

4th Filter-Radiometer Comparison

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FRC Participants



12th International Pyrheliometer Comparison (IPC-XII)

4th Filter-Radiometer Comparison (FRC-IV)

2nd International Pyrgeometer Comparison (IPgC-II)



28 Sep - 16 Oct 2015 PMOD/WRC Davos

pmod wrc

Participating Instruments

30 instruments - 15 groups – 12 countries
 6 (+3) types covering the majority of instrumentation used for AOD measurement worldwide

PFR

WORCC Triad-CH (3)
 SMHI-SE
 DWD-DE
 PMOD-CH (3)
 MeteoSwiss-CH



Direct sun
 wl: 368, 412, 500,
 863 nm
 Fwhm: 3.8-5.4nm
 FOV=2.5 deg
 Meas: 1 minute

CIMEL

PMOD-CH
 AERONET-EU
 IZANA-ESP



Direct sun
 wl: 340, 379, 440,
 500, 670, 870,
 1021 nm
 Fwhm: 10 nm
 FOV=1.2 deg
 Meas: ~15 minute

MFRSR

DWD-DE
 NASA-US1
 NOAA-US2
 NOAA-US3



Global+diffuse
 wl: 415, 500, 610,
 665, 860, 940 nm
 Fwhm: 10 nm
 FOV = variable
 Meas: 1 minute

PSR

DWDa-DE
 DWDb-DE
 PMOD-CH



Direct sun spec
 wl: 320-1000 nm
 Fwhm: 1.5-6 nm
 FOV=1.5 deg
 Meas: ~10 sec

POM-2

ARPA-IT
 JMA-JP
 DWD-DE
 KACARE-SA



Direct sun spec
 wl: 315, 340, 380,
 400, 500, 675,
 870, 940, 1020,
 1627, 2200 nm
 Fwhm: 10 nm
 FOV=1 deg
 Meas: 1 min

SPO2

BoM-AU
 NOAA-US



Direct sun spec
 wl: 368, 412,
 502, 675, 778,
 812, 862nm
 Fwhm: 5 nm
 FOV=2.4 deg
 Meas: 1 min

SSIM

COFa-CA
 COFb-CA
 COFc-CA
 COFd-CA



Direct sun spec
 wl: 6 filters
 Fwhm: 5 nm
 FOV=2 deg
 Meas: 1 min

Microtops

MIC-GR



Direct sun spec
 wl: 6 filters
 Fwhm: 10 nm
 FOV=2.5 deg
 Meas: 1 min

Reference Instrument of FRC-IV

TRIAD WORCC PMOD/WRC

Izana, Tenerife, Spain



N06
N21

N24

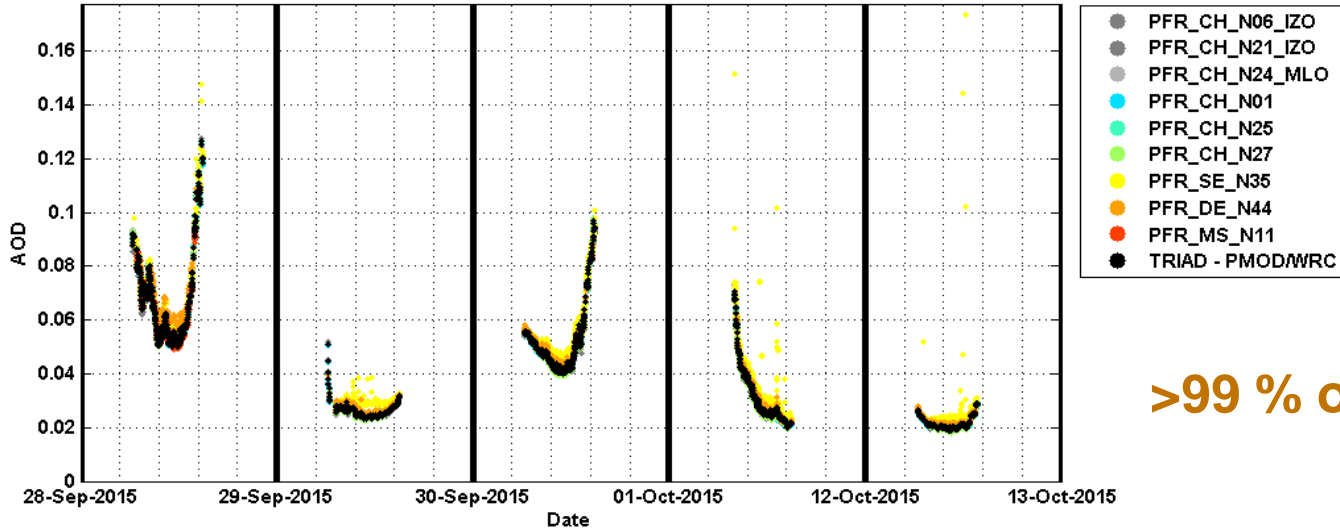
Mauna Loa, Hawaii, USA



Davos, CH

Davos TRIAD
Recalibration Before the
Campaign

AOD

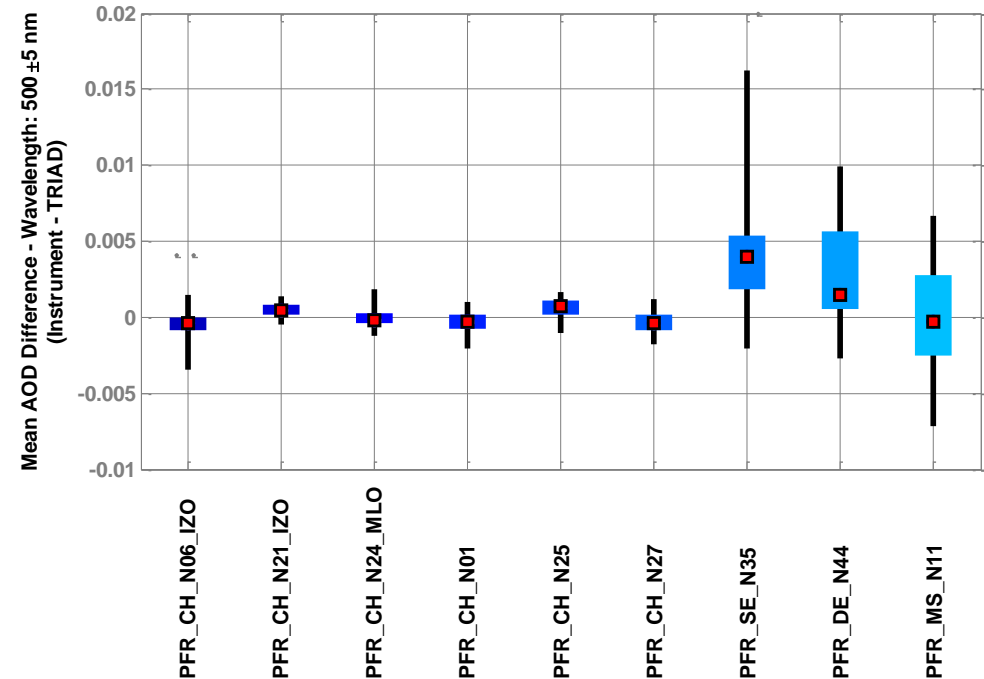
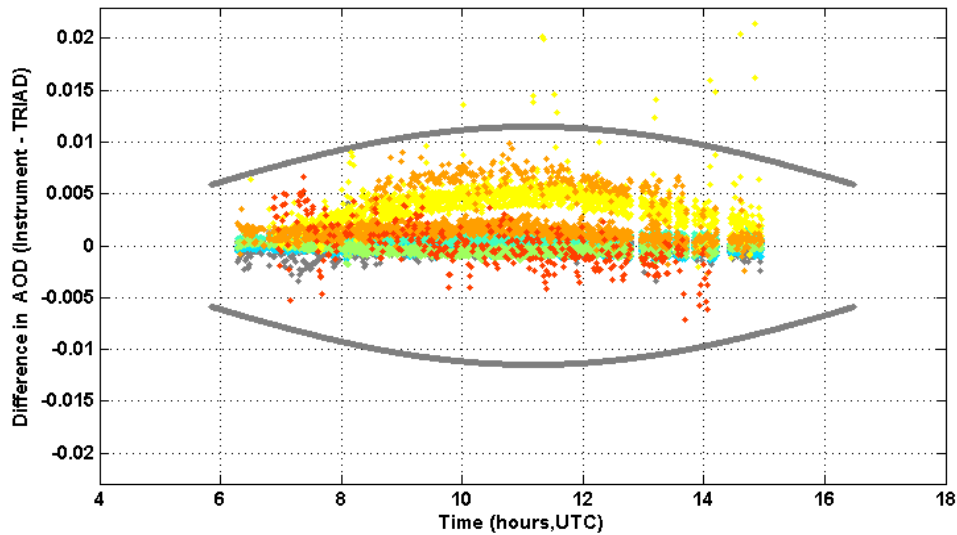


PFR (GAW-PFR)

instrument comparison at
500nm

>99 % of data within WMO limits

AOD differences



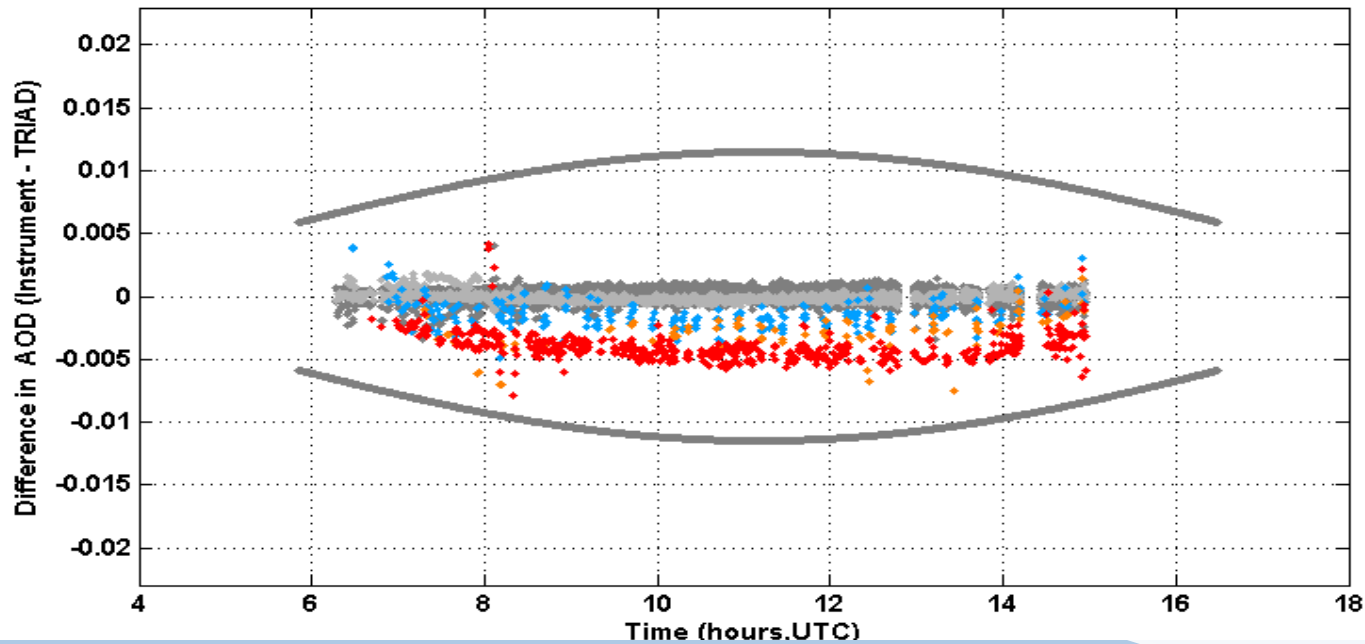
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- PFR_CH_N21_IZO
- PFR_CH_N24_MLO
- CIM_CH_354
- CIM_ES_627_VLD
- CIM_ES_917_IZO
- TRIAD - PMOD/WRC



CIMEL (AERONET)

**instrument comparison at
500nm**

>99 % of data within WMO limits



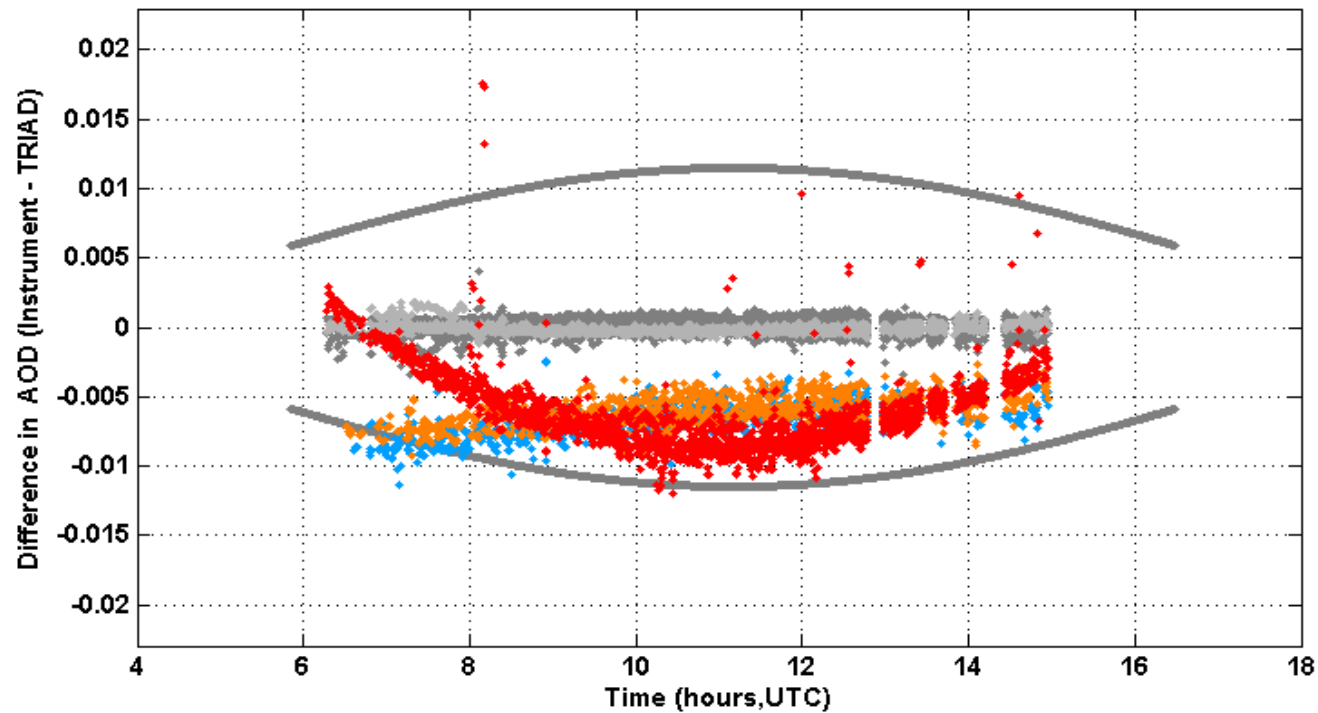
- PFR_CH_N06_IZO
- PFR_CH_N21_IZO
- PFR_CH_N24_MLO
- POM_IT
- POM_DE
- POM_JP
- TRIAD - PMOD/WRC



POM-2 (SKYNET)

**instrument comparison at
500nm**

96-99 % of data within WMO limits



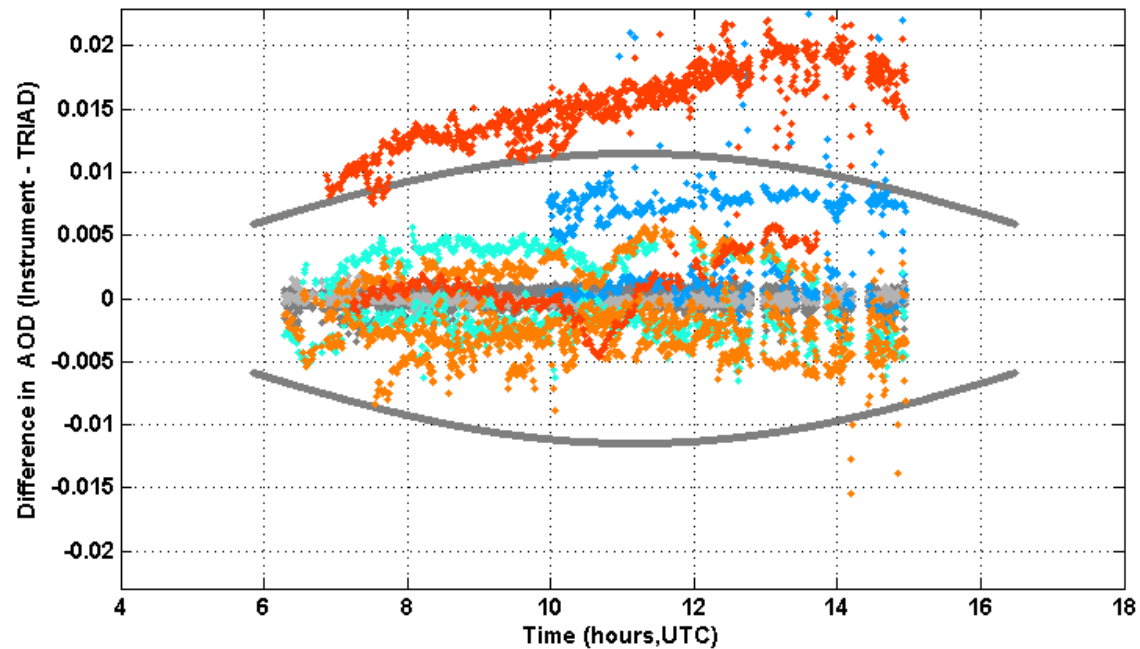
- PFR_CH_N06_IZO
- PFR_CH_N21_IZO
- PFR_CH_N24_MLO
- MFR_US_1
- MFR_US_2
- MFR_US_3
- MFR_DE
- TRIAD - PMOD/WRC



MFRSR

**instrument comparison at
500nm**

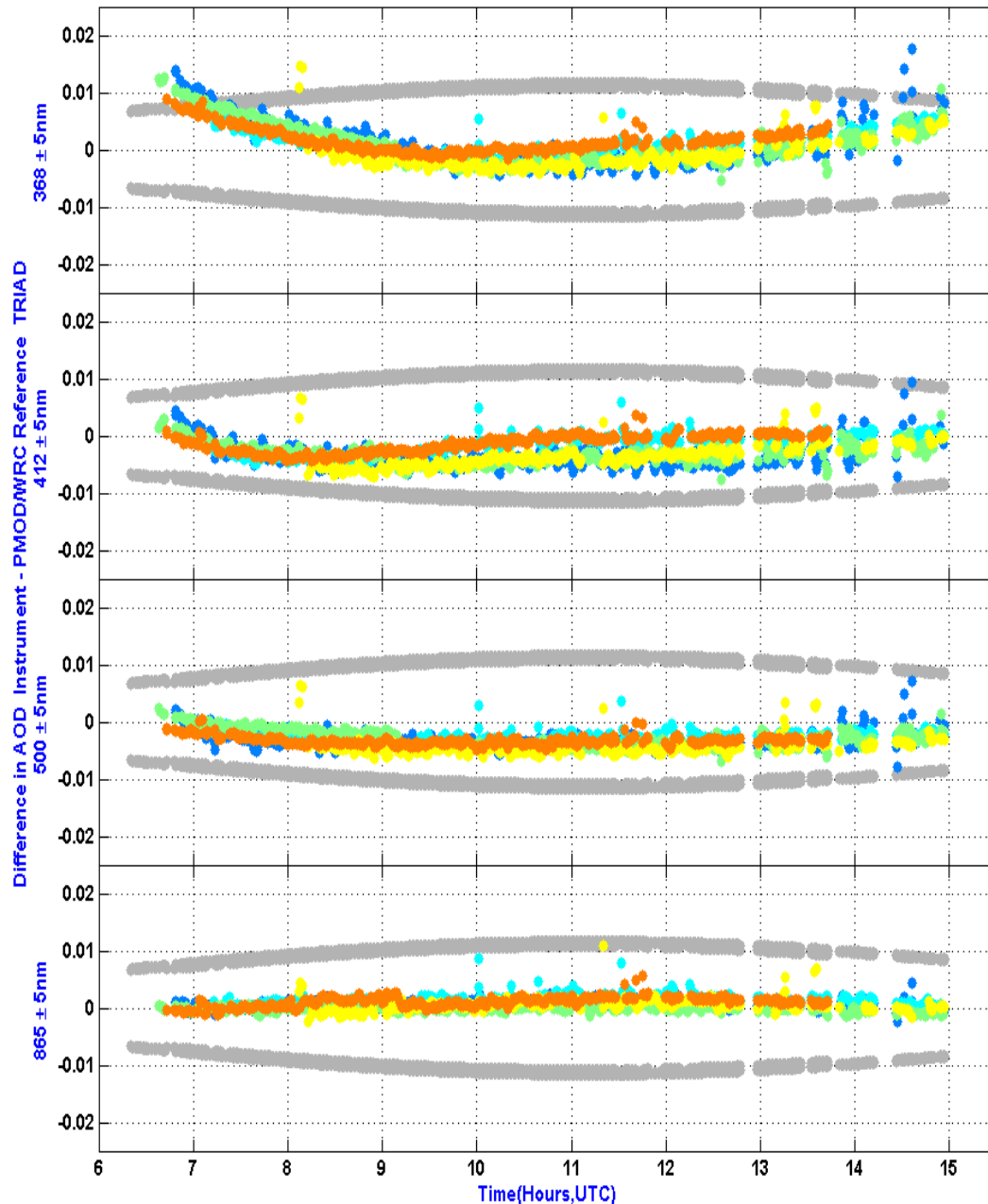
**96-99 % of data within WMO limits
25-85%**



FRC-IV Comparison Results

● 28.Sep ● 29.Sep ● 30.Sep ● 01.Oct ● 12.Oct

SPO_AU_1



368nm



SPO (AU)
instrument comparison
all wavelengths

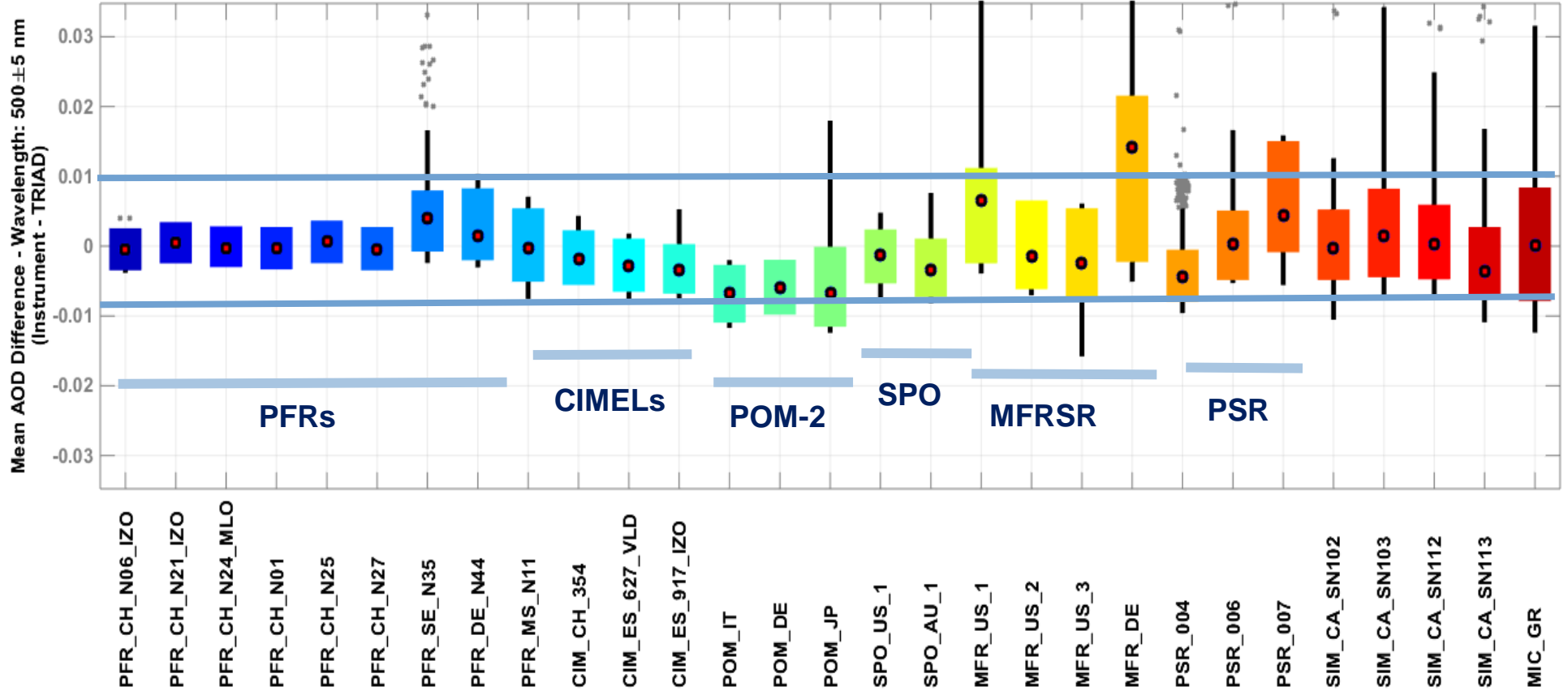
412 nm

500 nm

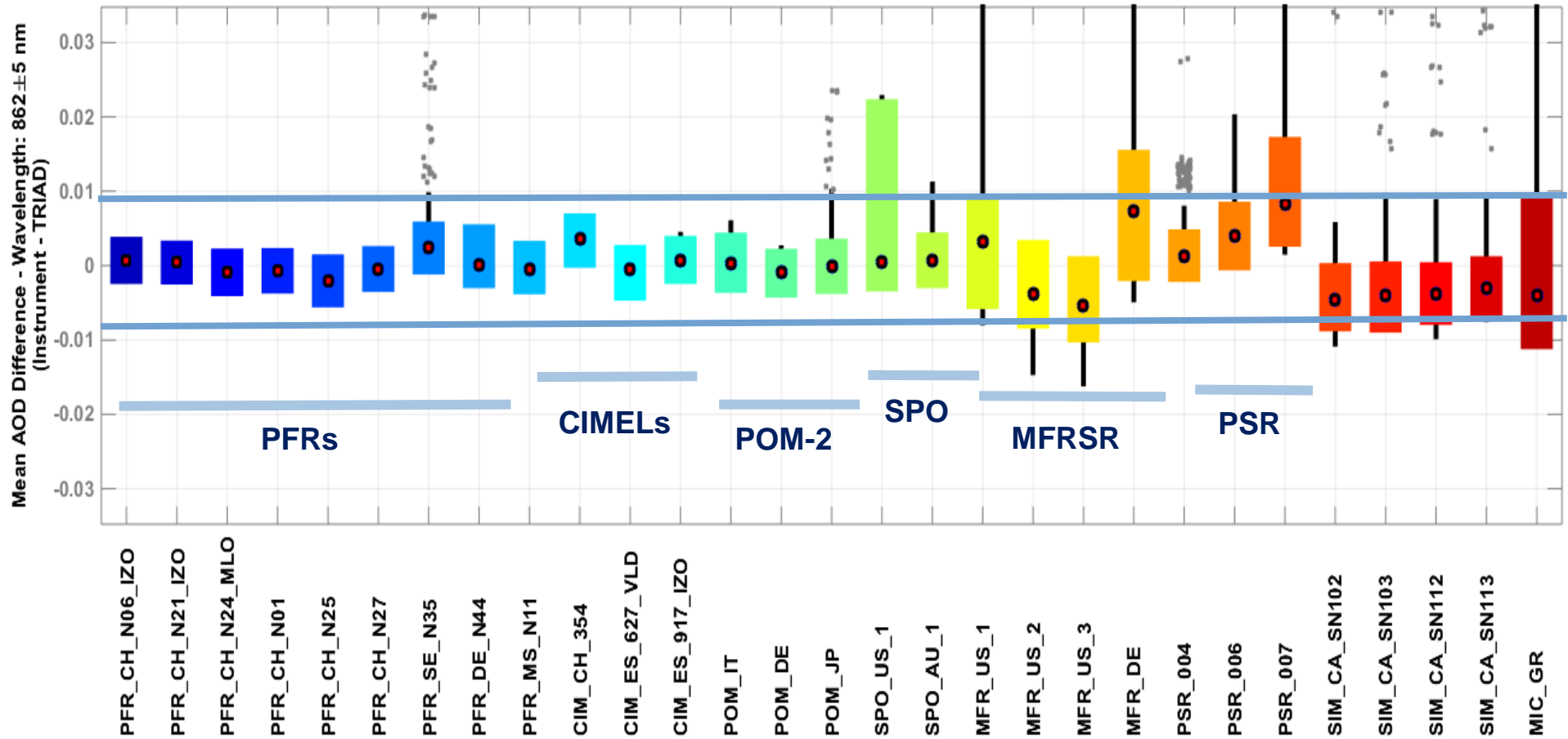
96%
& >99 % of data within WMO limits

865 nm

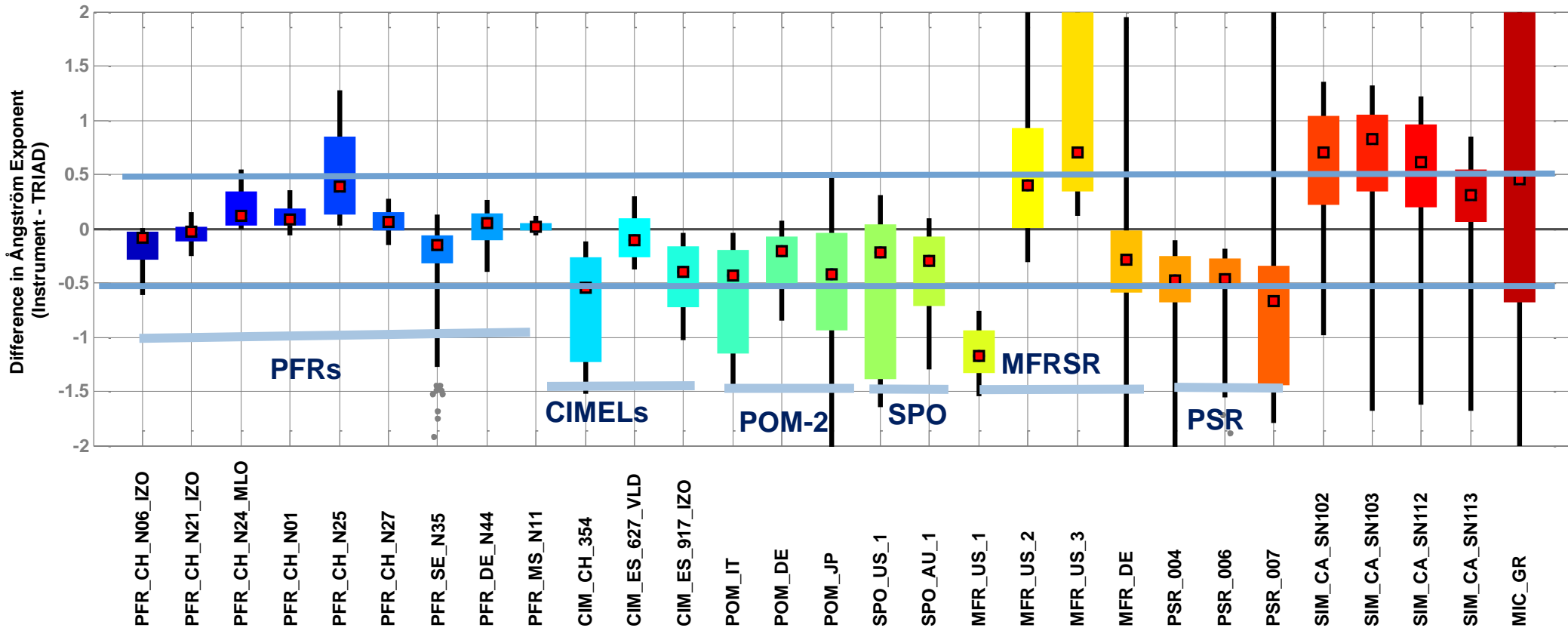
AOD differences at 500 nm



AOD differences at 865 nm

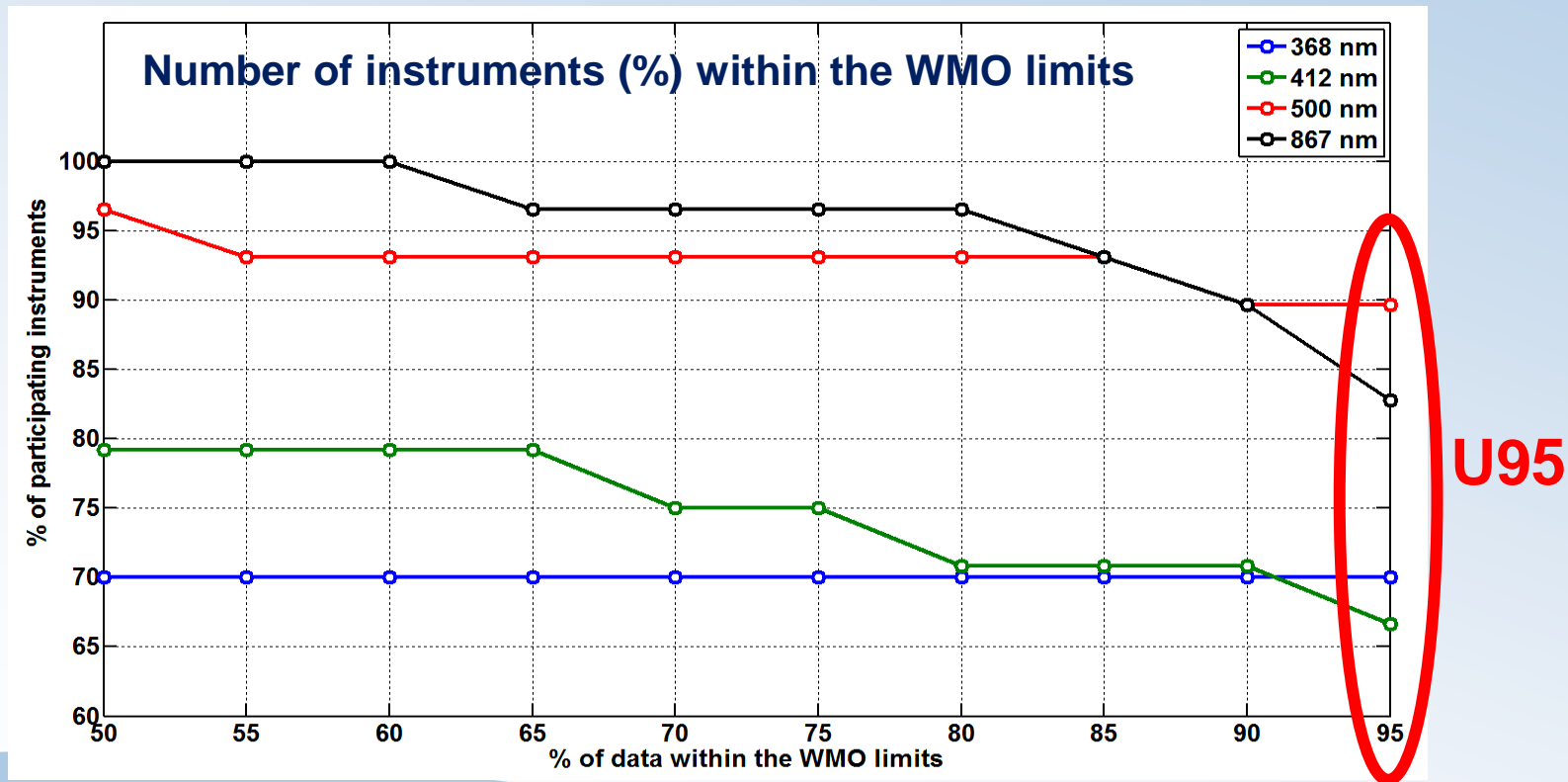


Ångström Exponent



Conclusions

- Ground based AOD measurements can achieve homogeneity of:
U95: 500 nm (26/29), 862 nm(24/29), 412 nm (16/24), 368 nm (14/20)



U95

Conclusions

- Very promising results during this FRC-IV
 - Most instruments agreed to within ± 0.01
- Angstrom Exponent highly uncertain for low AOD values around 0.1 as found during this campaign
- Future comparisons with higher AOD conditions would be desirable



Thank you
+ all the FRC
Participants



<http://projects.pmodwrc.ch/ipc-xii/>

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