

**Faculty of Civil Engineering and Geosciences**

**Geoscoence and Remote Sensing**

**Master of Science Project release date: June 2023**

**Theme: Air Quality**

**Exploring TROPOMI NO2 Observation over Low Clouds and Fog**

**Objective**

Investigate the TROPOMI NO2 observations over low clouds and fog, to develop imporved data retrieval algorithms.

**Students profile**

We are looking for a student with apparent interest in atmospheric remote sensing. The research will be (partly) conducted at KNMI in De Bilt.

Candidates will be offered a standard government internship stipend as well as the use of public transport for travel to and from KNMI.

**Obligatory committee members:**

Dr. Pepijn Veefkind (TU Delft, Geoscience and Remote Sensing & KNMI)

**Information:**

- Dr. Jos De Laat (KNMI) jos.de.laat@knmi.nl

For students of Geoscience and Remote Sensing

**Summary**

The TROPOMI satellite instrument is highly successful in detecting air pollutants, including nitrogen dioxide (NO2). Its high spatial resolution and excellent signal-to-noise allows for observing localized NO2 sources. The TROPOMI data are therefore used by researchers around the world as well as for air quality forecasts and emission monitoring services.

In the R&D Satellite Observations department of KNMI, we are exploring possibilities to further improve the data quality for TROPOMI. Recent work has demonstrated that data over bright surfaces, such snow, ice and Sun-glint conditions, contain unique information because of the enhanced sensitivity to the lower atmosphere.

Further exploration of such bright surfaces recently revealed that low clouds and especially fog might also be useful for monitoring NO2. The example figure is for a situation on 9 April 2023 and shows that NO2 emissions from the Rotterdam region extend over a fog field over the North Sea. Similar examples were also observed over fog in central Europe during spring 2023. However, KNMI experts also noticed discrepancies and discontinuities for TROPOMI NO2 under such conditions, likely related to the retrieval algorithm.

The main goal of this MSc thesis study is to make an In-depth analysis of TROPOMI NO2 observations for conditions with low clouds and fog, and to explore possible algorithm enhancements for such conditions.

*TROPOMI data for 9 April 2023 over the North Sea. Top panel: NO2 column; bottom panel: cloud fraction*

