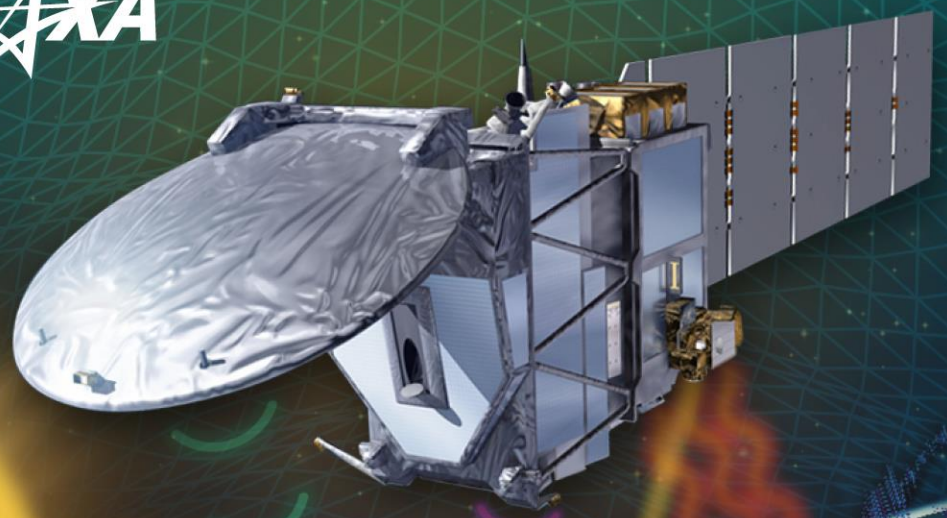

ESA-JAXA Pre-Launch EarthCARE Science and Validation Workshop

13 – 17 November 2023 | ESA-ESRIN, Frascati (Rome), Italy

EVID11: An Italian coordinated contribution to the Validation of EarthCARE products from three atmospheric observatories in the Central Mediterranean Sea

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Instrument	Site			ATLID							MSI			CPR				COMBINED				
	RMC	RMB	LMP	A-FM	A-AER	A-EBD	A-ALD	A-ICE	A-TC	A-CTH	M-CM	M-COP	M-AOT	C-TC	C-FMR	C-CD	C-CLD	AM-ACD	AM-CTH	AC-TC	ACM-CAP	ACM-COM
Raman-Mie-Rayleigh Lidar	x	x	x	D	D	D	D	D	D	D	D	D		D					D	D	D	D
Dual Polarization Weather Radar C-band	x							D						D	D	D	D			D	D	
Cloud Doppler Radar 35 GHz	x		x											D	D	D	D					
Metek Micro Rain Radar-profiler	x							D						D	D	D	D			D	D	
Thies Clima disdrometer	x		x					A						D	D	A	D			D	P	
Weather station	x		x										A					A			A	
Pandora	x	x			A	A	A						A					A			A	
CHM15k lidar ceilometer	X		X	D	D	A	D	A	D	D				D					D	D	A	A
Wind lidar	X	X		D	D	D	D		D	D				D					D	D	A	A
Sodar doppler	X				A	A	A						A					A			A	
SKYNET SunSky radiometer PREDE-POM 01		x		D	A	A	A		D	A			D					D		D	A	
AERONET Sun-Sky radiometer CIMEL-318	X	x	x	D	A	A	A		D	A			D					D		D	A	
Scanning mobility particle sampler	X				P	P	P						P					P			P	
Aerodynamic Particle Sizer	X				P	P	P						P					P			P	
Condensatationn Particle Counter	x				P	P	P						P					P			P	
Nephelometer	x				P	P	P						P					P			P	
Aethalometer	x				P	P	P						P					P			P	
Optical Particle Counter	x				P	P	P						P					P			P	
Gas Analyzers(NO-NO_2-NO_x–SO_2-H_2S)	x				P	P	P						P					P			P	
Vis MultiFilter Rotating Shadowband Radiometer		x		D	A	A	A		D			D	D					D		D	D	
All Sky Camera	x	x	x	D	P	P	P		A		D			A	A					A	A	
MWR HATPRO RPG			x						D			D					D			D	D	
Brewer MKII spectrophotometer			x		A	A	A						A					A			A	
MAX-DOAS	x				A	A	A											A			A	

- *Physiological* changes in the Team
- Addition of new instruments and/or upgrade of existing ones
- On-going studies on the proposed methodology
- Italian Space Agency funded project EC-ValMed.it 2024-2026
- Contribution to the *Best Practices* document
- (New sites)

Current RMR ToV Lidar acquisition channels

Specifications for the upgraded channel.

$$2\beta + 1\alpha + wv + T$$

	Current CH#	Tele ⌀ (cm)	λ (nm)	Type
ACTRIS	N/A	15	354,7-P	Elastic transmitted
	N/A		354,7-S	Elastic reflected
	N/A		386,7	N_2 Raman
	N/A		407,5	H_2O Raman
	1		532,1	Elastic
	N/A		607,6	N_2 Raman
	8	30	354,7-P	Elastic transmitted
	N/A		354,7-S	Elastic reflected
	4		386,7	N_2 Raman
	5		407,5	H_2O Raman
	2		532,1	Elastic
	N/A		607,6	N2 Raman
Medium-high atmosphere	3	9 x 50	532,1	Elastic
	6		386,7	N_2 Raman
	7		407,5	H_2O Raman

Upgraded RMR ToV Lidar acquisition channels

Specifications for the upgraded channel. The new acquisition channels are highlighted in the table.

$$2\beta + 1\alpha + wv + T \Rightarrow 2\beta + 2\alpha + 1\delta + wv + T$$

ACTRIS

Current CH#	New CH#	Tele ⌀ (cm)	λ (nm)	Type	IF FWHM (nm)	PMT model
N/A	1	15	354,7	Elastic transmitted	0,5	H10721P-110-01
N/A	2		354,7	Elastic reflected	0,5	H10721P-210-01
N/A	3		386,7	N_2 Raman	0,3	H10721P-210-01
N/A	4		407,5	H_2O Raman	0,3	H10721P-210-01
1	5		532,1	Elastic	0,5	H10721P-113-01
N/A	6		607,6	N_2 Raman	1,0	H10721P-210-01
8	7	30	354,7	Elastic transmitted	0,5	H10721P-110-01
N/A	8		354,7	Elastic reflected	0,5	H10721P-210-01
4	9		386,7	N_2 Raman	0,3	H10721P-210-01
5	10		407,5	H_2O Raman	0,3	H10721P-210-01
2	11		532,1	Elastic	0,5	H10721P-113-01
N/A	12		607,6	N2 Raman	1,0	H10721P-210-01

Medium-high atmosphere

3	13	8 x 50	532,1	Elastic
6	14		386,7	N_2 Raman
7	15		407,5	H_2O Raman
N/A	16 - 47	1 x 50	350 - 650	Aerosol fluorescence

Troposphere (32-channel PMT with a 750 mm spectrograph)

Proposed approach

- Representativity: Optimization of Match-up criteria variable/level/scenario dependent) (Bracci et al. 2023, www.eumetsat.int/characterisation-candidate-oc-svc-sites-lampedusa -> Liberti et al. 2020)
- Experience in statistical comparison (e.g. GPM DPR: Adirosi 2021; AEOLUS experience: Dionisi et al. 2023)
- Improved estimation of total uncertainty budget contributions for the ground based observations.
- Synergistic (e.g. Tsekeri et al. 2023, Adirosi et al. 2016) processing of observations from different instruments
- Optimization of comparison statistics and validation tests
- Estimation of the impact of the urban environment (Drosoglou et al. 2023)

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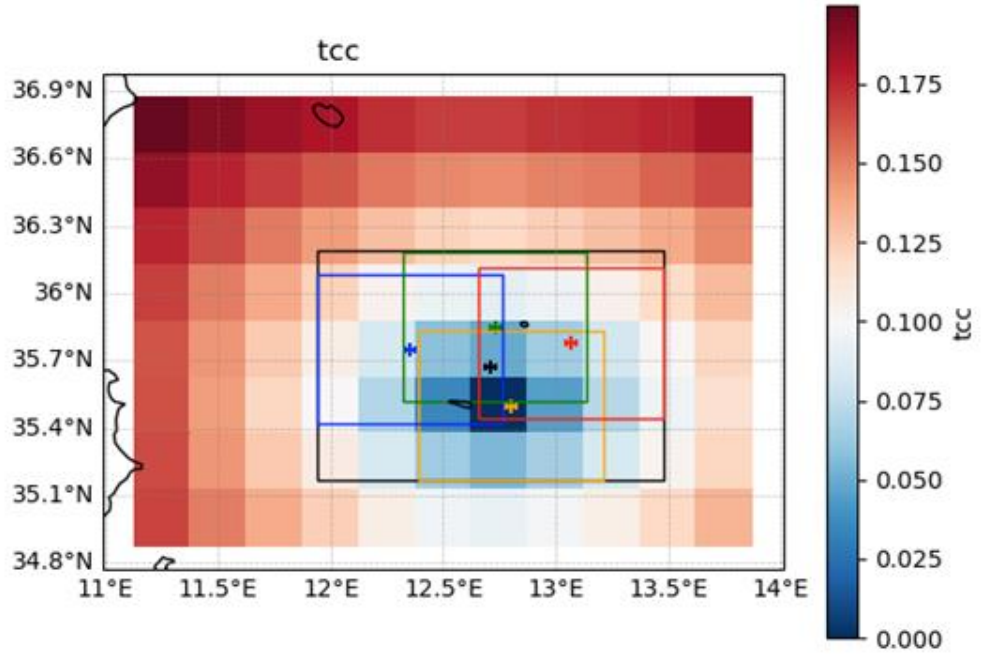
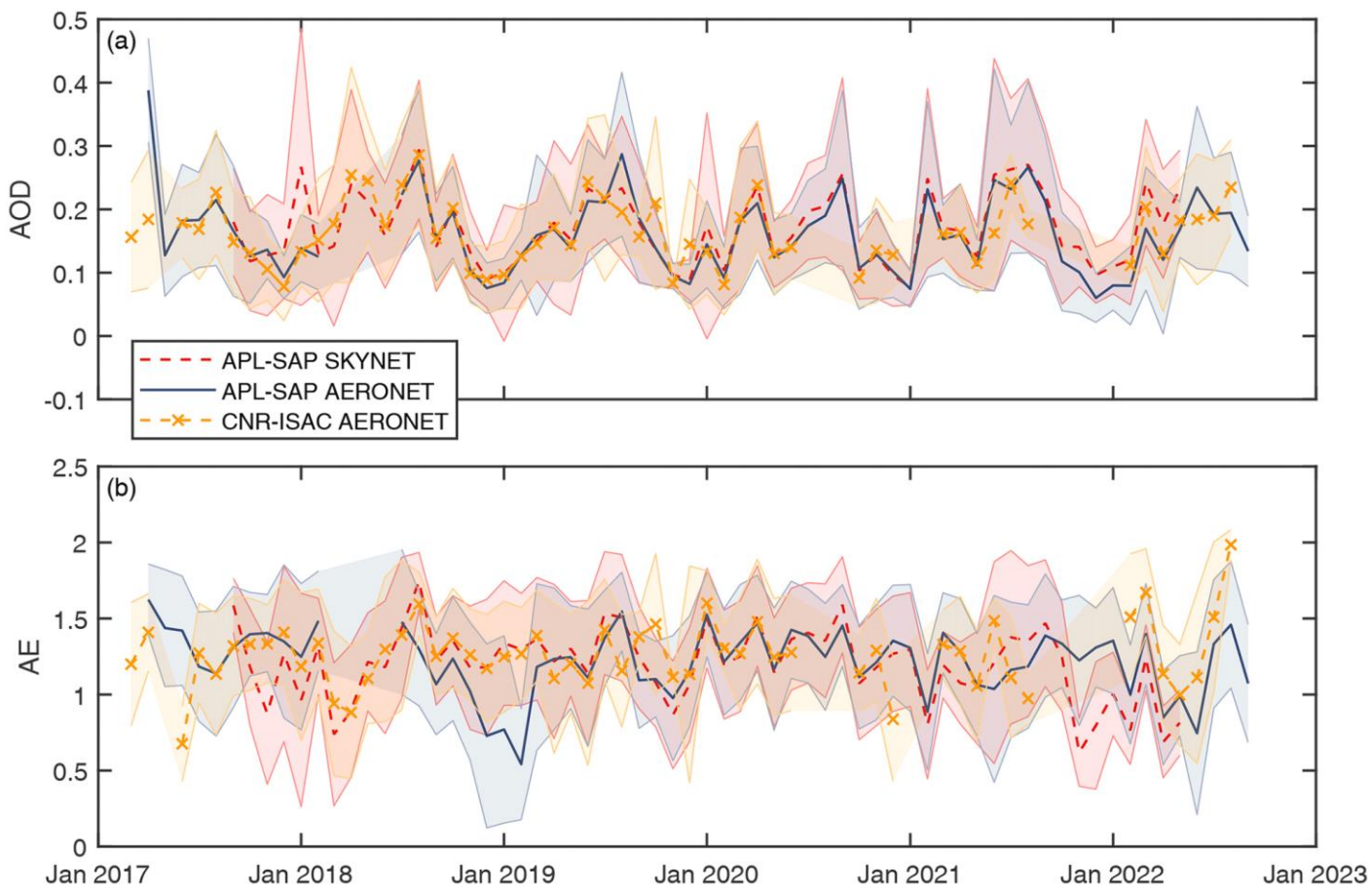


Map of average absolute cloud cover difference between the reference box (12.75° E,35.5° N) and the remaining ones in the considered area. Data source: 2010-2019 ERA-5 total cloud cover (unit: fraction)



Time series of monthly averaged AOD **(a)** and AE **(b)** measurements over APL-SAP (AERONET and SKYNET) and CNR-ISAC (AERONET). Note that AERONET AOD and AE correspond to the wavelength channels of 440 and 440–870 nm, respectively, whereas SKYNET AOD and AE refer to 400 and 400–1020 nm, respectively. The shaded areas correspond to the monthly 1σ standard deviation.