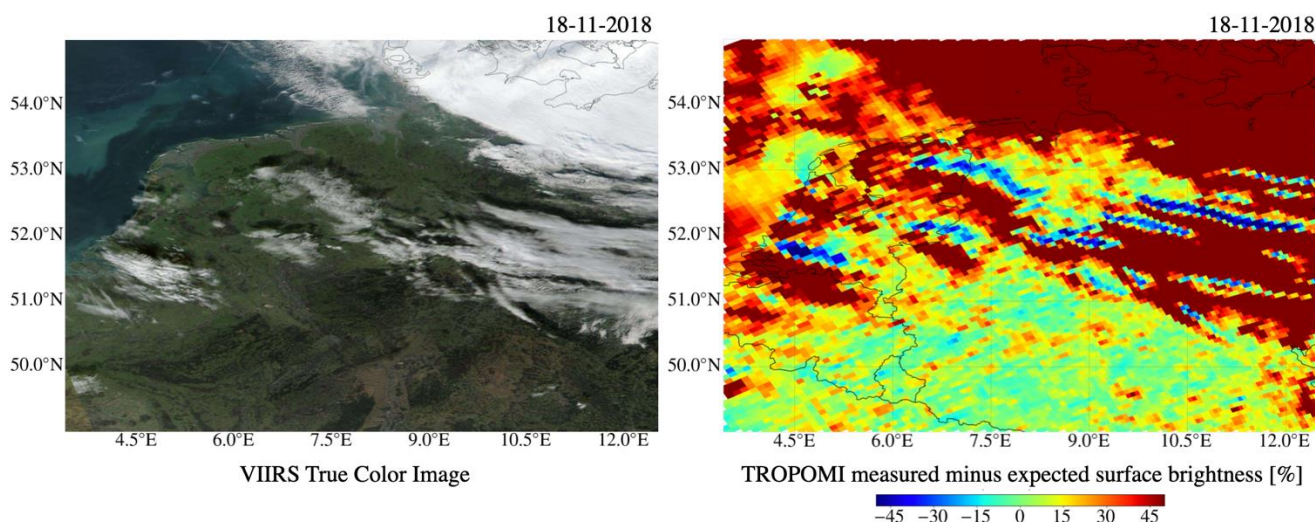


The impact of cloud shadows on TROPOMI air quality measurements (MSc. Thesis project)

Air quality monitoring from space becomes more and more accurate with the design of new satellite spectrometers. TROPOMI, launched in October 2017, is the satellite spectrometer with the smallest pixel size to date: 5.6 x 3.6 km. At this high spatial resolution, small scale features such as cloud shadows can be detected. Cloud shadows contaminate TROPOMI's air quality measurements, because they are not yet included in the air quality retrieval models used for TROPOMI.

R&D Satellite Observations KNMI, together with GRS TU Delft, is looking for a master student enthusiastic about science, to quantify the impact of cloud shadows on TROPOMI's nitrogen dioxide (NO₂) measurements. The student will (1) use the cloud shadow detection algorithm recently developed at KNMI to classify cloud, shadow and non-shadow pixels, (2) apply statistical analysis to large data sets of NO₂ inside and outside shadows, (3) look for relations between NO₂ shadow signatures and physical parameters such as cloud height, cloud fraction, surface albedo, viewing and illumination geometries and (4) try to explain the findings with the physics of radiative transfer. The quantification of the shadow impact on TROPOMI air quality measurements will be new information for the science community and will give insight into the possible ways to correct for the shadow contamination.



For satellite spectrometer instruments, the analysis of cloud shadows is a new topic. The innovative work of the student will increase the quality of TROPOMI's air quality monitoring and will also be relevant for future satellite spectrometer missions with even higher spatial resolutions, such as Sentinel-5, CO₂M and TANGO.

The project is programming intensive (Python). Experience with statistical data analysis, good communication skills and an interest in satellite remote sensing, differential optical absorption spectroscopy (DOAS) and radiative transfer, are essential. We are looking for a persistent student that is willing to dig deep into large data sets. The duration of the project is 6 months or longer and is preferably performed at KNMI.

Contact Victor Trees (victor.trees@knmi.nl) and Ping Wang (ping.wang@knmi.nl) for questions and to receive an entrance data analysis assignment in Python. After completion of the assignment, you will be invited at KNMI to communicate your results in an interview.

Ir. Victor Trees – PhD candidate GRS TU Delft / R&D Satellite Observations KNMI

Dr. Ping Wang – Research Scientist R&D Satellite Observations KNMI

Prof. dr. Pier Siebesma – Professor GRS TU Delft