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Interactive comment on "Sensitivity of the WRF model to PBL parametrizations and nesting techniques: evaluation of surface wind over complex terrain" *by* J. J. Gómez-Navarro et al.

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We appreciate the time devoted by the reviewer to carefully read the manuscript and provide interesting notes and insights that clearly will help to improve it. We have implemented all minor changes suggested by the reviewer, so we discuss below only the most prominent changes applied to the text according to his/her comments.

The reviewer is fully right in his main concern regarding the use of two-way nesting to evaluate the role of the horizontal resolution. Using two-way simulations precludes the real evaluation of the role of the spatial resolution, since coarser domains are artificially improved by the skill in the inner domains. Indeed we had this into account in the

design of the simulations, but unfortunately we failed to explain it properly. The reason is that although simulations were firstly carried out in a two-way set-up, they were repeated for specifically addressing the added value of the spatial resolution, once we realised that it would be an important added value of the paper. Unfortunately, the model set-up description in the paper was not updated to reflect this change. Thus, the results we present in the paper regarding the role of the spatial resolution (Section 4.3) correspond to simulations carried out in one-way configuration, and thus the Fig. 9 already reflects the changes demanded by the reviewer. Obviously we have introduced changes in this section to emphasise this important detail of the model set-up and avoid further misunderstandings.

The explanation of the YSU* scheme has been improved, specifically to account for the detail of how it works over mountain tops.

There was a misunderstanding regarding the temporal resolution of the data we use. We have reformulated the paragraph where we describe the temporal resolution of the observations and the simulations and how we make the comparison. We believe this is an important aspect of the paper, prone to critics, and thus we would like to explain here in some detail what we do and how we support our approach. However, in the main article we just mention the results without discussing the details and the figure we expose here, since we consider it is not a scientific result itself that adds value to our findings.

The observations are available at 10-min resolution in some cases. However, Meteoswiss provides though its data portal hourly mean series since the 80's in most stations, so this is the temporal resolution of the observations that we are using in this analysis, directly provided from Meteoswiss without further manipulations from our side. We compare this product to the instantaneous wind obtained every hour from the model. Clearly there is a mismatch between both variables, since we are comparing an instantaneous variable (simulated wind) with an averaged value (observed wind). However, we argue that the error introduced by this mismatch is low, and does not preclude obtaining robust conclusions regarding model performance and the role of different configurations.

We tested this by obtaining the instantaneous wind in a number of locations (WRF has an option that allows us to obtain a series of instantaneous output in every time step for certain locations, whereas this output would be prohibitive for the whole grid). We obtained this output, and compared it with its hourly mean, and with the sub-sampling that consists of the selecting one instantaneous value per hour. We tested this for four locations with different orographic conditions, and all reproduce similar results. The results for the station ZER (Located close to Zermatt) for storm Lothar and two model configurations are shown as an example in Fig. 1 in this document. The differences between the hourly mean (green line) and the hourly instantaneous (blue line) are negligible compared to the differences between the two model configurations. The instantaneous wind speed follows the other two on average, and although it exhibits a larger variability (as expected for having higher temporal resolution), it does not play a role in the comparison, since we only analyse hourly resolution observations (comparable to the green and blue series). Thus, this figure demonstrates how the error introduced by not using hourly averaged values of simulated wind speed is not an obstacle to disentangle the differences produced by different model configurations, so the results of the paper do not become compromised by such an approximation.

Regarding the height of the sensors, it has been also discussed with the reviewer 1. It is not homogeneous, but the number of observations whose height is not 10 meters is small (below 10%), and where it is not, the heights differ up to 60 metres at most. The first three eta levels are located on average at 1.3, 54.37 and 130.78 meters above terrain. Thus, the vertical interpolation is in all cases located between these first three levels, and the effect of these deviations is rather small. In contrast to the linear interpolation used in the manuscript, we also corrected the observations with a power law method. The results of the model performance are similar. This point was however not discussed in the former version of the manuscript, so in the new version we have

tried to clarify this aspect.

Finally, we have changed the title and polished the conclusions to narrow the focus of the paper towards wind storms, as suggested by the reviewer.

Interactive comment on Geosci. Model Dev. Discuss., 8, 5437, 2015.

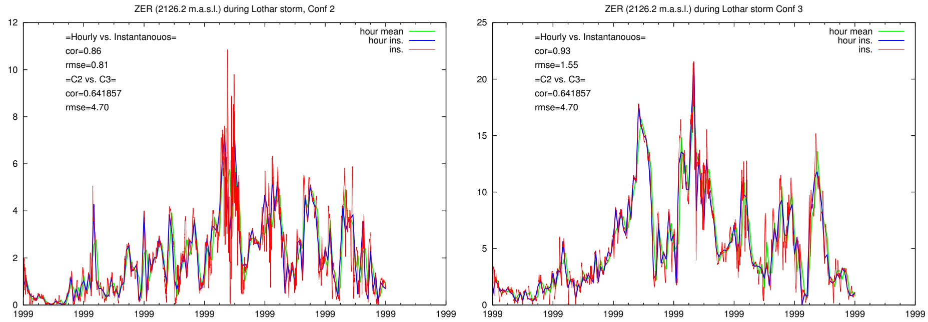

Fig. 1. Simulated time series of wind speed at the closest grid point to the ZER station for stormLlothar. The series indicate instantaneous (red), sampled hourly instantaneous (blue) and hourly mean (green)