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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "The 21st Century Decline in Damaging European Windstorms" *by* L. C. Dawkins et al.

L. C. Dawkins et al.

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General comments

Referee comment:

The excellent work of the author has definitely a quite real impact on the insurance industry. This study helps to understand and explain the observed discrepancy between the (in the insurance industry commonly used) windstorm risk models (build on 40 years of meteorological data) and the real claims data (captured over the last 10 years). Which helps to derive a more realistic risk view for the coming years. The paper is very clearly, consistently and illustratively write and I definitely recommend publication.

Response:

Thank you!

Detailed comments

Referee comment:

The following comment is rather a suggestion how the quality could be improved e.g. in a follow on study. The used 25km resolution of the windstorm footprints is rather a low resolution. For example, in tropical cyclone risk models normally a resolution of around 1km is used to best estimate the damage. Several studies in insurance companies (unfortunately unpublished to my knowledge) show an increase of the correlation between claims data and reproduced wind speeds with a higher resolution, even if a statistical down scaling is used. Common practice is to use a surface friction model as described for example in "Meng, Y., M. Matsui and K. Hibi (1997) A numerical study of the wind field in a typhoon boundary layer, Journal of Wind Engineering and Industrial Aerodynamics, 67&68, pp. 437-448." and estimating the surface friction based on land use data as for example described in "Graf, M., K. Nishijima and M. H. Faber (2009) A Probabilistic Typhoon Model for the Northwest Pacific Region, APCWE 7, Taipei.". This would help to derive more realistic local maximum wind speeds. A higher resolution could help to derive more realistic wind speeds compared to shown (low) wind speeds in the Paris example. But since the author is investigating an explanation of a "relative" decline of damaging European windstorms, rather than an absolute value, I strongly assume that the proposed suggestion will not have any impact on the final conclusion.

Response:

Thank you for these suggestions. This point could be addressed by adding a sentence in the conclusion, page 9, line 32:

'In future work, when such data is available, this investigation could be improved by using windstorm footprints at a higher grid cell resolution which may provide more

realist local maximum wind gust speeds and therefore be more representative of the damage caused by an event.'

Referee comment:

The findings on page 6, describing the increase in the variability of the storm activity in the recent years and describing the increase of the frequency of exceeding 20 m/s wind speeds in southern Europe, are also very interesting discoveries and should be mentioned in the conclusions and/or in the abstract.

Response:

This is a good idea. We will alter the second paragraph of the abstract to:

'The footprint of a windstorm is defined as the maximum wind gust speed to occur at a set of spatial locations over the duration of the storm. The area of the footprint exceeding 20 $ms-1$ over land, A20, is shown to be a good predictor of windstorm damage. This damaging characteristic has decreased in the 21st century, due to a statistically significant decrease in the relative frequency of windstorms exceeding 20 $ms-1$ in north-west Europe, although an increase is observed in southern Europe. The decrease in north-west Europe is explained by a decrease in the quantiles of the footprint wind gust speed distribution above approximately 18 $ms-1$ at locations in this region. In addition, an increased variability on the number of windstorm events is observed in the 21st century.'

And alter the third paragraph of the conclusion to:

'The October - March winter average and total A20 was shown to have decreased in the 21st century, mirroring the recent decline in windstorm related insured losses. The number of windstorm events in each winter and the variation in the number of event was found to have increased in the same period. This decline in A20 between 20th and 21st centuries was found to be due to a significant decrease in the relative frequency of exceeding 20$ms-1$ in north-west Europe. A significant increase in the

relative frequency of exceeding 20ms-1 is identified in southern Europe, however, this change is small in relation to the decrease in the north-west. The decrease in north-west Europe was shown to be because of a decrease in the quantiles of the footprint wind gust speed distribution above approximately 18 $ms-1$ at these locations.'

Referee comment:

As mentioned already in the outlook, it definitely would be interesting to investigate if there are more driving factors aside of NOA which influence the storm size.

Response:

We think that in adding more climate indices, a longer time series is required to identify relationships and we are restricted to 35 years of footprint data.

This could be commented on in the conclusion – page 9, line 32:

'In future research it would be desirable to further explore which factors, other than NAO, have an influence on A20. However, since many climate indices have multi-decadal cycles, this exploration would benefit from a longer time series of wind gust speeds than the 35 years of footprint data available here.'

Referee comment:

Figure 1: The legend of the color bar is missing, I assume it should be max 3 sec gust wind speed [m/s] as stated in the figure description.

Response:

Good spot, we will add this to the figure, thank you.

Page 5: Adding the value of the correlation coefficient between log(L98) and log(A20) could help to describe the positive correlation, e.g. in Figure 2.

Response:

Good idea, thank you.

Figure 5: It would may be worthwhile to set the limits for the x and y axis to 10 – 30 m/s, since the increase in the uncertainty below 10m/s is probably just related to the number of storms for which a footprint was generated and this would magnify the tail of the distribution which is relevant for the argumentation.

Response:

Good idea, we will do this.

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