Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2017-295-RC2, 2018

Geoscientific Model Development Discussions
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Interactive comment on "Atmospheric River Tracking Method Intercomparison Project (ARTMIP): Project Goals and Experimental Design" *by* Christine A. Shields et al.

Anonymous Referee #2

Received and published: 17 April 2018

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Review of the Manuscript “Atmospheric River Tracking Method Intercomparison Project (ARTMIP): Project Goals and Experimental Design” by Christine A. Shields et al.

Anonymous Referee

April 17, 2018

1 General Comments

This article comprises an overview of the experimental design and some initial results of the “Atmospheric River Tracking Method Intercomparison Project (ARTMIP)”. Since the number of methods meant to detect and track atmospheric rivers has risen exponentially during the last few years, whereas, from my point of view, the term “atmospheric river” is still defined in a very rough manner, such an effort is urgently needed. The paper is well written and to the point, the experimental design and the aims of the project are described clearly. Therefore, I would like to recommend publication after addressing the minor comments listed below.

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Discussion paper

2 Minor comments

- Concerning the “Threshold Requirements” in Table 1, it would be very important to know whether the relative thresholds (normally percentiles) have been calculated separately for each month or season, for the winter half-year or for the entire year and I would suggest to include this information at this point. To provide an example, a method relying on IVT percentile thresholds calculated separately for each month or season will —by definition— produce a much higher number of ARs in the warm season than another method relying on all-year or winter half-year thresholds, given that the same percentile is considered. A higher number of ARs would on the one hand increase the coincidence rate with extreme precipitation events (which could be seen as some kind of “hit rate”), which is desirable, but on the other also increase the “false alarms”, which is not desirable. Thus, a method could be “tuned” to fit some specific purpose and this could be discussed if you wish. Related to the above mentioned thoughts, the temporal window of the threshold calculation directly affects the seasonal cycle of the AR frequency counts, which is more pronounced for the “all-year” or “winter half-year” option and less so for the monthly/seasonal one. This holds for all variables associated with the seasonal cycle, i.e. also for the seasonal cycle of precipitation attributable to ARs.

- Section 3.2, page 17, lines: 9-13, “...but future climate research may be better served by relative methodologies, partly because of the model biases in the moisture and/or wind fields...”: To circumvent the problem of using absolute thresholds in climate model output, you could calculate the percentile corresponding to a given absolute threshold (e.g. an IVT of 250 $kg\ m^{-1}\ s^{-1}$) in observations/reanalysis data and find the absolute value corresponding to this percentile in the historical run of the model. This absolute value would then also be used in the RCP run or this model.

- Section 4.2.1: You could also consider to use the NOAA-CIRES 20th Century Reanalysis and/or ECMWF's ERA-20C to have AR presence-absence time series for the entire 20th century, but this is of course just a suggestion. Doing so, you could e.g. assess aspects of low frequency variability associated with the PDO or AMO.
- Section 5.1, page 24, lines 19-20: Here you state that "a moisture threshold of [...], as in the human control, is potentially too permissive". However, from my point of view, the human control should be always better than any automated method so it is the methods having a problem at this point, not the human eye. Since several persons observing the same IVT field could come to distinct conclusions on whether an AR is present or not, the rough AR definition you cite on page 6 (the AMS one) should be still improved to come to a better consensus on what an AR actually is. Anyway, from my point of view, it is wrong to claim that the human eye is worse than the automated methods.
- Section 5.4 on page 27 and Figure 8: I would recommend to use an independent "purely observational" precipitation dataset other than MERRA.
- Figure 4: I would suggest to use a discrete instead of continuous colorbar for this figure.
- Figures 5 to 6: Adding "IVT" below or next-to the colorbar would be helpful in these figures.
- Caption of Figure 6a: A space is missing after "kg" in the parenthesis.