



Is 2K/km the optimal threshold for thermal tropopause definition?

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The standard definition of the thermal tropopause involves the determination of the level at which the lapse rate decreases below 2 K/km (WMO, 1957). As lapse rates transition abruptly from the troposphere to the stratosphere, this threshold provides a reasonable compromise between characteristic upper troposphere and lower stratosphere lapse rates. However, because characteristic lapse rates depend to some extent on latitude and season, and may also vary across different climates, it is possible that other thresholds might be more appropriate under different conditions.

In this work we define “optimal” lapse rates for thermal tropopause definition as those thresholds which give the most contrast (in a statistical sense) between the tropospheric and stratospheric air masses, using different objective criteria. These definitions are tested in reanalysis data (ERA, NCEP) and in other higher-resolution datasets, as well as in simulations of cold and warm climates. Although the optimal thresholds change slightly with latitude, season and dataset, and across different climates, the values found were remarkably close to the standard 2 K/km criterion.