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Interactive comment on "Study of a prototypical convective boundary layer observed during BLLAST: contributions by large-scale forcings" *by* H. Pietersen et al.

Anonymous Referee #2

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In this paper, CBL evolution and structure during a selected day of the BLASST campaign are simulated using a mixed-layer theory based model and a LES model. Comparison with observations shows a large overestimation of the CBL height by the models indicating that horizontal advection and subsidence play an important role in the CBL evolution on that day. Mesoscale circulations induced by complex topography and surface heterogeneity is given as the possible reason for the horizontal advection and subsidence.

General comments:

The paper is clearly written and easy to follow. The research appears solid. The major concern I have is related to the novelty of this study. It is well known that in the presence of complex topography, subsidence and horizontal advection play an important role in CBL development. This has been shown and discussed, for example, in Whiteman (2000) for valley atmospheres and by De Wekker (2008) and Serafin and Zardi (2010) for locations in the proximity of a mountain range (as in the present study). Furthermore, the mixed-layer model and LES model results are rather simplistic and do not add to a better understanding of the relative magnitude and importance of horizontal advection and subsidence. I completely agree with the authors' statement on p. 19264 that "A meso-scale modeling study could give more insight in the evolution of the advection of heat and moisture". In fact, this is something I think they should do in a revised version of the manuscript. The paper is very speculative as for the underlying reasons for the differences between observed and prototypical CBL (other than the very general reasons of advection and subsidence cause by complex topography and surface heterogeneity) and a mesoscale modeling study would be very helpful.

Other comments:

In the introduction, there is a lot of emphasis on the CBL-SBL transition that is not so much addressed later in the paper. Keep the introduction relatively short and focused on the specific research questions for this paper and include a short review on previous studies of CBL near complex topography.

Even if the presented case study fulfills all the criteria for the investigation of a prototypical boundary layer, it would still be useful to know how the CBL evolved in the other cases. Is the selected case typical or a-typical for the CBL development in the region during BLASST?

References: Whiteman, C. D., 2000: Mountain Meteorology: Fundamentals and Applications. Oxford University Press, 355 pp.

De Wekker, S.F.J. 2008: Observational and Numerical Evidence of Depressed Con-

vective Boundary Layer Heights near a Mountain Base. J. Appl. Meteor. Climatol., 47, 1017–1026. doi: http://dx.doi.org/10.1175/2007JAMC1651.1

Serafin, S. and Dino Zardi, 2010: Structure of the Atmospheric Boundary Layer in the Vicinity of a Developing Upslope Flow System: A Numerical Model Study. J. Atmos. Sci., 67, 1171–1185. doi: http://dx.doi.org/10.1175/2009JAS3231.1

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