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Stratospheric NO_2 Climatology from Odin/OSIRIS Limb Scattering Measurements

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An NO_2 climatology, in terms of mean and standard deviation, as a function of latitude (5 deg bins), altitude (10-46 km in 2 km bins) local solar time (24 hours) and month is constructed based on the Odin/OSIRIS limb scattering data from 2002-2005. The measured profiles, given at specific local solar times, are scaled to all 24 hours using a 1-D photochemical boxmodel (PRATMO). Near global coverage is achieved with full latitude coverage around the equinoxes and limited coverage in the winter hemisphere.

The mean NO_2 fields at a specific local solar time involves high concentrations in the polar summer, peaking at around 25km, with a negative equator-ward gradient. Distinct high levels between 40-50 degrees at 30 km in the winter/spring hemisphere are also found, associated with the so called *Noxon-cliff*. The diurnal cycle reveals lowest NO_2 concentrations at noon and steep gradients around sunrise and sunset. The 1-σ standard deviation is generally quite low, around 20%, except for winter and spring high latitudes conditions where values are well above 50% and stretch through the entire stratosphere, a phenomenon probably related to the polar vortex. It was also found that NO_2 concentrations are log-normally distributed rather than gaussian.

Comparisons to a climatotology based on CTM (REPROBUS) data for the same time period reveal relative differences below 20% in general which is comparable to the estimated OSIRIS systematic uncertainty. Clear exceptions are the polar regions in winter/spring throughout the atmosphere and equatorial regions below 25 km, where OSRIRIS is relatively higher by 40% and more. These discrepancies are most likely attributable to limitations of the CTM, but is has to be further investigated.