Atmosphere Cal/Val

PREDE-POM: the Skynet contribution

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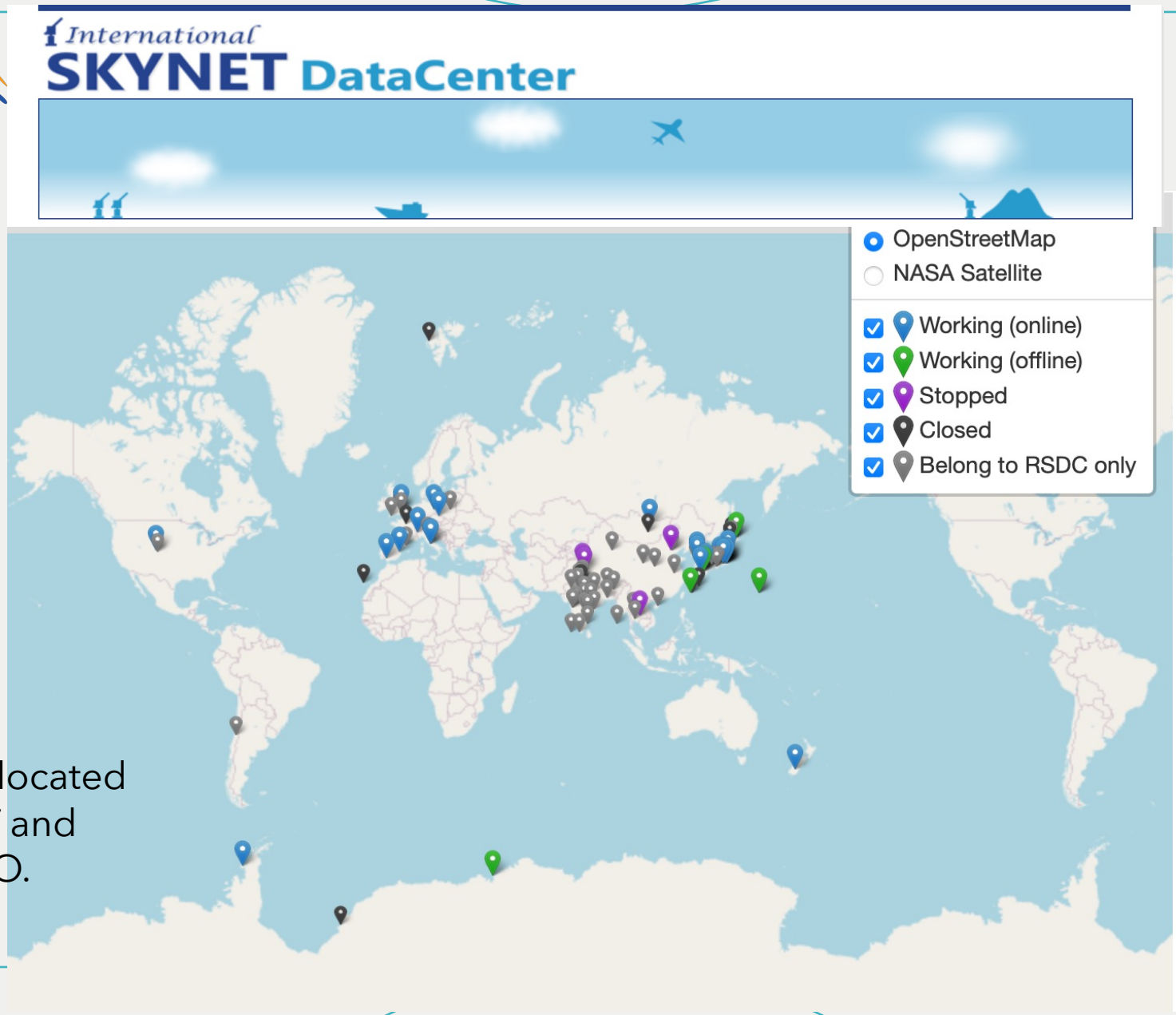
CNR ISAC

International
SKYNET DataCenter



more than 100 sites worldwide located

some of them co-located with AERONET and PMOD/WMO.

The moon-network status

Model	Location	Operation time	PI
POM02	Rome – downtown, IT	Since May 2022	Sapienza University
POM01	Rome – Tor-Vergata, IT	Since August 2023	ISAC-CNR
POM02	Baltic sea coast-Zingst, GE	Not yet available	DWD
POM01	Campaigns: Rome, IT Davos, SW Izana, SP	 September 2021 October 2021 September 2022	ISAC-CNR
POM02	Valencia, SP	Planned 2024	Univ. Valencia
POM02	Aosta, IT	Planned	ARPA-VDA
10 POM02	Italian Air Force	Planned	Italian Air Force sites
POM01	by PREDE for update	/	ISAC-CNR

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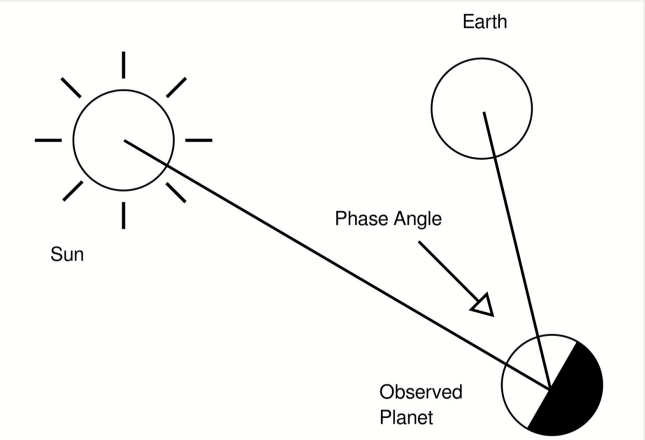


Nocturnal aerosol optical depth measurements with modified sky radiometer POM-02 using the moon as a light source

Akihiro Uchiyama[1], Masataka Shiobara[2], Hiroshi Kobayashi[3], Tsuneo Matsunaga[1], Akihiro Yamazaki[4], Kazunori Inei[5], Kazuhiro Kawai[5], and Yoshiaki Watanabe[5]

- Modification of the POM Sun model => change of amplification and position sensor
- After Amplification: good measure at 340 and 380 nm, difficult at 1225, 1627 and 2200 nm
- 4 quadrants photodiode for MPA [+90°,-90°]; then by software (Nagasawa 1981) up to 120°=> good comparison with SPICE (<0.01°in zen; <0.04° in Az)
- Reflectance from ROLO is considered, not transformed in Irradiance
- Reflectance at wls of POMs are obtained by linear interpolation of the 2 closest ROLO wl (extrapolation for 340 nm)

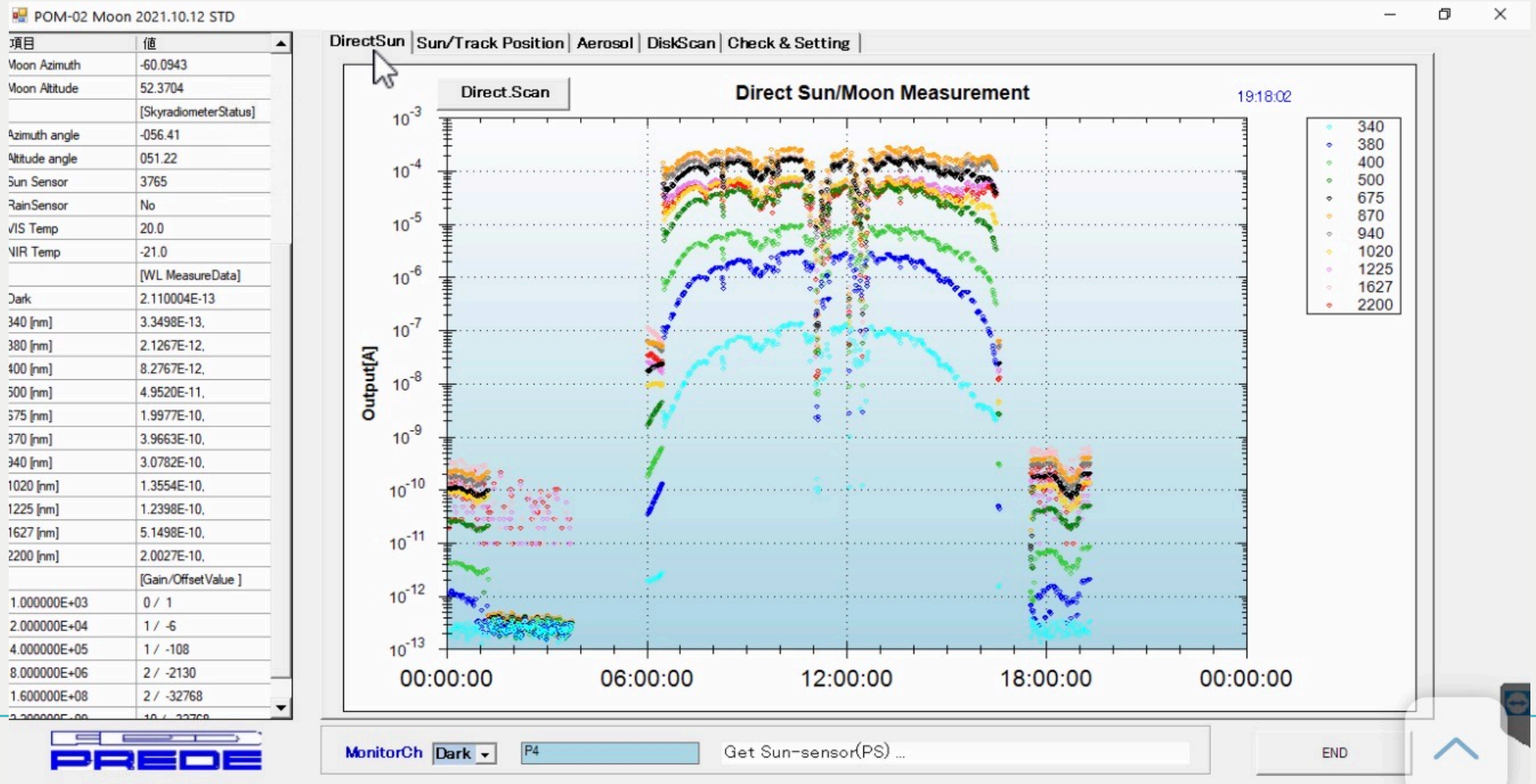
Type of measurements: **Direct Sun**, **Direct Moon**, **Almucantar and Pricipal plane Sun**, **Almucantar Moon**

The measurement of scattered light around the moon is controlled by Prede software

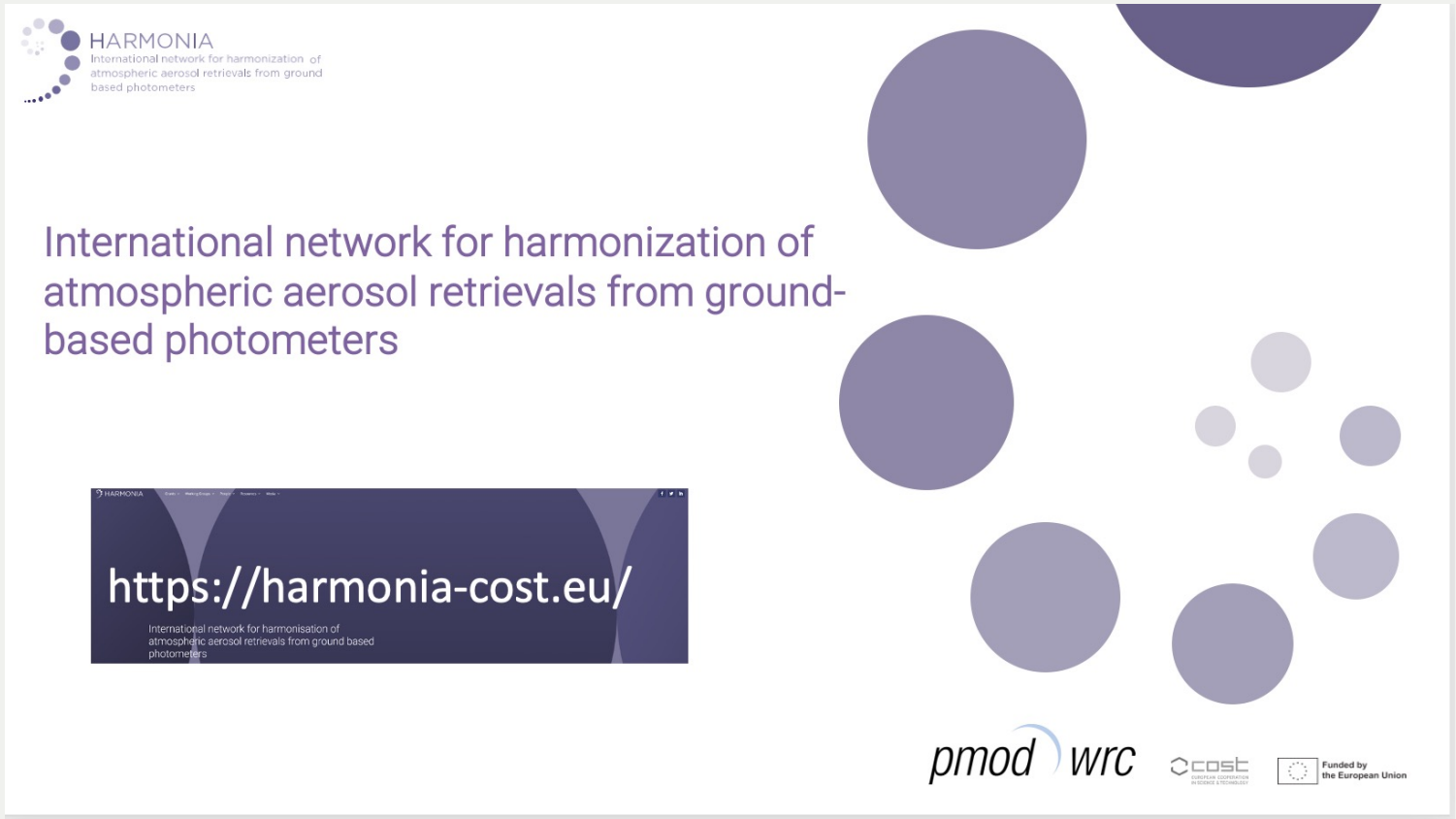
The maximum scattering angle is user defineble : default maximum value = 30°.

Personal comunication of Dr. Uchiyama: data up to 5° can be used to remove the scattered light affecting the direct measurement and it may be used to determine the presence or absence of clouds

NOT YET USED

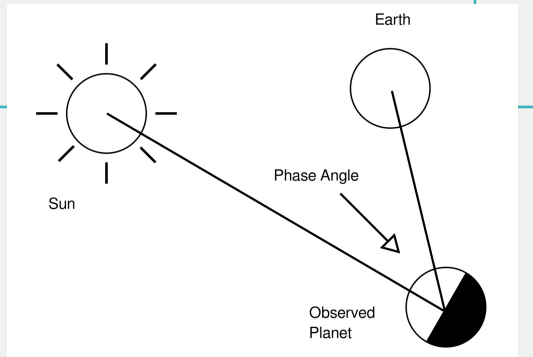


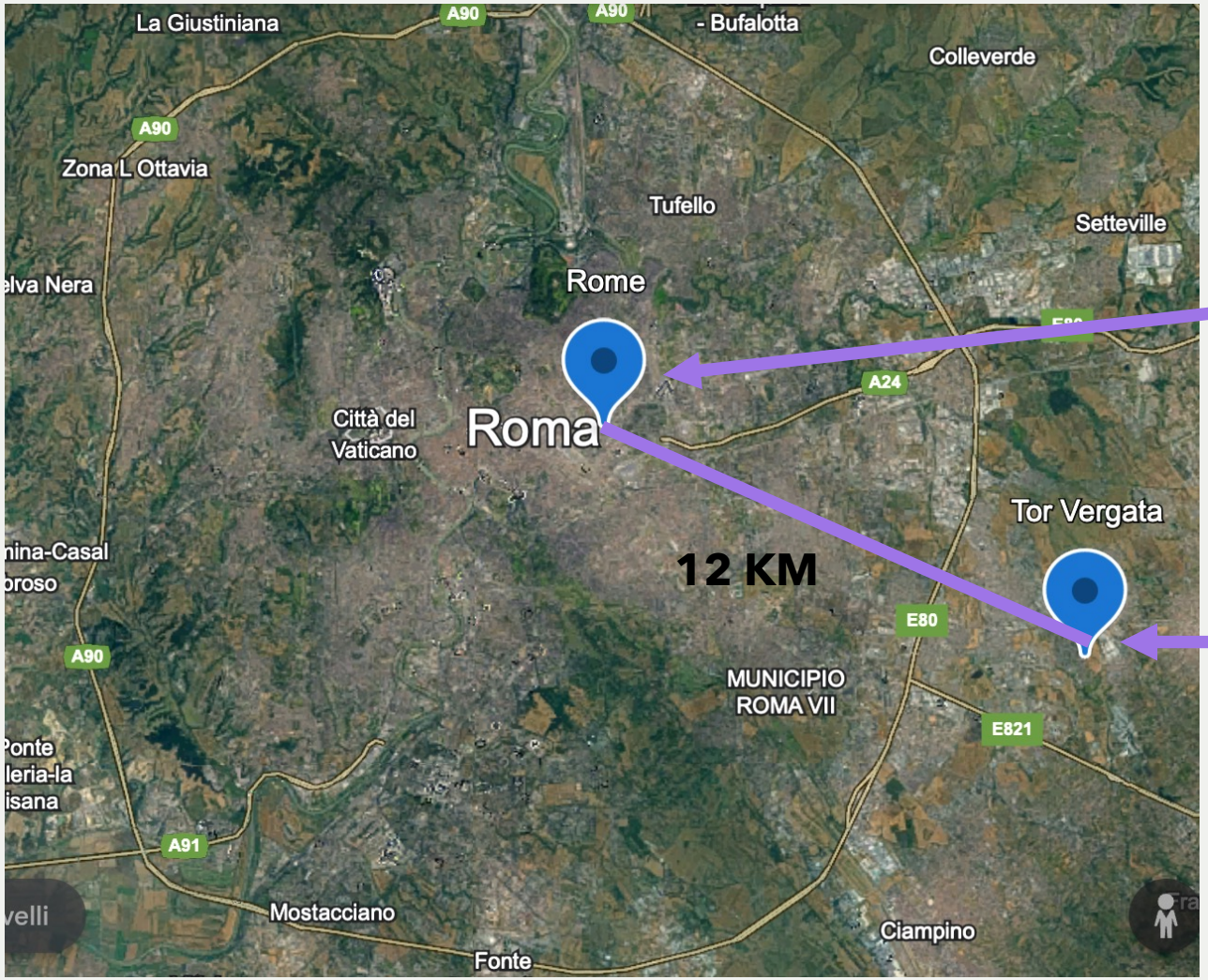
RESULTS from the SKYNET network



STSM of **Gaurav Kumar** , PhD student by University of Valencia to CNR, Italy- 2023 and 2024. Implementation of a method for retrieving lunar AOD in different European Skynet Radiometers (ESR) network sites; Near Real-time comparison of nighttime aerosol optical depth (AOD) from Skynet and AERONET systems.

AOD obtained for moon phases greater than 65%



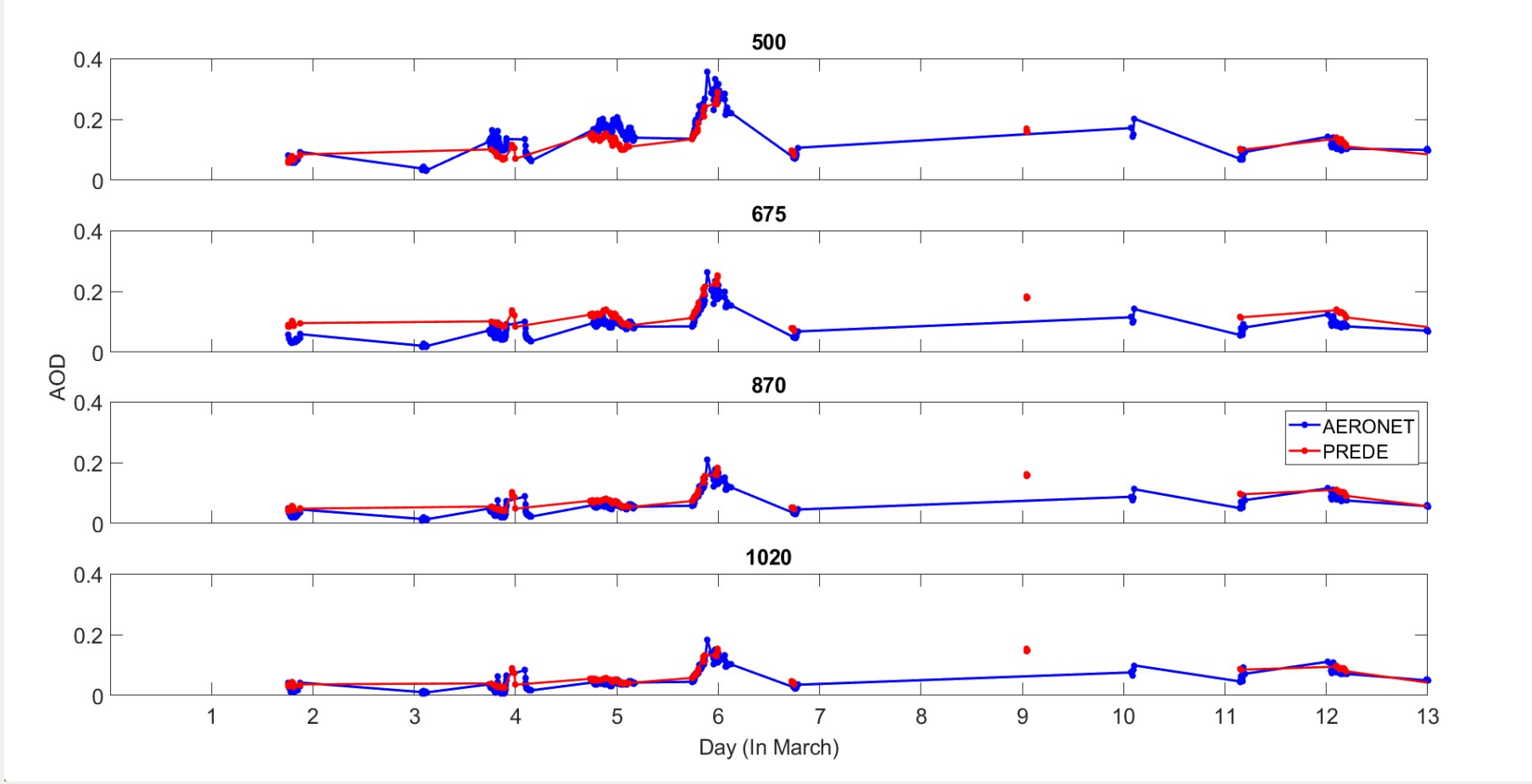


SKYNET – LUNAR POM
AERONET –LUNAR CIMEL
only for QUATRAM
campaign

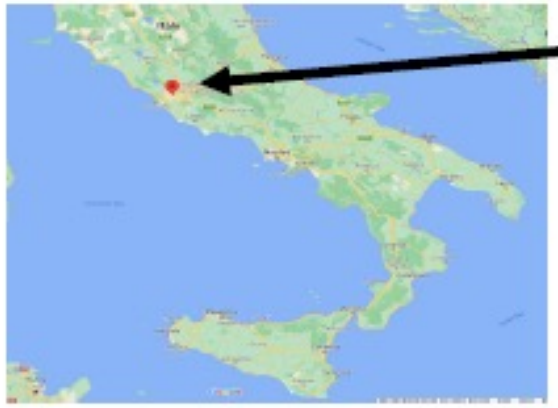
AERONET – LUNAR CIMEL
F.Barnaba PI

Results

- Preliminary result of comparison of cloud-screened AOD retrieved using Moonrad at the University of Sapienza, Italy and AERONET at Tor Vergata in 2023



2. Study area



Rome, Italy

- Rome metropolitan area
- 41.902°N, 12.516°W
- Altitude 83 m
- Coast located 32 km West
- Urban pollution with marine effect
- Occasional biomass burning effect

Izaña, Spain

- Located in El Teide national park
- 39.92°N, 1.13°W
- Altitude 2300 m
- Pristine environment
- Near dust source region (Sahara).

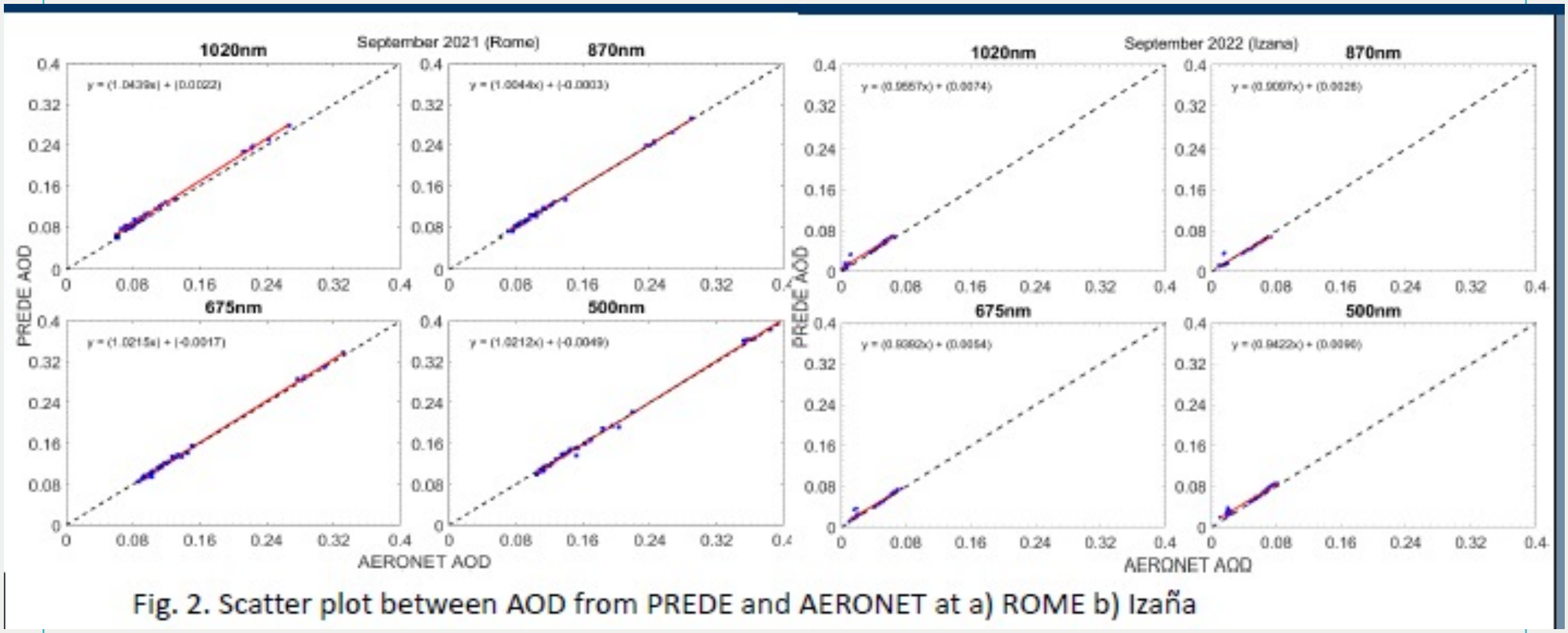


Fig. 2. Scatter plot between AOD from PREDE and AERONET at a) ROME b) Izaña

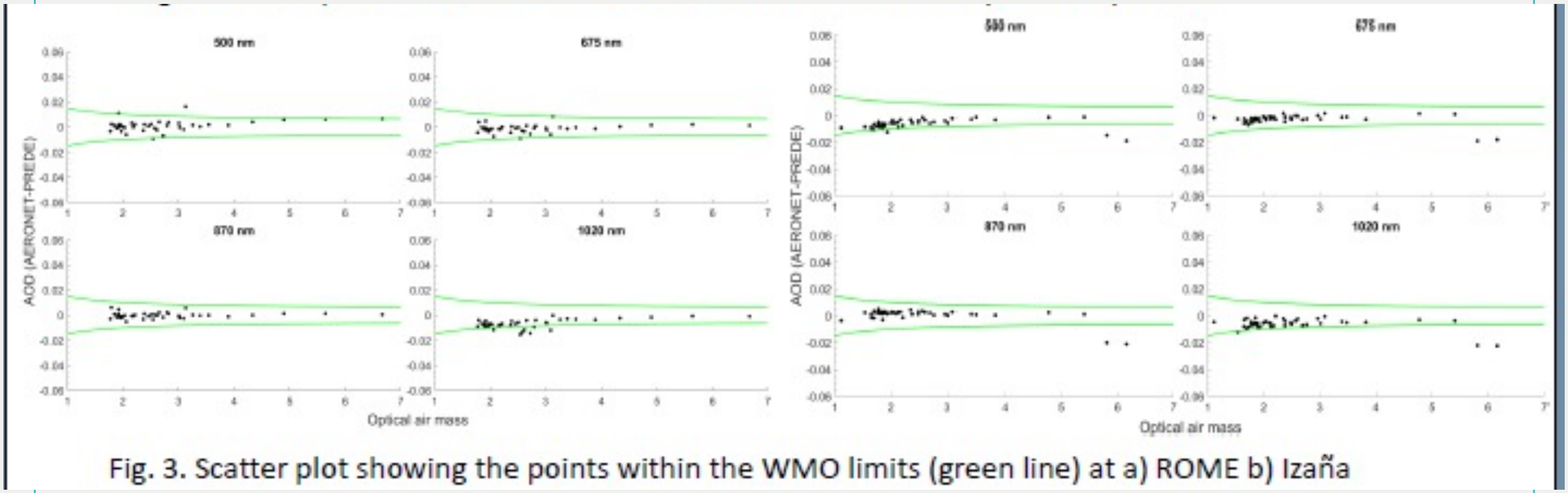


Fig. 3. Scatter plot showing the points within the WMO limits (green line) at a) ROME b) Izaña

Results

- Scatter plot between AERONET and SKYNET (PREDE) at Tor Vergata. The green lines show the WMO limits.

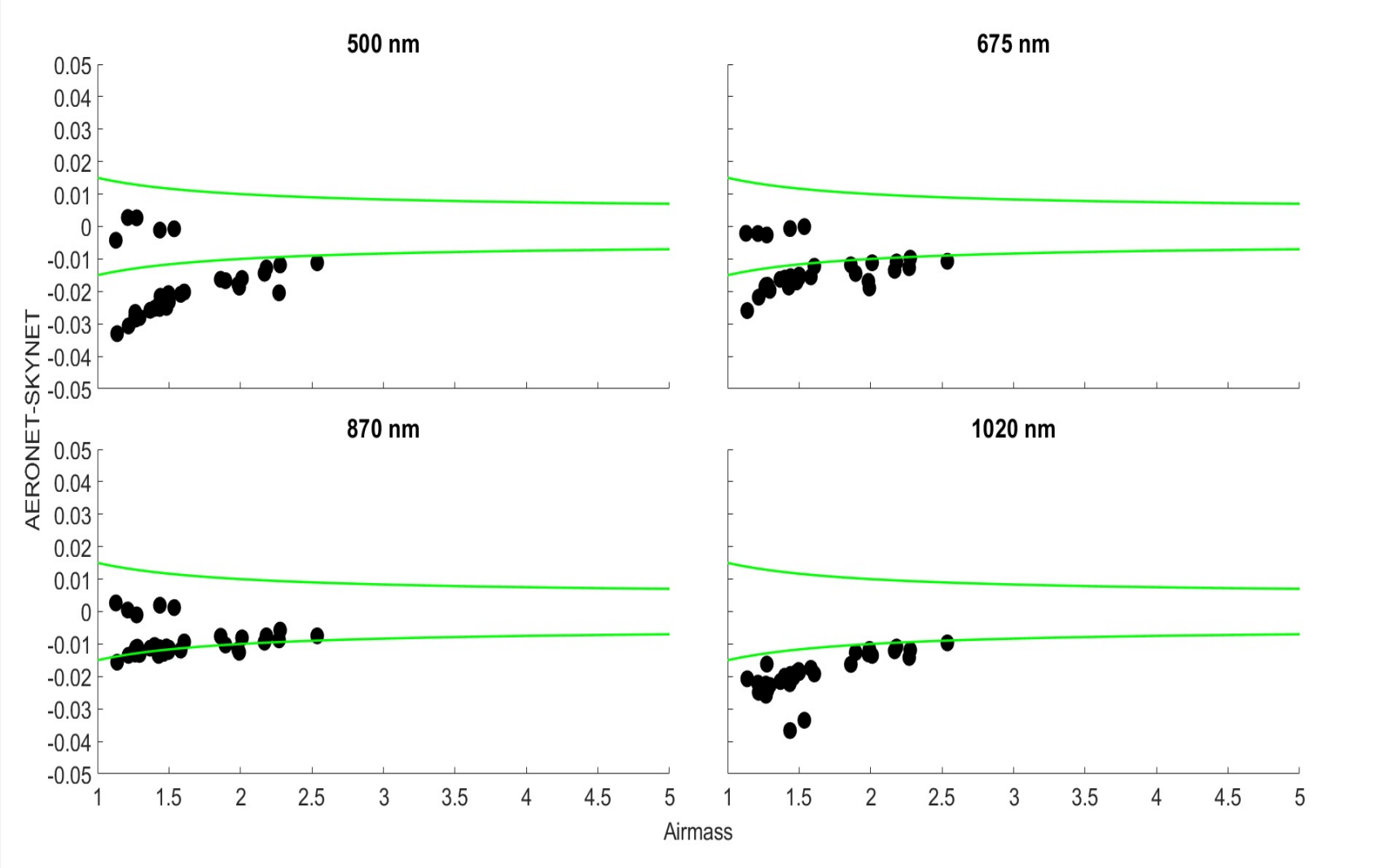


Fig 2

Results

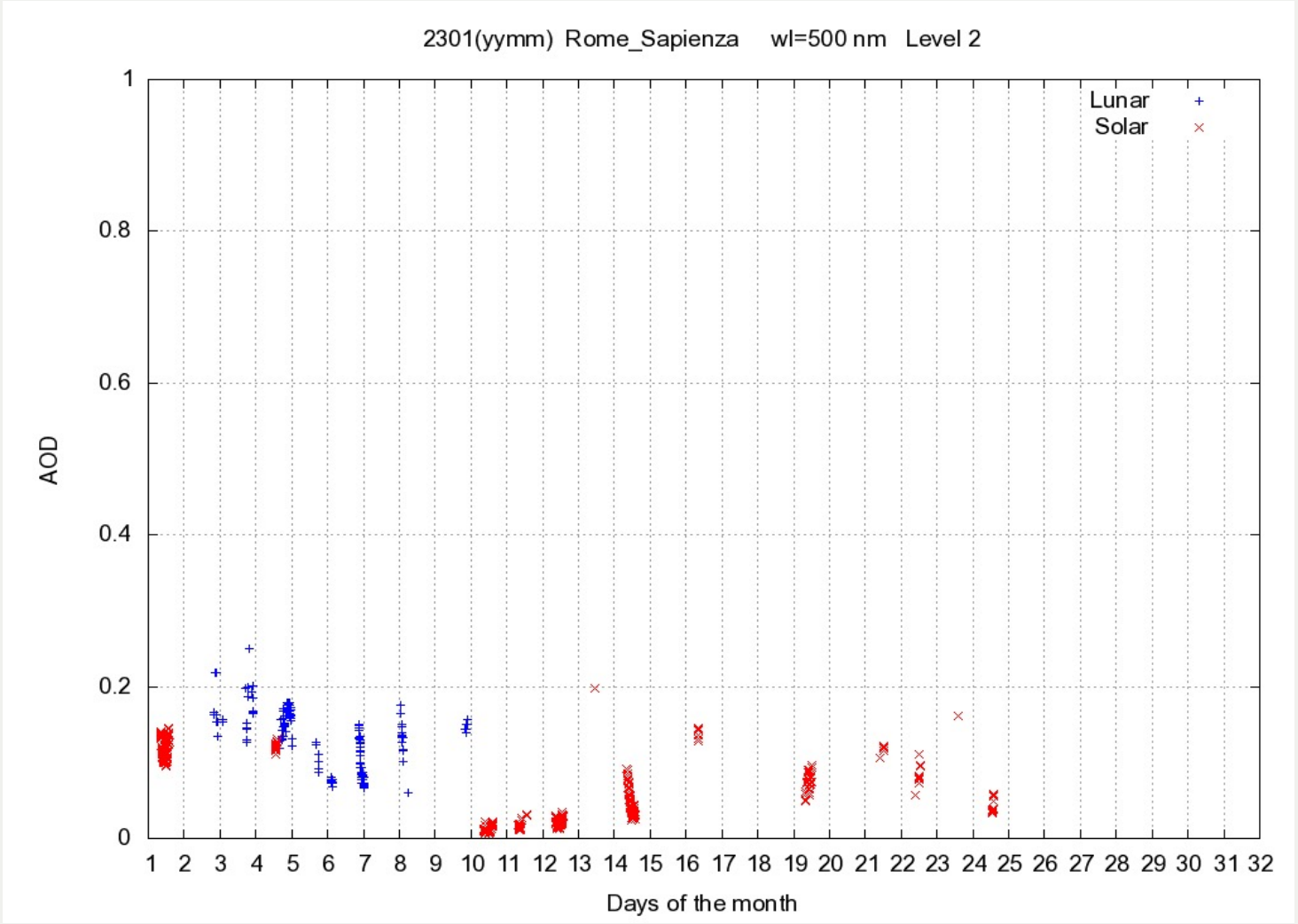
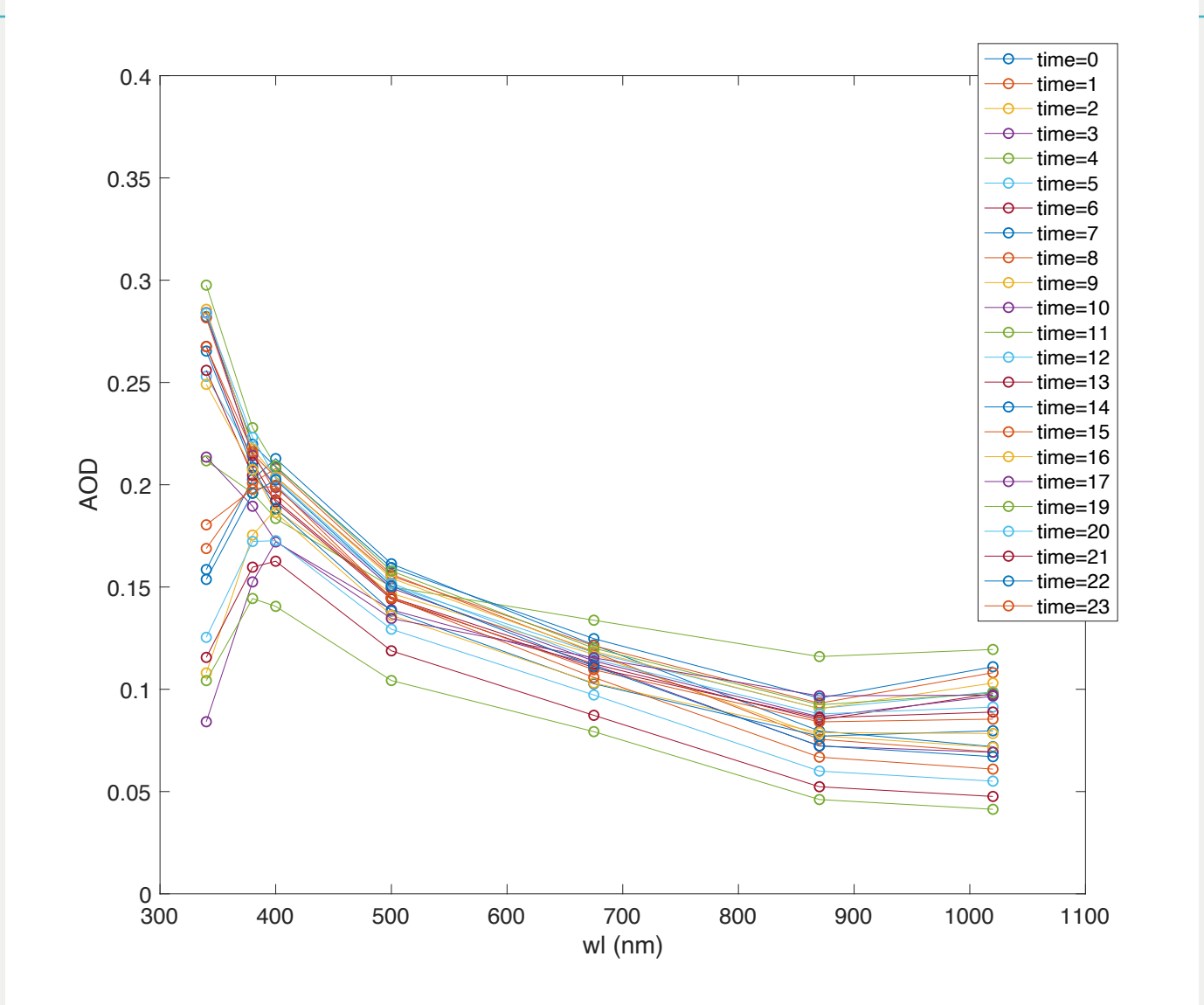


Fig 3


AOD
wl (nm)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
300
400
500
600
700
800
900
1000
1100
time=0
time=1
time=2
time=3
time=4
time=5
time=6
time=7
time=8
time=9
time=10
time=11
time=12
time=13
time=14
time=15
time=16
time=17
time=19
time=20
time=21
time=22
time=23

To do in the future

- Improvement of cloud screening algorithm: abnormal values of AOD observed; still using the same cloud screening for sun measurements
- Implementation of the algorithm in more sites.
- Validate and improve the calibration coefficients mentioned in Uchiyama et al 2019.
- Make AOD downloadable from Europe Skynet web page.
- Understand 340 and 380 nm night-time AOD
- Precipitable Water Vapour retrieval