Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2016-225-RC2, 2016
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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A method to estimate freezing rain climatology from ERA-Interim reanalysis over Europe" *by* Matti Kämäräinen et al.

Anonymous Referee #2

Received and published: 3 October 2016

Review: A method to estimate freezing rain climatology from ERA-Interim reanalysis over Europe By: M. Kämäräinen et al.

General Comments:

This article represents an attempt to produce and examine a gridded dataset of freezing rain over Europe as well as to examine this issue with station information. The study makes a number of assumptions regarding the conditions leading to freezing rain although it does end up with a gridded product along with some analysis. There are several issues associated with this article as identified below. Such issues need to be addressed before the article is acceptable.

The article is, in general, structured well and is reasonably well written.

Specific Comments:

Page 1, Line 17: There are many instances of short but 'heavy' freezing rain.

Page 2, Line 12: A recent climatology over parts of northern Eurasia has been completed: Groisman, P.Ya., O. N. Bulygina, X. Yin, R. S. Vose, S. K. Gulev, I. Hanssen-Bauer, and E. Førland 2016: Recent changes in the frequency of freezing precipitation in North America and Northern Eurasia. Environ. Res. Lett. 11, 045007.

Page 3, Line 27: 3-hourly reports are probably insufficient. Most freezing rain events occur at shorter time scales. Was any attempt made to at least 'estimate' how many events were uncounted by using hourly information as well?

Page 3, Line 27: I may have missed this but how did you treat combinations of precipitation types? It is common for freezing rain to occur with ice pellets for example.

Page 4, Line 3: A threshold of 80% is quite low. Why didn't you show the fraction of missing data during the cold season?

Page 4, Line 15: What fraction of observations was beyond these thresholds? Were any of the high valued temperatures associated with very low relative humidities that would lead to much lower wet bulb temperatures?

Page 5, Line 7: This scale is very large for freezing rain. It is quite common for these regions to be less.

Page 6, Line 3: Ice-initiated precipitation is not initially generated in the inversion aloft. What is the implication of assuming it is?

Page 11, Line 31: This paragraph is poorly worded and hard to follow.

Page 12, Line 5: There are standard observing practices to identify freezing rain. Why is this so hard to do?

Page 12, Line 8: You are associating 'minor' with short duration. On what basis? There

can be severe impacts with durations smaller than 6 h and precipitation rates can be high as well..

Page 12, Line 11: Are the errors 'random'?

Page 12 Line 25: Given the enormous smoothing at 70 km, maybe the authors should only consider analyses over 'flat regions'?

Page 12, Line 33: "Occasional misclassification"? How often did this occur?

Page 13, Line 3: To me, this section is too long and wordy. This is a long shopping list. What are the most important and feasible next steps? From my perspective, some of these should be done within this article.

As well, a recent article (Liu et al., 2016) pointed out that precipitation at the surface (including freezing rain) is calculated directly from the model's microphysical package without needing the approach used here. Isn't that the best way forward?

Liu et al., 2016: ContinentalâĂŚscale convectionâĂŚpermitting modeling of the current and future climate of North America. Climate Change, DOI 10.1007/s00382-016-3327-9

Page 14, Line 12: I do not think that it is 'sophisticated enough. . .'. Melting rates of particles aloft, for example, depend on the features of the particles themselves as well as temperature and moisture conditions.

Page 14, Line 15: Why did you not examine sounding information taken during freezing rain events? You could then more quantitatively assess how well the approach is handling particular instances. The lack of such validation is a major drawback in this article.

Page 14, around Line 25: Why not compare against previous studies on the climatological features?

Page 14, Line 30: Given the limitations of the dataset as you have mentioned, how

confident are you that you can 'reliably' address such questions?

Page 14, Line 31: Clarify what is meant by 'station scale analysis'.

Technical Corrections:

Page 2, Lines 5 and 7: The word 'where' is not correct in referring to an event 'in time'. This error was done in other places as well.

Page 2, Line 22: Another incorrect use of 'where'.

Page 13, Line 28: 'criteria'

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