



Undergraduate student measurements to validate satellite-derived aerosol optical thickness

J.P. de Vroom (1), K.F. Boersma (1), D.R. Brooks (2)

(1) Royal Dutch Meteorological Institution (KNMI), De Bilt, Netherlands, (2) Drexel University, Philadelphia, USA

In reference to aerosols and their role in the climate system, the need to measure aerosols with satellite instruments, and reduced enthusiasm for technical sciences in secondary education, the main question addressed in this talk is: Can measurements by 15-18 year undergraduate students be used to validate aerosol measurements by satellite instruments?

We have investigated the accuracy of aerosol measurements performed by undergraduate students in the Netherlands within the GLOBE (Global Learning and Observations to Benefit the Environment) framework. A network of 17 schools equipped with simple, hand-held Sun photometers is currently operational in the Netherlands. This network has been set up as a cooperation between the Institute for Environmental Education (SME Milieuadviseurs), The GLOBE Program (www.globe.gov) and KNMI. The students take measurements, calculate aerosol concentrations, and learn to report their results through the internet. AOT measurements are processed by GLOBE scientists who also provide comments and feedback to students and teachers. The aim is to generate public outreach for the OMI and SCIAMACHY satellite instruments and to increase undergraduate student's interest in science. With this network, the Netherlands contributes substantially to the worldwide GLOBE aerosol monitoring project. For more information and examples of feedback to students: www.knmi.nl/globe.

Some of the students measurements have been directly compared to collocated professional measurements of aerosol optical thickness (AOT). As a proof of concept, we first characterised the LED-based GLOBE Sun photometer's performance relative to a full-automatic, sun-tracking Sun photometer at KNMI. Results from this comparison indicate that collocated measurements by the GLOBE instrument are within 0.02

AOT of the values retrieved from the SPUV. Subsequently, AOT measurements performed by undergraduate students in The Hague have been compared to results from the AERONET CIMEL-instrument in The Hague. The encouraging results from this comparison show that undergraduate students are capable of measuring AOT up to a reasonable degree of precision (0.03 AOT) and with no significant bias.

With these results, the student measurements can be used for qualitative validation of satellite-derived AOT measurements. As a case study for future SCIAMACHY and OMI validation, we discuss in our paper the results of a comparison between MODIS AOT and undergraduate student-measured AOT over the Netherlands. We will discuss strategies to overcome the main practical obstacles in getting students to measure AOT on a regular basis, as well as some important technical aspects of the AOT retrieval and comparison, including the determination of the extraterrestrial constant and assumptions on spectral interpolation.