

Ver2. Atmosphere Products

Evaluation Summary

Product	Release threshold	Standard accuracy	Target accuracy	Status* ¹	Evaluation Methods
Cloud flag/Classification	10% (with whole-sky camera)	Incl. below cloud amount	Incl. below cloud amount	☆	Comparison with in-situ observation (sky-camera images) for release threshold. Evaluations for standard and target accuracies were performed as the Classified cloud fraction products.
Classified cloud fraction	20% (on solar irradiance)	15% (on solar irradiance)	10% (on solar irradiance)	☆	Comparison of SGLI-derived solar irradiance using cloud products including cloud flag, cloud fraction etc. with ground-measured solar irradiance.
Cloud top temp/height	1 K	3 K/2 km (top temp/height)	1.5 K/1 km (temp/height)	◎	Evaluation was made as vi-cal. of SGLI TIR bands for the release threshold. In addition, comparison with other satellite data for evaluating the achievement of the standard accuracy.
Water cloud OT/effective radius	10%/30% (CloudOT/radius)	100% (as cloud liquid water)	50% / 20%	○	Comparison with other satellite (MODIS) data.
Ice cloud optical thickness	30%	70%	20%	○	Comparison with other satellite (MODIS) data.
Aerosol over the ocean	0.1 (Monthly $\tau_{a_670,865}$)	0.1 (scene $\tau_{a_670,865}$)	0.05 (scene $\tau_{a_670,865}$)	○	Comparison with other satellite (MODIS) data.
Land aerosol by near ultra violet	0.15 (Monthly τ_{a_380})	0.15 (scene τ_{a_380})	0.1 (scene τ_{a_380})	○ → ◎	Comparison with in-situ observation and other satellite (MODIS) data.
Aerosol by Polarization	0.15 (Monthly $\tau_{a_670,865}$)	0.15 (scene $\tau_{a_670,865}$)	0.1 (scene $\tau_{a_670,865}$)	◎	Comparison with in-situ observation and other satellite (MODIS) data.

*1 Symbols denote as follows; ○: the release threshold achieved, ◎: the standard accuracy achieved, ☆: the target accuracy achieved.

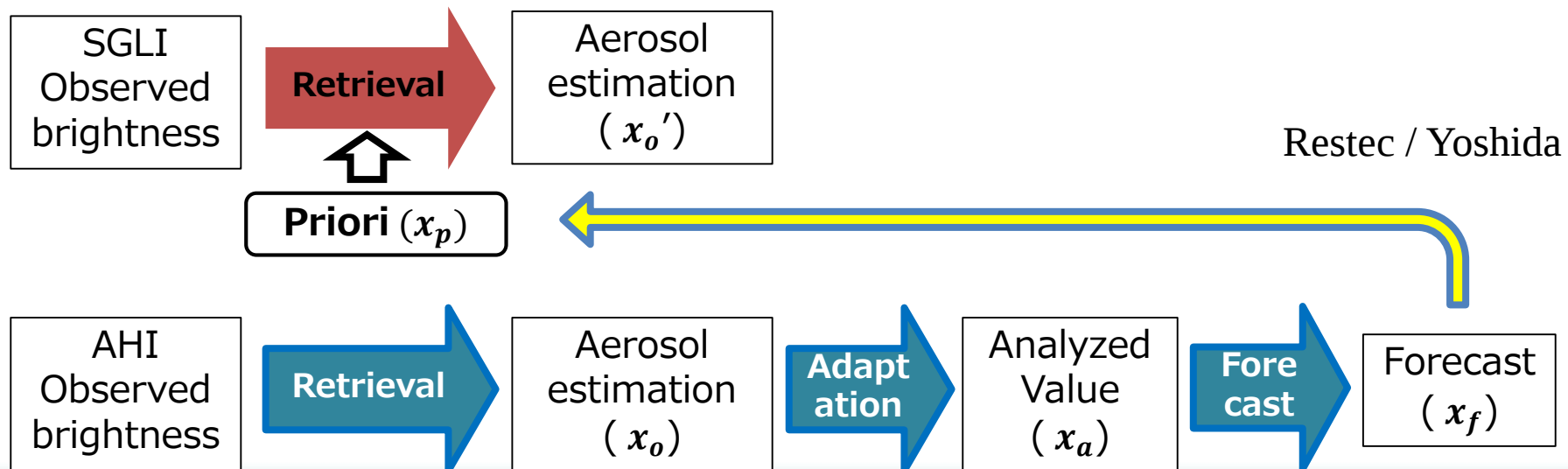
■ Changes from Ver. 1

- Aerosol retrieval by inputting model forecast of AHI as an initial value
- Simultaneous estimation of 3 variables with canonical correlation analysis (Optical thickness, Angstrom exponent, Single scattering albedo)

■ Using channels

- Land : VN01, VN02, VN03, VN05, VN08
- Ocean : VN10, SW01, SW03, SW04

■ Ver. 2 algorithm



■ Validation Method:

- Aerosol over ocean:

Standard accuracy: RMS errors are evaluated comparing SGLI derived AOT with those from other satellite sensors and shipborne in-situ observations (AERONET/Maritime Aerosol Network) (scene by scene).

- Aerosol over land:

Standard accuracy: RMS errors are evaluated comparing SGLI derived AOT with those from other satellite sensors and sky-radiometer at ground observation network (Skynet and AERONET) (scene by scene).

■ Validation data and condition etc.:

The SGLI data within 10 km from the in-situ sites were used and averaged for comparison with the in-situ data.

■ Validation period:

(1) Land: Sky-radiometer

Source – Irie PI@Chiba univ. (SKYNET), Aoki PI@Toyama univ., JMA, AERONET

Period – March 2018, June 2018, Feb. 2018, Jan. 2020, Feb. 2020

(2) Ocean: Microtops on ships

Source – AERONET/Maritime Aerosol Network

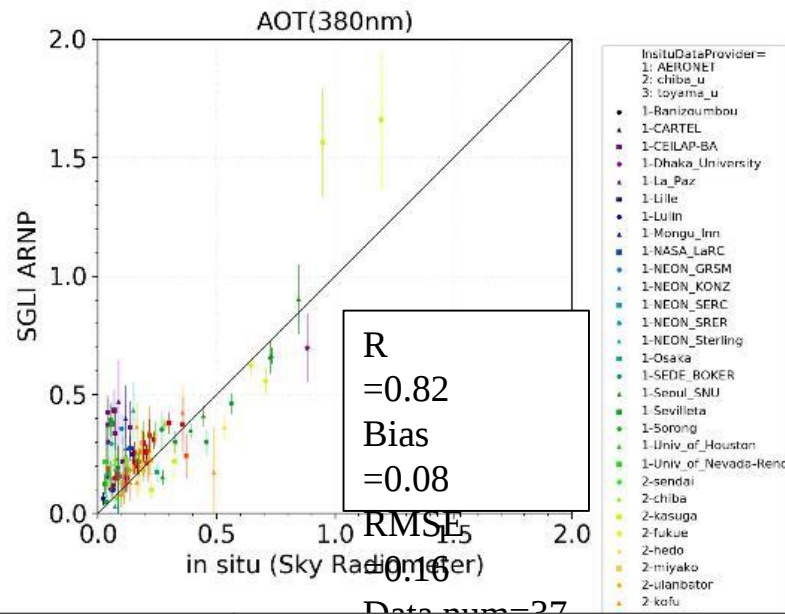
Period – March 2018, June 2018, Feb. 2019

Validation Results

Aerosol over land with near UV (ARNP_land)

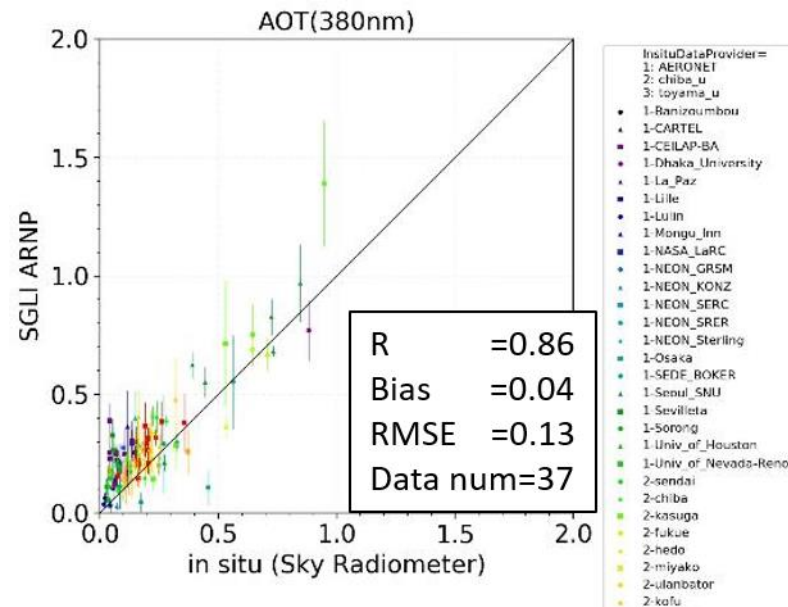
AOT over land (Ver. 1)

Averaged SGLI within 10km vs.
Sky-radiometer at the same time



AOT over land (Ver. 2)

Averaged SGLI within 10km vs.
Sky-radiometer at the same time



Product	Estimated RMSE		Standard accuracy (L+5)	Target accuracy (L+5)
	Ver. 1	Ver. 2		
AOT over land	0.16	0.13 (Scene)	0.15 (Scene)	0.10 (Scene)

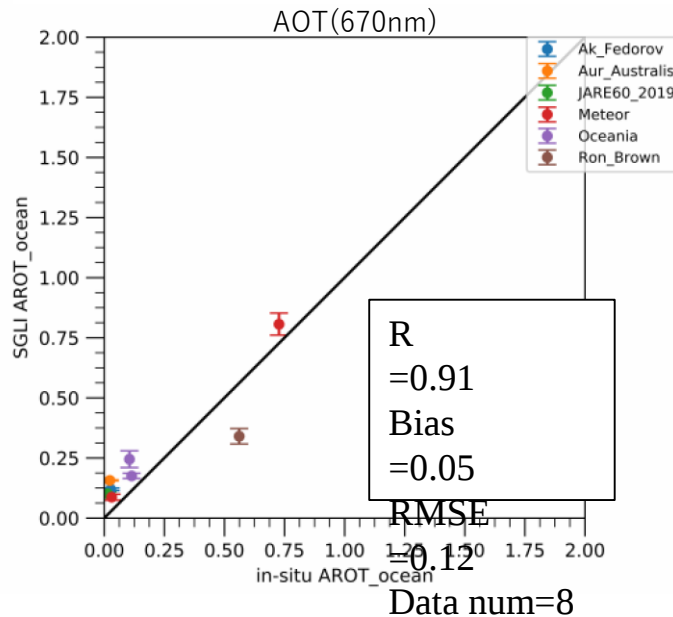
Standard accuracy is archived.

Validation Results

Aerosol over ocean with near UV (ARNP_ocean)

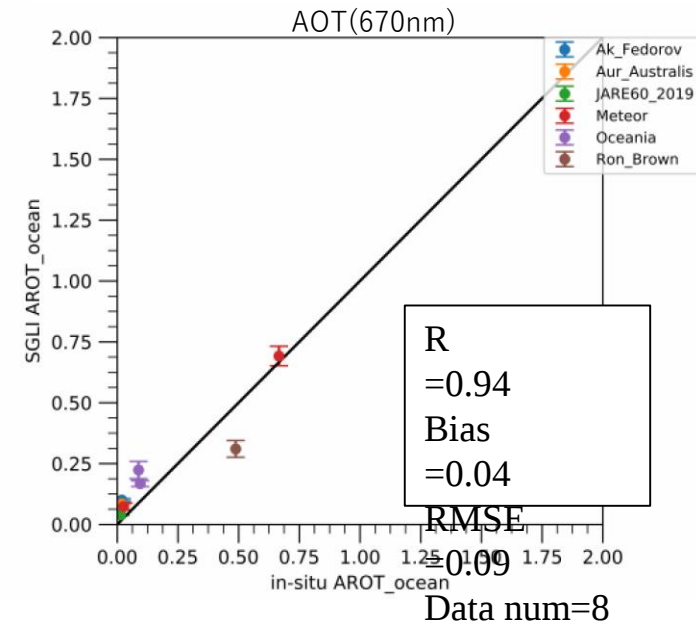
AOT over ocean (Ver. 1)

Averaged SGLI within 10km vs.
shipborne microtops at the same time



AOT over ocean (Ver. 2)

Averaged SGLI within 10km vs.
shipborne microtops at the same time

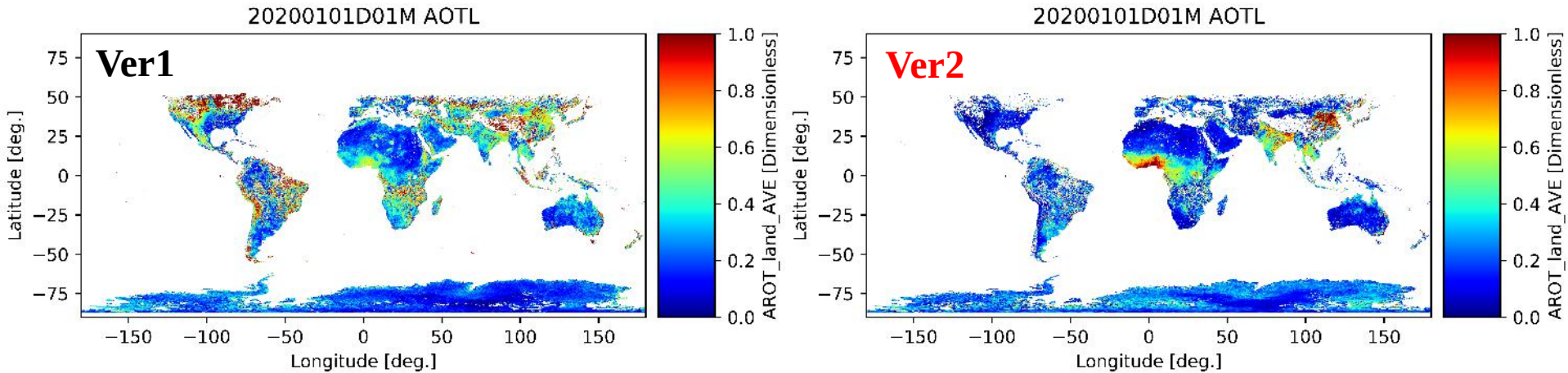


Product	Estimated RMSE		Standard accuracy (L+5)	Target accuracy (L+5)
	Ver. 1	Ver. 2		
AOT over ocean	0.12	0.09 (Scene)	0.10 (Scene)	0.05 (Scene)

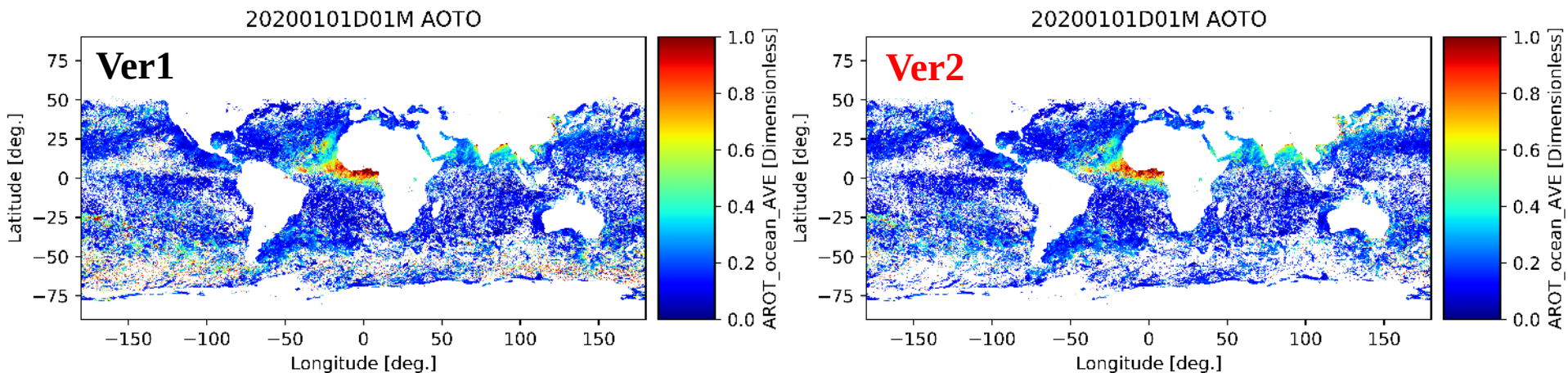
It has potential to archive standard accuracy.

Validation Results

Aerosol over land with near UV (Monthly ARNP_land)



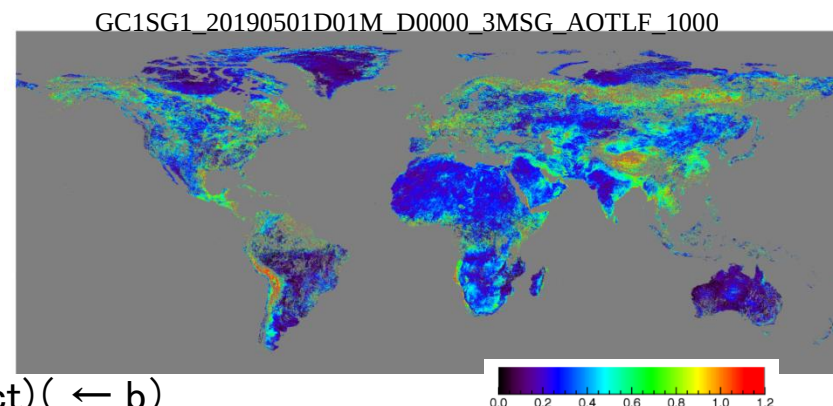
Aerosol over ocean with near UV (Monthly ARNP_ocean)



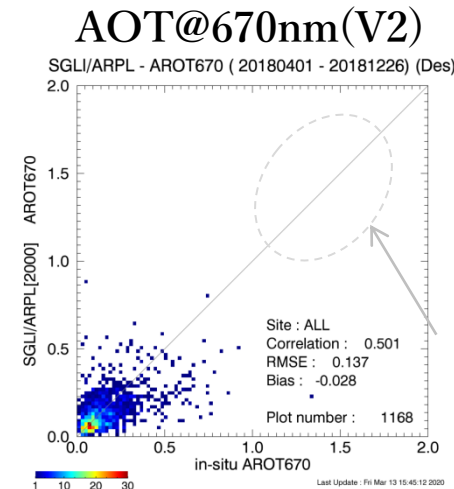
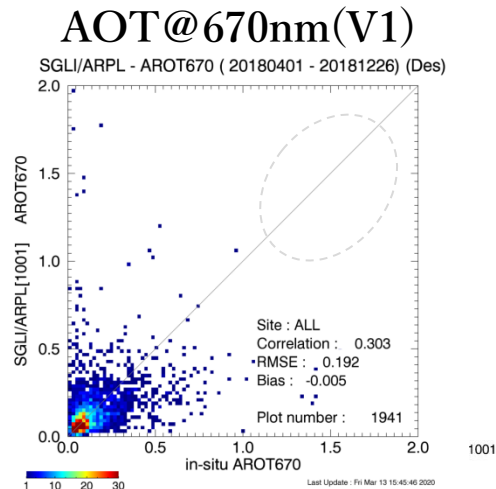
The cloud contamination reduced over both land and ocean.

Validation results of Aerosol by Polarization (1/2)

- Algorithm Overview
 - Algorithm PI: Dr. Sonoyo Mukai (The Kyoto College of Graduate Studies for Informatics)
Dr. Itaru Sano (Kindai Univ.)
 - Features:
 - Retrieval methods of aerosol properties based on POLDER research.
 - Improvements of the precision of aerosol properties by using polarization and near ultraviolet wavelength.
- Issues in V1
 - a. Large deviation of validation results
 - b. False detection of AOT in clear-sky area
 - c. Low AOT in dirty sky area
- V2 update
 - ① Cloud screening using polarization bands(←a)
 - ② Masking snow cover area (see cloud-flag product)(← b)
 - * Issue c will continue to be considered for the next version
- Validation data
 - In-situ: SKYNET, AERONET
 - Match-up:
 - distance $\pm 10\text{km}$ (ave.) / time $\pm 30\text{min}$.
 - Period: Apr.1st to Dec. 26 2018



Validation results of Aerosol by Polarization (2/2)

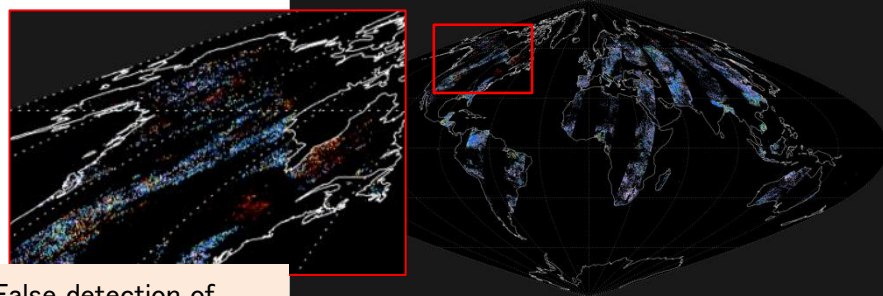


Decreased in the deviation and false detection of AOT in snow area.

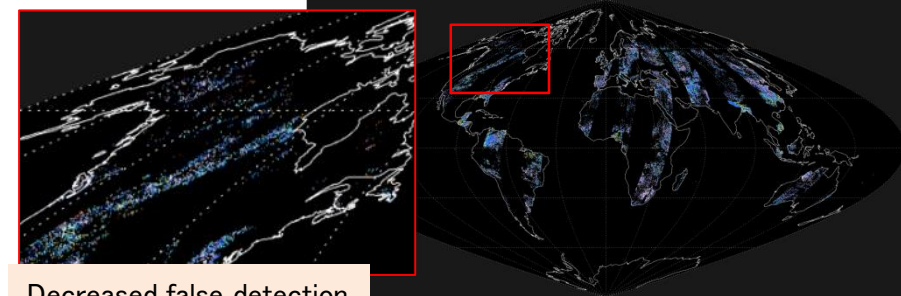
However, match-up points are not enough in higher AOT area (due to cloud screening, etc.)

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[Image_data/AROT_pol_land]

2019年5月1日daily全球



False detection of AOT in clear-sky area



Decreased false detection of AOT

Results	Release threshold	Standard accuracy	Target accuracy
RMSE=0.137 (scene)	0.15 (monthly average)	0.15 (scene)	0.10 (scene)

- Decreased in deviation and false detection of AOT in snow area at V2.
- Plan to consider the following for V3:
 - Re-examination of cloud screening threshold in high AOT region.
 - Detailed investigation of high AOT event cases. (air pollution, forest fires, etc.)
 - Re-examination of radiative transfer. (including LUT)