

The atmosphere is cooled from the top, indeed

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In general, the atmosphere near the ground is considered to be cooled by the ground surface, and therefore, it is stratified from the bottom of the atmosphere. However, according to the air temperature that we observed, stratification starts from the top of the boundary layer contrary to the general assumption. This indicates that the atmosphere in the ABL is mainly cooled by radiation. To confirm this nocturnal cooling process in the atmospheric boundary layer (ABL), we performed computations using a one-dimensional radiation model. The infrared cooling rate is computed as 2 K/day by Rowe and Liou (1978). However, the cooling process in the ABL is different from that described in previous studies. This is considered to be because in previous studies, radiative equilibrium in the atmosphere is studied. On the other hand, our study focuses on the ABL and daily variation. Therefore, we verified the data via calculations concerning the gray atmosphere in the ABL, which has transient properties. The results of the computations show that the atmosphere starts cooling from the top of the ABL.

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