Validation of NO2 measurements from the Improved Limb Atmospheric Spectrometer (ILAS) with the version 5.20 retrieval algorithm

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We compare ILAS NO2 mixing ratios with several balloon-borne and satellite NO2 mixing ratios in some limits.

From comparisons with balloon-borne NO2 data, the random difference in NO2 at 25-30 km was estimated to be 0.1-0.3 ppbv (~12%). The systematic difference in NO2 (ILAS minus balloon) at 25-30 km was estimated to be 0.3-0.6 ppbv (12-19%). An absence of diurnal correction along the line of sight is not a significant source of uncertainty above 25 km. We suggest that ILAS NO2, which are lower than 1.0 ppbv and/or associate with optically thick clouds, should not be used for the scientific analysis.

An agreement with POAM II at 35 km is very good. The ILAS NO2 at 25 km is systematically 30% higher than POAM II. Agreements with HALOE at 25-40 km are as good as +/-10%.

The Improved Limb Atmospheric Spectrometer (ILAS) on board the Advanced Earth Observing Satellite (ADEOS) measured nitrogen dioxide (NO2) using the solar occultation from November 1996 to June 1997 over high-latitude regions on both hemispheres. We compare ILAS NO2 mixing ratios with several balloon-borne and satellite NO2 mixing ratios in some limits.

From comparisons with balloon-borne NO2 data, the random difference in NO2 at 25-30 km was estimated to be 0.1-0.3 parts per billion by volume (ppbv) (~12%). The systematic difference in NO2 (ILAS minus balloon) at 25-30 km was estimated to be 0.3-0.6 ppbv (12-19%). Although the diurnal correction of line of sight has not been made, an absence of diurnal correction is not a significant source of uncertainty above 25 km. We suggest that ILAS NO2 mixing ratios, which are lower than 1.0 ppbv and/or associate with optically thick clouds, should not be used for the scientific analysis at all altitudes, especially below 20 km and above 45 km.

The agreement with the Polar Ozone and Aerosol Measurement (POAM) II at 35 km is very good. The ILAS NO2 at 25 km is systematically 30% higher than POAM II. Agreements with the Halogen Occultation Experiment (HALOE) measurements at 25-40 km are as good as +/-10%. The systematic differences between POAM II and HALOE measurements (POAM II minus HALOE) at 25, 30, and 35 km were estimated to be -17, -12, and +3%, respectively.