEX and can be used for climate studies in the region. Therefore, the paper deseves publication, but after the following comments are addressed.

Major

- Why there is not an explicit representation of the Black Sea? How do you determine the heat and mass exchange between the Black Sea and the Mediterranean?
- Why do you use spectral nudging? One of the adventages of the coupling is the freedom that the regional model has to develop its own, physically consistent climate. You are imposing a strong physical constrain that can be unnecessary, as the large scale climate is never too different from the global model, except when reflect an important issues related to domain size and location (see e. g. Sein et al, 2014). Could you elaborate on the reasons that lead you to use the nudging?

Dmitry V. Sein, Nikolay V. Koldunov, Joaquim G. Pinto & William Cabos (2014) Sensitivity of simulated regional Arctic climate to the choice of coupled model domain, Tellus A: Dynamic Meteorology and Oceanography, 66:1, DOI: 10.3402/tellusa.v66.23966

- I miss a comparison of the coupled runs with an ERA5 forced oceanic simulation. It would help to clarify the contribution of the oceanic formulation to the biases. In particular, to the positive SST biases, which are of opposite sign with other regional coupled models, e. g. the MEd-CORDEX ensemble used in Darmarki et al (2019)
- The short spin-up time can be of relevance to the behaviour of the simulated mixed layer, deep wáter formation and the temperature and salinity in the intermediate layer, as suggested by figure 15 of Parras-Berrocal et al (2020). In general, this figure and considerations of basin size suggest a spin-up time of around 80 years.

Minor

Line 39 "the regional climate"

Line 56 please, add the following reference:

Soto-Navarro, J., Jordá, G., Amores, A. et al. Evolution of Mediterranean Sea water properties under climate change scenarios in the Med-CORDEX ensemble. Clim Dyn 54, 2135–2165 (2020). https://doi.org/10.1007/s00382-019-05105-4

Line 61. Would be better "A number of model studies" instead of "Future model projections"

Line 69: " we evaluate the ability of of the ENEA-REG system to represent adequately the present climate of the Mediterranean by" instead of "perform the evaluation run of the ENEA-REG system"

Line 77 differing in

Line 85 correct "applications.For"

Line 95 please deleto "to glue", does not sound fit for the text

Lin 112 "in the experiments"

Line 123 “can be run with two“ instead of “is made up of two”

Line 129 “For any region”

Line 132 Any reason for using these parameterizations? Have you tuned the model in coupled mode?

Line 187 coupled to a global atmosphere? Or as the oceanic component of a global coupled model?

Line 205. Still, the spinup would be useful. Asstrssed above and also shown in Soto-Navarro et al, a short spinup or its absence can have a strong impact on the simulation, especially in the deeper layers.

Line 222. Outside the regional model domain, does the forcing come from ERA-Interim?

Line 232 Does not the short spin up period influence the simulated mixed layer and especially the Deep wáter formation? How Good is the simulation of the Nile discharge?

Line 250. ERA5 is a reanalysis and is not directly based on observational data. Why do not use a regional reanalysis for validation (e.g. https://climate.copernicus.eu/copernicus-regional-reanalysis-europe-cerra) in order to evaluate the simulation of the climate fields on smaller scales?

Line 263: The maximum and minimum daily temperatura could show better the impact of the parameterizations on temperature

Line 277. Is this true for the uncoupled or the coupled mode?

Line 400 what about cloud cover?

Figure 3: Two different colorscales for biases difficult their comparison. Please, correct