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Methodology for Determining Multilayered Temperature Inversions

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Abstract

Temperature sounding of the atmospheric boundary layer (ABL) and lower troposphere exhibits multilayered temperature inversions specially in high latitudes during extreme winters. These temperature inversion layers are originated based on the combined forcing of local and large scale synoptic meteorology. At the local scale the thermal inversion layer forms near the surface and plays a central role in controlling the surface radiative cooling and air pollution dispersion; however, depending upon the large scale synoptic meteorological forcing, an upper level thermal inversion can also exist topping the local ABL.

In this article a numerical methodology is reported to determine thermal inversion layers present in a given temperature profile and deduce some of their thermodynamic properties.

The algorithm extract from the temperature profile the most important temperature variations defining thermal inversion layers. This is accomplished by a linear interpolation function of variable length that minimizes an error function. The algorithm functionality is demonstrated on actual radiosonde profiles to deduce the multilayered temperature inversion structure with an error fraction set independently.

Fig. 1.

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