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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Long-range transport of terrain-induced turbulence from high-resolution numerical simulations" *by* M. Katurji et al.

M. Katurji et al.

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Author response to reviewer comment RC 6387 on the paper:

Thank you for taking part in making this research a better science.

Katurji, M., Zhong, S., & Zawar-Reza, P. (2011). Long-range transport of terrain-induced turbulence from high-resolution numerical simulations. Atmospheric Chemistry and Physics Discussions, 11(3), 9797-9829. doi: 10.5194/acpd-11-9797-2011.

All typo errors were attended to in the updated version of the paper.

Reviewer: "I do not understand the logic behind 1 min averaging period (page 9805)."

Author: Calculating the perturbation velocity from a mean quantity (model output) can

basically be done on any time average interval that represents the simulated phenomena and can be carried out without noise. Since the frequency analysis of the velocity signal suggests a periodic power enhancement on the wave period between 7 to 11 minutes, then this means the largest eddies take around this time to complete their travel cycle over a sampling point. In periods less than the 7 minute interval eddies, of various sizes are also present, in fact there exists overlapping periods of new coming and lagging eddies leaving various turbulent footprints in the signal. The 1-minute period was chosen as the average interval out of which the perturbation velocity was calculated so not to smooth out heavily the effect of these smaller eddies and large eddy footprints. The 30-minute average interval for the TKE diagrams is only a mean representation of the turbulent flow field and not the average interval out of which the turbulent quantities were calculated from.

Reviewer: "At the same page (9805) there is a sentence: "An inspection of the parameterized sub-grid scale TKE, deduced from the turbulence closure scheme, reveals that the model is resolving 97% of the TKE and only 3% is parameterized at the current spatial resolution." Could you please explain this inspection?

Author: Resolved TKE+ parameterized TKE=total TKE. The parameterized TKE is an output parameter from the ARPS model and is used to represent TKE on the sub-grid scale. Deriving the velocity perturbations and summing the half of the squares of each component gives us the total TKE. This leaves the resolved part as the difference of the total and paramterized TKE.

Reviewer: "I have some fundamental concerns about referring to TKE characteristics as "wavelike". For example on page 9805 – there is obviously some periodicity in TKE but I would not call it "waves". Please rephrase."

Author: There is no "wave" word on page 9805. But this point has been previously raised up by one of the reviewers for the ADCP submission. The waves that are evident in the horizontal velocity and TKE diagrams are not atmospheric waves

resulting from the restoring force of gravity due to atmospheric thermal stratification or stability. The simulations were carried out under an isentropic potential temperature background without surface energy balance parameterizations, therefore no moisture or heat exchange between the surface and the atmosphere, thus maintaining the neutral stratification throughout the simulation. The temporal averaging of the TKE field reveals a wavelike character, which only represents mean spatial distributions in the domain with increased or decreased magnitude of TKE. The wave-like features should in no way, shape or form be confused with internal or external atmospheric buoyancy generated waves. Clarification has been added on page 9810.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C7865/2011/acpd-11-C7865-2011-supplement.pdf

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 9797, 2011.