

Review of manuscript: Coupled regional Earth system modelling in the Baltic Sea region by Gröger et al.

This paper provides a very complete and clear overview of the state-of-the art of the regional Earth system modeling in the Baltic Sea and stands out future challenges for the climate modeling community studying the region, such as the role of aerosols or hydrological model coupling. The paper is very well written and the structure and objective very clear. Thus, I recommend it for publication. In the text below you find a list of minor comments to improve the manuscript.

General comments:

- Please, avoid the use of back-to-back brackets along the text.
- Be consistent with the capitalization of the term “Earth System” all over the text, also in the title.
- Write the word “modeling” with a single “L” in order to be consistent with the USA English style that is used in this manuscript.

Specific comments:

L75 → You can consider adding Cabos et al. (2020).

L92 → A dot is missing by the end of the sentence.

L107 → What do you mean by process? Please, be more specific

L125 → What do you mean by compartment behavior?

L188 → Please cite in chronological order: Bonan 2008; Anderson et al. 2011...

L289 → I think this sentence belongs to the previous paragraph.

L295 → Please, specify the year of the references you provide.

L330 → Please, replace “summarise” with “summarize” to be consistent with the USA English style.

L348 → Please, replace “work has” by “works have”.

L375 → What is LAI?

L377 → Please, replace “favour” with “favor” to be consistent with the USA English style.

L450 → What is PCO? Please, define it.

L451 → Please, add model data to reanalysis data.

L459 → Please, add other relevant studies such as Cabos et al. (2020).

L464-466 → Is this sentence referred to the Baltic Sea? If so, specify it since, to my knowledge, this is not the case in other regions of the world.

L509 → Please, add a comma after 70 hours.

L516 → I guess ERAI refers to ERA-Interim. Please, specify it for consistency.

L538 → An “A” is missing in “ERA40”.

L552 → Remove the word “far”.

L567 → Please, avoid repetition.

L569 → Replace “behaviour” by “behavior”.

L590-592 → Could you please add more details about the development of this effect?

L599 → You can also consider adding Cabos et al. (2020), in which a coupled model setup including the Mediterranean and the North Atlantic is used.

L758 → Please replace “parametrized” by “parameterized”.

L830-833 → Please rewrite the sentence to make it clearer

L928 and L944 → Change compared with by compared to.

L987-L990 → Isn't the information presented contradictory?

L1087 → I would say “Previous works have shown...”.

L1101-1104 → Please rephrase the sentence, it is hard to understand.

L1118 → add “to assess whether”.

L1157 → Please, keep the word “This”.

L1201 → What do you mean by realized?

References:

Cabos, W., de la Vara, A., Álvarez-García, F.J. *et al.* Impact of ocean-atmosphere coupling on regional climate: the Iberian Peninsula case. *Clim Dyn* **54**, 4441–4467 (2020). <https://doi.org/10.1007/s00382-020-05238-x>.