



ESA-JAXA Pre-Launch EarthCARE Science and Validation Workshop

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

EVID<22>: Validation of the EarthCARE ATLID and MSI products using ground-based lidar and sunphotometry measurements in East Asia

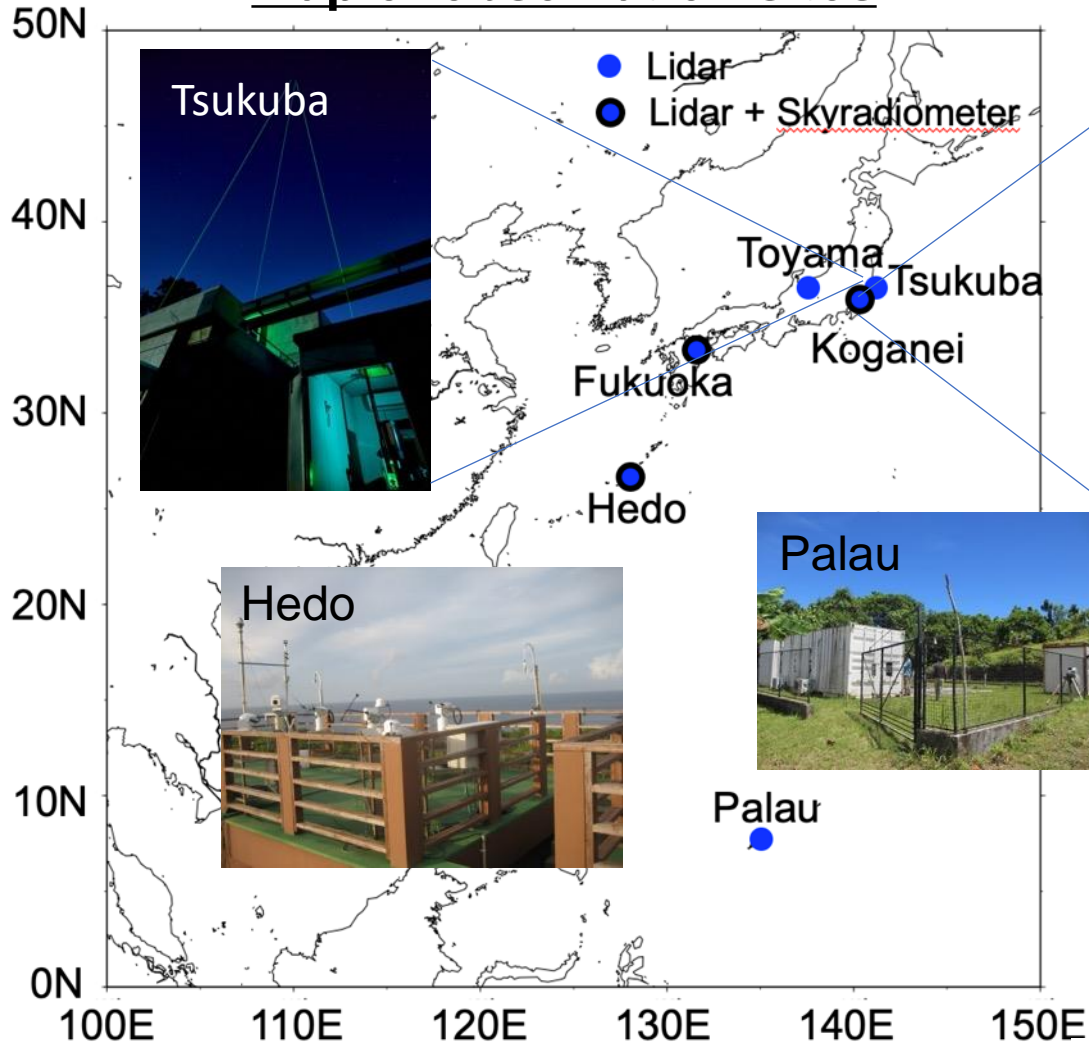
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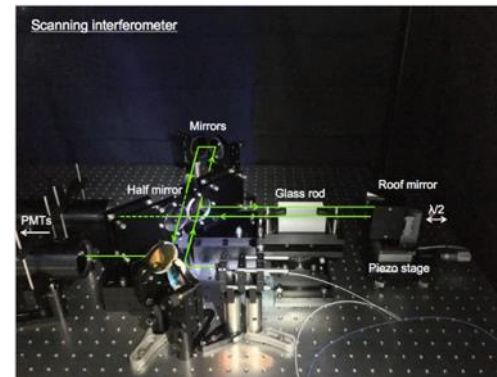
Observation (AD-Net + SKYNET)



Map of observation sites



NICT, Koganei site (35.7N, 139.5E)



Scanning interferometer used in 355nm-HSRL [Jin et al. 2020]



355nm-MFMSPL [Nishizawa et al. 2021]

Objective



The objective is to validate the aerosol and cloud products of the ATLID and MSI. This study focuses primarily on aerosol-related products. The main target parameters are:

- ✓ aerosol-oriented 355 nm extinction, backscatter, and depolarization profiles (**A-AER/ATLID L2A**)
- ✓ 355 nm cloud and aerosol extinction, backscatter, and depolarization profiles (**A-EBD/ATLID L2A**)
- ✓ aerosol layer products (**A-ALD/ATLID L2A**)
- ✓ aerosol optical thicknesses (AOTs) at 670 and 865 nm (**M-AOT/MSI-L2A**)
- ✓ columnar aerosol optical properties (**AM-ACD/ATLID-MSI L2B**)

using ground-based lidar network (AD-Net) data and sunphotometry network (SKYNET) data in East Asia.

Instruments/Status/measured parameters

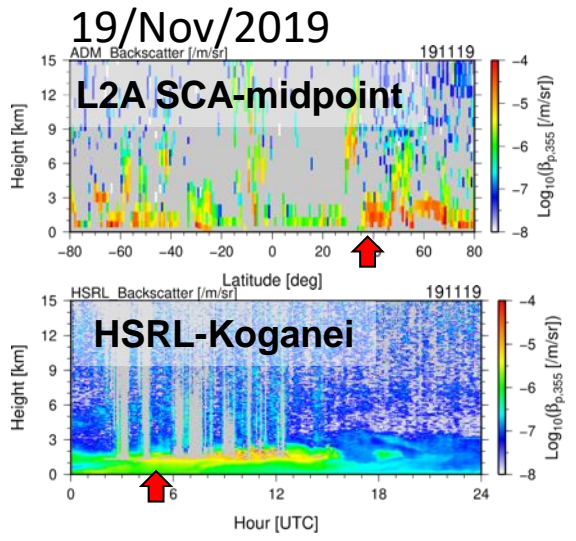
Site (Environment)	Lat / Lon	Instrument (Status)	Parameter
Koganei (Rural~Urban)	35.7N 139.48E	HSRL (In operation)	α , β , δ , S : 355 (Day & Night) Attenuated backscatter: 355 (Day & Night)
		Sky Radiometer (In operation)	AOT: 340, 380, 400, 500, 675, 870, and 1020 (Day) Angstrom exponent (Day)
Tsukuba (Rural)	36.05N 140.12E	HSRL (In operation)* ¹	α , β , δ , S : 355 (Day & Night) α , β , δ , S : 532 (Day & Night) Attenuated backscatter: 355/532/1064 (Day & Night)
		MRL (In operation)	α , β , δ , S : 355/532 (Night) Attenuated backscatter: 355/532/1064 (Day & Night)
Hedo (Maritime)	26.87N 128.25E	Sky Radiometer (In operation)	AOT: 340, 380, 400, 500, 675, 870, and 1020 (Day) Angstrom exponent (Day)
		MRL+HSRL (In operation)	α , β , δ , S : 355 (Night) α , β , δ , S : 532 (Day & Night) Attenuated backscatter: (Day & Night)
Fukuoka (Rural~Urban)	33.52N 130.48E	Sky radiometer (In operation)	AOT: 340, 380, 400, 500, 675, 870, and 1020 (Day) Angstrom exponent (Day)
		MRL (In operation)	α , β , δ , S : 355/532 (Night) Attenuated backscatter: 355/532/1064 (Day & Night)
Toyama (Rural)	36.7N 137.1E	MRL (Inactive)* ²	α , β , δ , S : 355/532 (Night) Attenuated backscatter: 355/532/1064 (Day & Night)
Palau (Maritime)	7.34N 134.5E	MRL (Inactive)* ²	α , β , δ , S : 355/532 (Night) Attenuated backscatter: 355/532/1064 (Day & Night)
RV Mirai (ocean)	Ocean	MRL (In operation)	α , β , δ , S : 355/532 (Night) Attenuated backscatter: 355/532/1064 (Day & Night)

Validation: ADM L2A vs Ground-based lidar

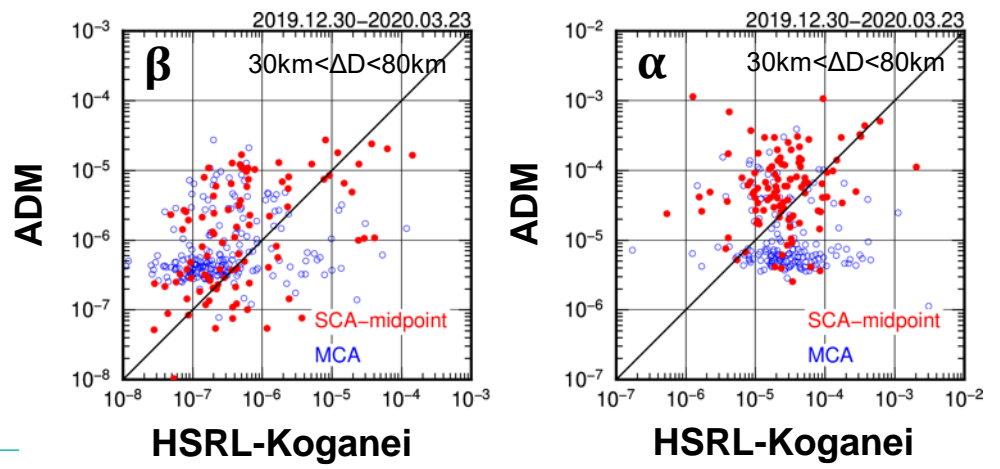


【ADM vs 355HSRL-Koganei】

HSRL-Koganei

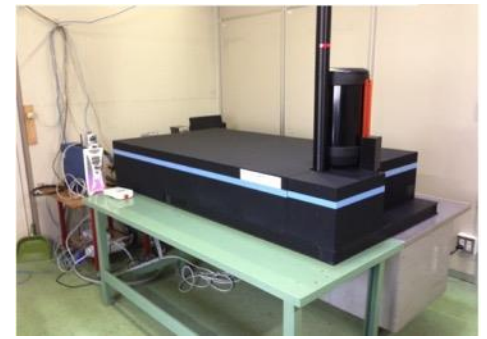


Scatter plot: 2019.12-2020.3, clear-sky

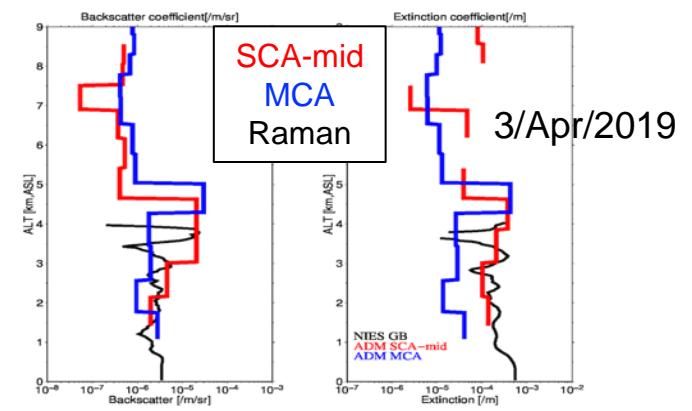


【ADM vs 355Raman-Fukuoka】

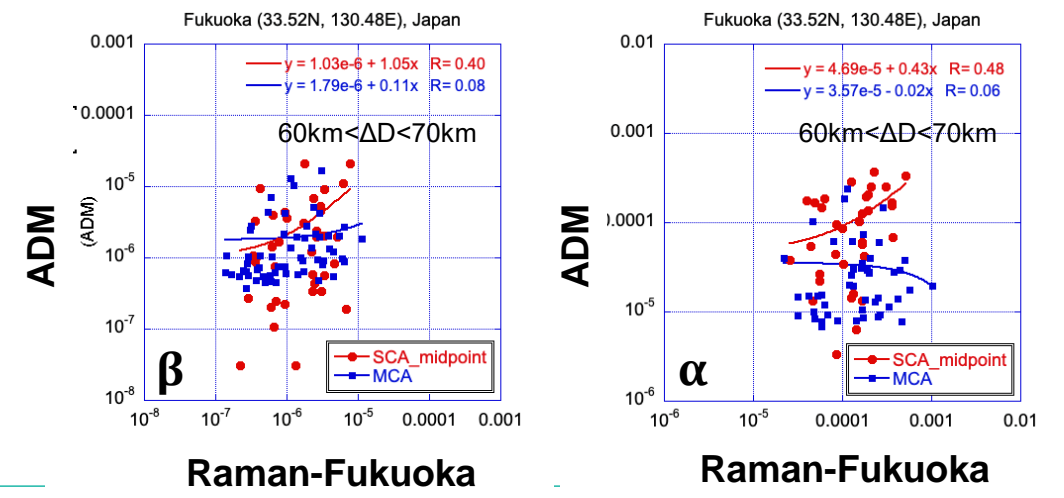
Fukuoka-Raman-HSRL



Vertical profile: L2A vs Raman



Scatter plot: 2019.11-2020.6, clear-sky



Observation (new addition, Koganei)

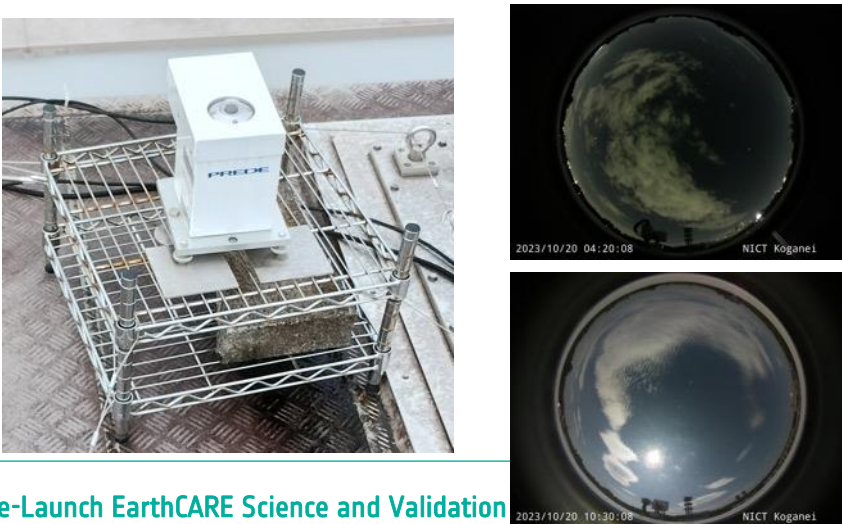


Skylight radiometer

Continuous measurements to begin in October 2023.

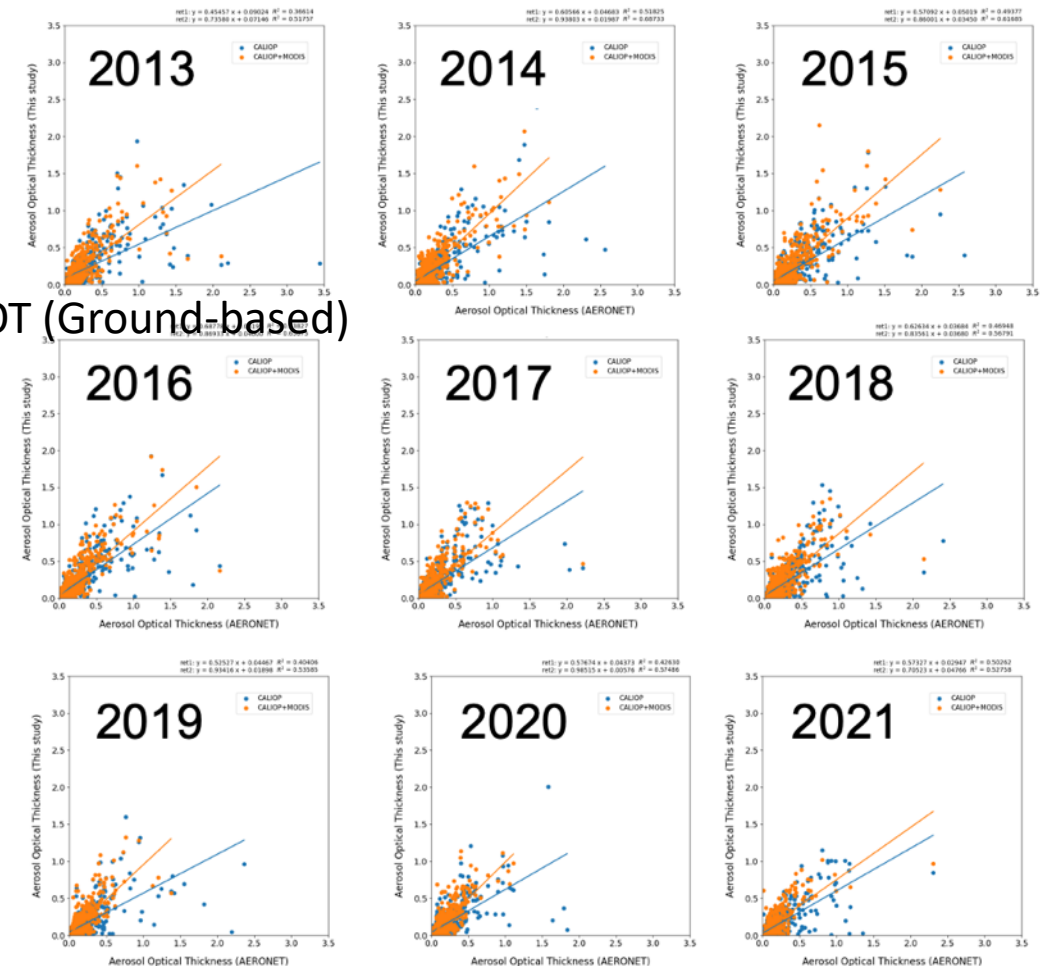


All-sky view camera (optional use)



Comparison of AOD (CALIOP vs AERONET)
Use data where the distance between satellite and site is within 27.5 km and the time difference is within 30 minutes.

AOT (CALIOP)
AOT (Ground-based)



Summary



● Continuous observation of AD-Net and SKYNET is being conducted.

● Operational expenses have been and will continue to be covered by external competitive funds from related research institutes and researchers.

● The Palau observation site will be closed in 2024 due to the situation of the operator (JAMSTEC). We are currently considering where to relocate the site.

● Data assimilation studies using satellite and ground-based data are underway, and the creation of integrated satellite and ground data is underway. The use of the integrated data adding the EarthCARE for satellite and inter-satellite comparison will also be considered in the future.

Example of Integrated AOT and extinction data
Here, CALIPSO, Himawari, MODIS, ADNet, SKYNET, and AERONET data in 2019 are integrated in 0.5 degree and 1 hour.

