Determination of Wave Turbopause and Investigations on Possible Wave Propagation Beyond

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Turbopause is conventionally considered to be the highest altitude in the Earth's atmosphere where all turbulences cease. Around the usual radar turbopause, studies show that there exists a zero crossing for wind fields where all waves, especially gravity waves can undergo breaking and dissipation. Recently, the concept of wave turbopause have been introduced which is a height region slightly below the radar turbopause in the mesosphere where the temperature fluctuation field indicates a substantial increase in wave amplitudes in the vertical direction. This is determined by the sudden steady change in the slope of temperature fluctuations in the atmosphere. It is reasonable to think that all waves dissipate and are prevented from further propagation beyond the turbopause. But recent studies have shown that not only does the effect of waves induce drag at thermospheric heights, but waves like gravity waves can themselves propagate much higher heights than the turbopause. With this background, we analyze the kinetic temperature data of TIMED/SABER payload for four years. The temperature profile of the atmosphere from 20 km to 120 km in altitude is used with 1 km vertical resolution. The data is averaged zonally and a global latitudinal structure of the wave turbopause is first established. This is in agreement with the present understanding of the wave-turbopause. This is compared with the global latitudinal structure of the mesopause and the variability at different scales is looked into. This study then concentrates on the vertical propagation of gravity waves. After removing the contributions from planetary waves using well established methods, the gravity wave amplitude and phase structures are constructed. Investigation is carried out to find out the altitude of maximum wave breaking and dissipation at the wave-turbopause and the propagation beyond that.

Keywords: Turbopause, TIMED/SABER, MLT region