



水循環変動観測衛星「しずく」

Global Change Observation Mission-Water "SHIZUKU"

Updates of AMSR2 Level 2 (Geophysical Parameters) to Ver.4 (Research Product)

JAXA/EORC

Oct. 12, 2020

Ver.4 Updates

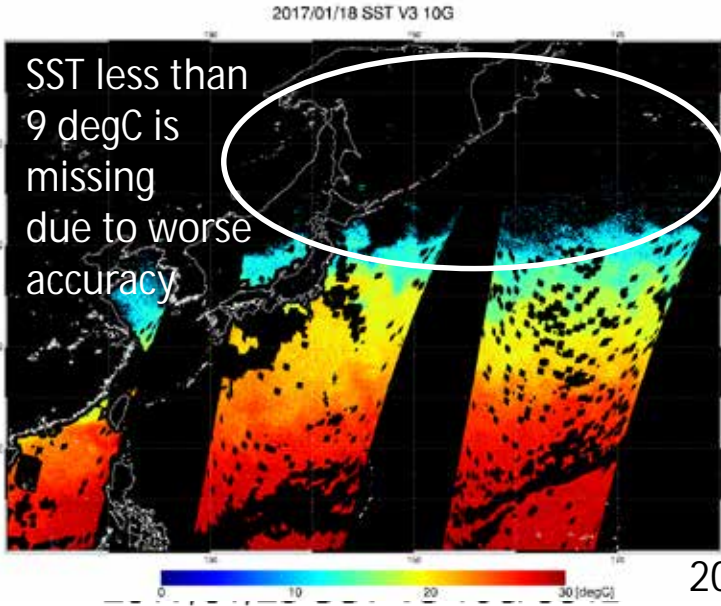
- In Ver.4 updates, following research products are updated or newly added. Those products are stored in the second and third layers of “Geophysical Data” in the standard SST product file.
 1. 10GHz Sea Surface Temperature: 2nd layer (updated)
 2. Multi-band Sea Surface Temperature: 3rd layer (newly added)

1. 10GHz Sea Surface Temperature

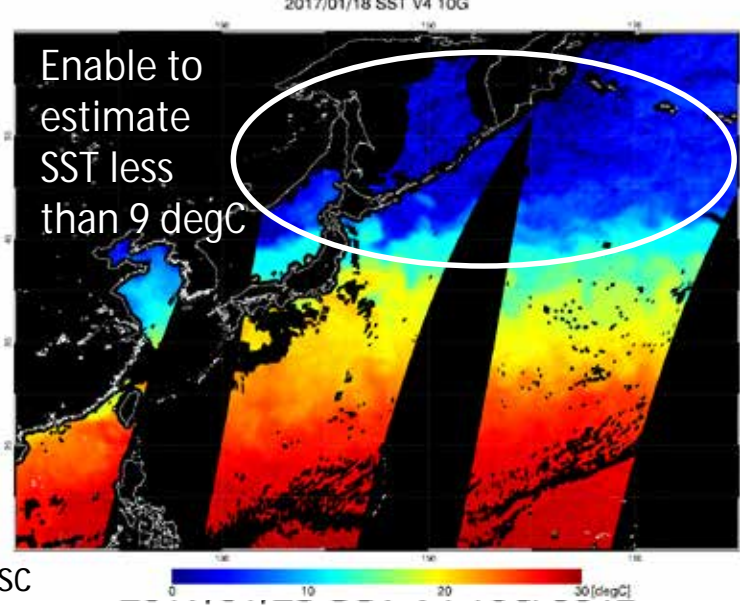
- Algorithm PI
 - Dr. Akira Shibata (RESTEC)
- Major improvements
 - Correction of positive trends since the late 2017, especially found in Ascending orbit
 - Apply spatial filter to reduce random noises
 - Enable to estimate SST under 9 degC by improving calibration of low brightness temperature
 - Enable to estimate SST closer to the coast (about 30km off the coast)
- Validation
 - Matchup AMSR2 and buoy data included in NOAA iQuam Ver.2.1 buoy dataset with time difference within 2 hour and distance less than 30 km. AMSR2's 10 pixels near the buoy are averaged when SSTs are spatially homogeneous (differences of max and minimum SST is less than 3 degC).
 - Period: from July 2, 2012 to December 31, 2018

1. 10GHz Sea Surface Temperature

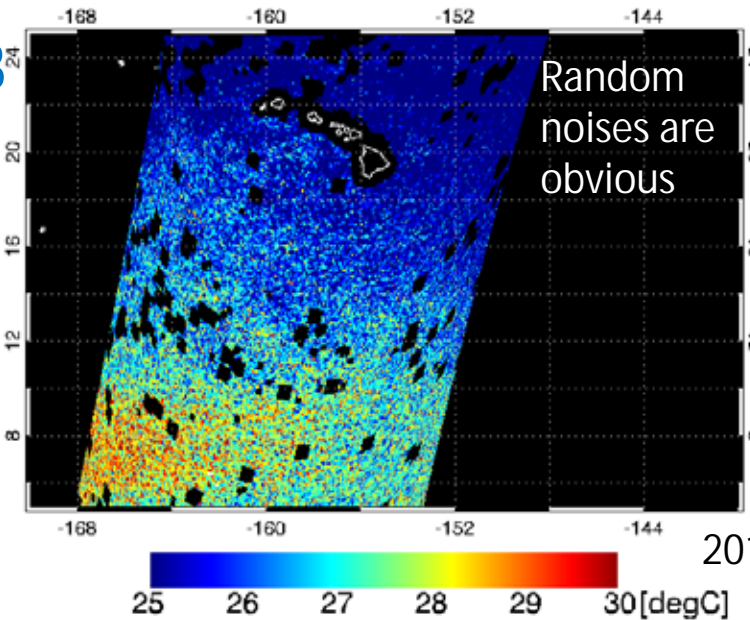
Ver.3



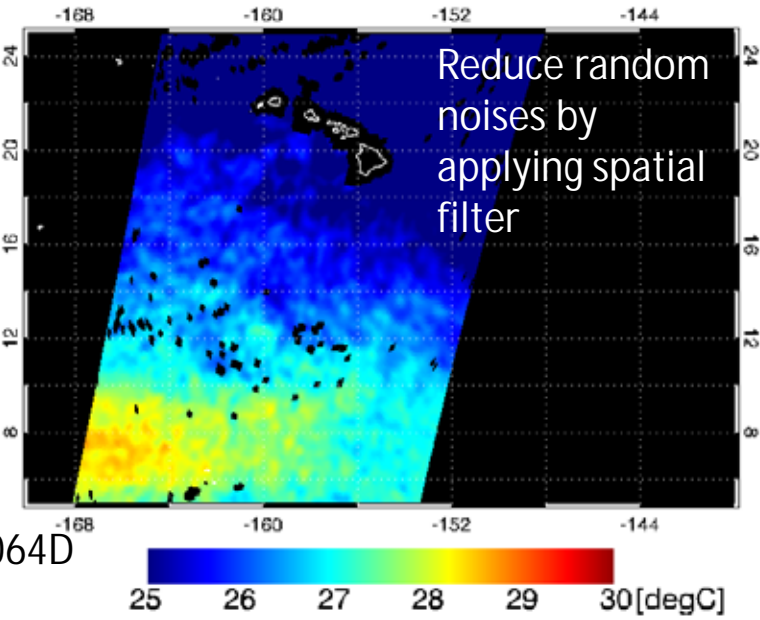
Ver.4



Ver.3



Ver.4

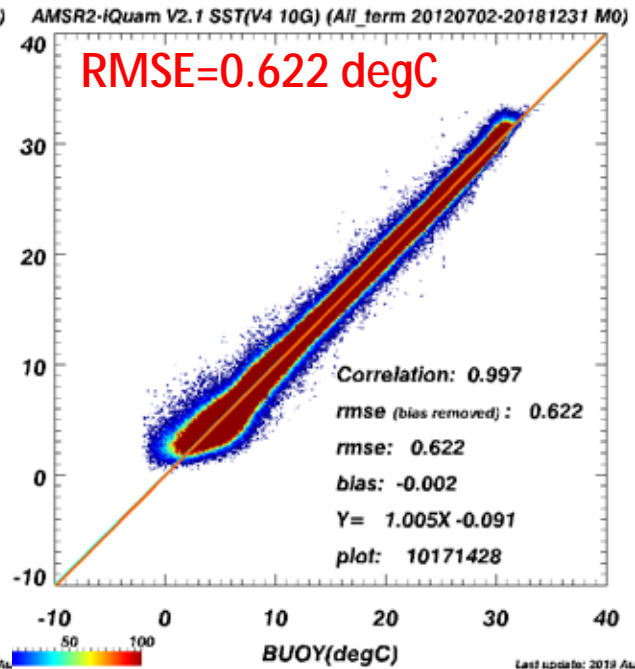
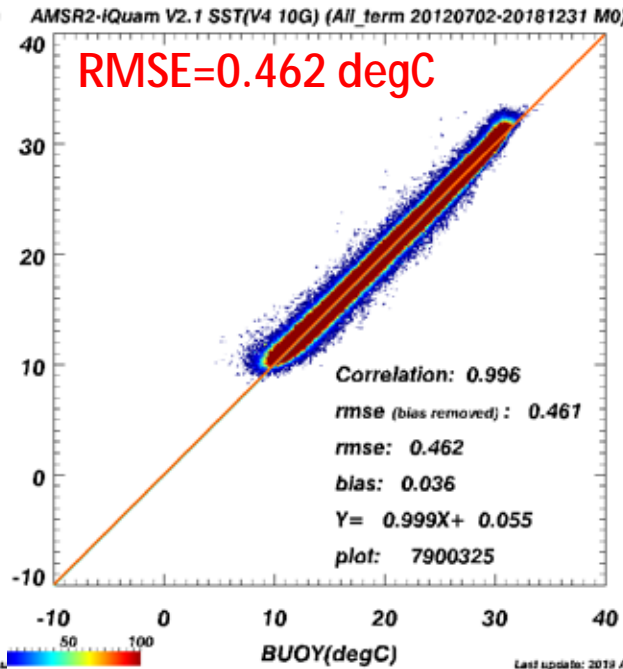
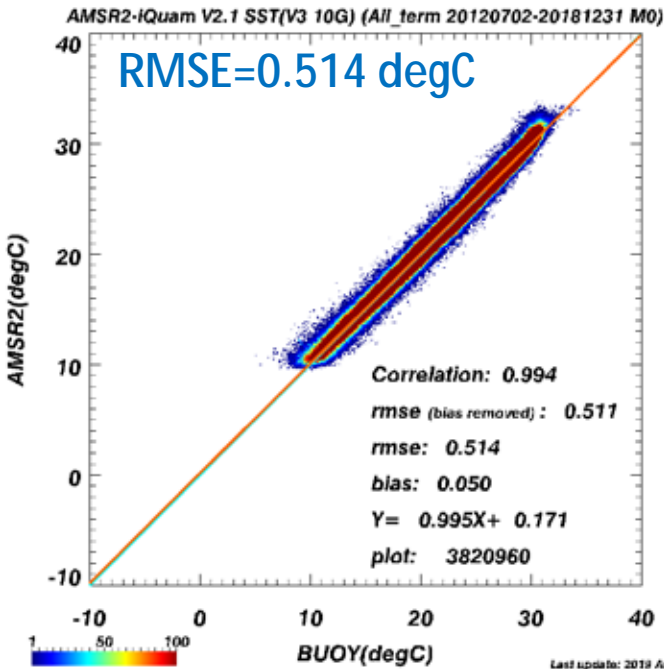


1. 10GHz Sea Surface Temperature

Ver.3 (≥ 9 degC)

Ver.4 (≥ 9 degC)

Ver.4 (all temp.)



* All orbits (A+D)

Ver.4 products provides all SST that achieved target accuracy (0.8 degC) although SST less than 9 degC has worse accuracy than higher SSTs.

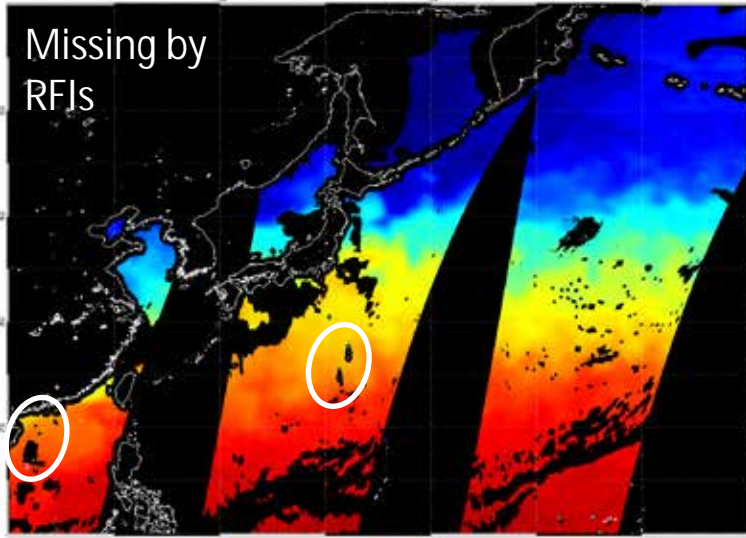
2. Multi-band Sea Surface Temperature (new)

- Algorithm PI
 - Dr. Akira Shibata (RESTEC)
- Target
 - To improve SST estimate near the coastal area and spatial resolution
- Characteristics
 - Stored in the third layer of the standard SST product to complement it
 - Produce SSTs using each 6.9, 7.3 and 10.65GHz brightness temperature to mitigate missing areas due to RFIs and rainfalls
 - Enables to estimate SST closer to the coast by determination of effects due to RFIs in each SST
 - Reduce noises found in current (Ver.3) 6 and 10GHz SSTs by applying improved spatial filter with less degradation of spatial resolution to expand areas where 10GHz SST with finer spatial resolution can be used
- Validation
 - Matchup AMSR2 and buoy data included in NOAA iQuam Ver.2.1 buoy dataset with time difference within 2 hour and distance less than 30 km. AMSR2's 10 pixels near the buoy are averaged when SSTs are spatially homogeneous (differences of max and minimum SST is less than 3 degC).
 - Period: from July 2, 2012 to December 31, 2018

2. Multi-band Sea Surface Temperature (new)

Ver.4: 6GHz

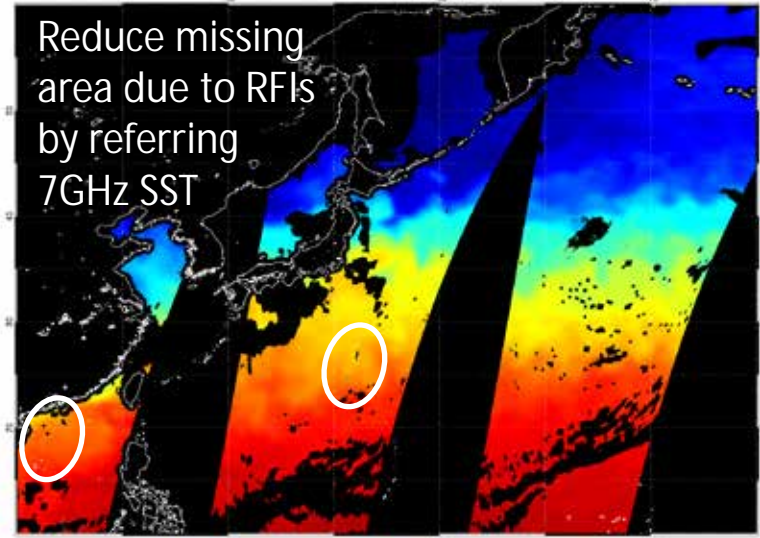
2017/01/18 SST V4 06G



Missing by RFIs

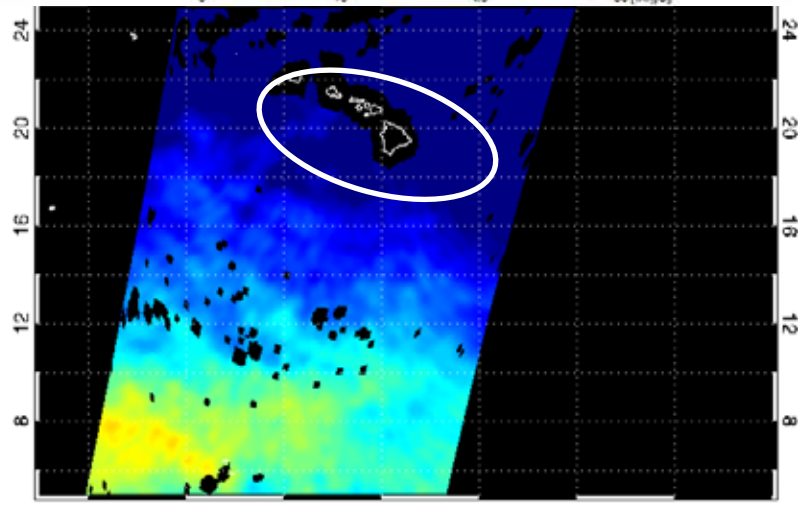
Ver.4: Multi-band

2017/01/18 SST V4 3band



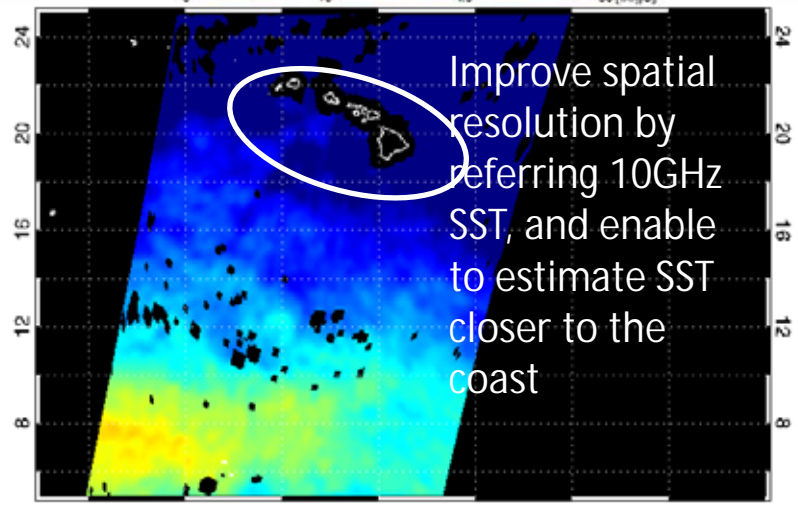
Reduce missing area due to RFIs by referring 7GHz SST

2017/1/18



25 26 27 28 29 30[degC]

2017/1/28 064D

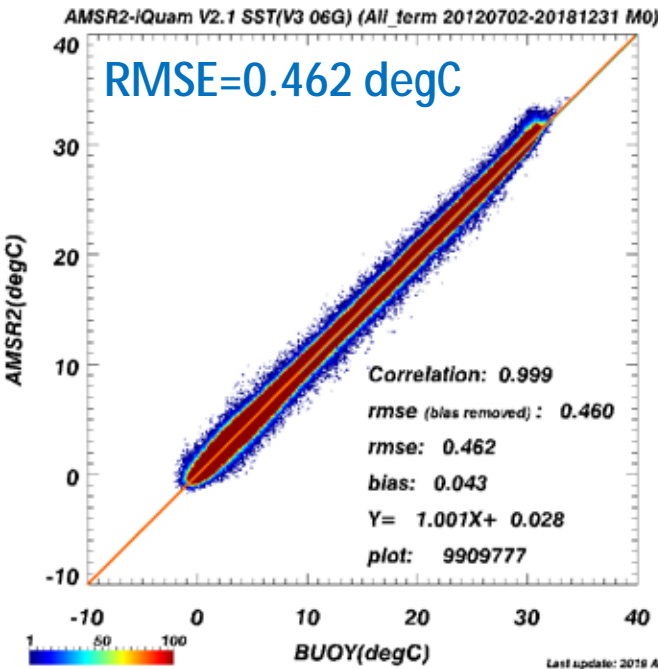


25 26 27 28 29 30[degC]

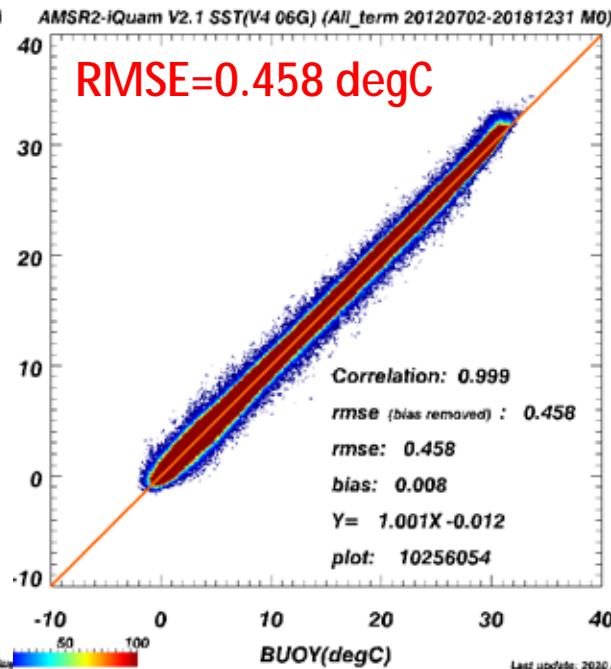
Improve spatial resolution by referring 10GHz SST, and enable to estimate SST closer to the coast

2: Multi-band Sea Surface Temperature (new)

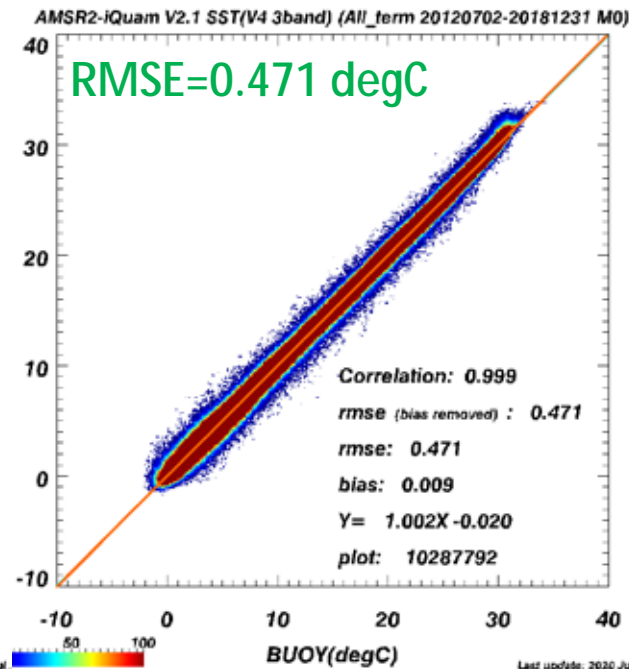
Ver.3: 6GHz



Ver.4: 6GHz



Ver.4: Multi-band



* All orbits (A+D)

Multi-band SST achieves not only target accuracy of research product (0.8 degC) but also standard accuracy of standard SST (0.5 degC).

AMSR2 Ver.4 SST & 10GHz SST Quality Flag

Sea Surface Temperature (SST:6G SST,10G SST)

No	Status	bit7~bit4				bit3~bit0				Unsigned byte	Signed byte
		Error				Normal					
01	Normal	0	0	0	0	0	0	0	0	0	0
02	10GHz : strong wind (15-23m/s)	0	0	0	0	0	0	0	1	1	1
03	10GHz : SST (Sea Surface Temperature) below 9 degC	0	0	0	0	0	0	1	0	2	2
04	10GHz : strong wind (15-23m/s) and Sea Surface Temperature below 9 degC	0	0	0	0	0	0	1	1	3	3
03	incident angle error	0	0	0	1	0	0	0	0	16	16
04	land area	0	0	1	0	0	0	0	0	32	32
05	sea ice	0	0	1	1	0	0	0	0	48	48
06	sun glitter	0	1	0	0	0	0	0	0	64	64
07	rain, abnormal Brightness Temperature	0	1	0	1	0	0	0	0	80	80
08	abnormal SST (Sea Surface Temperature) or RFI (Radio Frequency Interference)	0	1	1	0	0	0	0	0	96	96
09	6GHz: strong wind 10GHz: strong wind (above 23m/s)	0	1	1	1	0	0	0	0	112	112
10	cold SST (Sea Surface Temperature) (below minus 2 degC)	1	0	0	0	0	0	0	0	128	-128

Notice: The Accuracy of the No.2, No.3 and No. 4 is worse than No.1.

AMSR2 Ver.4 Multi-band SST Quality Flag

Sea Surface Temperature (SST: Multi Band SST)

No	Status	bit7~bit4 Error				bit3~bit0 Normal				Unsigned byte	Signed byte
01	Normal	0	0	0	0	0	0	0	0	0	0
02	land area in 6GHz SST (Sea Surface Temperature)	0	0	0	0	0	1	0	0	4	4
03	incident angle error	0	0	0	1	0	0	0	0	16	16
04	land area	0	0	1	0	0	0	0	0	32	32
05	sea ice	0	0	1	1	0	0	0	0	48	48
06	sun glitter	0	1	0	0	0	0	0	0	64	64
07	rain, abnormal brightness temperature	0	1	0	1	0	0	0	0	80	80
08	abnormal SST (Sea Surface Temperature) or RFI (Radio Frequency Interference)	0	1	1	0	0	0	0	0	96	96
09	strong wind	0	1	1	1	0	0	0	0	112	112
10	cold SST (Sea Surface Temperature) (below minus 2 degC)	1	0	0	0	0	0	0	0	128	-128

Notice : The Accuracy of No.2 is worse than No.1.

Evaluation results of research products



Updated

Released	Not released		
Geophysical Parameters	Target (Release) Accuracy	Latest Validation Results	Product Status
All-weather sea surface wind speed (V3)	± 7 m/s (high winds)	± 3.95 m/s (>= 16 m/s)	Released
10GHz sea surface temperature (V4)	± 0.8 degC	± 0.48 degC (>= 9 degC) ± 0.62 degC (all temp.)	Released
Land surface temperature (V1)	Forest: ± 3 degC Nondense vegetation: ± 4 degC	Forest: ± 3 degC Nondense vegetation: ± 4 degC	Released
Vegetation water content	± 1 kg/m ²		Validating
High-resolution sea ice concentration	± 15 %		Validating
Thin ice detection (V1)	80 % (correct answer rate)	> 88 % (Okhotsk, Bering sea, Hudson bay)	Released
Sea ice motion vector	± 3 cm/s (x & y components)		Validating
Soil moisture & vegetation water content by land assimilation model	Soil moisture: ± 8 % Vegetation water: ± 1 kg/m ²		Developing
Integrated water vapor over land (V1)	± 6.5 kg/m ² (except ice & vegetation area)	RAOB: ± 3.5 kg/m ² GPS: ± 2.6 kg/m ²	Released
Sea ice thickness (< 20 cm)	Thin solid ice: ± 10 cm Active frazil: ± 3 cm		Developing
Sea ice thickness (>= 20 cm)	± 20 cm		Developing
Multi-band sea surface temperature (V4)	± 0.8 degC	± 0.47 degC	Newly released