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Effects of baroclinicity, capping inversions and large-scale vertical motions over the A,B,C resistance law's functions in neutral and stable PBL

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In the new paper of Zilitinkevich and Esau (submitted to "Quart. J. Roy. Met. Soc") the resistance and heat transfer laws are revised accounting the non-local effects caused by the free-flow stability, through new composite stratification parameters. The baroclinic effects are indirectly taken into account through the actual PBL's depth and the structure of PBL is also analyzed at capping inversion.

In the present work on the basis of that approach and some additional considerations about the vertical structure of PBL, it is determined the explicit dependence of A,B,C on the baroclinic parameters and those characterizing the capping inversion. This leads to respective corrections ΔA , ΔB , ΔC about the basic functions determined by Zilitinkevich and Esau.

Within the frameworks of this formulation it is studied the influence of the large-scale vertical velocity, induced by the orographic and thermal heterogeneities over the depth h of PBL. It is determined a general expression for the correction Δh , depending on the mutual configuration of these heterogeneities and the synoptic advection of warm and cold.

It is studied in details the specific case of coastal area at different orientation of flow about the coastal line and stratifications over the land and sea. The estimations show that effects are significant.

The results can be used for parameterization of environmental, climate and weather prediction modeling.