Abstract IASI 2024 Conference

Spatiotemporal variability of ammonia (NH_3) derived from the future IRS geostationary satellite and IASI observations

Nadir Guendouz[1], Camille Viatte[1], Anne Boynard[1,2], Sarah Safieddine[1], Carsten Standfuss[2], Solène Turquety[1], Martin Van Damme[3,4], Lieven Clarisse[3], Pierre Coheur[3], Pascal Prunet[2], and Cathy Clerbaux[1,3]

1. LATMOS/IPSL, Sorbonne Université, UVSQ, CNRS, Paris, France
2. SPASCIA, Ramonville-Saint-Agne, France
3. Université libre de Bruxelles (ULB), Spectroscopy, Quantum Chemistry and Atmospheric Remote Sensing (SQUARES), Brussels, Belgium
4. Royal Belgian Institute for Space Aeronomy, Brussels, Belgium

Ammonia (NH_3) is an atmospheric pollutant mainly emitted by the agricultural sector, which has an effect on public health since it is a precursor of fine particles ($PM_{2.5}$). The diurnal variability of NH_3 in the atmosphere and its transformation into particles are poorly constrained and strongly depend on meteorological parameters, in particular temperature. This strongly influences our ability to correctly simulate NH_3 emissions and associated particulate pollution events in atmospheric models.

The InfraRed Sounder (IRS) instrument which will be launched onboard the Meteosat Third Generation (MTG) satellite into geostationary orbit in 2025, will be able to measure NH_3 diurnal variabilities and its dependence to atmospheric temperature with more frequent measurements (every 30-45 minutes over Europe and Africa) and better spatially resolved observations (4 km x 4 km at the Equator and Greenwich meridian).

In this study, we assess the potential of the future IRS-MTG NH_3 observations. By using synthetic spectra generated from the 4A/OP radiative transfer model and the simulated atmospheric states derived from the CHIMERE chemistry-transport model, we compare spatial and temporal variabilities of NH_3 of the future IRS-MTG mission and the available IASI satellite NH_3 observations over the Brittany region (France) for July 2016.

The uncertainty analysis over the Brittany region is calculated using NH_3 Jacobians computed from the 4A/OP radiative code and the noise covariance matrix provided by each satellite. Vertical sensitivity and error budget are computed for IASI and IRS datasets. This study aims to demonstrate the improvements in terms of NH_3 variabilities with the future IRS-MTG satellite.