EGU21-10153, updated on 19 Sep 2021
https://doi.org/10.5194/egusphere-egu21-10153
EGU General Assembly 2021

N_2O retrievals from IASI: a new strategy, its validation and a preliminary 13-years trend assessment

Sophie Vandenbussche[1], Bavo Langerock[1], Martine De Mazière[1], and the NDACC FTIR team and TCCON Partners[*]

[1]Royal Belgian Institute for Space Aeronomy, Sources and sinks of atmospheric composition, Brussels, Belgium (sophie.vandenbussche@aeronomie.be)

[*]A full list of authors appears at the end of the abstract

N_2O is the third anthropogenic greenhouse gas, after CO_2 and CH_4. N_2O is about a 1000 times less abundant than CO_2, but is a much stronger greenhouse gas (265 times stronger, for the same amount of gas). N_2O has an atmospheric lifetime of about 120 years, and resides mostly in the troposphere and lower stratosphere. N_2O is also the principal source of nitrogen in the stratosphere, participating in the ozone destruction.

Although N_2O emissions are mostly natural as a part of biogeochemical cycles, a significant part of the emissions is anthropogenic, linked to agriculture, industry and transport. The N_2O concentrations are continuously increasing since the industrial era. Because its greenhouse potential is very high, identifying and regulating the anthropogenic N_2O emissions is crucial for climate change mitigation.

The Infrared Atmospheric Sounding Interferometer (IASI) is a nadir viewing satellite instrument, measuring the outgoing radiation in the Infrared range. It flies on board the Metop satellite series, on a polar sun-synchronous orbit, and has been providing data since 2006 with a succession of 3 instruments. The follow-up instrument, IASI-NG (new generation), is already in preparation and will not only ensure data continuity for at least an additional decade, but it will also provide improved performances.

In this work, we present N_2O profiles with a limited resolution of maximum 2 degrees of freedom, and the corresponding integrated columns, retrieved from IASI measurements using a new retrieval strategy. We assess the quality of our data through comparisons with Network for the Detection of Atmospheric Composition Change (NDACC) and Total Carbon Column Observing Network (TCCON) measurements. We will discuss the main “trouble makers” in this retrieval, i.e. the non-retrieved parameters that have the highest impact on the resulting N_2O data quality. Finally, we will discuss a preliminary trend assessment derived from the retrieved time series covering 13-years.

NDACC FTIR team and TCCON Partners: NDACC FTIR team: K. Strong, J. Notholt, J. Hannigan, T.

Blumenstock, J. Mellqvist, M. Makarova, R. Sussmann, E. Mahieu, T. Nagahama, G. Toon, I. Morino, M. Schneider, M. Grutter, G. Mengistu Tsidu, J. Notholt, M. De Mazière, D. Griffith, D. Smale, H. Nakajima; TCCON Partners: Goo, Feist, Notholt, Warneke, Morino, Velazco, Wennberg, Griffith, Iraci, Wunch, Strong, Sussmann, Schneider, Hase, Sherlock, Connor, Pollard, Petri, Schrems, Té, Jeseck, De Mazière, Shiomi, Kivi