

Atmospheric Rivers in CMIP5 climate ensembles downscaled with a high-resolution regional climate model.

Review report:

Many thanks to the authors for addressing the review comments carefully and revising the manuscript accordingly. I strongly believe that the manuscript has been improved a lot through changes and additions made by the authors. Despite the changes made, I would recommend authors to make **a minor revision** to improve the article further and make it suitable for publication in the journal Earth System Dynamics.

Comments:

1. Ln-23: Please write full form or expand ERAI at first instance.
2. Authors may discuss more about interpolation techniques used in comparing downscaled RCA-ERAI with ERAI reanalysis data.
3. Ln-25: Please improve the abstract by providing reasons for the results discussed in the abstract.
4. Ln-42: Authors may discuss these results in connection with the North Atlantic winter storm activity and frequency changes.
5. Ln-78: Is it local groundwater recharge?
6. Ln-136: I would assume that authors used HIRLAM based Rossby Centre regional atmospheric climate model in which atmospheric model RCA and ocean model NEMO were used. However, in the text, it is mentioned that the Rossby Centre regional atmosphere model, which might be confusing to the reader. Please make necessary corrections carefully.
7. Ln-186: Please detail the interpolation techniques if any are used.
8. Ln-225: Though it is a well-known approach for Europe, I suspect a drawback back in it. Here authors are comparing the 85th percentile along 10 degrees west with westward and eastward grid cells. This approach might suit well for the westward grid cells where in many instances, moisture transport occurs from the west or southwest. But assuming the same threshold for the eastward grid cells might eliminate a few grid cells from the actual AR imprint. This is because the AR landfall at the western Europe boundary could decrease IVT along the eastern landmass due to the loss of IVT in the form of precipitation and the moisture cut-off from the ocean. Hence the less IVT values during the subsequent time steps in a given AR. As pointed out in line 366, Instead, authors may consider taking the 85th percentile at each grid specially and find the AR.
9. Ln-274: Should it be RCP 8.5? Please check Figures 7 and 8 labels as well.
10. Fig-3: It would be nice to see an additional figure displaying a special difference between reanalysis and hindcast.
11. Ln-285: It is not entirely clear whether authors consider AR days with precipitation or without precipitation in computing ARF.
12. Ln-327: Please check and correct the sentence.
13. Ln-330: Please try to elaborate on the dynamics influencing the IVT decrease in RCA-HAD in the RCP 8.5. For example, you may consider citing the recent paper from Venugopal et al., (2021), who have studied the decadal changes in specific humidity and wind components leading to changes in IVT over the North Atlantic using reanalysis data.
14. Ln-438: Is it RCA-MEAN in place of RCA-ENSM?

15. Ln-445: Very interested to see that RCA-MEAN failed to reproduce the precipitation but IVT. Please consider including more details and causes for the same for the reader's benefit.
16. Ln-547: The statement is valid if the North Atlantic SSTs are strong enough to permit the convection in summer. But in winter, the scenario mostly depends on the Arctic cold air outbreaks and convergence of the moisture from the adjacent areas into the AR.
17. Fig-12: Does the inter-model standard deviation means the average standard deviation obtained from different RCA ensembles?
18. Ln-635: Please check the sentence as it is contradicting.