Geophysical Research Abstracts, Vol. 8, 00896, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00896

The Wave Turbopause: Concept and consequences

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Middle atmosphere temperatures show fluctuations that are different at different altitudes and latitudes. Temperature standard deviations σ have frequently been used as wave proxies in the literature. Vertical distribution of σ are presented here from CRISTA and SABER measurements. Vertical σ profiles show a kink (break) in the upper mesosphere which is interpreted as a “wave-turbopause”. Such a kink is also seen in vertical profiles of carbon monoxide mixing ratios of CRISTA indicating a transport barrier near to that turbopause. The height of the turbopause is found to vary strongly with both latitude and time of the year. Such altitude variations might be suspected to modulate the downward flux of atomic oxygen from the lower thermosphere to the upper mesosphere and thus influence ozone and related minor species here. To check on this we have analyzed the intensity of near infrared emissions (1.57 μm) of the hydroxyl layer in the upper mesosphere. We find, indeed, a close correlation between this intensity and the turbopause altitude: a) in their seasonal variations measured at a fixed station (Wuppertal, 51°N, 7°E), b) in their latitudinal variations measured during a north-south cruise of the research vessel “Polarstern” in late autumn. Corresponding analyses of NIR data from SABER are also being performed.