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8-years time evolution of stratospheric HNO₃ columns: investigation of the drivers of variability and of the link to O₃

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Nitric acid (HNO₃) is one of the main species involved in the stratospheric ozone cycles. Its spatial distribution was until recently only available from limb-sounding instruments but the IASI nadir-viewing sounder provides HNO₃ concentrations distributions since 2007 with unprecedented spatial and temporal sampling.

In this presentation, we will briefly review the characteristics of HNO₃ profiles retrieved from IASI measurements, in terms of vertical sensitivity and error budgets. The results from a validation exercise made by comparing the IASI-retrieved HNO₃ profiles and columns with those from ground-based FTIR measurements will also be presented.

The focus of the presentation will then be on the time evolution of the HNO₃ columns obtained from IASI measurements since the end of 2007. Global distributions as well as latitudinal time series will be shown and analysed, with a focus on total and stratospheric columns in the polar regions.

First results of a multivariable regression model will also be shown and discussed with regard to the main chemical and dynamical processes driving the seasonal and inter-annual variability of HNO₃ concentrations. This will be done through the use of a regression model including dynamical variables accounting for the atmospheric circulation and other proxies accounting for the chemical reactions between HNO₃ and other components of the atmosphere.

In addition to HNO₃, IASI has the capability to measure accurate ozone columns in at least two stratospheric layers. This offers the possibility to analyse jointly the time evolution of the two species. Preliminary results from such a combined analysis will be shown, putting emphasis on the unexpected patterns of variability.