

International Filter Radiometer Comparison Results

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The Event:

In conjunction with the eleventh International Pyrheliometer Comparison (IPC XI) held in Davos, Switzerland, from 27 September to 15 October 2010, the Physikalisch-Meteorologisches Observatorium Davos/World Radiation Center (PMOD/WRC) also conducted the 3rd Filter Radiometer Comparison (FRC III).

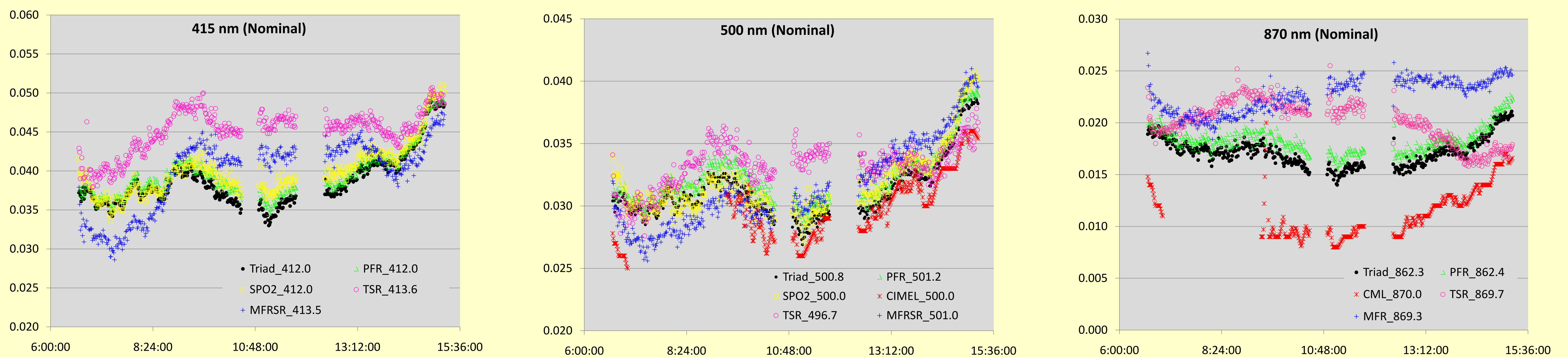
The Purpose:

To determine how well aerosol optical depths (AOD) obtained with the predominant commercial radiometers compare with AODs obtained by the filter radiometer reference triad operated by PMOD. The reference triad is made up of Precision Filter Radiometers (PFRs).

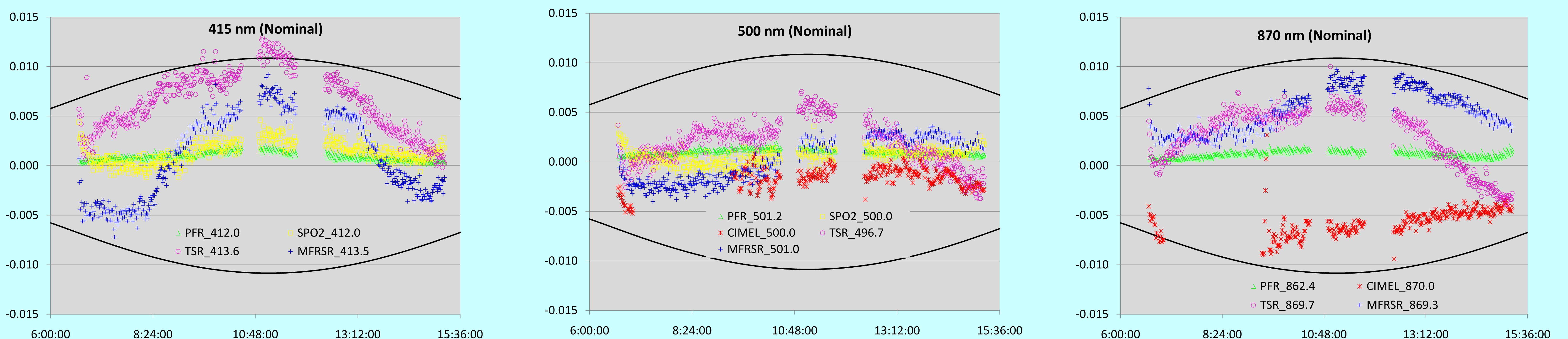
The ARM Connection:

A refurbished ARM Multi-Filter Rotating Shadowband Radiometer (MFRSR) was included in the comparison, along with a new version of the MFRSR, known as the Thermopile Shadowband Radiometer (TSR). It uses a thermopile sensor for broadband solar measurements, replacing the silicon photodiode that is used in earlier (and all of ARM's) MFRSRs.

The three panels below are time series of AOD near the nominal wavelengths: 415 nm, 500 nm, and 870 nm. Actual wavelengths are provided in the legends. Data were collected on 12 Oct 2010. Results from other days were similar. The reference triad plotted as black circles is the average of three PFRs.



The three panels below show the Δ AODs from the reference triad for the best performing unit of each instrument type that participated in FRC-III. Data below are also from 12 Oct 2010. A value greater than zero indicates a reading greater than the reference triad. The envelope limits (black lines) were determined during the 2004 WMO Workshop on Long Term Observations of Aerosol Optical Properties, and represent acceptable 95% uncertainties for direct sun-pointing radiometers.



Participating Instruments

(Red selections are used in above analyses)

Manufacturer	Model	Serial Number	Organization
PMOD	Reference triad of PFRs	N/A	Switzerland, PMOD
PMOD	PFR	N01	Switzerland, PMOD
PMOD	PFR	N23	Canada
PMOD	PFR	N25	Switzerland, PMOD
PMOD	PFR	N27	Switzerland, PMOD
PMOD	PFR	N33	Germany
PMOD	PFR	N35	Sweden
Middleton	SPO2	1020	Australia
Middleton	SPO2	1031	Australia
CIMEL	CE-318	354	Switzerland, PMOD
CIMEL	CE-318	433	Canada
CIMEL	CE-318	534	Canada
Yankee	MFRSR	244	NASA
ARM Refurb Head	MFRSR	320	ARM
Yankee	MFRSR	546	Switzerland, PMOD
Yankee	TSR	584	NOAA

Highlights

- MFRSRs (2 π FOV instruments) were allowed approximately twice the uncertainty during the 2004 WMO workshop, but are in fact generally performing within the limits allowed for direct sun-pointing radiometers.
- Continuous field calibrations employed within the ARM program produce remarkable agreement when compared with instruments calibrated at pristine sites.
- The refurbished MFRSRs are performing at least as well, if not better, than the original YES units.
- The ARM community can have confidence in the MFRSR AOD record. It is notable for its longevity, continuity of measurements, and relatively high sampling rate (20 sec).