# REVIEW OF LU AND LALL

## GENERAL COMMENTS

This paper discusses the role of tropical moisture exports in extreme precipitation and flooding events in the Northeastern United States. The authors seem to have done a thorough investigation, but I found it difficult to assess the value of their results. My main points are:

- Lack of comprehensiveness. I found it difficult to pick up the main messages from the paper, because it is lengthy with many figures and many abbreviations. Moreover, the text is often literally saying what is already seen in the figures, but not saying what we learn from these figures. The tables are often full of data, but could often be moved to a Supplement. The methods and definitions should be given more clearly. The conclusions are not 1-to-1 related to the research questions. I'd advice the authors to seriously condense their manuscript.
- Context. What is the reason the Norteastern United States were picked as a study region? Is this part of a bigger project or something else? Why is ENSO given so much attention as previous studies showed little influence of ENSO in this region?

These main point will also come back in the specific comments below.

## SPECIFIC COMMENTS

1 and 1.1. The section 1.1 appears to be a mixture of literature review, objectives and method description. Please follow a more common outline. Part of it should go to the introduction and another part should be in Methods and merged with 2 Data, which is a misleading name as well, because it also discusses the modelling framework.

Why is not the latest version of the LAGRANTO model used (Sprenger and Wernli, 2015)? Is backward tracking from the NE-US applied or forward tracking and then integrated? Is the LAGRANTO model run at all by the authors or did they post-process a dataset from previous work? This is all not clear to me.

P2:L10-L11: There are many more regions in the world besides the NE-US that not have been studied much in this context. Is there any specific reason why the NE-US has been chosen as a region of study?

P2:L14-24: Some suggested definitions are discussed for ARs, "moist conveyor belt" and TME, but what is the exact definition that is used in this paper?

P3:L23-25: "Each trajectory represents $3 * 10^{12}$ kg of atmospheric mass" I do not understand the (relevance of) this statement. How many parcels are released from the vertical? Why is the unit not kg m$^{-2}$?

P4:L14: I suppose that little HESS readers will be familiar with the mei-yu-baiu front. Some explanation is required for readability.

The four regions should also be outlined in a Figure.

Why isn't sea level pressure data used from the same source as the input to LAGRANTO (ERA-Interim)?

Sea level pressure and Oceanic Niño Index is being used how and why exactly?

Four paragraphs are used to discuss Fig. 2. Could this not be summarized in one table?

P9:L25-26: Is this conclusion drawn from Fig. 2? Or from somewhere else?

P10: I'd expect a general conclusion from Fig. 3, besides the discussion of the individual panels only. The influence of ENSO seems rather small in general, and definitely not statistically significant, as the neutral years or often not in between El Niño and La Niña, am I right?

7 Summary and Discussion: There appear to be 5 key findings, but it would help the reader if the 4 research questions from Page 4 are exactly answered. Moreover, this section could be named Conclusions and significantly condensed.

Figure 1: What is the meaning of the different colors of the arrows? What does EP mean? None of it is explained in the caption.

Figure 2: The panels are really tiny and difficult to read. I'd advice to split this into at least two figures or maintain only the most important panels. Please also provide this as a movie, pdf or ppt in the Supplement with each individual panel in one view.

Figure 2: What is the exact definition of a storm track being born?

Figure 2: I suppose the dots are connected to become actual tracks? This is not distinguishable from the tiny panels. Does all tracks "end" in the NE-US? If so, what is the exact definition of the "end" of a storm track?

Figure 3: I suppose that the number of tracks is not really a physical quantity, but dependent on the resolution used in LAGRANTO or am I wrong? This should be explained.

Figure 3: Do all these TMEs also go to the NE-US? If not, what is the value of this figure?

Figure 4: Is a birthplace (source region) the same as an evaporative source (e.g. Keys et al., 2012) or something else?

Figure 5b: This is very much scale-dependent and that should be mentioned.

Figure 6: P stands for what? Precipitation, probability? I suppose probability, but it is not defined. As the ENSO signal does not do much, could this whole figure not be merged with Fig. 5b to show the variability?

Results could be compared to http://cola.gmu.edu/wcr/ (Dirmeyer et al., 2009) and then looking at the St. Lawrence river basin.

I am missing the entire point of Figures 7 and 8. What do they explain?

Figure 9 and Page 14 (and other places as well): Precipitation is a flux is should be defined per unit of time. The time integrator of ΔQ is not given. See http://www.hydrology-and-earth-system-sciences.net/for_authors/manuscript_preparation.html

Regarding floods and ENSO reference should be given to Ward et al. (2010) and their findings should be mentioned. They find little influence of ENSO in the NE-US.

The number of tables is exaggerated and could for a large part be moved to a Supplement.

Page 16, 2$^{nd}$ bullet: This is a weak and scale-dependent conclusion. I could equally pick any number between 1 and infinite, assign that number of regions and calculate the percentage they contribute.

Page 16, 3<sup>rd</sup> bullet (and other bullets as well): Please direct the reader to the figures from which the conclusions are drawn. I cannot follow the reasoning around ENSO here.

## TECHNICAL CORRECTIONS

It is kg and not Kg is often used in the paper.

The enormous amount of abbreviations makes the paper difficult to read. Please use abbreviations sparsely. The four source regions do not have to be abbreviated in my opinion. IWV is used only once, TNAO only twice, DFO only twice, thus it makes no sense to abbreviate. Please check for more of these examples. TME needs to be redefined in the summary section to be able for the cross-reader to read this sections stand-alone. Should it not be TMEs by the way? "N.E. USA" is supposed to be the abbreviation of Northeast United States as read in the abstract. As there is no "A" (see title) and the placement of the dots is a bit random I would suggest to write is as NE-US and it to be the abbreviation of the Northeastern United States.

P2:L18: "Tropical Moisture Exports (TME) was" → "were"

P4:L20: "enters" → "enter"

P5:L1: "mechanism" → mechanisms. There are simply too many plural/singular mistakes that I will not list any more.

P5:L1: "Atmospheric" → atmospheric

P5:L15: & → and

P11:L5: place a comma after First

## REFERENCES

Dirmeyer, P. A., Brubaker, K. L. and DelSole, T.: Import and export of atmospheric water vapor between nations, J. Hydrol., 365(1–2), 11–22, doi:10.1016/j.jhydrol.2008.11.016, 2009.

Keys, P. W., van der Ent, R. J., Gordon, L. J., Hoff, H., Nikoli, R. and Savenije, H. H. G.: Analyzing precipitationsheds to understand the vulnerability of rainfall dependent regions, Biogeosciences, 9(2), 733–746, doi:10.5194/bg-9-733-2012, 2012.

Sprenger, M. and Wernli, H.: The LAGRANTO Lagrangian analysis tool – version 2.0, Geosci. Model Dev., 8, 2569-2586, doi:10.5194/gmd-8-2569-2015, 2015.

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