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Spatio-temporal variations of HNO_3 total column from 9 years of IASI measurements - A driver study

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Nitric acid (HNO_3) is known to influence the ozone (O_3) concentrations in the polar regions, because of its role of reservoir for NO_x and of its capacity to form polar stratospheric clouds (PSCs) when temperatures decrease. However, few studies have attempted to address the spatio-temporal variations of HNO_3 and, in particular, what factors drive this variability.
In this presentation, we will briefly review the characteristics of the HNO_3 profiles retrieved from IASI, a nadir instrument onboard Metop that provides observations with an unprecedented spatial and temporal sampling. The 9-year HNO_3 time series, covering the entire globe, will also be shown and shortly described.
The focus of the presentation will be on the results of the first multivariate regression analysis applied to the HNO_3 total columns time series. The analysis is based on equivalent latitudes and uses a multivariate regression model to identify what variables are responsible for HNO_3 variability and to quantify their respective influence. The variables included in the model are: an annual cycle, the solar flux, the quasi-biennial oscillation, a multivariate ENSO index, the Arctic and Antarctic oscillations and the volume of PSCs. While the results were analysed for all latitudes, focus will be put on the polar regions, where a clear distinction between the inner and outer vortex (in the southern hemisphere) can be confirmed. Also, we show the large influence of the PSCs and the impact of their inclusion (or omission) in the regression model in the southern as well as in the northern polar regions.
Finally, preliminary results of a joint study comparing HNO_3 and O_3 time series in terms of explanatory variables will be shown. The long IASI time series covering the polar regions of both hemispheres during the whole year allow a precise monitoring of the polar processes at play during the winter, and applying multivariate regression to both HNO_3 and O_3 allows identifying the potentially common trends and influencing factors in their time evolution.