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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Interactions among drainage flows, gravity waves and turbulence: a BLLAST case study" *by* C. Román-Cascón et al.

Anonymous Referee #1

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This paper describes a case study from the BLLAST field campaign which focussed on formation of stable boundary layers around the evenning transition in complex terrain. The case study is an interesting one where after a brief period of calm, a shallow drainage flow forms downslope, eventually overwhelmed by a larger scale nocturnal katabatic flow from the mountains to the south (which is investigated with help of a numerical model). Propagating gravity waves are detected in pressure signals at the surface during both the main phases of the flow, and in turn characterised, and impacts on surface turbulence and fluxes due to these waves and the drainage flow are examined. Multi-Resolution Flux Decomposition (MRFD) is used to elucidate effects across scales, and comparisons made for a range of heights spanning the depth of the shallow drainage flow, and for three different sites. MRFD illustrates nicely the sepa-

ration of scales and, for instance, direct (wave-induced convergence/divergence) and indirect (modulation of winds and hence turbulence and fluxes as a result of convergence/divergence) influences of gravity waves. These aptly demonstrate local variability, and at times how difficult it is to explain conclusively, and the difficulty in defining averaging intervals for turbulent flux calculations. While I felt explanations in places could be a little better thought through and lucid, and perhaps more attempt made to at least tentatively explain rather than simply describe, I'm happy to recommend publication subject to carrying out minor revisions in response to the list below, expanding their analysis if the answer to a given point exposes any oversight by the authors or potential benefit of deeper examination.

12824. 22. "allusive" should be "elusive".

12826. 6. "on the study" should be "out the study".

12830. 25. What instrument is shown in Figure 3?

12830. 27. It looks like there _is_ a shallow (1m) drainage current occurring at the wheat site.

Figures 2 and (especially) 4 - it would be better if a given colour corresponded to approximately the same height in each figure panel.

Figure 8(d) - how was this BV frequency calculated? It looks rather noisy. Were adjacent pairs of heights used? If so did the authors try any methods which take into account a deeper range of heights at each level (which would, looking at Figure 8(c), presumably lead to a smoother profile of BVF)?

12833. 8. "as" should be "such as".

12834. 11-18. It feels as though the authors should at least make some effort to back up their assertion by helping the reader draw a visual correlation between the variables in Figures 2 and 4 and the pressure oscillations, perhaps by drawing dotted lines on the figures to indicate particular features.

12836. 8. word missing here?

12389. 8. Do the authors have any explanation for the difference in wind between the grass and wheat sites during this period? Can the authors comment on the effect of the field boundary close and to the south (i.e. upwind) of the grass site? Could this play any part in the low winds experienced at the lowest detector levels during the SDF period at this site? Alternatively does the downwind wheat (and associated "flow collision") have any impact.

12839. 11. Figure number incorrect.

12839. 9-20. It seems that a lot of this can be explained simply by the fact that the wind changes barely at the wheat site, but radically at the grass at the onset of the mountain-plain wind...

12840. 21-24. I didn't understand this sentence, could the authors clarify?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 12821, 2015.