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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Lifted Temperature Minimum during the atmospheric evening transition" *by* E. Blay-Carreras et al.

Anonymous Referee #3

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Review of acp-2014-571, "Lifted Temperature Minimum during the atmospheric evening transition" by E. Blay-Carreras et al.

General:

This article describes careful tower observations of small-scale Lifted Temperature Minima (LTM) during BLLAST. These occurred at about 10 cm height above the ground during the evening transition in rather calm conditions. There is however some wind (1-2 m/s at 2m, Figure 4) and weak turbulence (Figure 6). The article is well-written and quite useful in presenting observations around this interesting but rare phenomenon. What I missed was the presentation of the observed moisture profiles. These are important input for radiation codes, e.g. for modellers who would like to try and simulate

the observed cases.

Specific comments:

When looking at the potential temperature profiles, especially those of Tower 2 of Figure 2, one gets the impression that above the LTM at about 10 cm there is actually a temperature maximum in every case at about 20-30 cm height, and that the LTM could here be in fact the side-result of this sharp maximum being temporarily created into the otherwise normal evolution toward an inversion caused by the rapid cooling of the ground (Figure 8). The maximum could be driven e.g. by the strong radiative warming from 0 to about 50-70 cm above a rapidly cooling surface (Edwards 2009a,b, Savijarvi 2006, 2014) being temporally dominating at 20-30 cm over turbulent cooling, which gets strong and dominating only in the lowest 10-15 cm or so under fairly calm conditions (see the references above). This is open to discussion, of course.

Edwards JM 2009a. Radiative processes in the stable boundary layer: Part I. Radiative aspects. BLM 131: 105-126. Edwards JM 2009b. Radiative processes in the stable boundary layer: Part II. The development of the nocturnal boundary layer. BLM 131: 127-146. Savijarvi H 2006. Radiative and turbulent heating rates in the clear-air boundary layer. QJRMS 132: 147-161. Savijarvi H 2014. High-resolution simulations of the night-time stable boundary layer over snow. QJRMS 140: 1121-1128.

Details: - References are not normally allowed in the Abstract. - Page 27783, line 9: . . . longwave net radiation . . . - p 27783, l 18: . . . increases . . . - p 27783, l 19: . . . This increase in the . . .

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 27769, 2014.