Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2020-55-RC1, 2020

Geoscientific Model Development Discussions

Interactive comment on "Detection of Atmospheric Rivers with Inline Uncertainty Quantification: TECA-BARD v1.0" *by* Travis A. O'Brien et al.

Anonymous Referee #1

Received and published: 13 May 2020

General comments:

O'Brien et al. document a process for detecting atmospheric rivers (ARs) using expert input combined with statistical tools. They also include some uncertainty quantification in the form of parametric uncertainty associated with the correlation between ARs and ENSO events. This is an important topic of research, the study is well designed, and the paper is well written. There are a few places that could use additional context/discussion, and I have highlighted these below. Once these and other comments are addressed, I recommend the paper for publication in GMD.

1) Here the authors use a dataset of AR counts instead of a dataset of AR footprints

to develop the framework. This factor is mentioned briefly in the introduction, but worth more discussion on potential limitations/caveats.

2) Number of experts/samples: Is 8 experts enough? There is clearly a lot of variation among them. I found it fascinating that the authors are able to quantify the spread in expert judgement regarding how to define ARs (e.g., Figure 8). I would like to see more discussion on the "traits" of the expert groups and how they impact the results.

3) The multimodality of parameter posterior distributions could use more discussion (Fig 4). Can these be interpreted in a meaningful way?

4) What other applications (besides ENSO/AR relationship) might be worthwhile to test parametric uncertainty?

Specific comments:

Page 2, Line 29-30: I believe the ClimateNet project is working to achieve this type of dataset (spatial footprints of ARs). It is worth mentioning here and/or in the discussion how that effort might contribute to this topic and related future work.

Page 3, Line 26: Does the user see IVT only, or are there multiple fields available to diagnose ARs?

Page 7, Line 2: What does σ represent?

Section 2.3.1: Is there some way to visualize the content in this section (like Fig 3 for the previous section)? It can be challenging to follow equations only.

Section 2.3.1: Why does the f equation on page 7 have sin(delta y) but equation 5 on page 8 has sin(2*delta y)?

Page 8, Line 1: How does grid cell size (i.e., resolution) impact these constraints?

Page 8, Line 23: How was statistical equilibrium determined? Autocorrelation time?

Page 9, Line 6ff: Some clarification is needed on the difference between Expert ID and

Expert Group ID.

Page 9, Line 7: How were 128 samples acquired for each Expert ID, when some experts did not contribute that many? Unless I am misinterpreting the numbers reported in Figure 2a and line 7 on page 4 (“between 64 and 906 time slices”).

Figure 7: Where is Expert Group ID shown in this figure? Caption could use some clarification.

Page 13, Line 5: Please explain what the ELI is; what does it physically represent?

Technical corrections:

Figure 1: Recommend increasing the size of this image. It is difficult to see the green X’s, for example.

Page 6, Line 6: Lower bound of parameter P is listed in text as 0.999 but in Table 1 as 0.99.

Section 2.3.1: Some of the equations don’t have numbers (e.g., equations for A and f).

Page 7, Line 24: I think subscript of N_t should be capital (N_T), unless this is a different quantity.

Figure 5: Recommend increasing the size of this image to make text more readable.

Figure 10: Expert Group colored lines could be bolder/brighter (hard to see on panels, especially yellow colors).

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-55, 2020.