

Interactive comment on “Re-Analysis of one of the deadliest Tornadoes in European History and its implications” by Alois M. Holzer et al.

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We are very thankful to the work of the two reviewers. We would also like to thank Georg Pistotnik for his elaborate online comments. The reviews and comments led to fruitful discussions within the team of authors and will help to improve the paper, as we hope. Before we are going to answer the single raised points, we would like to summarize our understanding of the synopsis from reviews and comments: A) We see that a multi-disciplinary paper faces the challenge to be seen as such. Expectations that arise from a paper title and abstract in different disciplines need to be addressed. In our case the paper touches in different aspects at least meteorology, engineering, climatology, geography, social sciences and historical sciences. B) The term “reanalysis” used in the paper title in meteorology is mainly used for numerical reanalyses,

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while it has a much broader meaning in other disciplines. Our aim was to use this title in a broad, not meteorology-centric way, which was not understood by those readers, who seem to be meteorology-focused. We therefore consider resubmitting the paper with a slightly altered title: “Forensic Re-Analysis of one of the deadliest Tornadoes in European History and its implications”. Only the word “forensic” would be added, pointing towards the sub-discipline of forensic meteorology, where meteorological past events would be reconstructed with strong ties into other sciences. C) The larger-scale weather situation, the environment of the storm that spawned the tornado, was not in the focus of our work. We therefore would like to cut this aspect out of the paper and maybe report on that part in a later, separate paper. This would allow a more stringent structure and would enable us to highlight the main work that has been done in establishing a repeatable research methodology for damage assessment as well as path and magnitude reconstruction of historical tornado and local windstorm cases. D) In our detailed answers below we believe that we can either solve the raised issues or in other cases argue that they are not appropriate.

G. Kopp (Referee) gakopp@uwo.ca Received and published: 6 October 2017 General Comments This is a well-written paper which develops a coherent methodology for assessing tornado intensity and track details from historical sources, and then applying the method to a historically significant event. All tornado archives use reanalysis of historical events, so clarifying the methodology is of importance for users of such databases, as is data storage for future users. Answer 20: We thank the second reviewer for this positive view.

In addition, from an international perspective, developing a clear description of what tornado damage for the most severe European tornadoes looks like is important, since it will contrast with the distinctly different damage in the United States and elsewhere, where building practices and styles differ (e.g., wood-frame houses are the primary indicator for severe tornadoes in North America where the Fujita Scale originated). Such work will ultimately be important for establishing a unified and consistent international

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standard for tornado intensity estimation. Answer 21: We fully agree and will consider mentioning this in the introduction. It is important to review the historical cases, because these violent events are very rare in Europe and difficult to compare with the effects of violent tornadoes in North America.

Scientific Questions There is significant uncertainty with the authors' analysis, which I believe they have addressed with reasonable effectiveness. However, there are a couple of ways in which the analysis could be extended to reduce the uncertainty. The F4 rating of the tornado is centred on a brick building with 1m thick walls. It is not clear if this was typical practice, then or now, but one wonders if the capacity of such a wall system could be estimated from current engineering practice or literature. Such an analysis could ultimately provide support for the current rating (or a different one), when combined with appropriate aerodynamic data. The aerodynamics of a wall system, after the roof has been removed, are straightforward and unlikely to be altered much by details of the tornado vortex structure and wind field. I am not suggesting that the authors have to conduct this analysis; however, this aspect of tornado-intensity estimation is not mentioned in manuscript even though it is useful and becoming common amongst engineering analyses of tornado damage. Answer 22: We thank the second reviewer for this suggestion. We will mention it in the limitations that the F4 classification is based in a small number of objects.

A second technical aspect, which is typically important in severe tornadoes is wind-borne debris. I wonder, particularly, about the effects on trees. In severe tornadoes, one typically sees trees that are shredded by the debris (at least in North America), but Figure 9 does not appear to indicate that. One wonders if observations are available, but are just not reported by the authors. Answer 23: Figure 9 in its upper part already shows the outer parts of the tornado track with less intense wind speeds. This is also supported by the presence of a nearly untouched roof in the upper right. We will try to address this topic more specifically in a revised version of the manuscript by naming in the results specific damage indicator and degree of damage pairs in the region of

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highest interest.

Technical Corrections P.2, line 10. Building aerodynamics and structural ' analysis are much further advanced nowadays as well. ' Answer 24: Thank you, we will take this into account in a revised version of the manuscript.

P.4, lines 20-21. ' Unclear/awkwardly-worded sentence. ' Answer 25: We will rephrase the sentence.

P.4, line 30 and following. One could argue that the DI/DoD approach arose with the EF-Scale, not the original Fujita Scale, although the authors are treating the DIs in a simple way that is perhaps more consistent with the Fujita-Scale than that currently used in the EF-Scale. A sentence or two on this would be helpful. Answer 26: We will mention this in the article.

P.6, lines 1-2. Unclear/awkwardly-worded sentence. Answer 27: We will rephrase the sentence.

P.6, line 3. A sentence or two about the meaning and interpretation of "damage prevalence" would be helpful. Answer 28: We will include this.

P.7, Figure 3. It would be helpful to have the track ' boundaries identified on this map. Answer 29: Thank you for this good suggestion. A new map with the boundaries of the tornado track will be available in the revised manuscript.

P.18, the sentences around line 10. No need to ' repeat the text from earlier in the manuscript. Answer 30: We will review this part.

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