

General comments

This manuscript introduces a new 3D Eulerian moisture tracking model and uses it in a WRF to analyse the moisture sources of two atmospheric river events. I interpret the goals of the paper as: (1) “to evaluate the relative contribution of tropical moisture to total water vapor and precipitation” in two AR events, (2) obtain information about the “vertical distribution of tropical moisture”, (3) “as well as the position of the maximum of moisture with regard to the low-level jet”. The study makes a contribution to the understanding of sources of atmospheric rivers and I think it is of interest for the ESD readership. However, there are ample opportunities to improve the presentation. Because of the large amount of minor errors and inconsistencies (e.g., concerning units, colours, definitions, figure labels, acronyms, event name, etc.), I would suggest the authors to carefully proofread the manuscript before re-submission and not just check off the issues currently identified by the referees. I agree with the comments made by previous referees. Below are some general comments, specific comments, and technical corrections on issues that have not already been raised.

- **Introduction**

- **Text editing.** The introduction comes across as unfocused. It is often difficult for the reader to extract the authors’ key messages, understand how the provided information relates to the study, or fit in the context. For example, P1.L16 states that the “relationship between ARs and cyclones has been documented to be complex” without further explanation – what does that mean? P1.L22 list an enormous amount of references, but what do they say that is meaningful and relevant to mention in this context? In paragraph P2.L16, the importance of tropical moisture is first presented as a fact, just to be immediately contested by a list of findings from other studies. This leaves the reader wondering: Is there a real controversy? Is there a side that is more convincing? Why? What is this paragraph trying to convey? These are just examples of why I felt the introduction needs more editing. Please consider guiding the readers rather than just list information. Please also consider that in an efficient writing style, the first sentence of a paragraph ideally conveys the paragraph’s key message.
- **Add models overview.** Given that this paper introduces a new model, I would suggest the authors to add a paragraph that gives an overview of moisture tracking models, addressing questions such as: What are the main families of moisture tracking models (e.g., difference between Lagrangian and Eulerian models)? What are their key differences in terms of tracking ARs? Do any of today’s moisture tracking models trace moisture from a 3D volume? Is this study’s research goal of investigating “vertical distribution of tropical moisture” something other models are able to do as well, and if so, how do they do it? Such an addition would put the new tracking model presented in this study in a context, allow the authors to better explain how their model differ from others, and help the reader understand what underpins the aims of this study. In the paragraph starting from P2.L16, there are also several references to moisture tracking models and methods that would become easier to understand if preceded by a model overview paragraph.
- **Add paragraph on AR and LLJ.** In the conclusion, the authors state that “It is widely accepted in the literature that the bulk of moisture in ARs is primarily advected within the LLJ.” However, this “acceptance” is not addressed in the Introduction. Given that relation to LLJ is one of the aims and findings of this study, I think the paper would benefit from having a dedicated paragraph reviewing the literature on

this topic. Such a review would also allow the authors to elaborate or discuss why they think their results differ from the literature.

- **AR selection motivation.** Currently, the motivation for selecting the two AR events for the analyses are included in the methods. Perhaps a matter of taste, but I think it would flow better if the information of the two AR events is inserted before paragraph P2.L30, where the two events are first mentioned.
- **Methods.**
 - What is the method used for AR detection? Is it one of the methods described in the introduction?
 - How is the position of LLJ estimated?
- **Selection of AR events.** Why have the authors chosen to only analyse two events for which there are no possibility for comparisons with previous studies? Would it not be useful to also analyse AR event(s) that others have analysed, so that the results can be compared and potential differences discussed? Especially since the authors are introducing a new model, and challenging previous findings (on e.g., how ARs relate to LLJ)? I am not suggesting that it is absolutely necessary to include an analysis of a previously studied AR event, but I miss the discussion and reasoning behind the choice of not doing so.
- **Limitations and uncertainties.** Could you also discuss limitations and uncertainties in a separate paragraph?

Specific comments

- **Figures 1, 6 and 7.** Please consider adding corresponding videos in the supplementary information to show the temporal development in addition to the snapshots.
- **P4.L9 “10 days”.** How is that motivated? How much can the results be affected by the cut-off at 10 days?
- **P6.L5-6:** What difference do you expect between only tracking evaporation from the surface versus the presented approach of volume tracking? Could you discuss that?
- **P8.L1 “(sub)tropical”:** Tropical or subtropical? Which latitudes? Please specify what is considered “tropical moisture”?
- **P8.L4-10:** It is not clear how the information described can be interpreted from Figs. 6 and 7. E.g., how can the reader tell the relative tropical moisture content? How can the location of the “local convergence mechanism” be observed? Or how do we see that the tropical moisture contribution is less in Fig 7 than in Fig 6? Please consider providing clearer analyses and plots (e.g., of relative tropical contribution instead).
- **P8.L33-P9.L8 and Figure 10:** As LLJ is a key issue investigated, would it not be more informative to calculate and plot how often and when the maximum moisture actually coincides with the low level jet? Also, is LLJ simply defined as the “maximum in wind speed at lower levels” – or is there a wind speed threshold as well? If this is the definition, Fig 10b also shows maximum wind speeds spots at 1 km height, which coincide more with maximum moisture content – why are these spots not identified as LLJ?

Technical corrections

- **Figure 5.** What is the area highlighted in blue?
- **Figure 11.** Please label the vertical axes. Also, should the two axes scale really be identical? If not, consider changing the Ratio axis colour to red.
- **P7.Eq1:** Please define sfc.