Nat. Hazards Earth Syst. Sci. Discuss., 3, C3046–C3049, 2016
www.nat-hazards-earth-syst-sci-discuss.net/3/C3046/2016/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "The observed clustering of damaging extra-tropical cyclones in Europe" *by* S. Cusack

M. Raschke

mathiasraschke@t-online.de

Received and published: 25 January 2016

The author presents in his paper samples of storms, which are quantified by different measures. He analyses these samples in regard to clustering and over dispersion, and applies the cluster coefficient that is introduced to storm analysis by Raschke (2015). Other analyses of storm clustering in Europe applied the statistics of over dispersion by Mailier et al. (2006). I appreciate and fully support the approach to analyse clustering and over dispersion of as many samples as possible. I also welcome the analysis of the estimation error (called sampling error by the author) and its consideration in the interpretation of the results. The primary interpretation/statement of this study is the relation between an increasing cluster coefficient by the increase in the threshold and the corresponding return period. I would like to make following comments:

1. It would be helpful if the sampling error (called standard error or estimation error in statistics) and the observational error would be briefly defined/explained in section 3 (Analysis method).

2. The estimation method for the parameters (cluster coefficient and/or expectation and variance) should be described in section 3. A corresponding statistical reference would be also helpful.

3. The analysis results are compared with the findings of recent publications. However, the dispersion statistics is applied in many publications and not the cluster coefficient methodology. That is why any comparison would need more details and explanations on the differences of the applied methods.

4. The result of an increasing cluster coefficient by an increase in the threshold/return period is in contrast to the results of Raschke (2015) for winter storms in Germany wherein the cluster coefficient does not depend on the threshold/return period. This could be discussed in the current paper.

5. The modelling of Raschke (2015) is based on winter storm data, which have been extracted from climate model simulations (for Germany, details see Karremann et al. (2014), including supplemental). These data indicate a constant cluster coefficient for different thresholds/return periods (difference between the point estimations are not statistically significant). If in reality a cluster coefficient exists, which increases with an increase in the threshold/return period of e.g. a winter storm index (magnitude or the like), than the climate model approximations are incorrect, which need to be discussed in detail.

6. The samples with a large history are not complete. Figure 3 illustrates this fact; older time periods include much less storm events than younger periods. The problem of completeness is well known in earthquake magnitude statistics (e.g., Hakimhashemi and Gruenthal, 2012; Kijko, 2012). The incompleteness mainly concerns the smaller storms and could cause a bias. The filtering by incomplete documentation and inho-

NHESSD

3, C3046–C3049, 2016

mogeneous perception might be very complex. The documentation of three storms with short time delays might be more likely than the documentation of one storm event.

7. How is the homogeneity of the event definition with respect to the event duration considered? For example, while one definition might identify two events in short succession, another definition might detect only one event.

8. If the cluster coefficient really increases with an increase in the threshold/return period than a stochastic model/process should be formulated for this phenomenon in the same way as e.g. done by Raschke (2015); for the case of constant cluster coefficient (key word: thinning process). I do not expect that the author formulates such a stochastic model but the gap in the theory should be mentioned.

9. The samples could get a name or number in section 2 (data) which could be also used in section 4. This way the reading would be much easier.

10. It would be also helpful if the analysed data are published in a supplemental to ensure simple reproducibility.

I hope that my reflections are useful.

References:

Hakimhashemi, A. H. and Grunthal, G.: A Statistical Method for Estimating Catalog Completeness Applicable to Long-Term Nonstationary Seismicity Data, Bulletin of the Seismological Society of America (Impact Factor: 2.32). 12/2012; 102(6):2530-2546. DOI: 10.1785/0120110309, 2012.

Karremann, M. K., Pinto, J. G., von Bomhard, P. J., and Klawa, M.: On the clustering of winter storm loss events over Germany, Nat. Hazards Earth Syst. Sci., 14, 2041-2052, 15 doi:10.5194/nhess-14-2041-2014, 2014.

Kijko, A.: On Bayesian procedure for maximum earthquake magnitude estimation, Vol 2, No 1, 7th International Workshop in Statistical Seismology in 2011, 2012.

NHESSD

3, C3046–C3049, 2016

Mailier, P. J., Stephenson, D. B., Ferro, C. A. T., and Hodges, K. I.: Serial clustering of extratropical cyclones, Mon. Weather Rev., 134, 2224–2240, 2006.

Raschke, M.: Statistical detection and modeling of the over-dispersion of winter storm occurrence, Nat. Hazards Earth Syst. Sci., 15, 1757–1761, doi:10.5194/nhess-15-1757-2015, 2015.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 3, 7457, 2015.