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## Global distributions of nitric acid from IASI /MetOP measurements

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**Abstract.** This paper presents the first global distributions of HNO<sub>3</sub> total columns acquired by the Infrared Atmospheric Sounding Interferometer (IASI) instrument, launched onboard the MetOp platform in October 2006. IASI is an infrared nadir-looking Fourier transform spectrometer providing atmospheric radiance spectra at 0.5 cm<sup>-1</sup> spectral resolution, from which temperature and infrared absorbing gas concentration profiles are retrieved with global Earth coverage twice a day. A first analysis of the IASI measurements in terms of information content demonstrates the possibility of retrieving a total column for HNO<sub>3</sub> at all latitudes with a maximal sensitivity in the middle stratosphere. The retrievals are performed from IASI spectra in the atmospheric window using a fast radiative transfer model and inversion software (FORLI) relying on the Optimal Estimation Method. The operational processing of HNO<sub>3</sub> total columns is achieved since March 2008. We show that FORLI-HNO<sub>3</sub> performs well at all latitudes (RMS of the spectral residuals around 2.3 × 10<sup>-6</sup> W/m<sup>2</sup> sr m<sup>-1</sup>) and provides HNO<sub>3</sub> total columns with on average statistical errors of about 12%, reaching the threshold value of 32% at the equatorial belt. The global distributions of the retrieved total columns for one year (from March 2008 to February 2009) are presented and discussed with emphasis given to seasonal and interhemispheric variations. Local seasonal variations at 6 specific locations are also described and discussed in comparison with MLS volume mixing ratios at 46.5 hPa. The seasonal cycle observed in Polar regions is highlighted, with maxima observed in fall-winter and minima during spring-summer. The denitrification inside the Antarctic polar vortex during winter is clearly revealed with unprecedented horizontal resolution: HNO<sub>3</sub> columns decreasing down to about 1 × 10<sup>16</sup> molecules cm<sup>-2</sup> are observed, which is consistent with the lower values of temperature observed between 50 and 15 hPa (~20–25 km) and the resulting formation and sedimentation of polar stratospheric clouds. During the same period, the collar region of high quantities of HNO<sub>3</sub> at the vortex edge is also observed around 65–60° S latitude. Preliminary correlations

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between IASI derived HNO<sub>3</sub> and O<sub>3</sub> columns inside the polar vortex are presented and discussed.

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