Spatial and Temporal Distribution of Static Stability in Middle Atmosphere Observed with Rocketsonde Data

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The dataset containing the rocketsonde observations obtained by global network over 1975-1990, which is released by the SPARC Data Center, are used to estimate atmospheric static stability in height range 10-60 km. At each station, squared Brunt-Vaisala frequency (N_2) is estimated after a quality control procedure by using the raw measurements. Then, monthly mean estimates are created at the regular height grids of 500m interval. Latitudinal variation of N2 is represented by the estimation results at six stations, Ascen at 8S, Antig at 17 N, Brsnk at 22N, Capek at 28 N, PtMugu at 34 N and Wallops at 38N. Long-term mean of N_2 over 1975-1990 shows that above 30 km, the Brunt-Vaisala frequency at different latitudes are substantially homogeneous from the southern tropics to northern mid-latitudes. Three distinct layers are observed in the vertical. One is in height range 30-40 km where the N_2 exhibits constant value. The other two are in range 40-50 km and in the range that is above 50 km, where N2 decreases with height with significant stronger decreasing rate in the higher layer. Below 30 km, while N_2 at both latitudes exhibits substantial increase across the tropopause, significant difference is seen in between the height variation at low and high latitude. Significant annual variation of N_2 is observed at all the sounding sites, and semi-annual variation is seen at low latitudes. Reconstruction of the seasonal cycle further discloses that clear propagation in the vertical is seen in the phase of the annual (semi-annual) cycle at different heights. Additionally, application of Lomb-Scargle periodogram analysis with the 15-year time series discloses that quasibiennial oscillation (QBO) signal can be clearly seen in the equatorial region in height 20-40km. The details will be presented in the talk.

Keywords: static stability; vertical structure; annual variation; QBO