Long-term simulation of the boundary layer flow over the double-ridge site during the Perdigão 2017 field campaign

Reply to editor comments of manuscript acp-2018-997

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1 Introduction

We thank the editor for the comments and acknowledge his effort to improve our manuscript.

In the following, comments of the editor are marked with numbers and corresponding replies of the authors are written in bold and labeled with "⇒". Changes in the new manuscript are written in bold.

2 Comments

1. For experiment layout refer to perdigao.fe.up.pt (e.g. page 3)

⇒ **We added the link to the manuscript.**

2. Where it is "Estrala" it should be "Estrela" (e.g. page 13, 15, 23)

⇒ **Thanks for the comment. We misunderstood the technical corrections of reviewer 1 and changed "Estrala" to "Estrela" in the manuscript.**

3. Where it is "Caros" it should be "Carlos" (page 24)

⇒ **We are sorry for this typo and corrected it.**

4. The statement (page 4) "A grid size of 200 m was necessary to properly resolve the double-ridge topography of Perdigão." is not right. 200 m are not enough and the authors should be more cautious.

⇒ **With this sentence we want to say that a resolution of 200 m is necessary to resolve the double-ridge topography with at least 7 grid points. With this resolution the valley and its interaction with the boundary layer can be resolved. We agree that of course much finer computational grids are necessary to simulate the flow within the complex terrain. We added this in the text (L52-L54)**

5. The consequences of relying on WRF alone to mimic the small-scale turbulence requires additional justification, other than "Note that no mechanism was implemented in WRF to generate turbulence at the lateral edges of the LES domain, e.g., similar to the method described in Munoz-Esparza et al. (2017)." (page 4) and "The realistic computation of turbulence features was not the focus of this paper (page 23)". Would the authors please expand their justification and elaborate on the consequences of using the approach by Munoz-Esparza, or in line with referee N. 1 "show ... the comparison of results related to the turbulent field in one of the towers (most likely, T20 or T29)."

⇒ **In our simulations we did not use a technique to introduce turbulence at the edges of the LES-domain, as such methods are not available in the WRF code, yet and as the application of turbulence generating schemes requires higher grid resolutions in the order of 10 m to 50 m (Muñoz-Esparza et al. 2017; Muñoz-Esparza and Kosović 2018). This means that it is not possible to compare simulated and observed turbulence characteristics by using grid resolutions of 200 m. This is visible by means of Fig. 1 (see below), which shows spectra of cross-valley winds at 100 m AGL at tower T20 and indicates that the inertial subrange is not represented. We also added some explanations in the text in L57-L60.**

6. See PDF file attached for additional notes

⇒ **We looked at the additional notes in the PDF and corrected the typos.**

⇒ **We changed the cross-sections in Fig. 4 by plotting larger horizontal distances (-30 km to 30 km for D1 and D2; -15 km to 15 km for D3), as it does not make sense to show distances from -3 km to 4 km for D1 and D2 (see old manuscript).**

References

Muñoz-Esparza, D. and Kosović, B.: Generation of Inflow Turbulence in Large-Eddy Simulations of Nonneutral Atmospheric Boundary Layers with the Cell Perturbation Method, Mon. Wea. Rev., 146, 1889–1909, doi:10.1175/MWR-D-18-0077.1, 2018.

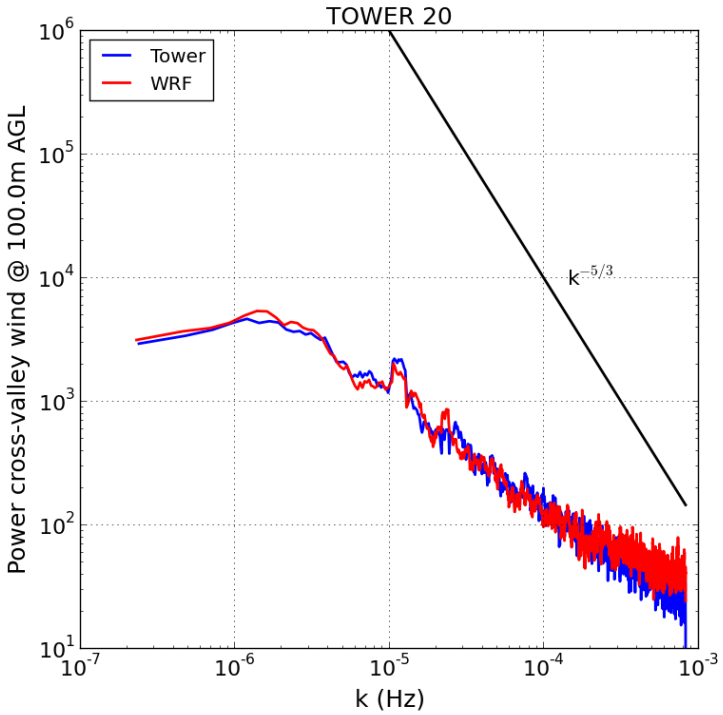

Figure 1: Spectra of cross-valley winds at 100 m AGL for observed and WRF D3 timeseries at tower T20.

Muñoz-Esparza, D., Lundquist, J. K., Sauer, J. A., Kosović, B., and Linn, R. R.: Coupled mesoscale-LES modeling of a diurnal cycle during the CWEX-13 field campaign: From weather to boundary-layer eddies, Journal of Advances in Modeling Earth Systems, 9, 1572–1594, doi:10.1002/2017MS000960, 2017.