[GMDD]

Interactive comment on "Topological Data Analysis and Machine Learning for Recognizing Atmospheric River Patterns in Large Climate Datasets" *by* Grzegorz Muszynski et al.

Anonymous Referee #1

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General Comment

This paper presents a method to detect atmospheric rivers by using topological data analysis and machine learning techniques. The method is novel and different with most of methods to detect atmospheric river (AR) in literature, as well as has the advantage of not depending on sometime arbitrary values as threshold for isolating potential ARs. In my opinion, this paper deserves to be published, however, I provide a few comments below which should be easily addressed by the authors in order to improve the manuscript.

Specific comments:

1. Since the method is so novel and different with respect to relatively large number of method available now in literature (e.g., Shields et al 2018), it would be nice to see some figures and analysis of the frequency of ARs that make landfall on the west coast of North America according to this method. These extra figures may constitute a reference point to compare the occurrence of AR between this new and novel method and previous ones in other studies, especially those that use IWV field to detect ARs (Neiman et al 2008, Dettinger et al 2011, Wick et al 2013). A comparison with previous climatology is expected, as well as between the different gridded datasets used here and the possible cause of differences.

2. It is not clear for me what labels are uses as "ground truth". It should be stated explicitly in the text despite that a related reference has been added.

3. It is suggested in page 5 line 20-23 that the TDA approach works with scalar field. If so, this is the main reason to not use the vectoral IVT variable for identifying ARs, rather than IWV being observable by satellite. Please explain further about this point, especially because IVT variable is now being used more than IWV variable for detecting ARs (e.g., see ARTMIP paper, Shields et al 2018).

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