

Response to the reviewers

Report #1

We thank the referee for suggesting this missing reference of De Wekker (2008). It is indeed an important study due to the similar characteristics of the terrain and the analysis concerning the influence of large-scale forcing on boundary layer development. Consequently, we have included a small discussion and the reference at the introduction and at section 6. We have also edited and corrected the typos.

Report #2

The remarks suggested by the referee have indeed helped to improve parts of the manuscript and majority of them were taken into account.

At the introduction, we have added several sentences to be more precise in our definition of the canonical CBL (end of first paragraph) including the specific role of subsidence and the horizontal advection of heat and moisture.

At lines 555, we have explained better the method to estimate subsidence and the horizontal advection of heat and moisture.

Following the referee suggestion and the one in report #1 we have added a reference (De Wekker, 2008). In doing so, we relate better the subsidence to the influence of the mountain characteristics.

The paragraph starting at line 266 explains the method in estimating the sensible and latent heat fluxes employed in the model calculations. Note that we are using observations (gathered at 7 stations) of all the representative and measured land use, except the forest. In doing so, we attempt to include as much information of the surface forcing in the our boundary condition. Our model results of the boundary layer evolution confirm that an average of the observed fluxes at the 7 stations provides already a representative "integrate" heat and surface flux.

Specific comments

L40 We have added a sentence to be more precise in our definition of the CBL equilibrium.

L140 (new L150) We have modified the sentence to explain that with favourable we meant weak synoptic conditions.

L150 We have modified according to the suggestion of the referee.

L178 For the sake of completeness in the criteria defining the IOP we have included the momentum structure.

We have corrected the labelling

Figure 3 We have verified the height in which occur the largest shear. It is around 700 m, 100 m above the boundary layer height. We agreed with the referee that shear must be included in future analysis of the boundary layers observed during BLLAST. However, in the selected day it was above the entrainment zone.

Figure 4. Following the advice of the referee we have completed the caption of the figure.

Paragraph including L290. We agree with the referee that there are a lot of studies investigating the impact of surface heterogeneity due to the land surface and topography effects. However, in our opinion, the uniqueness of our research is that we are using a conceptual mixed-layer model that is very close in scale to the measurements. In that respect, we can estimate how large-scale forcing influence the boundary layer dynamics from a bottom-up approach, closely constrained by the surface and upper air observations. We have introduced modifications in this paragraph to make it more comprehensively.

Section 4.2.1 We have added some sentences to improve the discussion.

P9 (L 593) Corrected.

P9 (Figure 6). We have included the suggestion from the referee.

Section 6.1. We agree with the reviewer. However, in all the paper we have kept potential temperature and specific humidity separately to make a clear analysis of the two state variables.

L812 Corrected.

L830 We have added a sentence to be more precise.

L840 We have included a sentence to improve the paragraph. Advection is constant on time. We have modified Table 1 to make it clearer.

Figure 7. Yes. We have clarified this at the beginning Section 6.