JAXA validation overview

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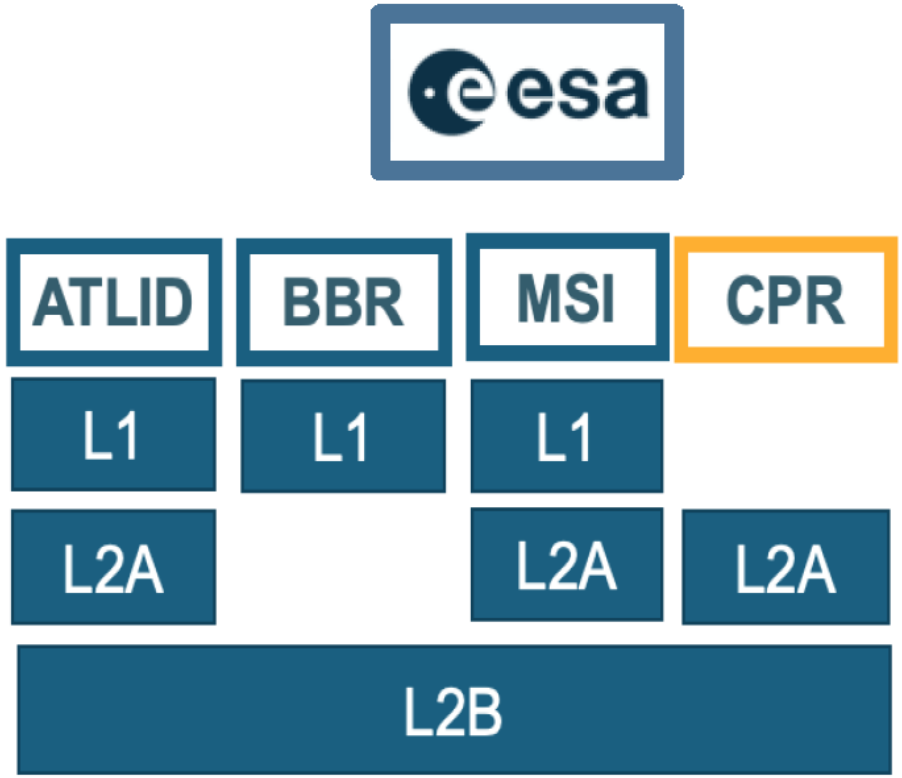
JAXA

2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop
17 – 20 March 2025 | ESA-ESRIN | Frascati (Rome), Italy

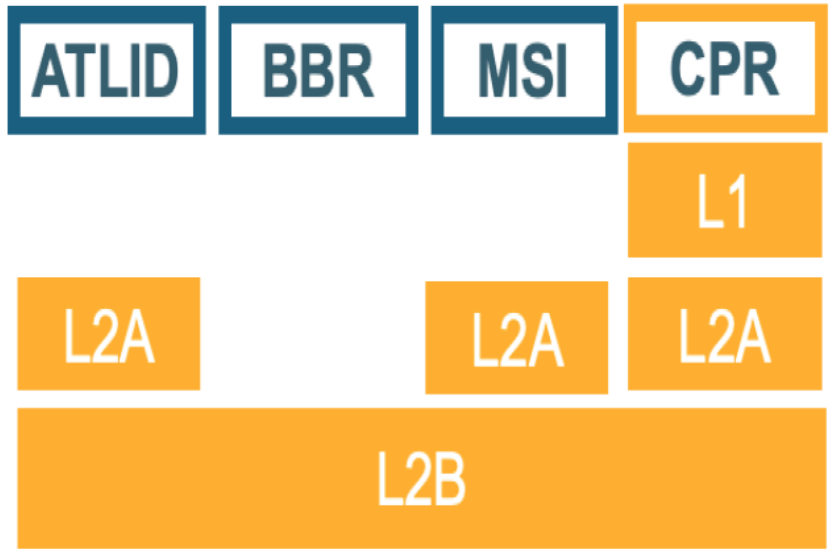
Validation of ESA and JAXA L2 products



ESA for ESA products
JAXA for JAXA products

- ESA-JAXA Joint Scientific Validation Implementation Plan (2.0)
- ESA-JAXA validation coordination

- ESA-JAXA Joint Validation Workshops
- Interaction between ESA & JAXA algorithm and validation team members



Validation Activities toward L2 public release

- JAXA has established before launch the public release criteria for each Level 2 data product (such as accuracy standards for main parameters).
- Based on the validation results mainly conducted by the JAXA validation team, the JAXA review for the public release of JAXA Level 2 products (L2a and L2b 2-sensry synergy) was successfully completed on 13th March to confirm that the criteria were met.

Product	Product identifier	Result
CPR One-sensor Echo Product	CPR_ECO	✅
CPR One-sensor Cloud Product	CPR_CLP	✅
CPR-ATLID Synergy Cloud Product	AC__CLP	✅
ATLID One-sensor Cloud and Aerosol Product	ATL_CLA	✅
MSI One-sensor Cloud Poduct	MSI_CLP	✅
ECMWF-AUX-2D Product	AUX__2D	✅
ECMWF-AUX-3D Product	AUX__3D	✅

- In the 2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop, many of these validation results will be reported by the JAXA validation PIs/CIs.
- This presentation will provide an overview, introducing the overall picture of JAXA validation activities focusing on level 2 products (only main results).

JAXA Validation Approach

Campaigns

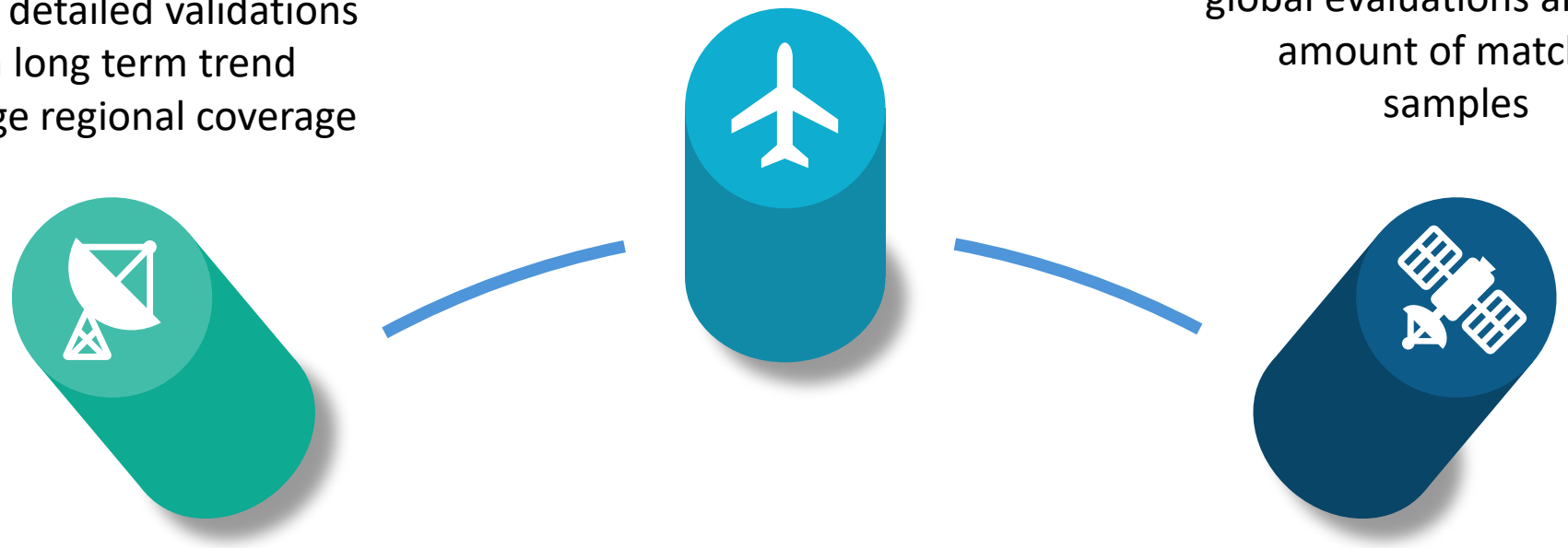
Ground campaign provides multi-sensor detailed evaluations, and airborne campaign provides abundant number of matchup samples in early phase

Networks

Ground network observations provide detailed validations with long term trend and large regional coverage

Spaceborne

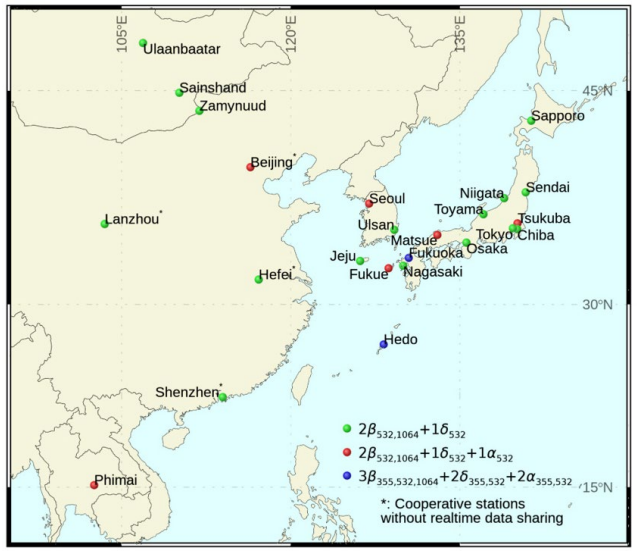
Satellite sensors provide global evaluations and large amount of matchup samples



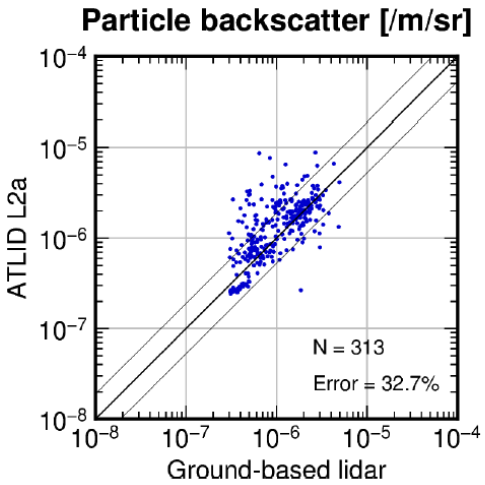
JAXA Validation Overview

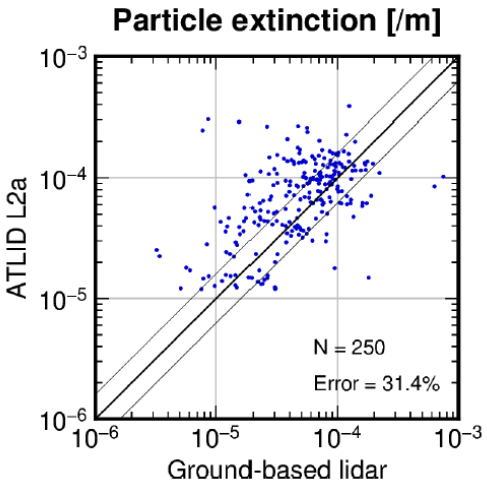
- Direct comparison of ATLID product (ATL_CLA) with ground-based HSRL and Raman lidars of the Asian dust and aerosol lidar observation network (AD-Net)

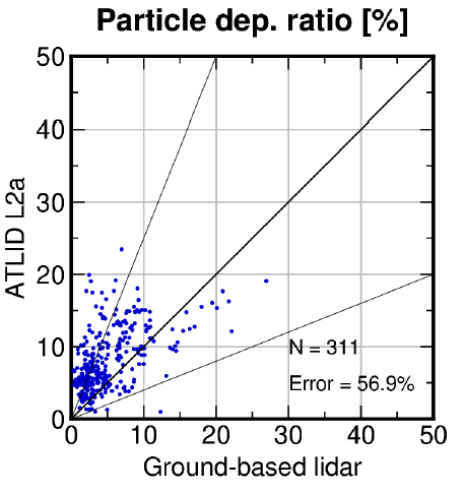
Networks



	Backscatter	Extinction	Dep. ratio
Error [%]	32.7%	31.4%	56.9%
Target [%]	±90%	±60%	±150%







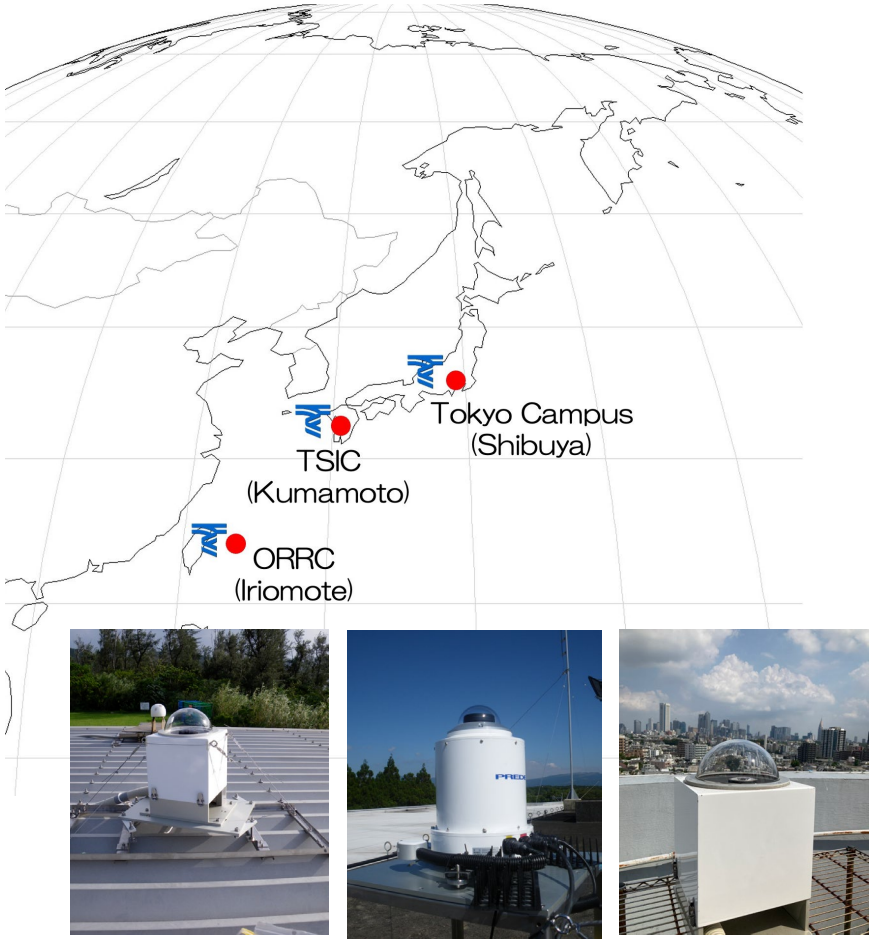
Y. Jin-san's talk on Day 3

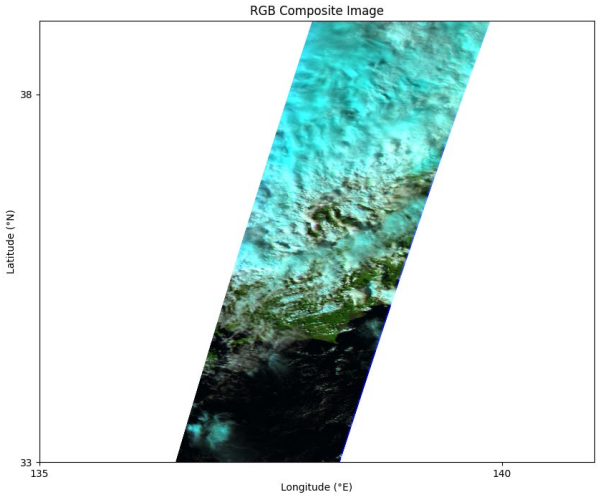
Figures and results are provided by Y. Jin and T. Nishizawa

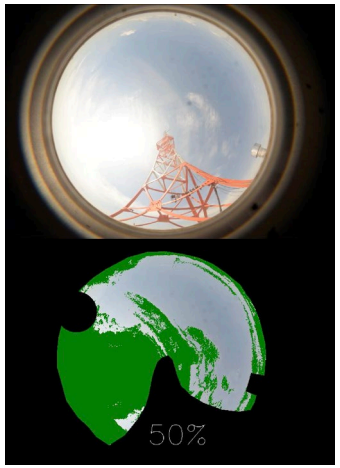
JAXA Validation Overview

- Comparison of MSI cloud product with ground-based whole sky cameras (Whole Sky Camera system in Tokai University)

Networks







		Cloud Fraction from sky images		
		Clear	Cloudy	Total
Cloud Fraction from MSI data	Clear	10	3	14
	Cloudy	0	11	11
	Total	10	14	24

Case All_day

Total Accuracy:
87.5%

M. Wang-san's talk on Day 2

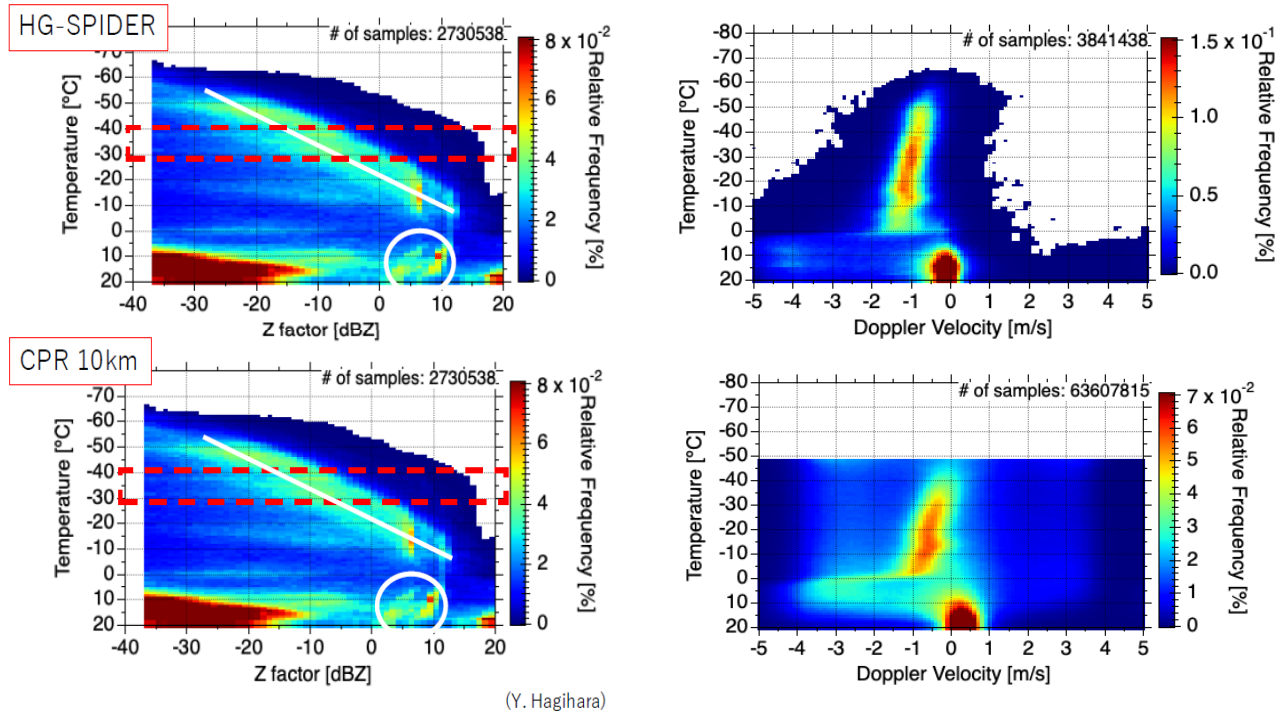
Figures and results are provided by M. Wang and T. Y. Nakajima

JAXA Validation Overview

- Koganei validation super site has multiple types of instruments, including High sensitivity doppler cloud radar and scanning cloud radar, wind profiler, doppler lidars, HSRL, MFMSPL for field campaign observations for EarthCARE validation.

Campaigns

The high sensitivity doppler cloud radar (HG-SPIDER; -40dBZ at altitude of 15km) obtained consistent radar reflectivity and doppler velocity with CPR_ECO.



H. Horie-san's talk on Day 1

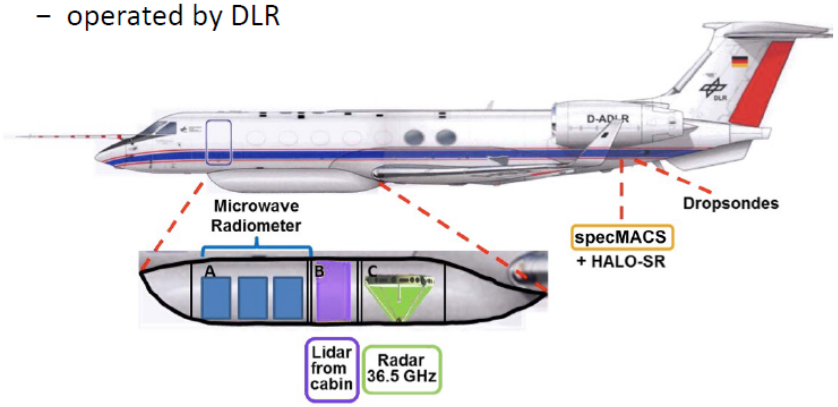
Figures and results are provided by H. Horie, Y. Hagihara, Y. Ohno

JAXA Validation Overview

- Collaboration with DLR for EarthCARE-like airborne campaign PERCUSION in ORCESTRA which was conducted with HALO aircraft (High Altitude and Long Range Research Aircraft)

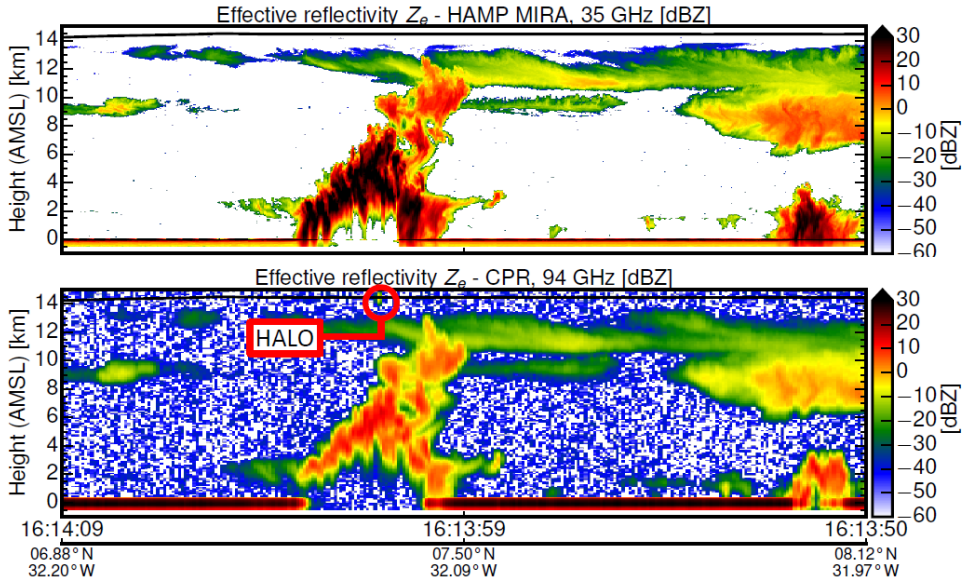
Campaigns

- G550, max. alt 15 km / max. range: 8000 km
- In operation since 2012
- operated by DLR



Scientific Instruments

HSRL-Lidar (WALES, 532 nm – Wirth et al. 2009)
Cloud Radar (HAMP MIRA, 35 GHz – Ewald et al. 2019)
Hyper-Spektral Imager (specMACS – Ewald et al. 2016)
Microwave Radiometer (HAMP passive – Mech et al. 2014)



MIRA
Radar reflectivity

CPR
Radar reflectivity (BA baseline)

F. Ewald-san's talk on Day 1 for CPR
S. Gross-san's talk on Day 3 for ATLID

Figures and results are provided by F. Ewald, S. Gross and PERCUSION team

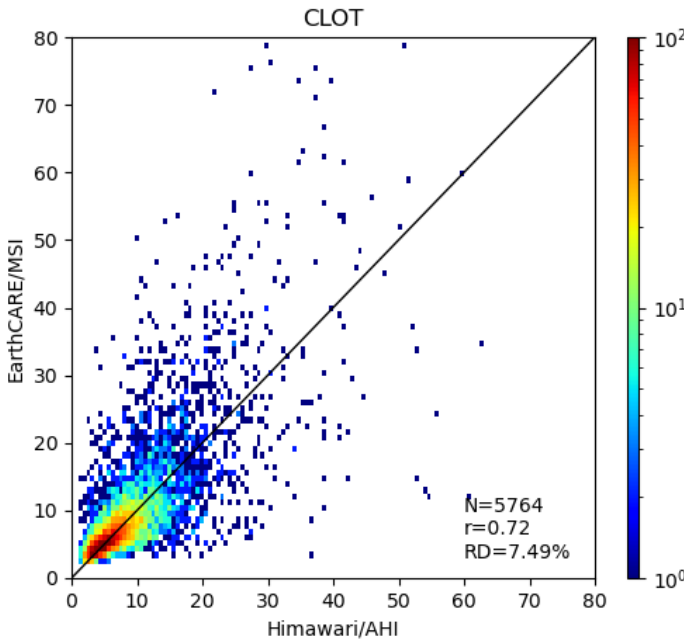
JAXA Validation Overview

- Comparison of the MSI cloud product with the Himawari geostationary satellite.

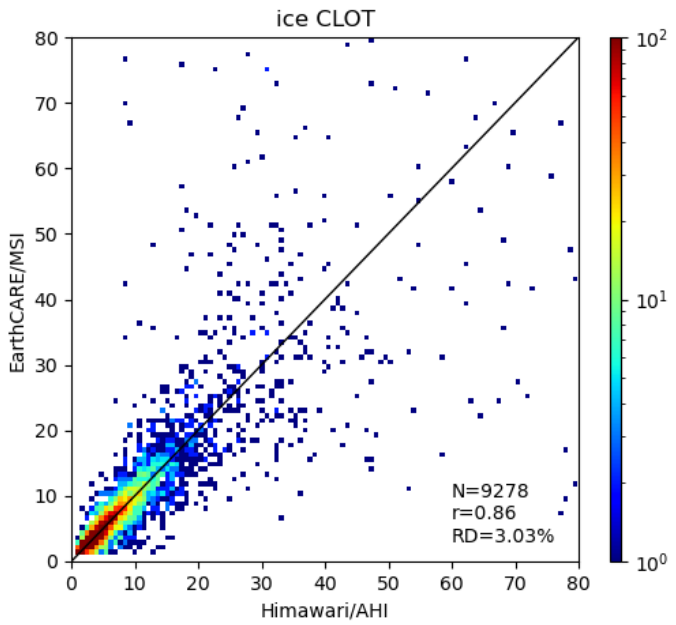
M. Muto-san's talk on Day 2

Spaceborne

Optical thickness (water cloud)



Optical thickness (ice cloud)



Cloud detection

Land Total: 673464		AHI cloudy	AHI clear
MSI	cloudy	251872	53171
		37.4%	7.90%
	clear	15983	352438
		2.37%	52.3%

match 89.7%, mismatch 10.3%

Ocean Total: 4923767		AHI cloudy	AHI clear
MSI	cloudy	1957298	460516
		39.8%	9.35%
	clear	189028	2316925
		3.84%	47.1%

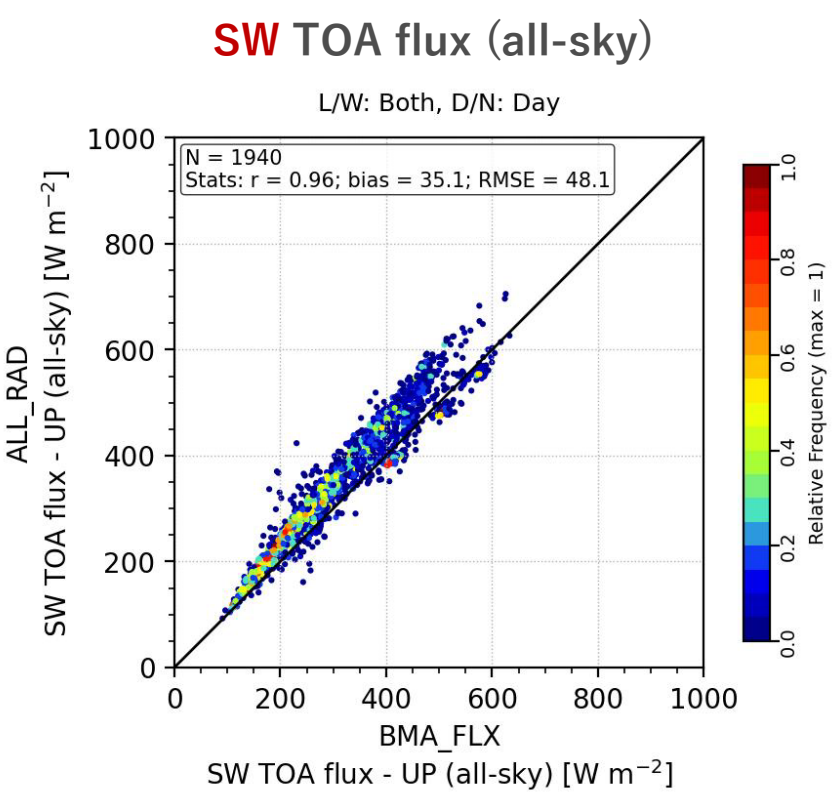
match 86.8%, mismatch 13.2%

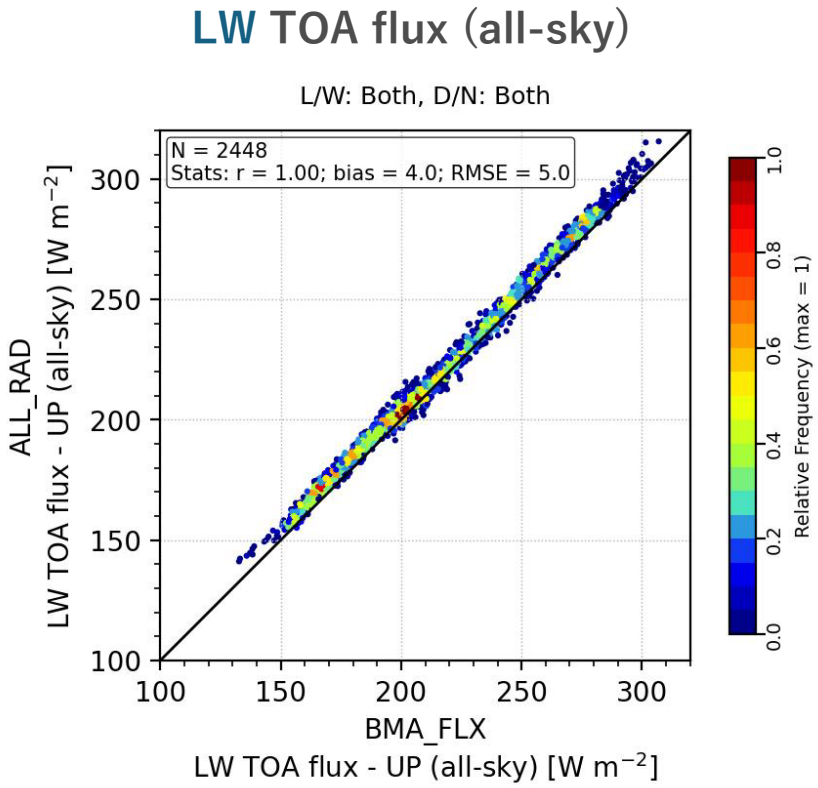
Figures and results are provided by M. Muto

JAXA Validation Overview

- Radiative flux estimated from aerosol-cloud-precipitation vertical and horizontal distribution observed by CPR, ATLID, and MSI with BBR as radiative closure (ALL_RAD)

Spaceborne





Monthly and 5 x 5 degrees averaged

T. M. Nagao-san' talk on Day 3

Figures and results are provided by T.M. Nagao and K. Suzuki

Summary

- The JAXA validation team including international collaboration with DLR and NOAA is advancing the validation of JAXA EarthCARE products.
- A multifaceted evaluation is being conducted by comparing with field and airborne campaigns, network observations, and satellite observations which have complementary aspects in terms of sample numbers/density, spatial coverage, multi-instrumentality, etc.
- Based on the validation results, the JAXA review for the public release of JAXA Level 2 products (L2a and L2b 2-sensor synergy) was successfully completed on 13th March to confirm that the criteria were met.

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ECMWF-AUX-3D Product	AUX__3D	✅

Now in public!