Royal Meteorological Institute,
Brussels, Belgium

16 November 2013

Ref: gmd-2013-86

Dear Reviewer 2,

First, we would like to thank you for your careful and constructive review of our paper. We have tried to follow all your requests as best as we could and believe that it helped to substantially improve the manuscript. A point by point explanation follows below for your general and detailed comments:

General comments:

- *I wonder why you don't utilize more observations in your validation study. In many figures and tables results based on only one station at the time are discussed. Some times a few stations. For example, why don't you utilize all observations present in the Belgium model domain (Figure 1), i.e. also France, the Netherlands and Germany? This would give a better statistical basis for your study and make your conclusions more strong. Now, I think one can question how general your conclusions are due to the limited number of stations.*

Reply: We agree with the reviewer that using more observations would make the conclusions of the study more robust, however, the philosophy behind the evaluation exercise presented in this manuscript is that:

* Each participating ALADIN country could test the performance of SURFEX on **their domain** using the verification scores that are put forth in the **national operational context** of each country. Therefore for Belgium, for example, we were more interested to examine the performance of SURFEX using the synoptical stations belonging to **our** national network. We present some graphical results only for the station of Uccle, but in Table 2 we give also a summary for 8 synoptical stations over Belgium classified as flat topography, high topography, and coastal stations. The same strategy was followed by the other participating countries, some example are given for Slovenia, Morocco, and Turkey. For Hungary, the scores were calculated over some selected Hungarian stations (not shown), but also for the whole Hungarian domain (see Fig. 16, 17, 18, 19).

* In order to test the impact of the novel features developed in SURFEX on the scores, we need to select some stations where the effect could be seen. For example the effect of introducing TEB will not be assessed if we calculate the scores over the whole Belgian domain. The same is valid for the benefit of using a new physiographic database.

Royal Meteorological Institute,
Brussels, Belgium

- *The font size of the labels and legends in most of the figures is too small and in some cases almost impossible to read. Please go through the figures and improve readability.*

Reply: We agree, a new set of improved figures will be provided with the revised manuscript.

Detailed Comments:

- *Page 4056, line 1: Please remove "upper" as it confuses more than it helps I think. Also later in the text I would recommend to exclude "upper" and only refer to the "atmosphere".*

Reply: We agree, "upper" is now removed in the revised manuscript.

- *Page 4058, lines 25-26: I recommend to remove "is not ... we would like".*

Reply: Done.

- *Page 4064, line 4: Please specify version of ECOCLIMAP used.*

Reply: We now write in the revised manuscript "...**GTOPO30, ECOCLIMAP (Masson et al., 2003) and FAO maps (FAO, 2006) for soil texture)"**

- *Page 4065, lines 11-12: How do you know it is "too little near-surface vertical turbulent mixing" that causes the cold bias? Is there another study with SURFEX indicating that or is the Best and Hopwood study really so general so their conclusions are valid for this specific problem?*

Reply: Two other references are added now in the revised manuscript, where the origin of the cold bias were studied using SURFEX: Hamdi (2009) and Masson and Seity (2009).

- *Page 4066, line 7: Better to say directly "too high" instead of "higher" I think.*

Reply: Done.

- *Page 4066, line 9: Mistake with sign. Replace "+/-" with "+", right?*

Reply: Corrected.

- *Page 4066, line 20: Mistake with sign. Replace "+/-" with "+", right?*

Reply: Corrected.

Royal Meteorological Institute,
Brussels, Belgium

- *Page 4066, line 24: Remove "too" or if you keep "too" it should be followed by "compared with...".*

Reply: We now write in the revised manuscript "...**the use of CANOPY improves the forecast of near-surface air temperature at night for strong stability conditions.**"

- *Page 4069, lines 20-27 and Figure 11: Why don't you show/discuss bias results?*

Reply: We agree, we now add in the revised manuscript a sentence about the bias reduction when using TEB over Istanbul city but without adding a new figure since we think that we already have a large number of figures. We now write in the revised manuscript "**During the night the average mean bias of the 2m temperature is reduced (not shown), with an average cold bias of -1 °C for ALARO with SURFEX versus almost 0°C for ALARO with SURFEX and TEB. Also during the day the average mean bias of the 2m relative humidity is significantly reduced (not shown), with an average of +15 % for ALARO with SURFEX versus 8% for ALARO with SURFEX and TEB**.".

- *Page 4074, line 16: Replace "higher" with "too high".*

Reply: Corrected.