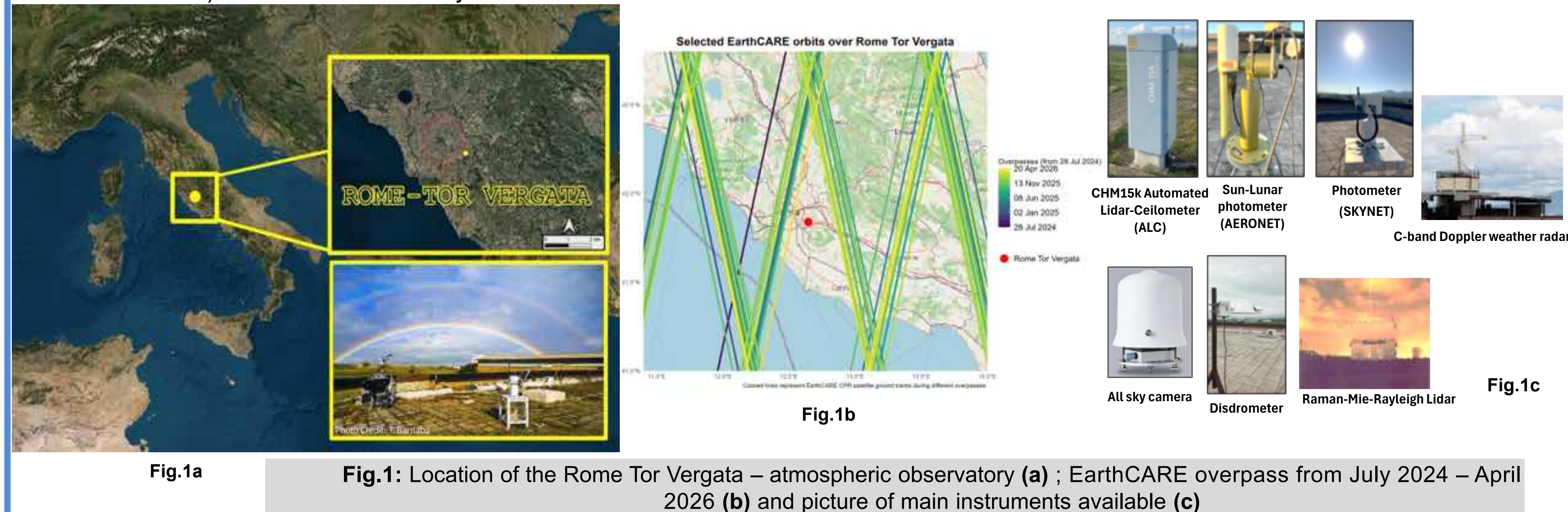


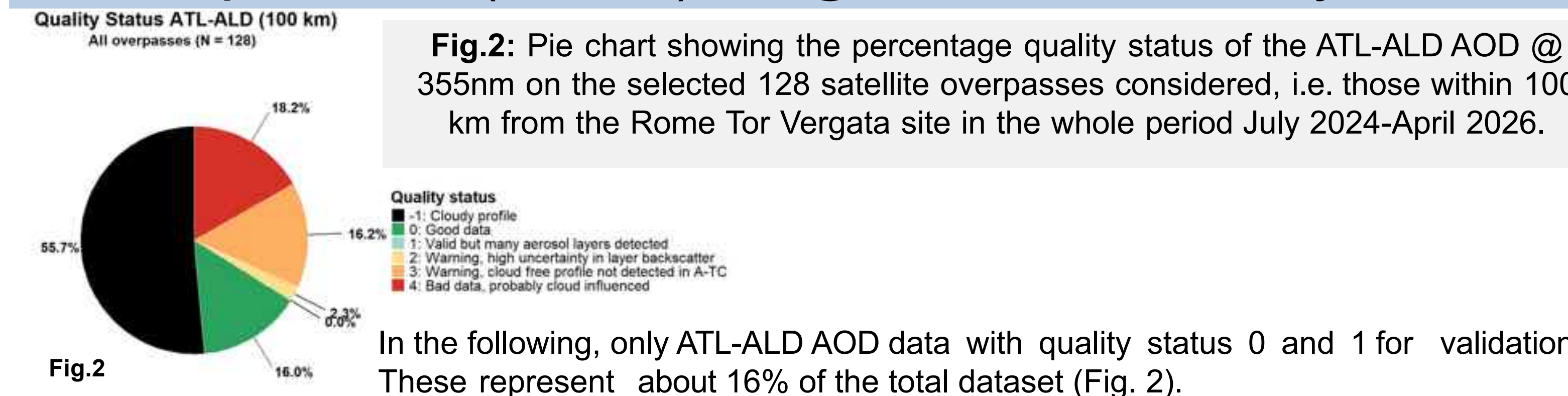
1- Site Introduction – Rome-Tor Vergata

EarthCARE (EC) is a recent ESA mission launched in May 2024, designed to improve our understanding of aerosol, clouds and radiation interactions. The validation of Level 2 aerosol products is essential to assess their reliability. The Italian Space Agency (ASI) funded the Project EC-ValMed.it to provide support in validation of EC products over two Italian Mediterranean sites: Rome, representative of urban conditions, and Lampedusa, representative of clean maritime conditions. Here we focus on aerosol data over Rome. The Rome Tor-Vergata atmospheric observatory hosting several instruments for aerosol, clouds, precipitation and meteo variable observations (Fig.1). In this poster we showcase ongoing use of AERONET and SKYNET sunphotometers, as well as a profilers (Raman Lidar System-RMR- and of the Automated-Lidar Ceilometer – ALC) for validation and analysis of EC-MSI and EC-ATD data within EC-ValMed.it

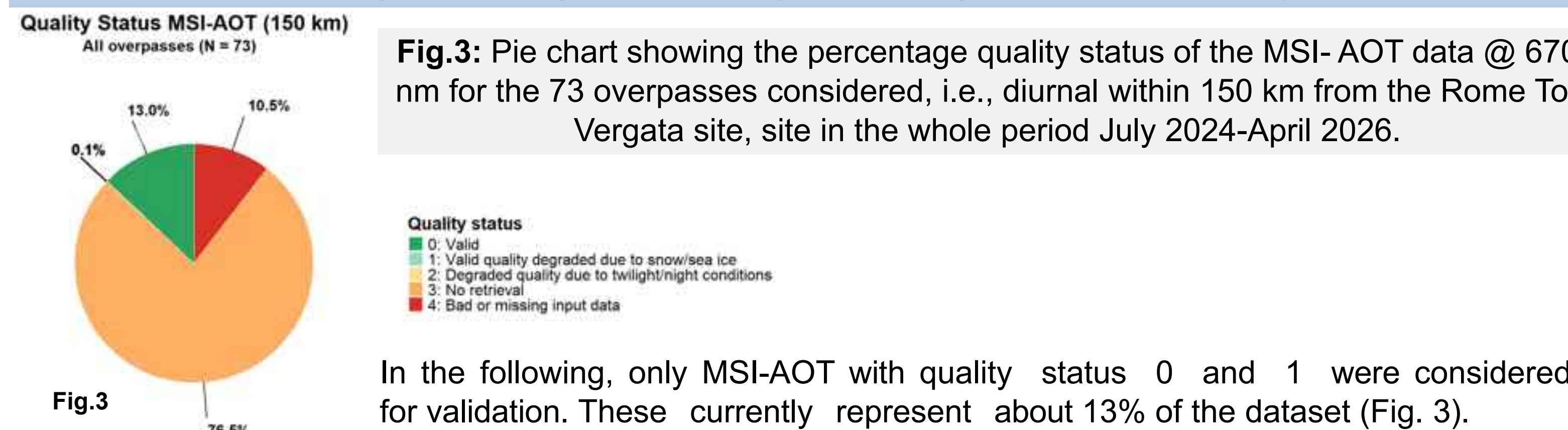


2- EarthCARE aerosol products addressed

EC Atmospheric Lidar (ATL-ALD) AOD @ 355 nm data availability over Rome

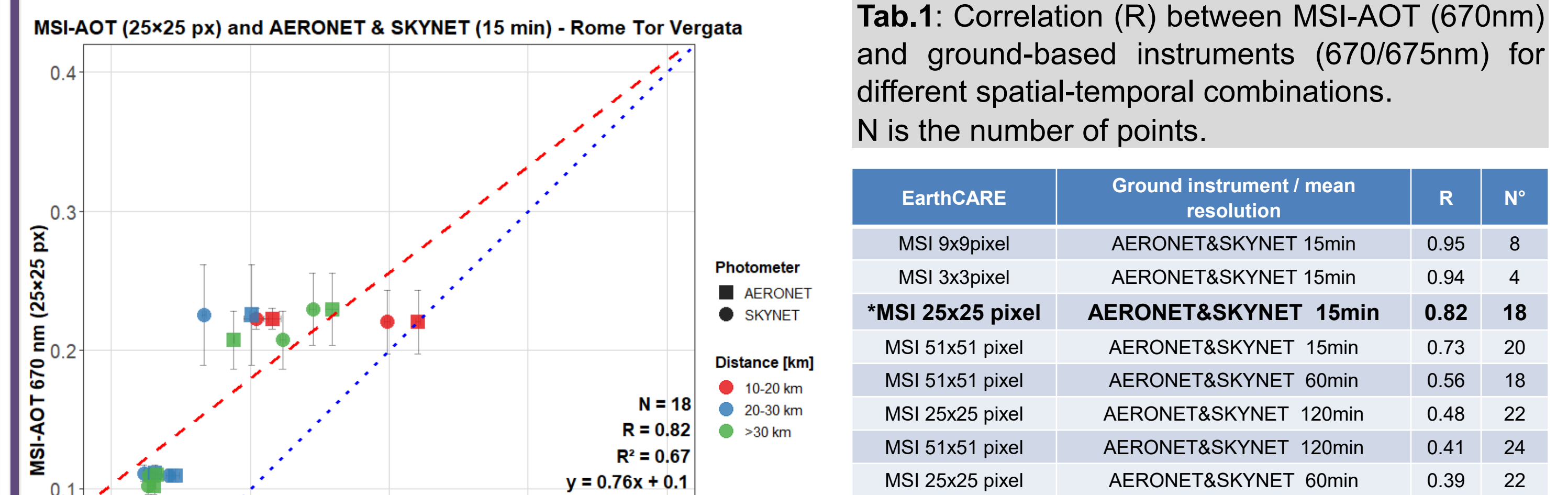


Multispectral Imager AOT (MSI-AOT @ 670 nm) data availability over Rome



3- Validation EarthCARE aerosol with photometers

EC AOD products (from both MSI-AOT and ATL-ALD) are being validated against ground-based photometers (AERONET, SKYNET) using different spatial and temporal co- location criteria. ATL-ALD AOD is averaged along the satellite track over 4, 10, and 20 s intervals, while MSI-AOT is spatially averaged over fixed areas (3×3, 9×9, 25×25, and 51×51 pixels) centered on the site. Relevant AERONET and SKYNET AOD observations are temporally averaged over 15, 30, 60, and 120 min centered at the overpass time.



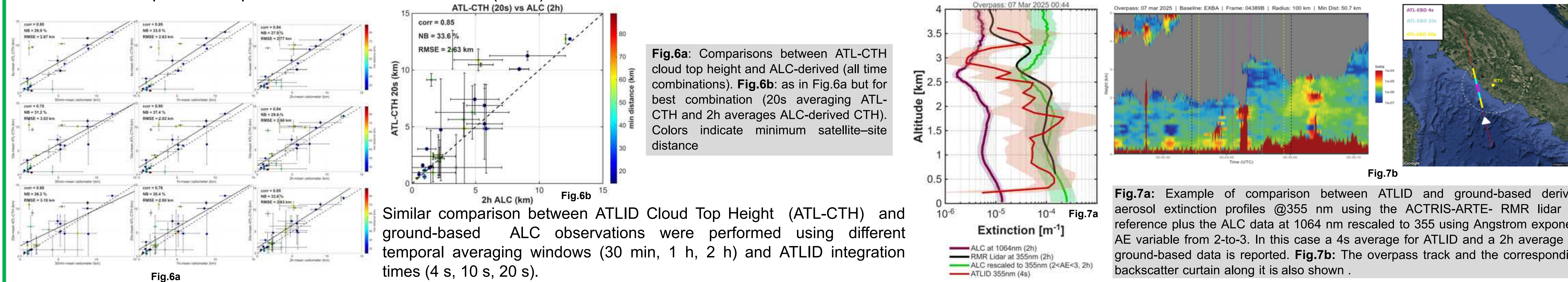
Tab.1: Correlation (R) between MSI-AOT (670nm) and ground-based instruments (670/675nm) for different spatial-temporal combinations. N is the number of points.

EarthCARE	Ground instrument / mean resolution	R	N°
MSI 9x9pixel	AERONET&SKYNET 15min	0.95	8
MSI 3x3pixel	AERONET&SKYNET 15min	0.94	4
MSI 25x25 pixel	AERONET&SKYNET 15min	0.82	18
MSI 51x51 pixel	AERONET&SKYNET 15min	0.73	20
MSI 51x51 pixel	AERONET&SKYNET 60min	0.56	18
MSI 25x25 pixel	AERONET&SKYNET 120min	0.48	22
MSI 51x51 pixel	AERONET&SKYNET 120min	0.41	24
MSI 25x25 pixel	AERONET&SKYNET 60min	0.39	22

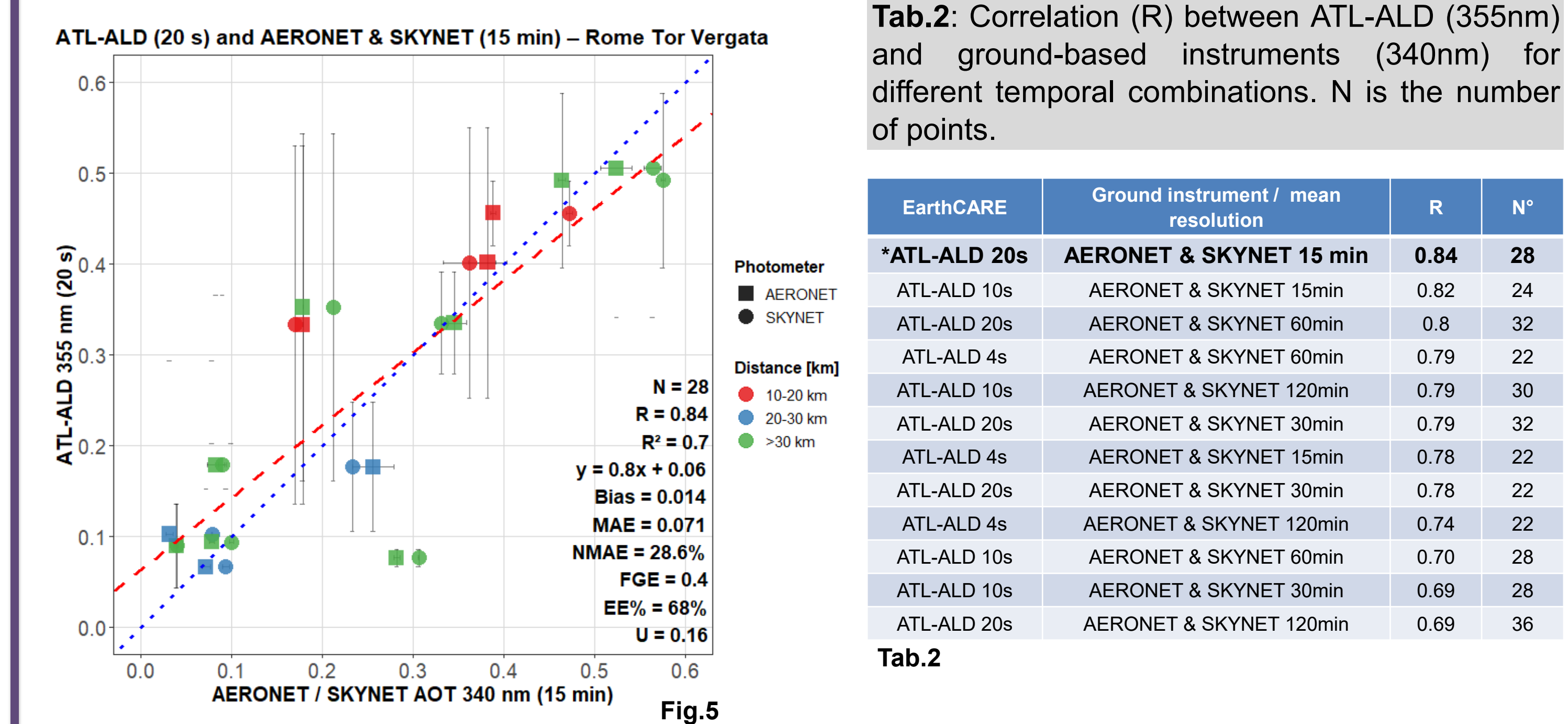
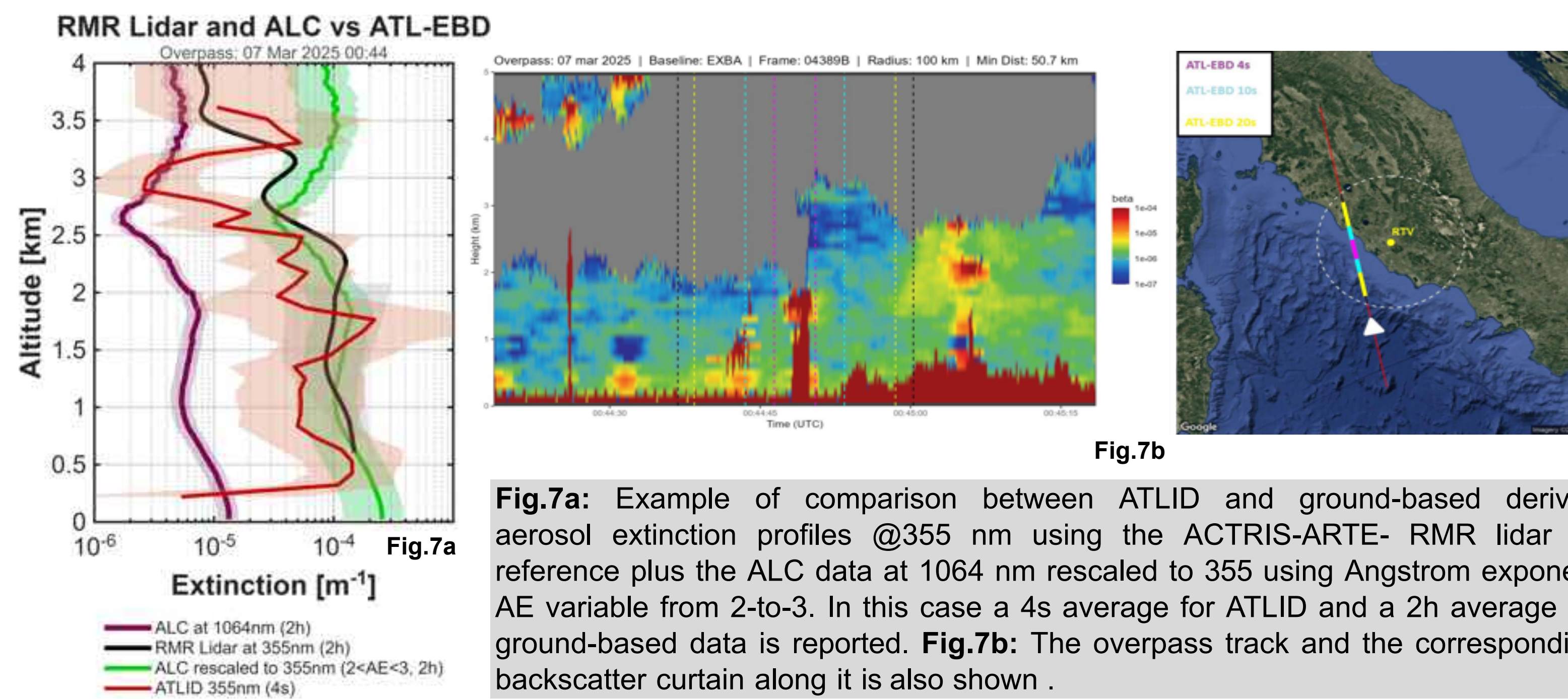
Fig.4: Best comparison between MSI-AOT AOD @ 670nm (25x25 average pixel) and AERONET/SKYNET photometers 670/675nm (15min temporal average). See Tab.1 (*)

4- Use of ground-based profiling instruments (ALC and RMR Lidar) with EarthCARE

Ground-based profilers are used to validate both aerosol and cloud data. Fig.6a-b shows an example of validation of ATLID Cloud Top Height (CTH) data, while Fig. 7a-b shows an example of ATLID extinction profile comparison with both Raman Lidar (RMR) and ALC-based ones.



Similar comparison between ATLID Cloud Top Height (ATL-CTH) and ground-based ALC observations were performed using different temporal averaging windows (30 min, 1 h, 2 h) and ATLID integration times (4 s, 10 s, 20 s).



Tab.2: Correlation (R) between ATL-ALD (355nm) and ground-based instruments (340nm) for different temporal combinations. N is the number of points.

EarthCARE	Ground instrument / mean resolution	R	N°
*ATL-ALD 20s	AERONET & SKYNET 15 min	0.84	28
ATL-ALD 10s	AERONET & SKYNET 15min	0.82	24
ATL-ALD 20s	AERONET & SKYNET 60min	0.8	32
ATL-ALD 4s	AERONET & SKYNET 60min	0.79	22
ATL-ALD 10s	AERONET & SKYNET 120min	0.79	30
ATL-ALD 20s	AERONET & SKYNET 30min	0.79	32
ATL-ALD 4s	AERONET & SKYNET 15min	0.78	22
ATL-ALD 20s	AERONET & SKYNET 30min	0.78	22
ATL-ALD 4s	AERONET & SKYNET 120min	0.74	22
ATL-ALD 10s	AERONET & SKYNET 60min	0.70	28
ATL-ALD 10s	AERONET & SKYNET 30min	0.69	28
ATL-ALD 20s	AERONET & SKYNET 120min	0.69	36

Tab.2

Fig.5: Comparison between ATL-ALD AOD @ 355nm(20s temporal average) and AERONET/SKYNET photometers @ 340 nm (15min temporal average). See Tab.2 (*)

5- Aerosol characterization in the Rome area using EarthCARE

As an additional data analysis, EC-only characterization of aerosol variability in the Rome area is currently in progress exploiting both the ATLID (vertical dimension, Fig. 8b-c) and the MSI (horizontal dimension, Fig. 9)

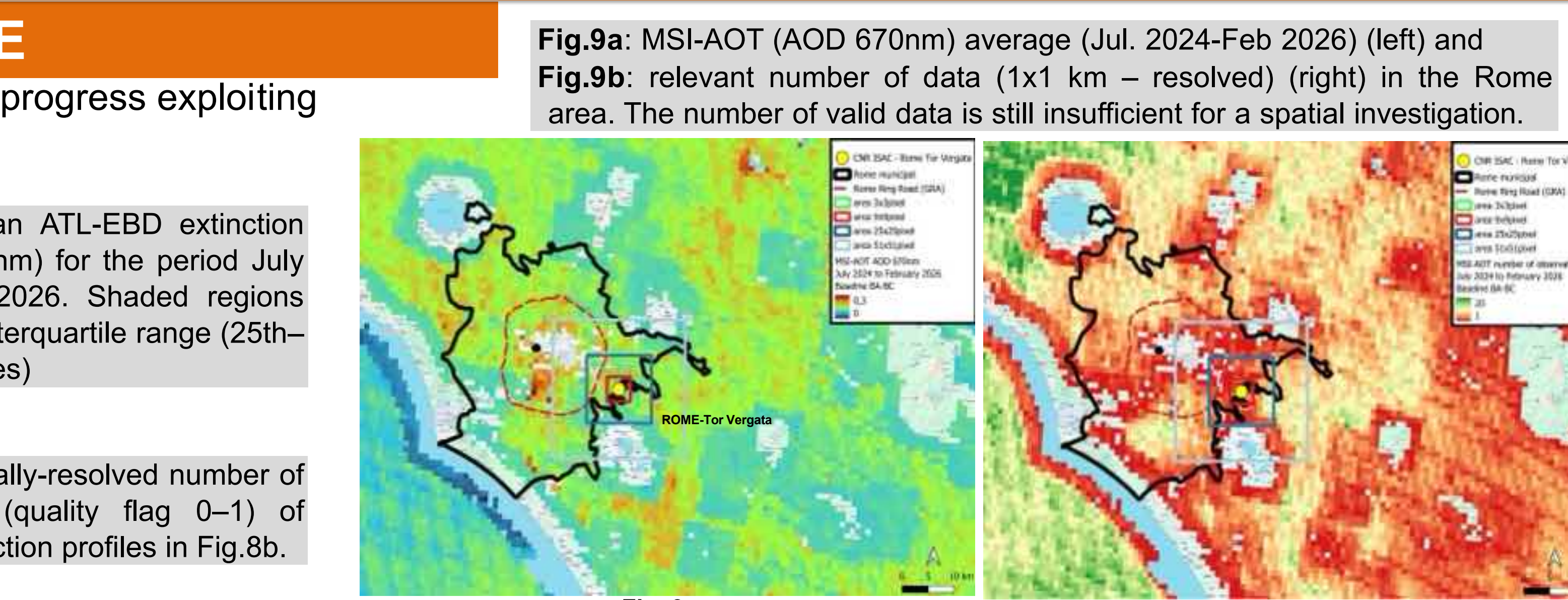
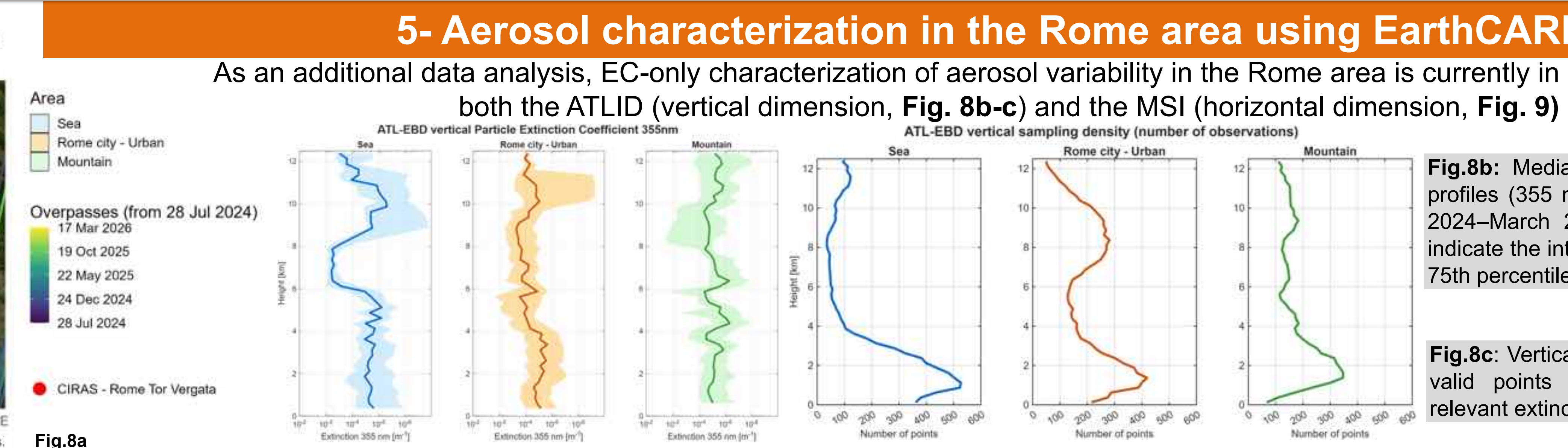
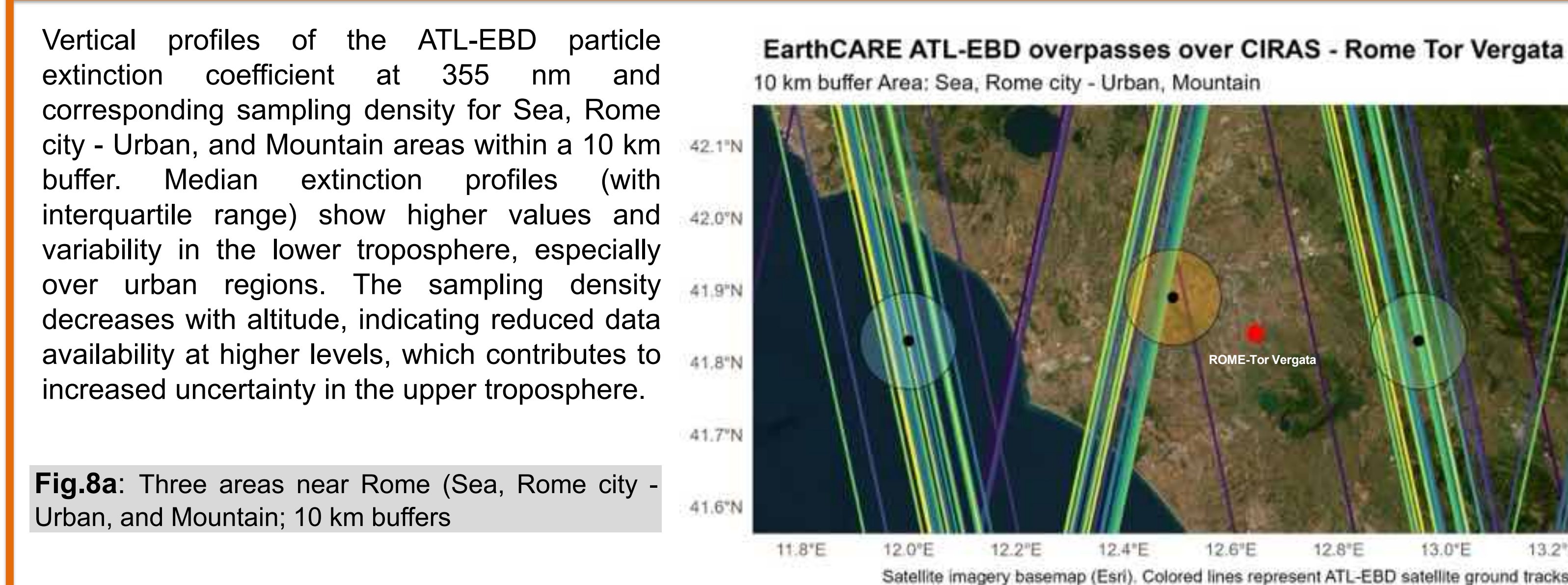


Fig.9a: MSI-AOT (AOD 670nm) average (Jul. 2024-Feb 2026) (left) and Fig.9b: relevant number of data (1x1 km – resolved) (right) in the Rome area. The number of valid data is still insufficient for a spatial investigation.

