Geophysical Research Abstracts
Vol. 21, EGU2019-13585-1, 2019
EGU General Assembly 2019

Satellite detection of desert dust in the ultraviolet and near-infrared with GOME-2 and TROPOMI

Piet Stammes, Jos de Laat, Gijs Tilstra, Olaf Tuinder, Deborah Stein, and Ping Wang

Royal Netherlands Meteorological Institute (KNMI), R&D Satellite Observations Department, De Bilt, Netherlands (stammes@knmi.nl)

Desert dust is the dominant natural aerosol type. It can be transported over thousands of kilometres and affects atmospheric processes over a large part of the globe. Satellite observations are indispensable to see the global distribution and transport of dust. Elevated atmospheric desert dust can be detected very well in the ultraviolet (UV) range using the absorbing aerosol index (AAI or UVAI). This index uses the UV absorption of mineral dust to make a colour contrast with the dust-free atmosphere. Since the surface albedo of deserts is very low in the UV, dust detection is equally possible over land and ocean. Furthermore, the AAI is hardly affected by clouds. There exists a multi-decade time-series of satellite AAI data.

The translation of AAI into aerosol optical thickness is however tricky, since the altitude of the aerosols is also affecting the AAI. Therefore, we have developed a method to retrieve aerosol height from the oxygen absorption band in the near-infrared (NIR) at 760 nm, the so-called O_2 A-band. Here we use the fast FRESCO cloud retrieval algorithm, which produces an effective height for optically thick aerosol plumes. The resulting satellite product is called the Absorbing Aerosol Height (AAH). This product has been developed for GOME-2, flying on board the Metop satellite series of EUMETSAT. The AAH is currently being produced for GOME-2 on Metop-A and Metop-B. In November 2018 the Metop-C satellite was launched and first GOME-2C data are expected in Spring 2019.

The distribution and the height of desert dust plumes is important information for the aviation sector. The EU H2020 project EUNADICS (www.eunadics.eu) aims at providing this information as a demonstration information system. GOME-2 satellite data of AAI and AAH are a key input to this system.

The satellite instrument covering both the UV and NIR spectral ranges with the highest spatial resolution is TROPOMI onboard the ESA Sentinel-5p satellite. Its spatial resolution of 3.5 x 7 km2 is one to two orders of magnitude better than GOME-2 (10 x 40 km2 for the AAI, and 80 x 40 km2 for the AAH), and therefore provides much more details. TROPOMI was launched in October 2017, and the operational data of AAI and FRESCO are available since mid-2018. The Aerosol Layer Height product of TROPOMI, based on a sophisticated retrieval from the O_2 A-band, will become available in the course of 2019.

We will show the latest results of desert dust detection with GOME-2 and TROPOMI.