Nitrous oxide observations from GOSAT-2/TANSO-FTS-2: Evaluation and potential

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Poster

Nitrous oxide (N_2O), with a lifetime of ~120 years, is the third most important greenhouse gas after carbon dioxide (CO_2) and methane (CH_4) contributing to global warming. It has a global warming potential 300 times greater than CO_2 on the 100-year horizon. N_2O emissions are not regulated by the Montreal Protocol and, although subject to the Kyoto Protocol, the ~0.25%/year increase in N_2O observed over the last 10 years is expected to continue until 2100. N_2O emissions involve both biotic (living organisms) and abiotic (environmentally induced e.g. water, soil, air) processes and are: 1) 60% natural, and 2) 40% anthropogenic. The annual average of N_2O in the atmosphere is about 332 ppb (for the year 2019).

Despite its importance, tropospheric N_2O measurements and surface emissions/sources remain understudied globally, with limited surface observations. However, sparse FTIR/NDACC instruments monitor N_2O profiles and satellite observations performed in the thermal infrared (TIR) from IASI (Ricaud et al., 2009; Chalinel et al., 2022), AIRS and GOSAT (Kangah et al. 2017) provide valuable global data. GOSAT-2/TANSO-FTS-2, with some sensitivity to lower tropospheric N_2O, offers potential studies on surface emissions using inversion methods.

This study evaluates the quality of GOSAT-2/TANSO-FTS-2 N_2O observations for 2019. Comparisons with ground-based observations, IASI (Chalinel et al., 2022), NDACC N_2O profiles and chemical transport models will assess the reliability of GOSAT-2 measurements at different atmospheric levels. The study includes discussion of measurement sensitivities, evaluation results, and potential for inverting N_2O surface fluxes.

References:

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