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Interactive comment on "Uncertainties in Forecasts of Winter Storm Losses" *by* Tobias Pardowitz et al.

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Reply to RC2

The authors would like to thank the reviewer for the very thoughtful review. The comments, suggestions and numerous technical corrections will certainly help us improve the manuscript. Point-by-point answers (in *italics*) to the comments are given in the following.

General comments:

The paper is clearly written and logically organised, it reads very well and the methodologies are well explained. Apart from one more general comment that can hopefully be addressed easily, I mainly found a couple of wording issues or typos that need to

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Discussion paper

be corrected. After some minor revisions the paper should be suitable for publication.

On the example of one storm (pages 8/9) the authors demonstrate how accounting for the uncertainties increases the probability of losses occurring, and this improves the forecast for the case when a storm / damage occurs as the deterministic model strongly underpredicted the losses. However, I am wondering if this also increases (and by how much) the probability of damage when no storm occurred, thereby leading to a higher false-alarm rate? I would appreciate if the authors could expand on issues around false alarm rate.

This is a very good comment. We will add a discussion on false alarms to the manuscript.

In case of the deterministic forecasts (no uncertainty treatment), the hit rate (H=100% x hits / (hits + misses)) and false alarm rate (FAR=100% x false alarms / (false alarms + correct rejects)) can directly be calculated from the contingency table. In case of probability forecasts, a threshold needs to be chosen to translate them into a deterministic one to be able to calculate FAR and H. This threshold can be freely chosen and strongly influences FAR and H. Naturally, trying to reduce the FAR will also reduce H and vice versa. Insight into this relation can be gained by assessing the ROC (Relative operating characteristic) curves, relating the false alarm rate (FAR) to the hit rate (H), depending on the probability threshold chosen. Compare Wilks (2008), Chapter 8 for details on the ROC curve.

We will add a figure (see Fig 1.) to the manuscript, showing exemplarily resulting ROC curves for a lead time of 3 days.

It can be clearly found, that using the probabilistic forecasts, the hit rate (H) can be strongly increased with only slight increase in the false alarm rate (FAR). Exemplarily, when considering the deterministic forecasts for a lead time of 3 days the hit rate is 3.5% (of all observed events, only 3.5% are forecasted), while the false alarm rate is 0.004% (an event was forecasted in only 0.004% of the cases for which no event was

observed) for the high threshold. By using the probabilistic forecasts, a much higher hit rate of 80% can be achieved while keeping the false alarm rate below 10%. In this way at least 80% of all events are correctly forecasted, which poses a great improvement, particularly since dealing with severe and damaging events.

Specific comments:

Title: the paper does not only report on uncertainties but also quantifies skill and shows how treating uncertainties increases the skill. Therefore I think it would be good to add "skill" to the title, e.g. "Uncertainties and skill in forecasts: : :" or similar

New title based on both reviewers' comments:

"An Analysis of Uncertainties and Skill in Forecasts of Winter Storm Losses"

Section 2: As the different data (loss, COSMO, ECMWF EPS) cover different time periods, it would be good to say explicitly for which period the skill calculations were performed, for which period the downscaling was trained, etc.

Details on the availability of individual data sources are already given in the data section. However we also corrected a mistake, namely that the dataset on losses on residential buildings is available for 1997-2011. We will add the information on the respective periods for which training and verification is performed.

"According to the data availability, the different modelling steps described in the following chapter are performed for different time periods. The statistical downscaling (compare Section 3.1) is developed on the basis of a set of simulations for individual storm events during the period 1959-2010. The ensemble post-processing (compare Section 3.2) is performed for the years 2006-2009 for which both COSMO-EU analyses and ECMWF-forecasts are available. The training of the probabilistic damage model (compare Section 3.3) can be performed for the years 2006-2011 for which both damage data and COSMO-EU analyses are available. Assessment of forecast skill is done for the period 2001-2009 for which ECMWF-forecasts and damage data are available."

Technical corrections:

page 1, line 30: not all references seem to be in the reference list at the end of the paper

page 2, line 27: would “records” be more appropriate then “measurements” when talking about the insurance data?

page 3, line 4: typo: inhomogeneities

page 5, line 7: end of sentence behind “over-dispersion”

page 5, line 12: comma at end of line behind “forecast ensemble”?

page 5, line 28: representative of

page 6, line 9: split the long sentence behind “loss ratio time series. The resulting: : :”

page 6, lines 19/26: past tense of forecast is forecast

page 6 section 3.4, it seems there is no explicit reference to setup ii)

page 6, line 28: 0.5 (decimal point rather than comma)

page 7, line 5: “ordered according to” rather than “after”

page 7, line 16: should the “and” (after has occurred) better be “or”?

page 9, lines 2/4: consider replacing “featured” by “recorded”

page 9, line 21: do you show “significant” or rather “positive” forecast skill?

page 10, line 5: consistent with

page 10, line 9: may the higher skill in northern regions also be due to higher average loss ratios in these districts?

Section 5: most of this sections reads more like a “Summary” rather than “Conclusions and Discussion”. I figure that the very last 3 lines (page 11, lines 23-25) may be your

main conclusion?

page 10, line 28: specify “meteorological analyses”

page 10, line 30: too little ensemble spread

page 11, line 3: remove comma behind "fact"

Thank you for these technical corrections! We will take care to incorporate them into the manuscript.

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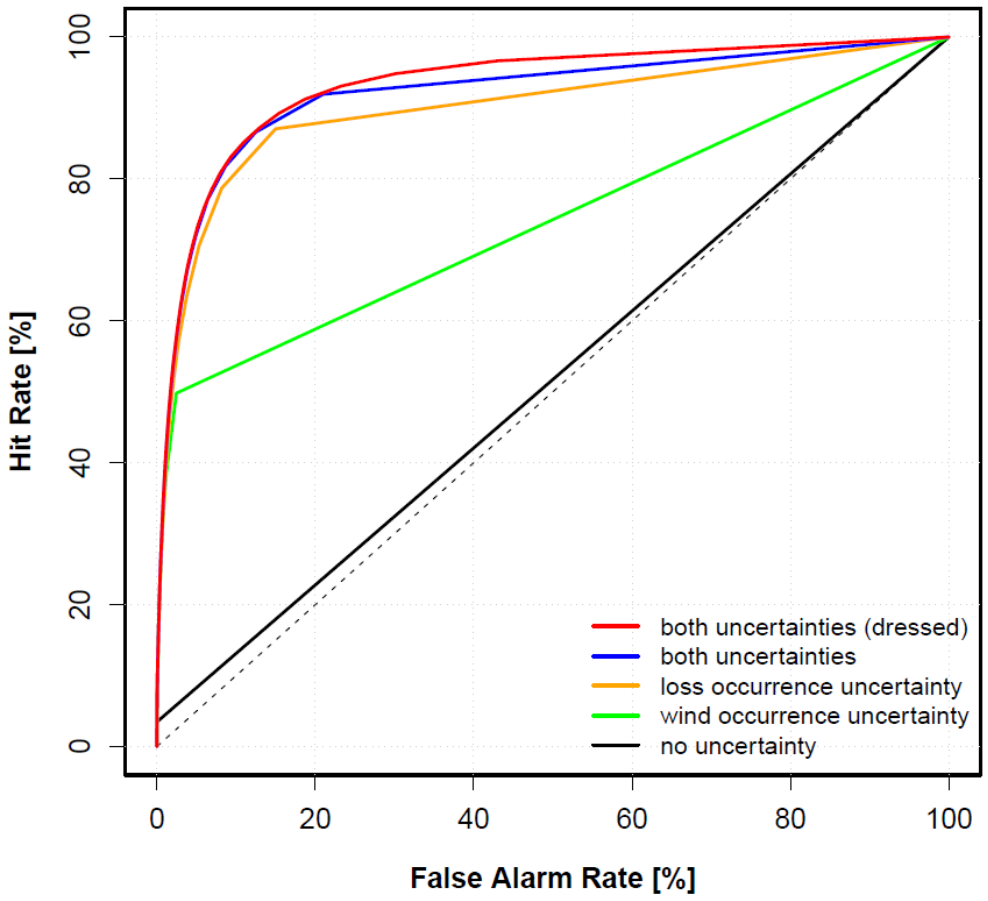

Fig. 1. ROC curves for the forecasts with lead time 3 days for the high loss threshold (0.001‰).