

Name of research institute or organization:

Institut für Weltraumwissenschaften, Freie Universität Berlin

Title of project:

Calibration of Sun and aureole spectrometer systems within the Cloud and Aerosol Characterization Experiment (CLACE)

Project leader and team:

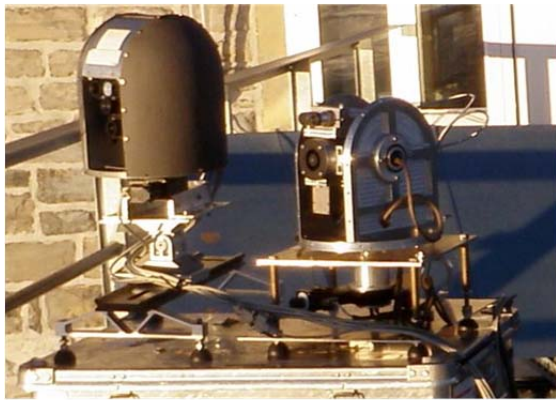
Dr. Thomas Ruhtz, project leader
Dipl. Phys. Jonas von Bismarck, Marco Starace

Project description:

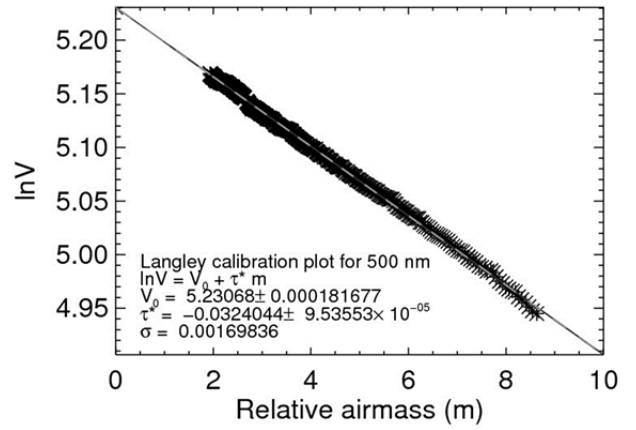
For aerosol and trace gas remote sensing, a number of multispectral sky and Sun photometers have been developed at our Institute. Some of the latest operational developments are the multispectral Sun and aureole photometers FUBISS-ASA1 and -ASA2. The combined Sun and aureole photometer FUBISS-ASA2 provides 256 spectral channels between 300nm and 1100nm, and in addition 512 pixels in the NIR between 950nm and 1700nm. The information content of the multidirectional and hyperspectral radiation measurements, regarding aerosol properties, exceeds the basic products derived from Sun photometer measurements, being the aerosol optical depth and Ångström exponent. The radiation measured in the solar aureole contains information about the aerosol phase function and therefore allows conclusions about the particle type by a comparison to values computed for model aerosols with a Miecode for spherical particles.

Within the framework of the CLACE 2010 campaign (Cloud and Aerosol Characterization Experiment, organized by the Paul Scherrer Institut) in June and July 2010, featuring a variety of in-situ and remote sensing instruments on the Sphinx Station and at Kleine Scheidegg, our two hyperspectral Sun and aureole photometers FUBISS-ASA1 and FUBISS-ASA2 were mounted at Kleine Scheidegg (~1500 m below JFJ with direct view to the Sphinx observatory). One scientific task was the determination of the aerosol extinction, derived from the difference of atmospheric transmissivity measurements at Kleine Scheidegg (by FUB) and at the Sphinx station (by MeteoSwiss).

For the calibration of the Sun photometers under stable atmospheric conditions, and for a necessary intercomparison with the MeteoSwiss Instruments, our Sun photometers were mounted on the terrace of the Sphinx observatory, for a few days at the beginning (between the 20th and the 24th of June) and the end (18th to 21st of July) of the campaign. To derive the atmospheric transmittance from the sensor voltages V recorded by the Sun photometers, the instruments have to be calibrated with respect to the exoatmospheric signal voltage V_0 . The instrument specific value of V_0 can be extrapolated from measurements under varying atmospheric path lengths of the direct solar beam (the so called relative airmass m), with the Langley-Plot method. Furthermore, the calibration coefficients can also be deduced from parallel measurements with a calibrated instrument (in this case the MeteoSwiss Sun photometers). Both methods could be successfully applied under very stable clear sky conditions while the instruments were mounted on the Sphinx terrace.



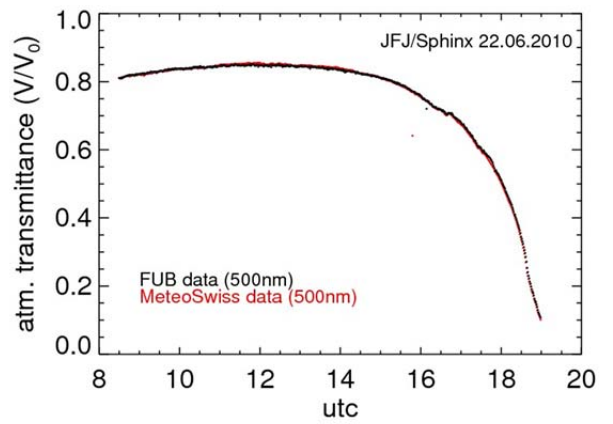
The Sun photometers FUBISS-ASA2 (left) and FUBISS-ASA1 (right) during a Langley calibration measurement



FUBISS-ASA2 Langley calibration plot for 500 nm



The Sun photometers FUBISS-ASA1 and FUBISS-ASA2 (bottom left) next to the domed Sun photometer operated by MeteoSwiss



Atmospheric transmittance derived from measurements of FUBISS-ASA1 and the MeteoSwiss Sun photometer

Key words:

Aerosol, radiometer, Solar aureole, Sun photometer, remote sensing, atmosphere

Collaborating partners/networks:

Paul Scherrer Institut: Paul Zieger, Eidgenössische Technische Hochschule Zürich:
Frank Wienhold, MeteoSwiss: Laurent Vuilleumier, Belgian Institute for Space
Aeronomy: Katrin Clemer

Scientific publications and public outreach 2010:

Theses

Extension of a ground and airplane-based Sun photometer into the Near Infrared
spectrum (in progress), Marco Starace, Institute for Space Sciences, Freie Universität
Berlin

Address:

Institut für Weltraumwissenschaften
Freie Universität Berlin
Carl-Heinrich-Becker-Weg 6-10
12165 Berlin

Contacts:

Thomas Ruhtz
Tel.: +49-(0)30 838 56 662
Fax: +49-(0)30 838 56 664
e-mail: ruhtz@zedat.fu-berlin.de
URL: <http://userpage.fu-berlin.de/geoiss/en/home.html>

Jonas von Bismarck
Tel.: +49 (0)30 838 56 656
Fax: +49-(0)30 838 56 664
e-mail: jonas.bismarck@wew.fu-berlin.de
URL: <http://userpage.fu-berlin.de/geoiss/en/home.html>

Marco Starace
Tel.: +49 (0)30 838 56 658
Fax: +49-(0)30 838 56 664
e-mail: marco.starace@wew.fu
URL: <http://userpage.fu-berlin.de/geoiss/en/home.html>