Answer to the reviewer 2 about the manuscript entitled : 'Boundary-layer turbulent processes and mesoscale variability represented by Numerical Weather Prediction models during the BLLAST campaign' by F. Couvreux et al.:

First, we wish to thank the reviewer for her/his review. Below is our response (in blue) to the comments on a point-by-point basis. References to how we plan to modify the text is indicated in italic.

General comments:

After careful reading, my general impression is that the manuscript contains relevant and sound scientific findings as result of a massive analysis work, and deserves publication. It is a pity, though, that the exposure of such a wealth of results is rather poor. The reading is hard and fragmented, with too many inaccuracies and repetitions. The style needs improvement before the paper can be accepted for publication. To my opinion, the figures are simply not to the ACP standard and require a complete rethinking, not only for publication but even for review. I have struggled to get useful information out of the figures in their current format. I leave the editor the decision if they can be accepted as they are. The structure and 'paragraphing' used for the discussion of the results, on the other hand, seems appropriate.

We have tried to improve the layout of the paper by improving the quality of the figures and trying to suppress repetitions and inaccuracies. Figure 1 has been enlarged to be more visible. A new Figure 2 has been added to present the orography in the real world and in the different models. In particular, old figures 2, 3 and 4 have been simplified and now only show the mean curves as you proposed (cf answer to your specific comment below). A figure presenting the overestimation of the sensible heat fluxes in ARPEGE has also been added and is presented with error bars to show the standard deviation in the observations. The colors of Figure 7 have been modified. We suppressed the appendix for clarity. In addition, a native English speaker has checked out the entire manuscript. We hope that now the paper reads more easily.

Specific comments:

First two lines of page 3. I don't understand the meaning of the sentence. Can you please clarify?

Those two lines have been modified to '*Several recent studies also assessed the behaviour of single-column models to represent the entire diurnal cycle by comparison to LES.*'

Second line of page 3. '. . .single-column runs ARE often used as a simplified configuration OF a full 3D simulation ...' . Also, define 'single-column' models. Done, we now define single-column model as *one single column of the atmosphere that integrates the same suite of parameterizations as a full 3D simulation.*

Line 10 page 3. '. . .are quite rare compared to. . .' Done

Define tke the first time you introduce the turbulent kinetic energy and (same for IOP). OK This is now done on page 2 line 7 for the turbulent kinetic energy. IOP and tke are introduced twice, once first in the abstract and a second time in the main text.

Remove 'days' after IOP. Done throughout the text

Page 4, line 7.' . . . all surface stations measuring turbulence. . .' Done

The first two lines of section 2.3 can be removed, or at least, rephrased. 'Due to the coarse grid spacing. . .' Following your advice, we have rephrased the sentence as : « *Due to the coarse grid spacing of each model, real surface heterogeneities, topography and local circulation are not expected to be reproduced by models.*"

Page 6, line 15. '. . .the tke is below . . .. In the observations. . .' Done

Page 6, line 18. '. . .usually provides an estimate. . ., based on the vertical gradient of the relative humidity' Done

Page 7, line 5. '. . .at a given hour h correspond. . .' Done

The paragraph at the beginning of section 3 should be moved to the methodology section Page 11.
As you proposed, we moved the paragraph at the beginning of the section 3 to the end of the methodology section (in the part 2.3).
line 12. '. . .variables indicating different. . .' Done

Page 11, line 26. '. . . the boundary layer depth estimated by the model with the boundary layer depth estimated by the observations'. Done

Page 11, line 29. Please provide reference We have added in the methodology section some words on the comparison of the boundary-layer height diagnosed from the tke profiles versus boundary-layer height diagnosed from thermodynamical profiles.

Page 11, line 30. '. . .the temporal variability in terms of maximum boundary layer depth from on a day to the other. . .' is not clear. Do you mean the variability diurnal cycle?
We wanted to comment in terms of variability from one day to the other of the maximum boundary-layer depth of the day, so not the diurnal cycle. This has been changed to '*Both AROME and ARPEGE are able to reproduce days with higher boundary layers compared to days with shallower boundary layers with for instance a shallower boundary layer during the hot days and, the highest on 30 June, 1 July and 2 July if we discard the 14 and 15 June.*'

Page 11, line 34. '. . .the physics of the models respondS . . .' Done

The end of page 8 is a left-over of some copy-paste?
We are sorry that this happens. In fact, at the last minute, we had to use another template provided by the journal. In fact this was note a left-over of some copy-paste but a foot note. However, due to no changes in the police, neither in its side, it really looks like a copy-paste. We decided to suppress the footnote and included the information into parenthesis in the main text.

The first sentence of section 3.3 is unnecessary (already said a few times) We suppressed this sentence.
In the Appendix the last words sounds strange..' A=3 would be a value too large'.
Eventually, we decided to suppress the Appendix and therefore the supplementary 2.

Table 2. The roughness length is measured in meters
You are right. We have added the unit in this table.

Figures 2. I would suggest to keep only the mean curves and/or to replace the time series with box and whiskers, four for each IOP (obs plus three models) or three is you prefer to plot the bias (obs – mods). Add the legend to all figures if possible, to help the readers.
As you propose, we decided to only keep the figures showing the mean curves. We also added a figure to show the over-estimation of the sensible heat flux for ARPEGE point (now Figure 3). In this figure, we have use bars to indicate the horizontal standard deviation of observations.
Eventually, now a complete caption is present for each figure.

Figure 6. The choice of colours is unfortunate. Why not blue, red and green for example? The graph is anyway difficult to interpret, please try to make clearer (in the caption please use 'becomes' in place of 'goes').

We have changed the colours. The colours are chosen here to reflect the daytime to nighttime evolution with red for 1200 profile, orange for 1400, dark-green for 1600, purple for 1800 and grey for 2000. We also changed 'goes' to 'becomes'.