Answer to Anonymous Referee (R3) in the Interactive comment on "A new moisture tagging capability in the Weather Research and Forecasting Model: formulation, validation and application to the 2014 Great Lake-effect snowstorm" by Damián Insua-Costa and Gonzalo Miguez-Macho.

In general this is a very good paper, with an excellent background on the range of moisture tracking options available including Lagrangian and Eulerian tracking schemes, as well as a detailed explanation of the model, data sources, and the novel contributions of this team. The moisture tagging approach that is implemented within WRF is somewhat outside of my academic background, but in general appears sound. The validation of the approach against an observed extreme event is particularly interesting and it is a sign of how far the science has come in recent years, especially in realistically representing surface and atmosphere coupling during extremes.

We thank very much the reviewer for the positive review. Please, find below the response to the specific comments.

I have only a few minor comments:

1. First in the introduction, the authors briefly discuss offline Eulerian tracking schemes, and it is suggested that the vertical integration is a significant shortcoming of these approaches. I think that if the authors are going to cite the Goessling and Reick (2013) paper (which is critical of the single column version of the WAM-2layers, as described in Keys et al. 2012), the authors should also cite how this issue has been addressed using a two-layer, model-level version of the Eulerian tracking scheme, which performs favorably relative to regional climate model comparisons. One of the other reviewers already highlights this, by pointing the authors to van der Ent et al. (2013) "Should we use a simple or complex model for moisture recycling and atmospheric moisture tracking?" https://doi.org/10.5194/hess-17-4869-2013

Other work that has used the two-layer, model-level tracking scheme includes van der Ent et al. (2014) which couples the WAM-2layers to a land-surface hydrology model, Keys et al. (2014) which examines whether the WAM-2layers can be used with multiple datasets, and Duerinck et al. (2016) which examines soil moisture coupling in Illinois. I am by no means suggesting the authors cite this list of other papers, but rather am illustrating that much work has been done to address the single column assumption, and now in using the improved version.

I do recommend the authors consider adding a sentence or two more at Page 2, Line 17 to more accurately represent the current state of Eulerian tracking generally (and that as a 'class' of tracking schemes some Eulerian models have addressed the valid criticism associated with the single model level integration).

We totally agree with the reviewer and, therefore, the following sentence is going to be added on Page 2, Line 17: "However, in recent years this hypothesis has been relaxed by adding an additional vertical level to some offline Eulerian models (i.e., moving from a single column to two layers), which has considerably improved the results provided by this method (Van Der Ent et al., 2013)."

Van Der Ent, R. J., Tuinenburg, O. A., Knoche, H. R., Kunstmann, H., and Savenije, H. H.: Should we use a simple or complex model for moisture recycling and atmospheric moisture tracking?, Hydrology and Earth System Sciences, 17, 4869–4884,https://doi.org/10.5194/hess-17-4869-2013, 2013.

2. The authors make a point in the final sentence of the abstract by writing ". . .resulting in the highest socio-economic impacts." Since this is the final sentence in their abstract I think the authors ought to either:

a) explore this a bit more, clarifying what those socio-economic impacts actually were(in specific terms) during the snowstorm event, which populations were affected, and may be even the adequacy of alerts and warnings ahead of the snowstorm.

b) eliminate any reference to that aspect of the paper.

I think that the authors have done such an amazing job with the rest of this work that it seems a little bit like they are doing themselves and the reader a disservice by mentioning socio-economic impacts so blithely (aside from the mention at Page 15, 1stparagraph of section 4). I think it is the norm in this field to feel obligated to say something about socio-economic impacts since you have to justify why this science matters. At this point, if the justification is 'socio-economic impacts' then I'm not convinced that this science helps with anything. I think it could, such as through improved monitoring of lake temperatures, regional humidity, etc. and coupling such monitoring insights with emergency management and weather monitoring stations. Perhaps this was already done during the snowstorm. But I think that the authors ought to dig a bit deeper here, if they want to justify the paper as such.

Following the recommendations of the reviewer, we are going to add the following sentence on Page 16, Line 5: "which affected especially New York state (mainly cities bordering lakes Erie and Ontario, and in particular, the Buffalo area) between the 17th and 21st of this month, causing at least 13 fatalities, widespread food and gas shortages due to impassable roads and, in general, many other traffic problems and material losses derived from the storm (National Weather Service, NOAA, 2014)."

National Weather Service, NOAA, U. D. o. C.: Lake Effect Summary: November 17-19, 2014, https://www.weather.gov/buf/lake1415_stormb.html, 2014.

These events are usually well forecasted, perhaps with some uncertainty in the exact position of the snowbands originating from the lakes. We mentioned socioeconomic impacts not really thinking of improving alert systems or to justify our work, but to simply highlight the social relevance of the event. We chose this particular case study because lake effect snowstorms are an easy and clean example to illustrate how the tracer´s method works.

MINOR CORRECTIONS (Page = P, Line = L)

P1 L21 Change 'especial' to 'special'.

The typo will be corrected.

P3 l2 Check formatting for the citation.

The citation will be corrected.

P5 L7 The last clause of this sentence is confusing; consider revising for clarity.

The sentence ", some of the most commonly used and of contrasted performance in numerous situations. " is going to be replaced by “These schemes have been selected because they are some of the most commonly used and show a reliable performance in numerous situations.”

P11 L11 Change ‘2104’ to ‘2014’.

The typo will be corrected.

P11 L21 Change ‘precipitations’ to ‘precipitation’

The typo will be corrected.

P15 L11 Good overview of the snowstorm event, but this is not adequate for justifying this work. Consider adding more substantive context for using this storm as a justification for the approach (perhaps in the summary section, or wherever is appropriate).

See response to general comment 2 above.

P16 L5 Cite the source of the “Snowvember” reference.

The colloquial nickname "Snowvember" spread quickly through the population and various local media after the event. There is no specific citation for it because the term does not have a specific known author.

P16 L17 Change ‘Eire’ to ‘Erie’.

The typo will be corrected.