Characteristics of the Tropical Tropopause Inversion Layer using High-Resolution Temperature Profiles by COSMIC GPS-RO

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This study focuses on the sharp variations of the temperature structure near the cold point tropopause (CPT), which is called the tropopause inversion layer (TIL). We analyze the height variations of the Brunt-Väisälä frequency squared (N^2) from the vertical gradient of the temperature data retrieved from the COSMIC GPS-RO in 2007-2016 using the Full Spectrum Inversion (cosmicfsi), which has the vertical resolution of about 0.1 km. This study describes new definition of tropical TIL utilizing high resolution of cosmicfsi that able to delineate the thin layer of static stability near tropopause. We examine the statistical distribution of the TIL parameters; such as *S*-aCPT, which is the difference between the maximum N^2 above CPT ($maxN^2$) and N^2 at CPT, and *S*-bCPT, the difference between the minimum N^2 below CPT ($minN^2$) and N^2 at CPT, the height difference distance for $maxN^2$ and $minN^2$ relative to CPT (*dH*-aCPT and *dH*-bCPT). The mean values of *S*-aCPT and *S*-bCPT are 6.2 $\times 10^{-4}$ s^{-2} and 4.0 $\times 10^{-4}$ s^{-2}, respectively, and the standard deviation of *S*-aCPT is approximately three times larger than that for *S*-bCPT. The mean and standard deviation of both *dH*-aCPT and *dH*-bCPT are 0.4 ±0.2 km and 0.5 ±0.2 km, respectively. We find *S*-aCPT reached up to $> 10 \times 10^{-4}$ s^{-2} from its random frequency distribution and *dH*-aCPT was mostly < 0.5 km, indicating a very sharp thermal gradient due to very low temperature. We also discuss the TIL depth (*dH*) which is defined as height difference at N^2 equal to 80% of $maxN^2$.

Keywords: COSMIC, GPS-RO, Full Spectrum Inversion, Tropopause Inversion Layer

