

## Review

“Impact of modulating surface heat flux through sea ice leads on Arctic sea ice in EC-Earth3 in different climates” by T. Tian, R. Davy, L. Ponsoni, S. Yang

### General:

I appreciate the additional analysis and modification the authors have made and thank for the detailed explanations and clarification as response to my questions and suggestions.

The article has been substantially improved, and to me the manuscript is almost ready for publication. I have only a very few minor comments:

**My old comment 6/** new Figure 13 with respect to improvements of trends: Thank you for showing the CDFs for the temperature trends in the three regions. Maybe I do not understand this, but I do not really see why you would judge from these figure that the trends are showing an improvement in ECE3L compared to ECE3? I see a reduced spread in the trends across the members in ECE3L compared to ECE3. While it could be possible that the reduced sea ice bias in ECE3L leads to a reduced and potentially more realistic spread in the trend across members, we do not know if that is really an improvement because we do not know how large the spread in reality would be if we would have an ‘ensemble of realities’. I do not think that we can judge from the fact that more ensemble members are closer to the observed trend that this is more realistic. Maybe the reality itself was not a central value but an outlier?

**My old comment 7:** Sorry to insist a bit on this point: Why should any coupled model reproduce the large observed ice decrease between 2000 and 2012? The observed reduction was clearly due to a combination of decreasing trend and (‘negative’) internal variability, similar as the missing trend after 2012 is also a combination of negative trend and (‘positive’) variability. It would be different if CMIP6 models would not at all be able to simulate sea ice reduction periods of the observed magnitude but I do not think this is the case.

**Line 9:** the spatial pattern is similar between cold and transient run but the amplitude is different, right? To clarify this, I would suggest to write “spatial patterns of the mean sea ice changes in ...” instead of “spatial changes”. I would suggest the same change in the conclusions.

I am still surprised that your 1985-control run is hardly warming and sea ice volume even slightly increasing after initializing from year 1985 of the transient historical run. Normally, you would assume that net radiation is not in balance in a transient run and you would see some warming thereafter. However, also in your 2015-year control run, no additional warming seems to happen, and I agree that your results suggest that this seems not to be an artifact of internal variability.

**Line 13:** replace “overestimated” with “overestimation” ?

**Line 66:** Both in the title and in the first line of section 2.1. If you mention “relationship”, I would expect a “relationship between A and B”, but you are only mentioning one thing (in the title) and nothing (in the first sentence).