Comment on esd-2021-49

Anonymous Referee #1

Referee comment on "Atmospheric rivers in CMIP5 climate ensembles downscaled with a high-resolution regional climate model" by Matthias Gröger et al., Earth Syst. Dynam. Discuss., https://doi.org/10.5194/esd-2021-49-RC1, 2021

This study discusses the ARs over the North Atlantic from ensembles of 24 global climate simulations following the greenhouse gas scenarios RCP2.6, RCP4.5, RCP8.5 downscaled using a regional climate model (RCA-NEMO) with 0.22° resolution and the results are compared with against ER-I reanalysis data. The study finds that ARs would become more frequent and more intense in a future warmer climate especially in the higher emission scenarios under the assumption of RCP2.6. They also propagate further inland to eastern Europe in a warmer climate.

Though I am yet to complete the review, here is a major comment on the detection of atmospheric rivers. Authors have mentioned that they employed Lavers et al. (2012, 2013) method to detect ARs based on the 5 degrees binning along 10 degrees west. Though it is a well-known approach, one might see the spatial "patchy" and "noise" at a given time step in the AR detection (figure 1 in Lavers et al., 2013). To be specific, one might expect that a high-resolution data detection algorithm could retain values over a few grid points that satisfy the binned threshold but do not satisfy the AR criteria. This noise in turn would cause bias in comparing the long term (climatology etc) spatial variability among different models. Also, the authors mentioned that the ARs with 18 hours of persistence were considered. But I do not see any description of finding persistence. Hence, authors are encouraged to provide more details on these issues in the manuscript.