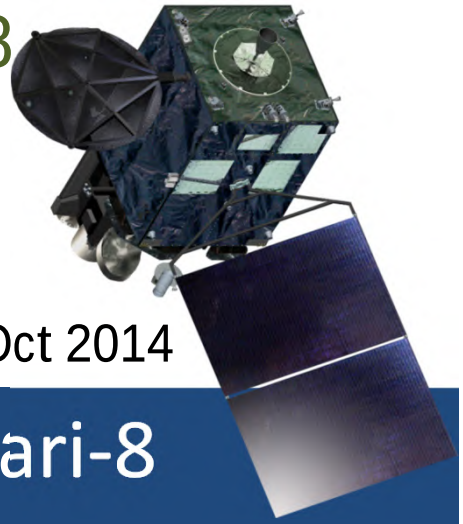
GMS
(Himawari)

Jul 1977

Himawari-8



Oct 2014

Advanced Performance of Himawari-8 Onboard Imager AHI

Toshiyuki KURINO
Satellite Program Division
Japan Meteorological Agency (JMA)

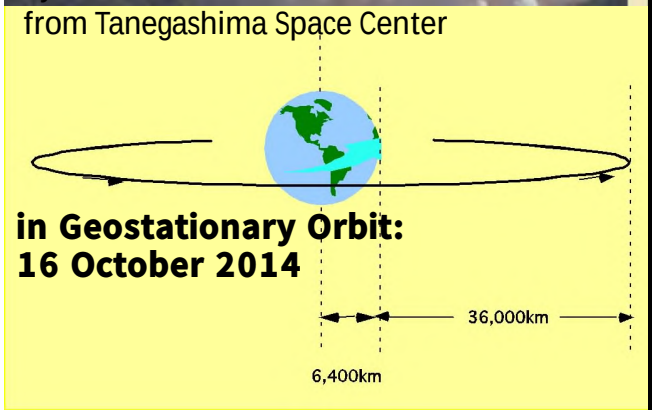
12th Annual Symposium on New Generation Operational Environmental Satellite Systems
The AMS 96th Annual Meeting
Tuesday, January 12, 2016

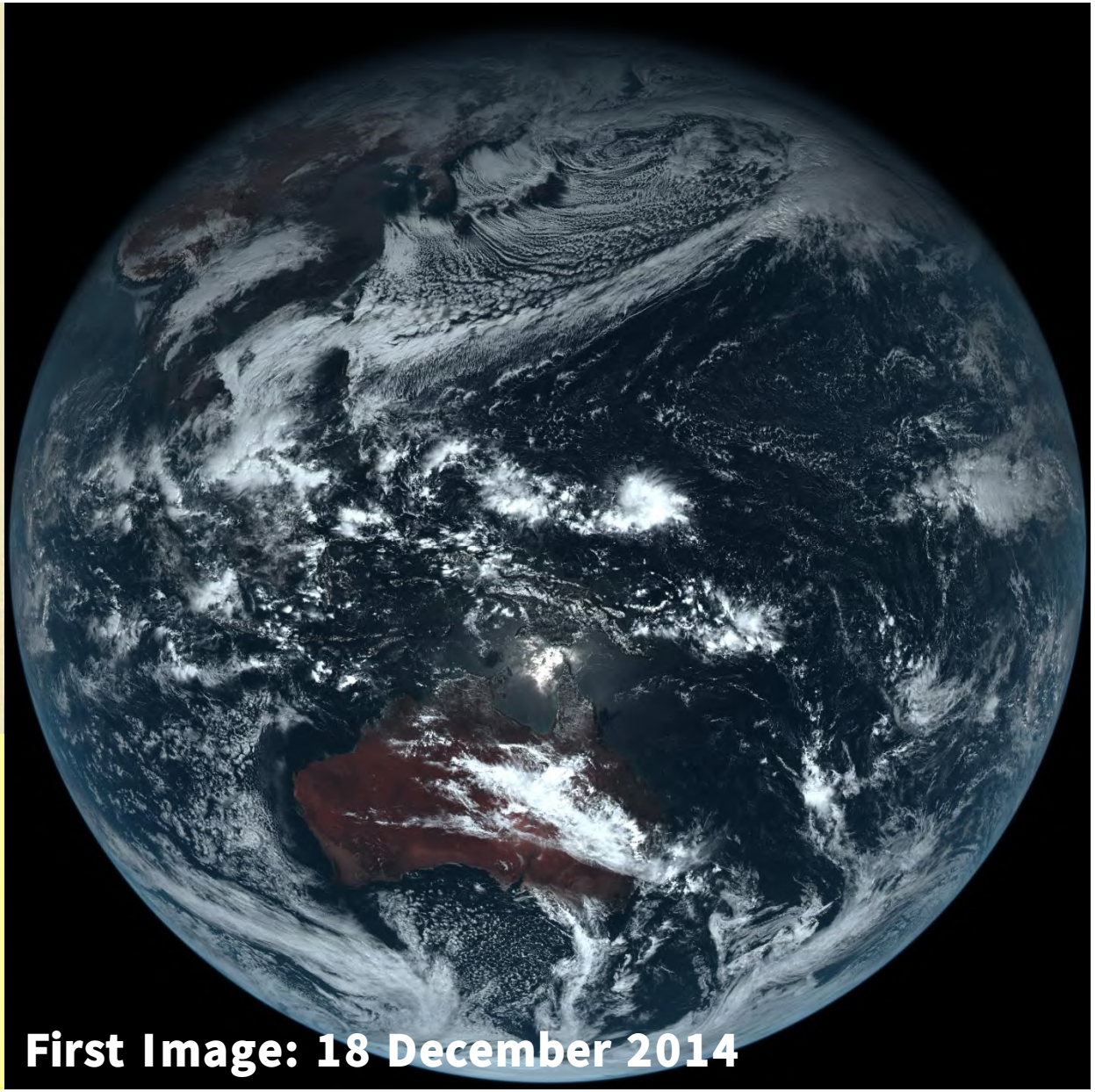
Introduction

- The deployment over the next few years of a constellation of advanced meteorological satellites in geostationary (Geo) orbit with their imaging capabilities by improved spectral, spatial and temporal resolution sensors, opens up a world of new possibilities for continuous monitoring of the high-temporal dynamics of the land, oceans and atmosphere.

- In this context, the first Japanese Next Generation Geostationary Meteorological Satellite, Himawari-8 is in operation since 7 July 2015

Himawari-8: JMA's New-Generation Geostationary Meteorological Satellite





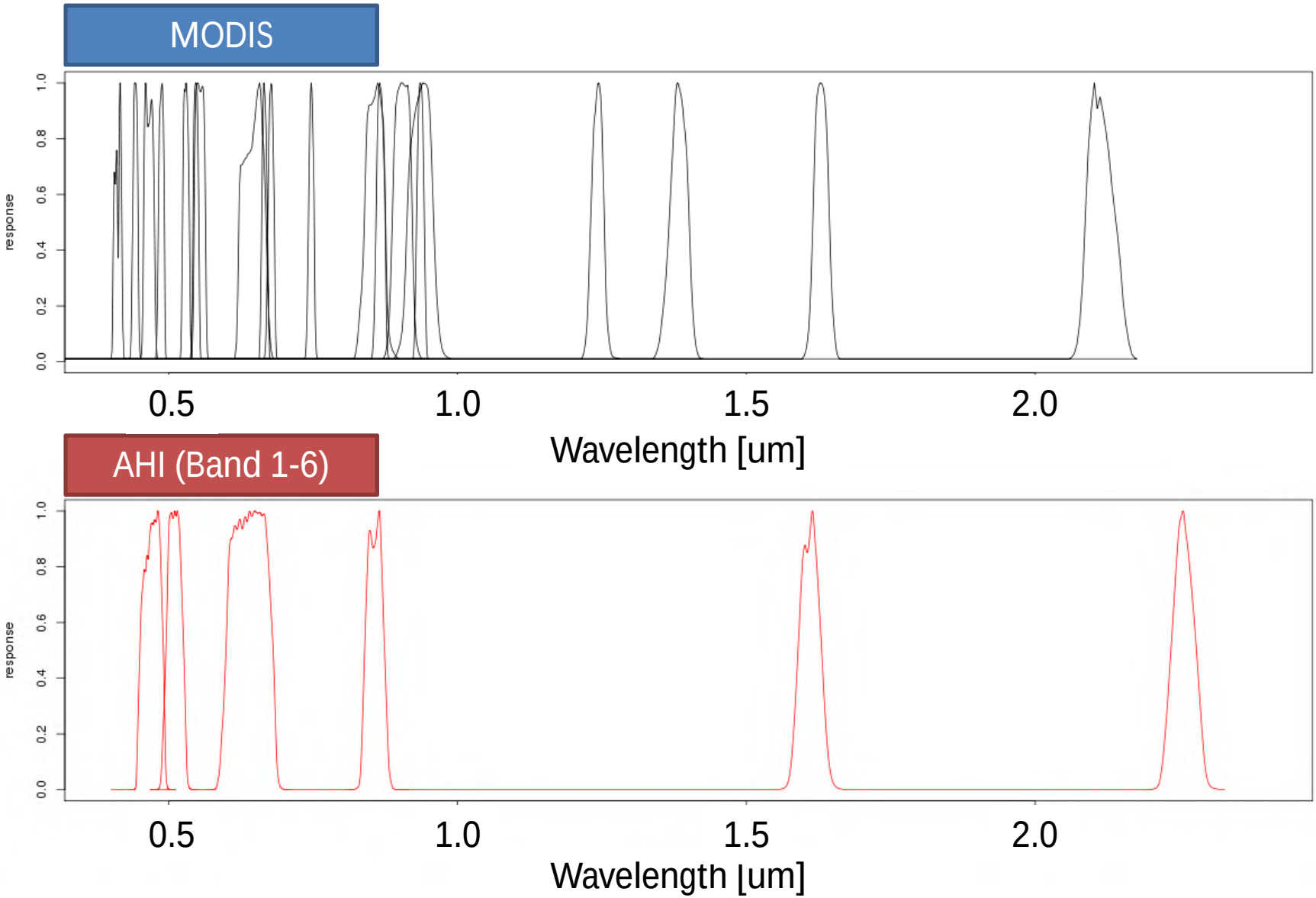
Himawari-8 in Operation

- Himawari-9 will also be launched in 2016 as a backup satellite
- Himawari-8/9 will be in operation for a period of 15 years

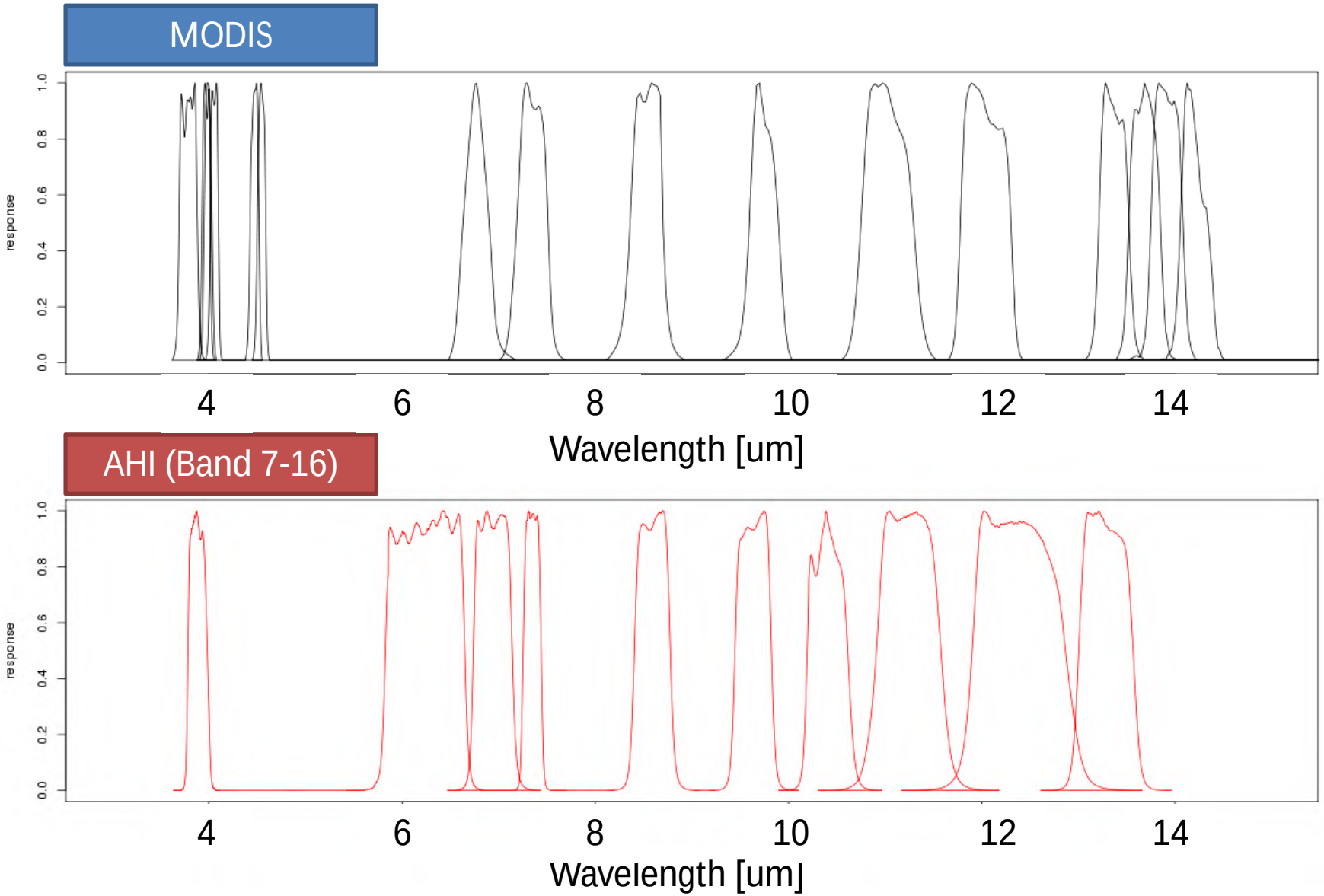
Geo-Leo Corresponding VIS-IR Imagery Bands (μm)

#	Himawari -8/ AHI	MTSAT-2/ IMAGER	MSG/ SEVIRI	MTG/ FCI	KOMPSAT -2A/AMI	FY-4/ AGRI	GOES-R/ABI	GOES -15	GOES -11	SNPP,JPSS/ VIIRS	Terra, Aqua/ MODIS	GCOM-C/SGLI	NOAA/ AVHRR
1	0.47			0.444	0.455	0.47	0.47			0.488 (M03)	0.488	0.490 (VN4)	
2	0.51			0.510	0.511					0.555 (M04)	0.531	0.530 (VN5)	
3	0.64	0.68	0.635	0.640	0.642	0.65	0.64	0.65	0.65	0.672 (M05) 0.64 (I01)	0.667	0.6735 (VN7,VN8,P1)	0.630
4	0.86		0.81	0.865	0.860	0.825	0.86			0.865 (M07) 0.865 (I02)	0.870	0.8685 (VN10, VN11, P2)	0.862
				0.914							0.905		
				1.380	1.38	1.375	1.38			1.378 (M09)	1.375	1.380 (SW2)	
5	1.6		1.64	1.610	1.61	1.61	1.61			1.610 (M10) 1.61 (I03)	1.640	1.630 (SW3)	1.61
6	2.3			2.250		2.25	2.26			2.250 (M11)	2.130	2.210 (SW4)	
7	3.9	3.7	3.92	3.80	3.85	3.75	3.90	3.90	3.90	3.70 (M12) 3.74 (I04)	3.750		3.74
8	6.2	6.8	6.25	6.30	6.24	6.25	6.15	6.55	6.75		6.715		
9	6.9				6.95	7.1	7.00						
10	7.3		7.35	7.35	7.34		7.40				7.325		
11	8.6		8.70	8.70	8.60	8.5	8.50			8.55 (M14)	8.550		
12	9.6		9.66	9.66	9.63		9.70				9.730		
13	10.4	10.8	10.8	10.50	10.43	10.7	10.3	10.70	10.70	10.763 (M15)		10.8 (T1)	10.80
14	11.2				11.20	11.0	11.2			11.45 (I05)	11.030		
15	12.4	12.0	12.0	12.30	12.30		12.3		11.95	12.013 (M16)	12.020	12.0 (T2)	12.00
16	13.3		13.4	13.30	13.30	13.5	13.3	13.35			13.335		

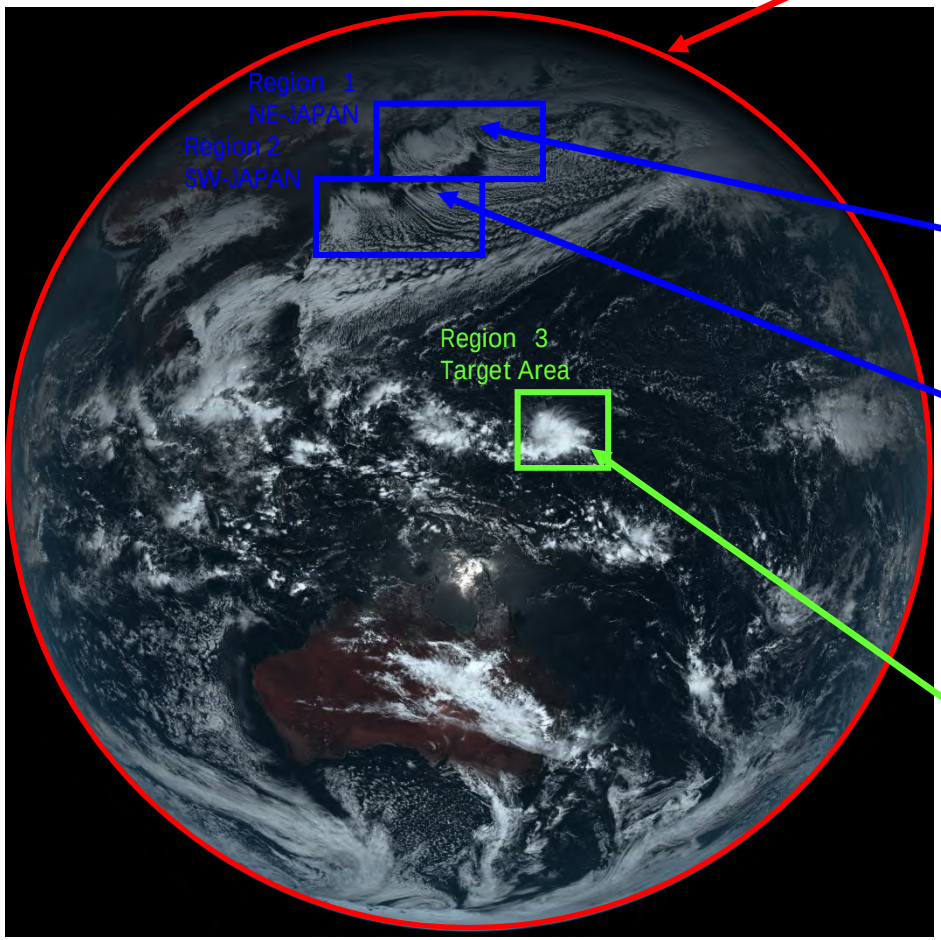
Himawari-8 AHI and corresponding MODIS Response Function in VIS-NIR Imagery Bands (~3.0 μm)



Himawari-8 AHI and corresponding MODIS Response Function in IR Imagery Bands (3.0 μm～)



AHI Observation Areas and Frequencies in 10 minutes time frame



Full Disk

Interval : 10 minutes (6 times per hour)

Interval: 60 min. ⇨ 10 min.

MTSAT Himawari-8

Region 1 : JAPAN & Vicinity (North-East)

Interval : 2.5 minutes (4 times in 10 min)

Dimension : EW x NS: 2000 x 1000 km

Region 2: JAPAN & Vicinity (South-West)

Interval : 2.5 minutes (4 times in 10 min)

Dimension : EW x NS: 2000 x 1000 km

Region 3: Targeted Area

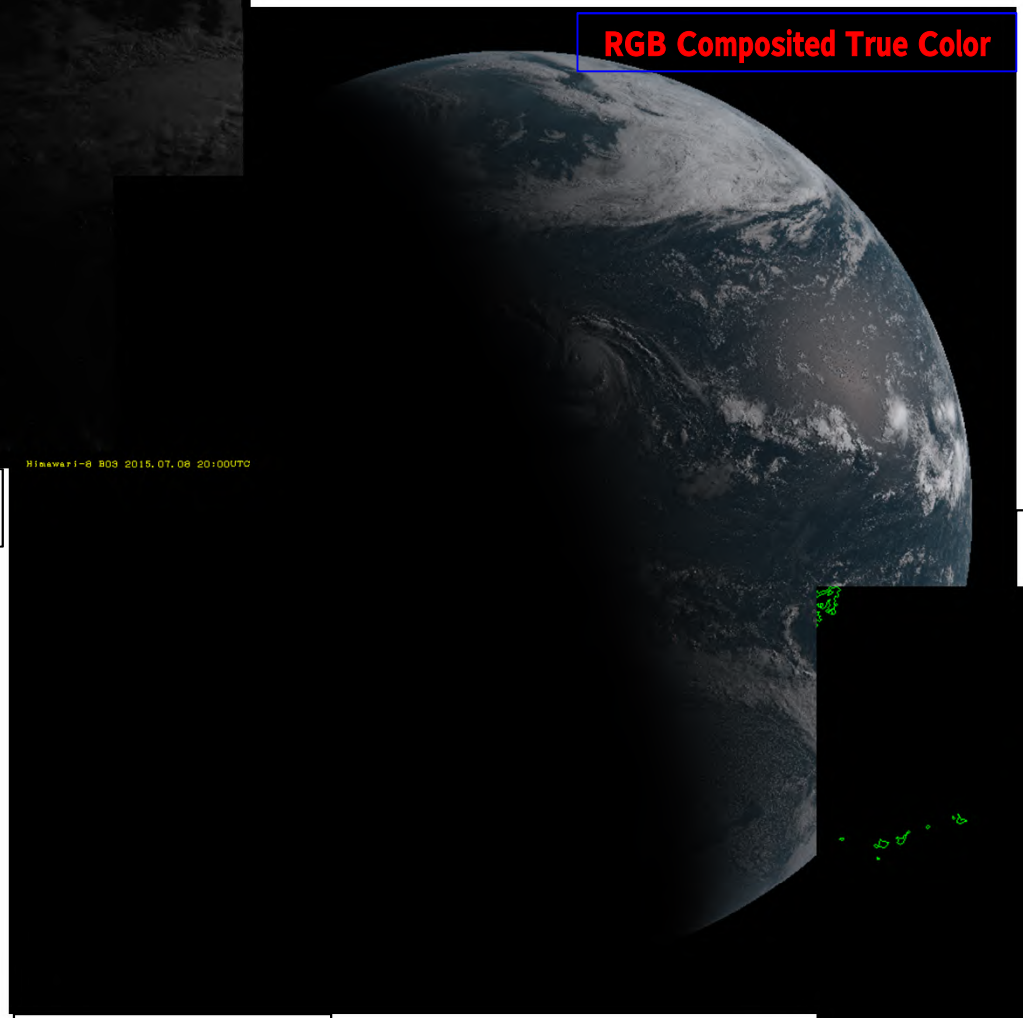
Interval : 2.5 minutes (4 times in 10 min)

Dimension : EW x NS: 1000 x 1000 km

Himawari-8: Observation Area and Interval

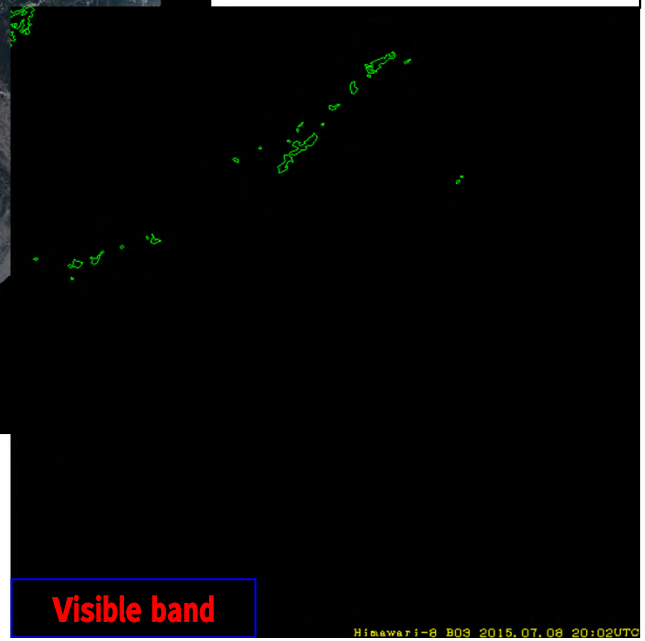
in 10 minutes time frame

Japan & Vicinity Obs.



Full Disk Obs.

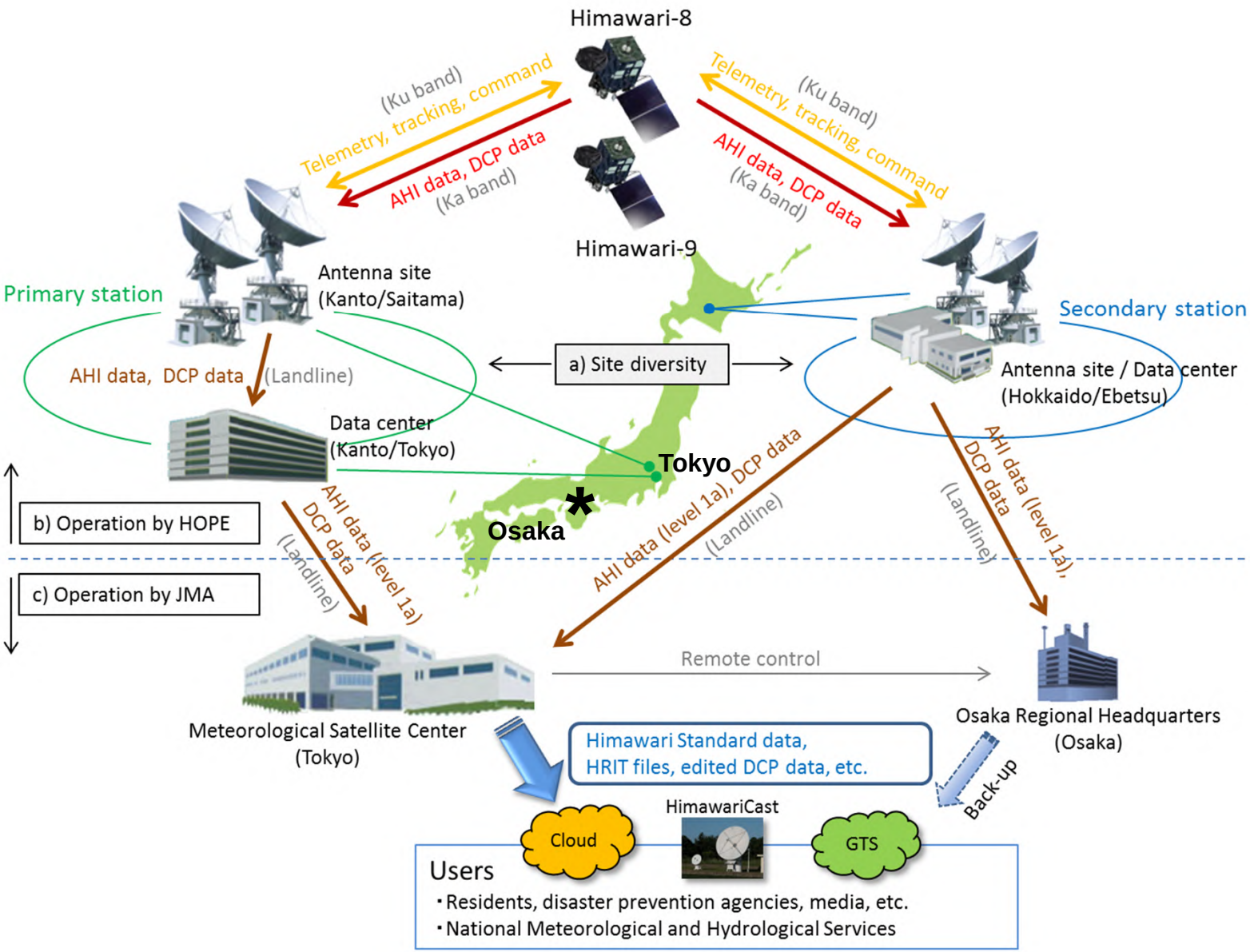
Targeted Area obs.



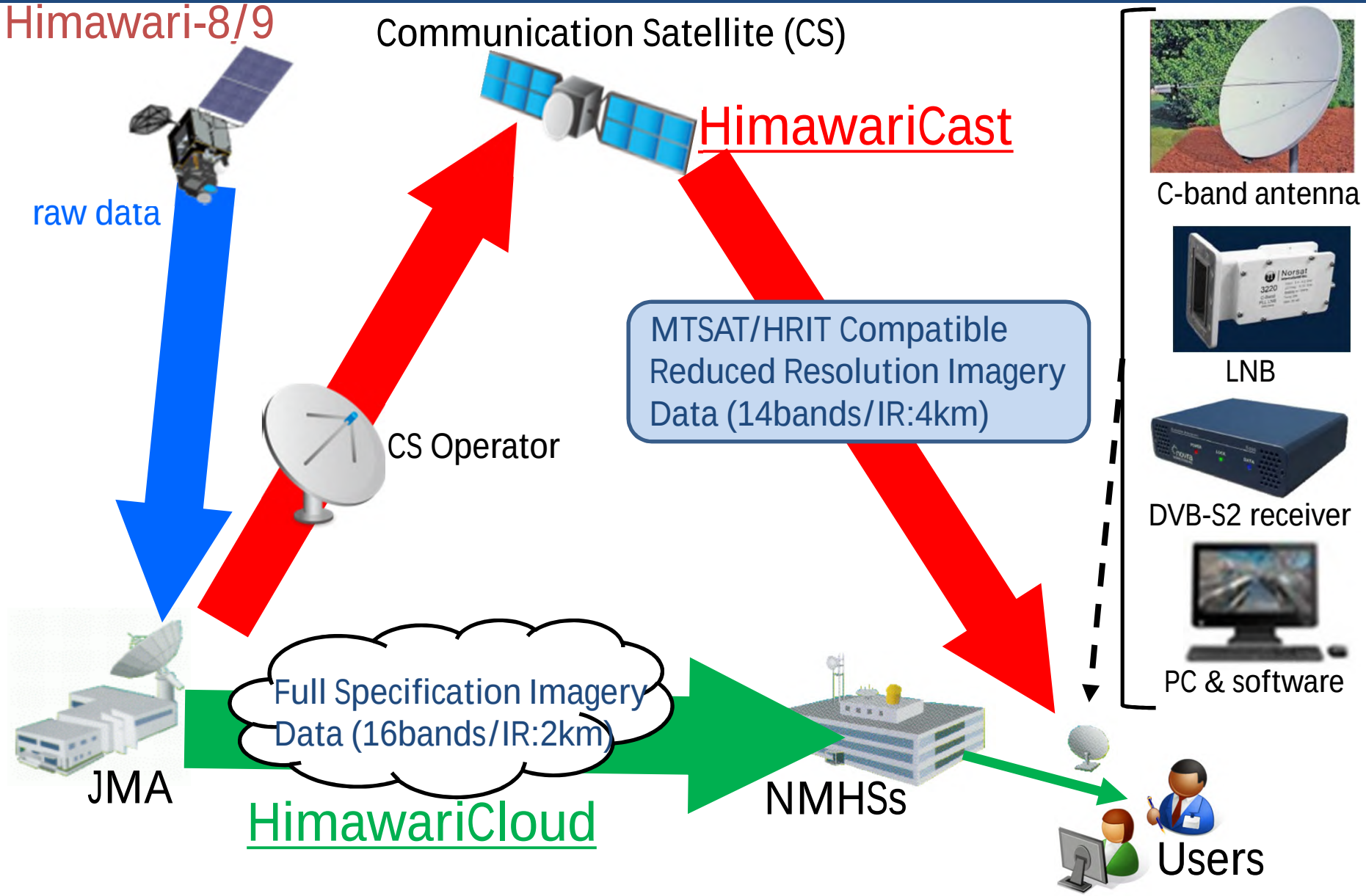
July 9-10, 2015

Himawari-8/9
Ground Segments

Himawari-8/9 Ground Segment and Operations

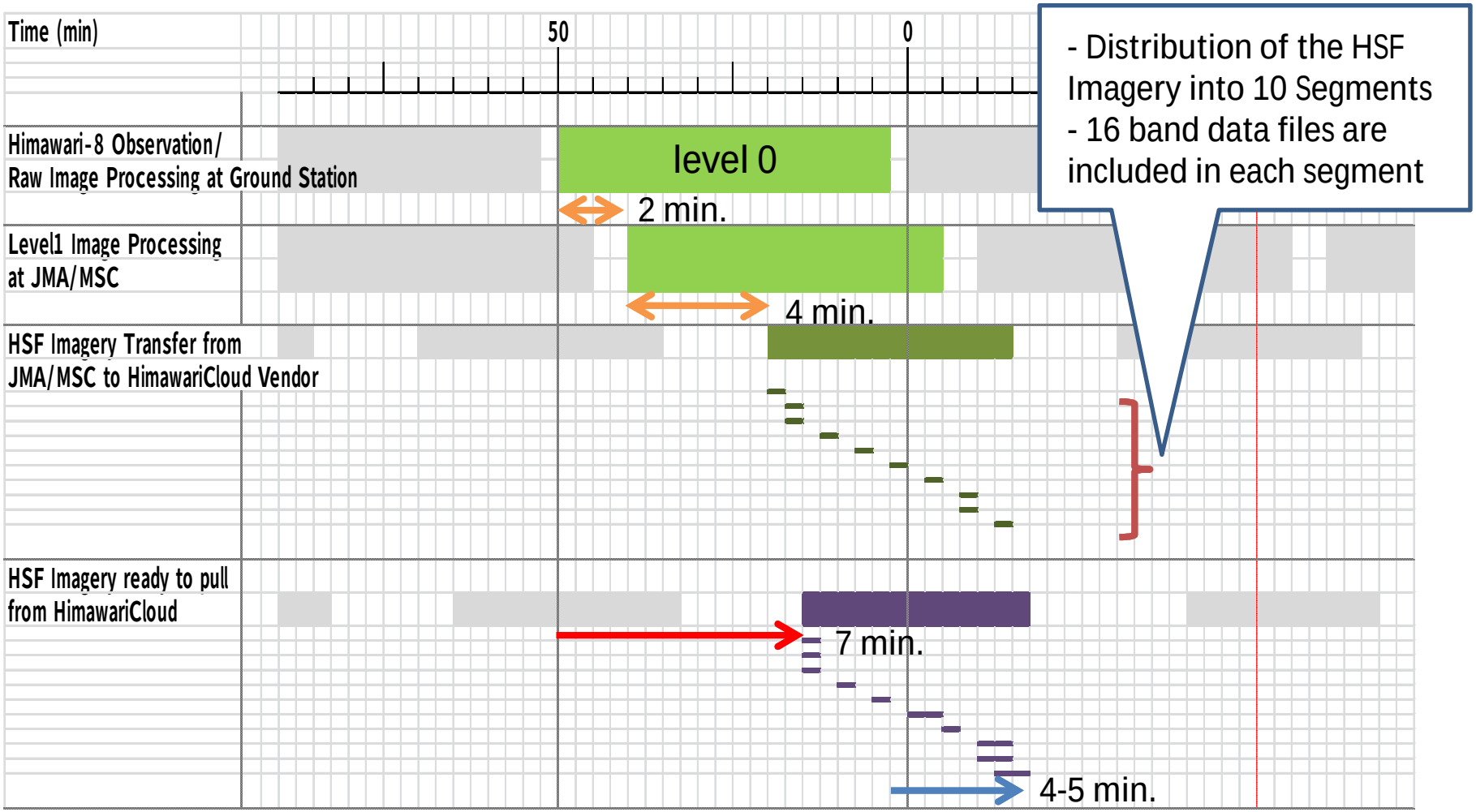


Two Ways of Data Dissemination/Distribution HimawariCast/HimawariCloud



Timeline of HimawariCloud HSF Imagery data Distribution

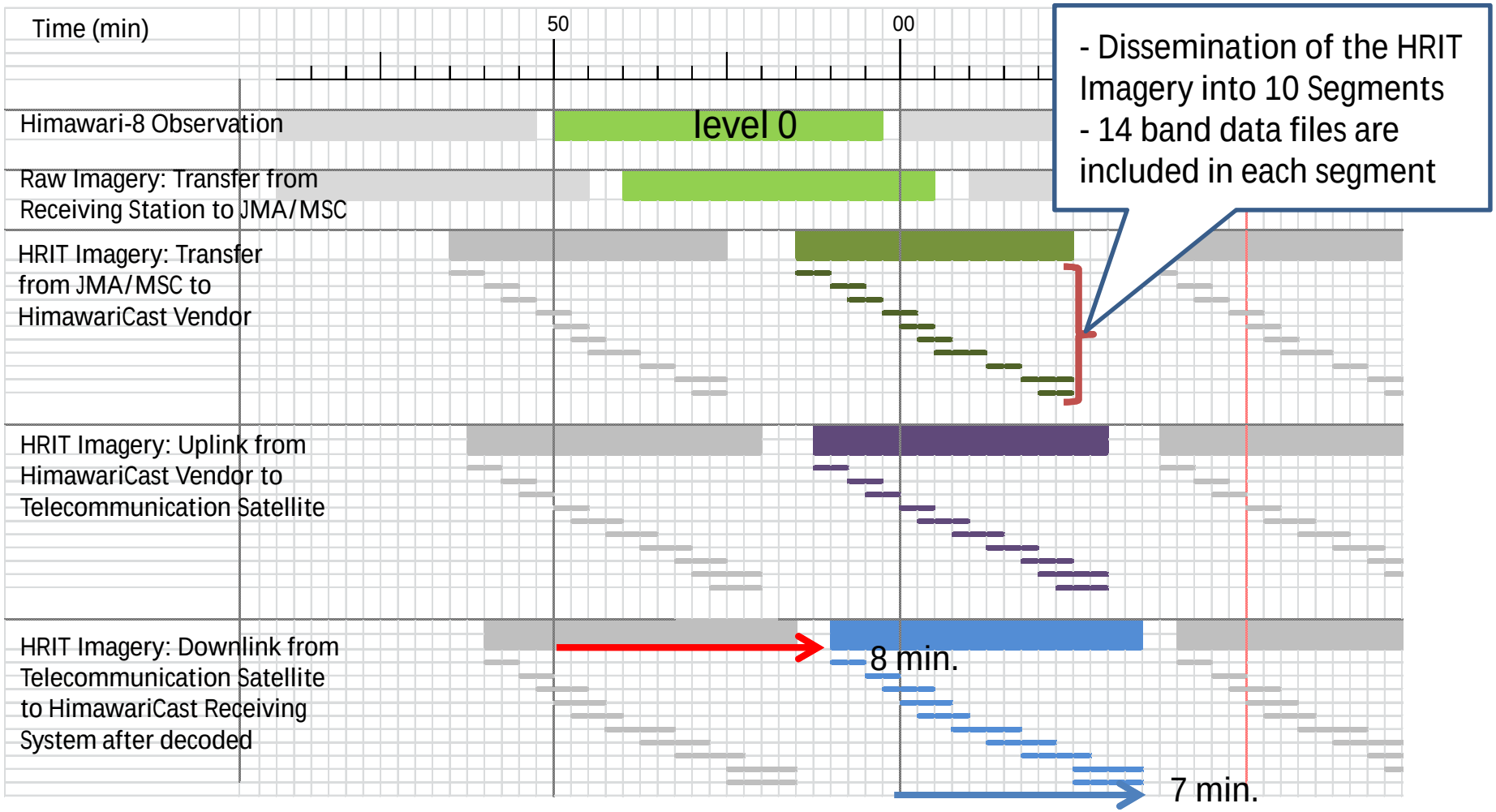
time is rounded in minutes based on the past record at "peak time" (local noon after spring equinox)



The first Segment Imagery Data will be ready to pull within 7 min. after observation start time (the last Segment within 4-5 min. after observation end time)

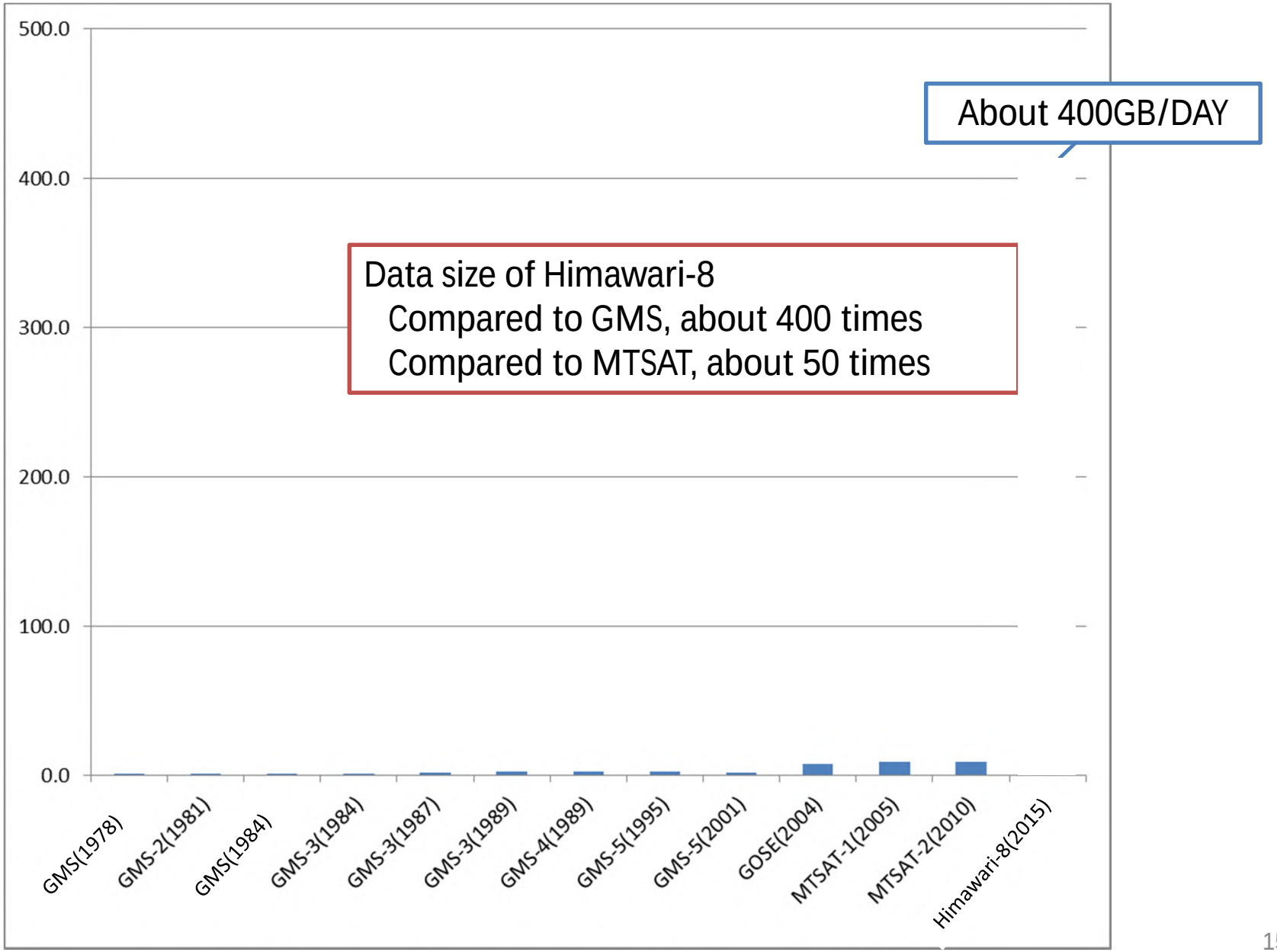
Timeline of HimawariCast HRIT Imagery data Dissemination

time is rounded in minutes based on the past record at "peak time" (local noon before spring equinox)



The first segment data is to be disseminated within 8 min. after observation start time (the last segment data within 7 min. after observation end time)

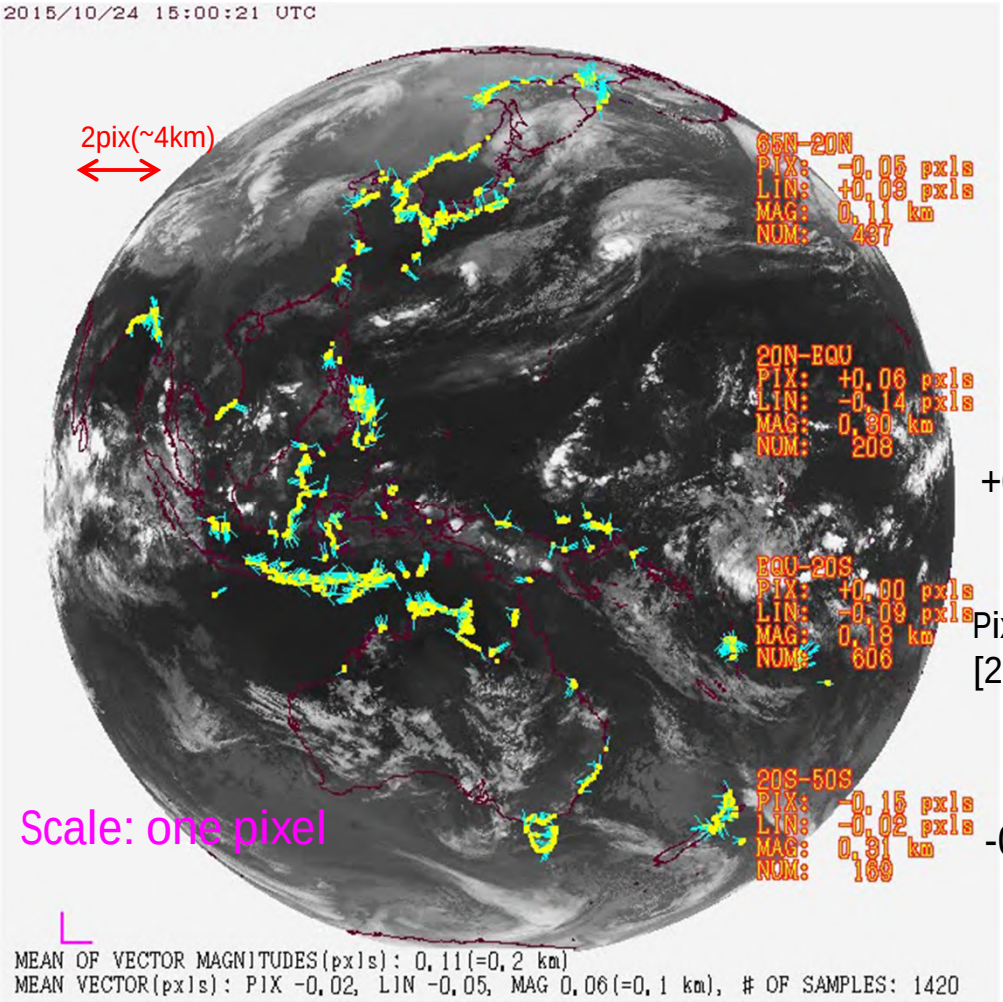
Data size of Himawari-8 Imagery



Himawari-8 Image Navigation & Calibration Quality

Image Navigation Quality in Band13 (10.4μm) Estimated from "Coast Line" Analysis

form 24 Sep. 2015 15UTC to 25 Sep. 2015 15UTC



•Image navigation error is less than 0.3 pixels in 2.0km-infrared bands.
Average error magnitude is 0.125pix (by 2km resolution).

Time series of image navigation error in pixel Band13 (10.4μm), analysis over Full-disk .

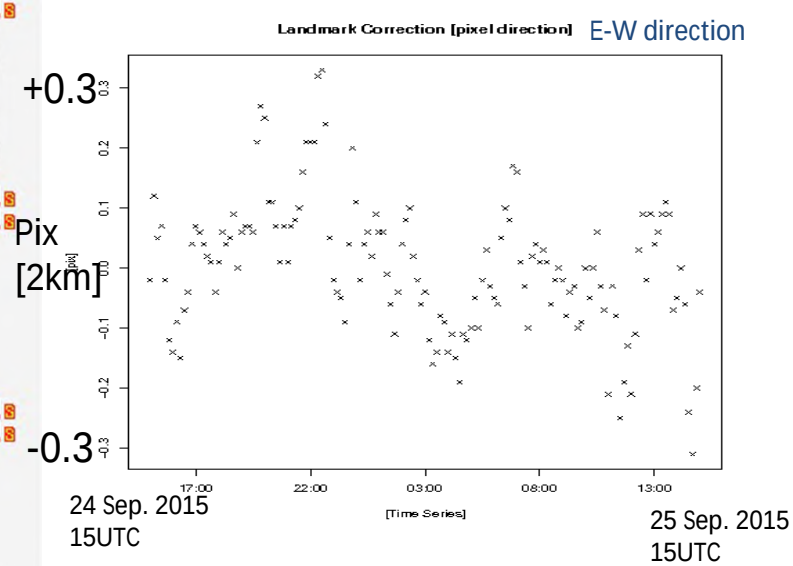


Image Navigation Quality in Band02 (0.51μm) Estimated from "Coast Line" Analysis

form 24 Sep. 2015 15UTC to 25 Sep. 2015 15UTC

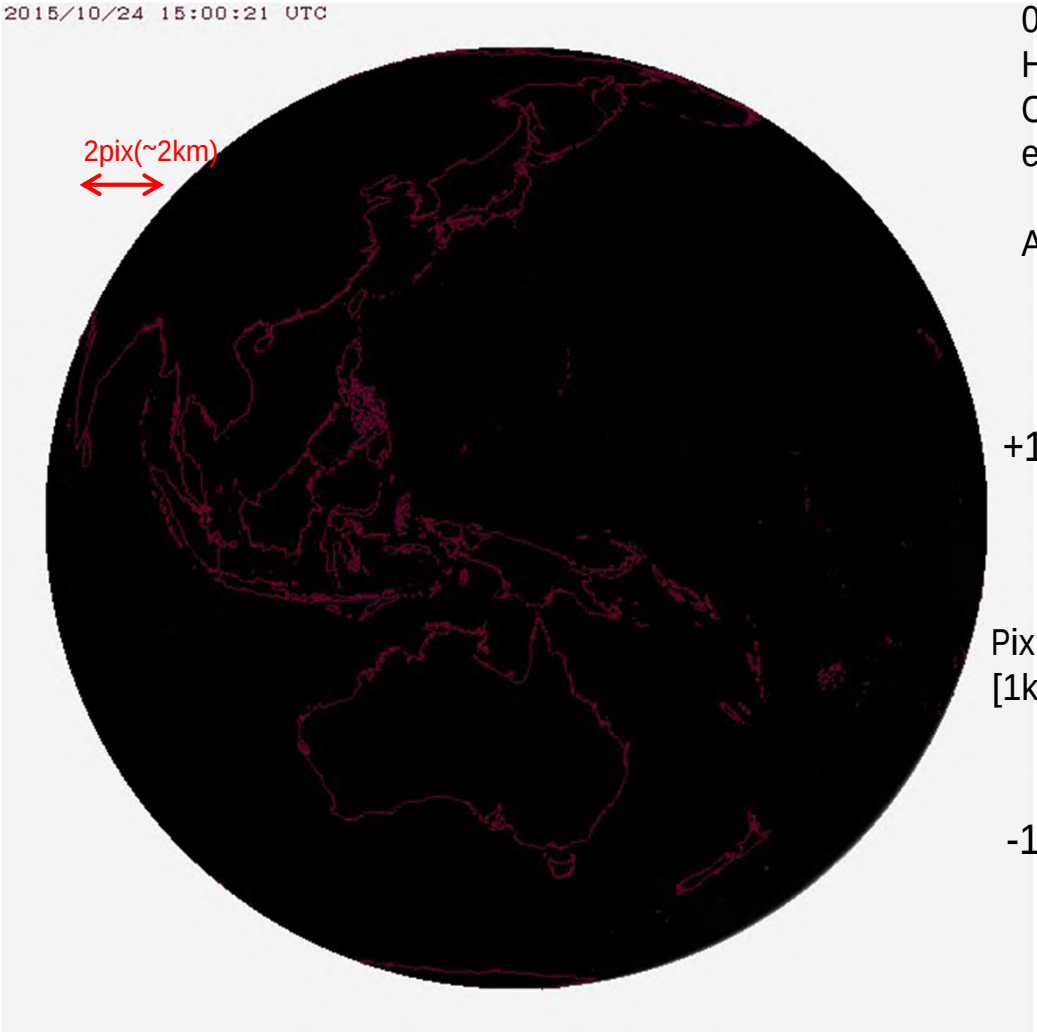
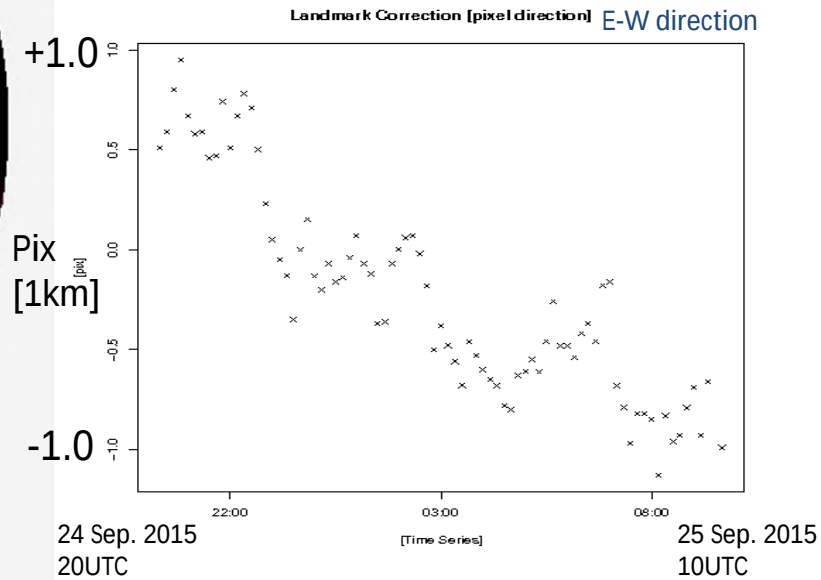


Image navigation error in daytime is less than 0.5 pixels at 1.0km resolution bands.
However, error is still larger in dawn and dusk time.
One of the major causes is co-registration correction error at visible bands and near-infrared bands.

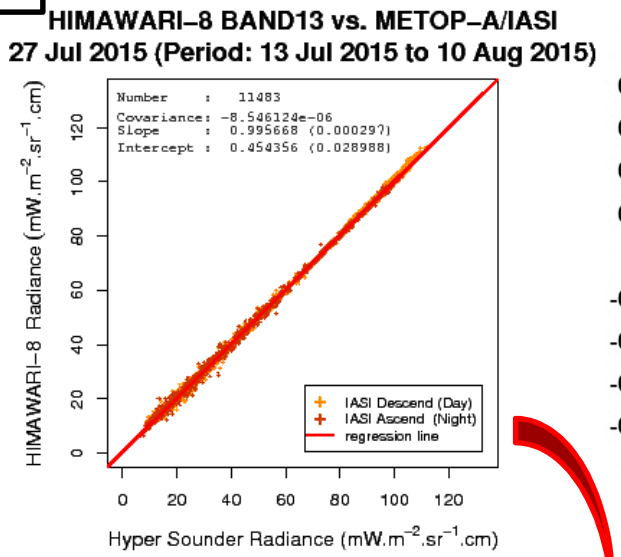
Average error magnitude is 0.60pix (by 1km resolution).

Time series of image navigation error in pixel Band02 (0.51μm), analysis in daytime area.

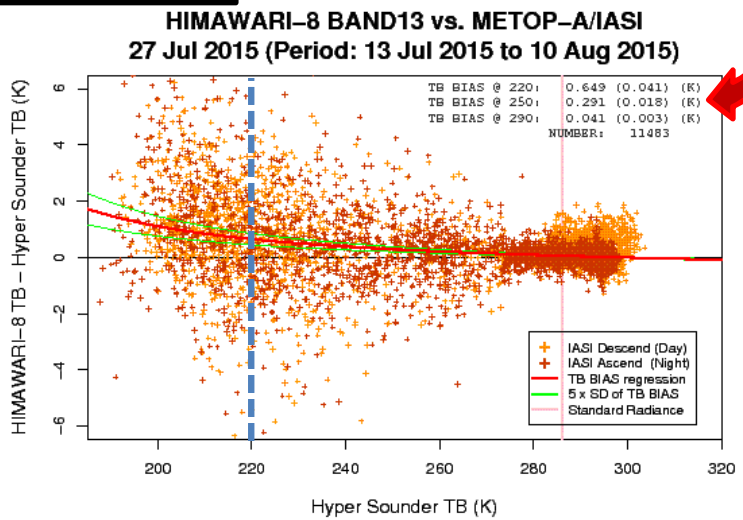


Validation of IR Bands Calibration based on GSICS inter-calibration

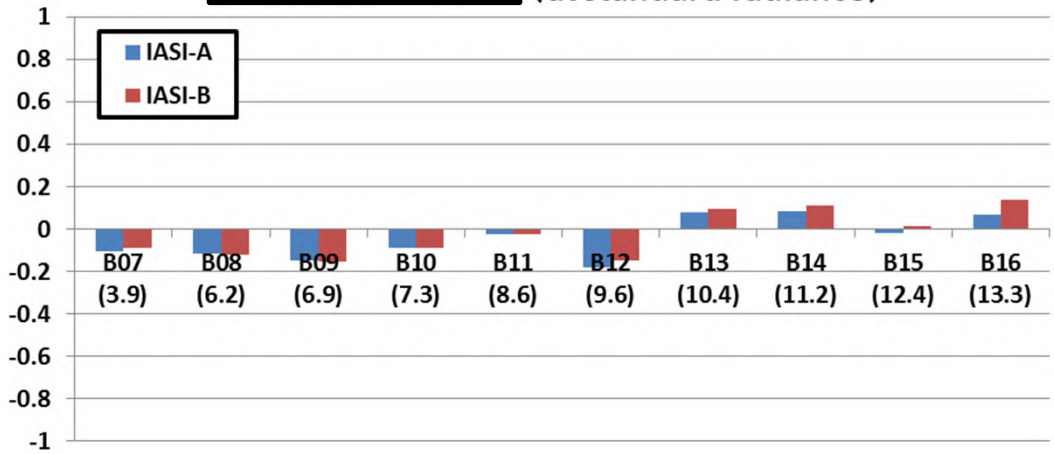
Radiance



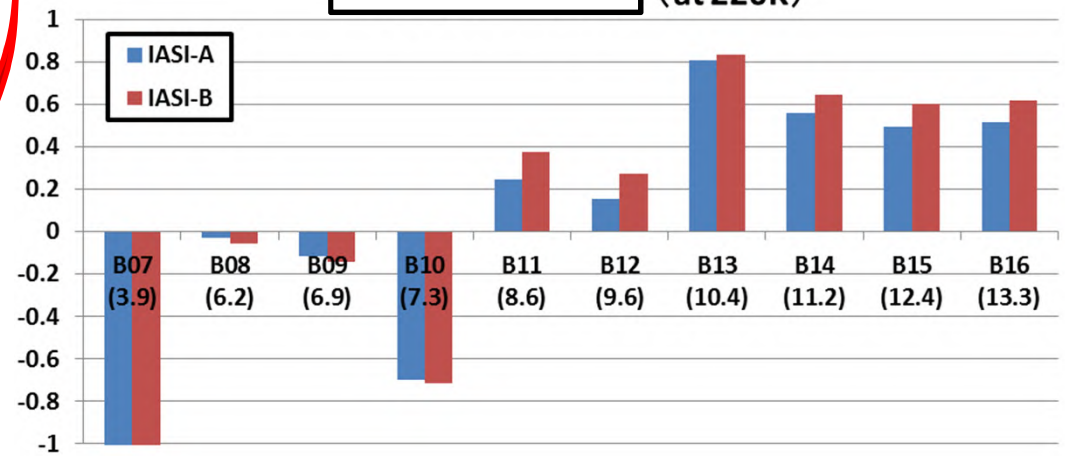
Brightness Temp. (Tb)



Tb Bias (at standard radiance)



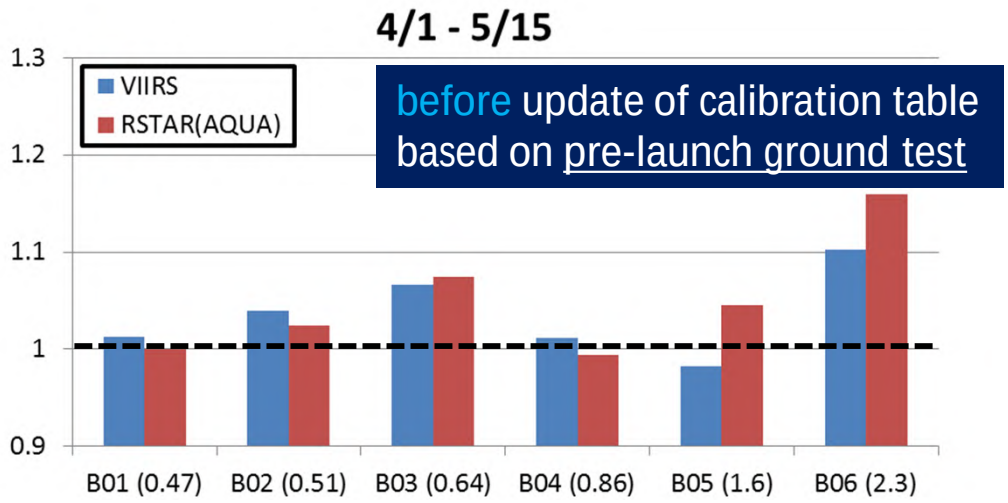
Tb Bias (at 220K)



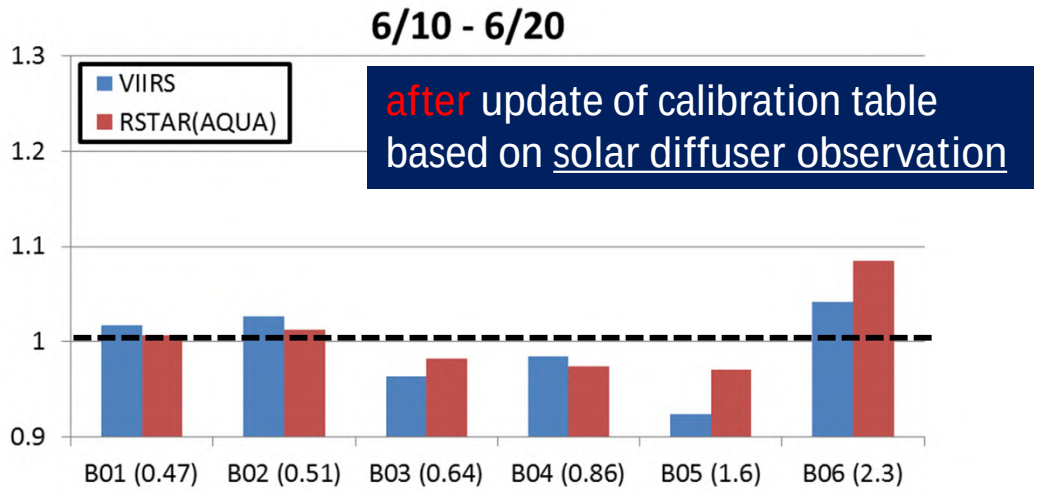
* Standard Radiance was calculated under clear sky condition over the ocean in nighttime by RTTOV 11.2 with US standard atmosphere (1976)

Validation of VIS/NIR Bands Calibration for Himawari-8 Imagery

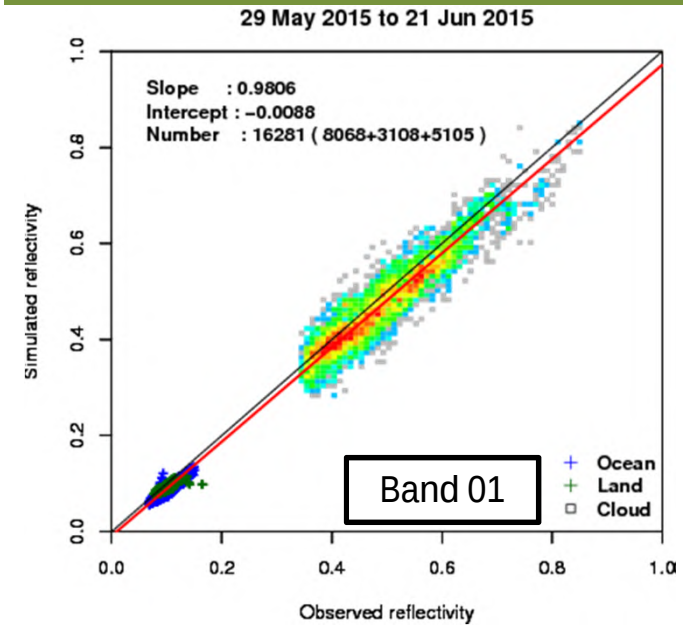
- Two ways of validation results are well agreed
- Ratio to observed AHI reflectivity are around 1.0 for all VIS/IR bands
- However, it differs in property between B01-04 and B05-06



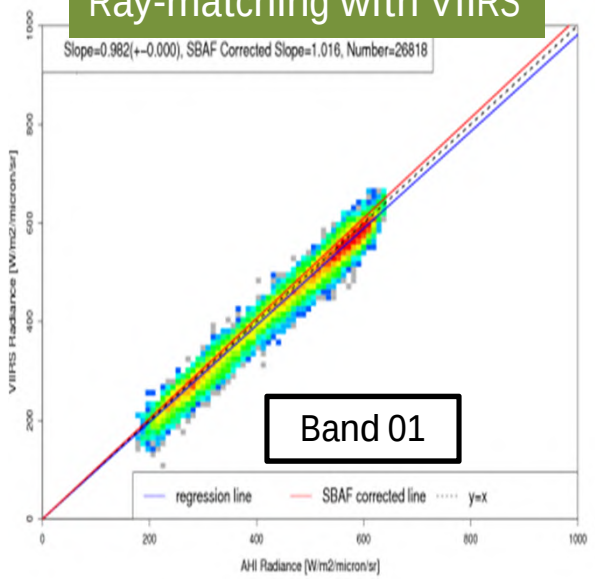
Updating calibration coefficients on 8 June,2015



Radiative Transfer Simulation with RSTAR



Ray-matching with VIIRS

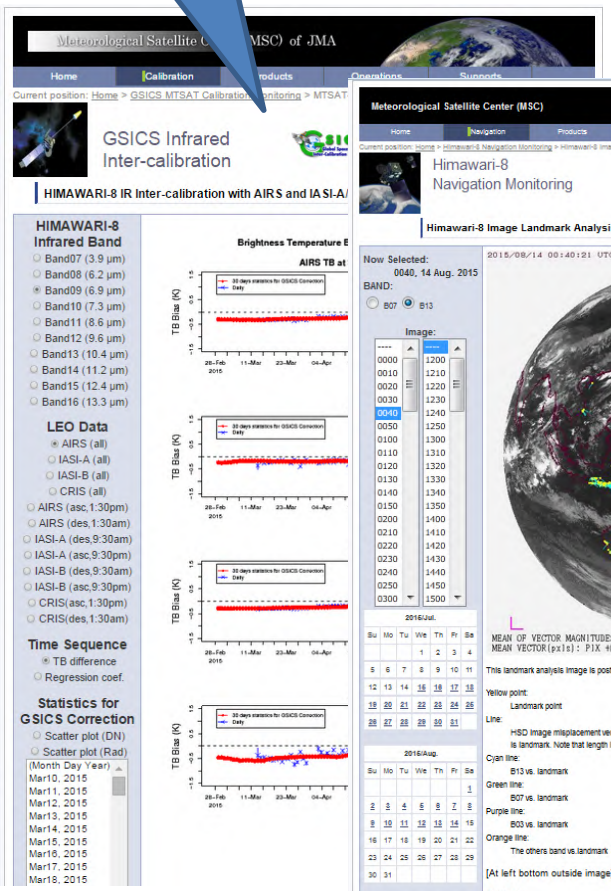


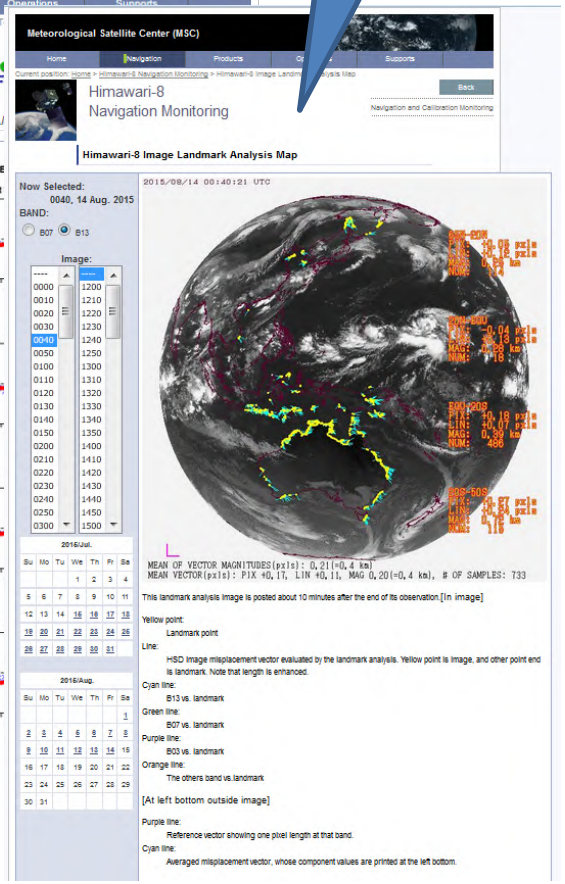
Himawari Operation Status and Imagery Calibration/Navigation Monitoring from MSC Web

Himawari-8 Operation Status

Imagery Calibration

Imagery Navigation





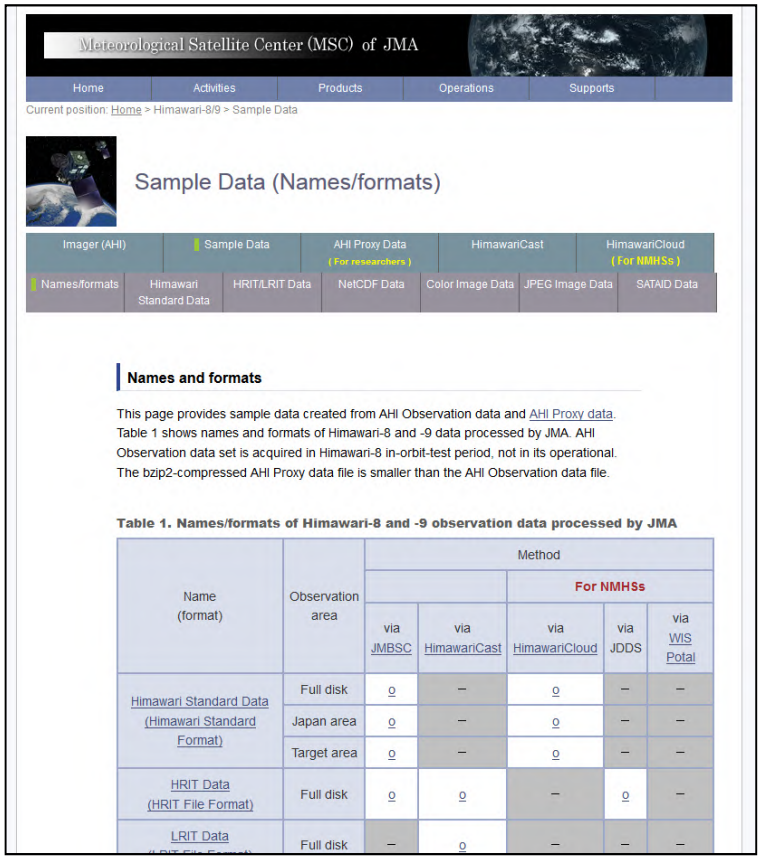
http://www.jma-net.go.jp/msc/en/index.html

Himawari-8/9 Users Support Information

http://www.jma-net.go.jp/msc/en/support/

Contents:

- Overview of satellite observation
- Overview of data dissemination
- Imager (AHI) specifications
- Operational status
- Sample data
- Sample source code to read Himawari-8 data and convert into other formats



Meteorological Satellite Center (MSC) of JMA

Home | Activities | Products | Operations | Supports

Current position: Home > Himawari-8/9 > Sample Data

Sample Data (Names/formats)

Imager (AHI) | Sample Data | AHI Proxy Data (For researchers) | HimawariCast | HimawariCloud (For NMHSs)

Names/formats | Himawari Standard Data | HRIT/LRIT Data | NetCDF Data | Color Image Data | JPEG Image Data | SATAID Data

Names and formats

This page provides sample data created from AHI Observation data and AHI Proxy data. Table 1 shows names and formats of Himawari-8 and -9 data processed by JMA. AHI Observation data set is acquired in Himawari-8 in-orbit-test period, not in its operational. The bzip2-compressed AHI Proxy data file is smaller than the AHI Observation data file.

Table 1. Names/formats of Himawari-8 and -9 observation data processed by JMA

Name (format)	Observation area	Method				
				For NMHSs		
		via JMBSC	via HimawariCast	via HimawariCloud	via JDDS	via WIS Potal
Himawari Standard Data (Himawari Standard Format)	Full disk	o	–	o	–	–
	Japan area	o	–	o	–	–
	Target area	o	–	o	–	–
HRIT Data (HRIT File Format)	Full disk	o	o	–	o	–
LRIT Data	Full disk	–	o	–	–	–

Feel free to contact:

Satellite Program Division, Japan Meteorological Agency

metsat@met.kishou.go.jp

Users' expectation for Himawari-8 in Japan

- Geoscience research communities in Japan, which are usually understood to be a "user" of Earth Observation Satellites, have a strong interest in the data utilization from Himawari-8 onboard imager AHI, without Research Announcement from JMA, in spite of the data volume (400GB/day) to process/archive

Cooperative Support for Research Communities in Japan

- For the utilization of Himawari-8 AHI data, Historical Data Servers are operated by Japanese Science Group on a voluntary basis for supporting non-Profit, R&D Users;

- Chiba University CEReS (Center for Environmental Remote Sensing) Data Server
- University of Tokyo DIAS (Data Integration and Analysis System) Data Server
- NICT (National Institute of information and Communications Technology) Science Cloud
- JAXA “Himawari Monitor” Data Server

A Japan - Australia International Collaboration for the development of non-meteorological applications

- The collaborative project was launched between Australia and Japan, namely "CSIRO – AuBoM" and "JAXA - JMA" for the utilization of the combined data from Himawari-8/9 and coming GCOM-C as a cooperation on application development.
- Extracted key non-meteorological (environmental) products

- Land: Vegetation parameters, Fire spread (Hot Spot), Flood warning, Land surface temp.
- Ocean: Ocean color, SST
- Atmosphere: Solar radiation for solar power generation, Aerosol/Smoke(haze) for air quality monitoring

Progress and outcome will be available from

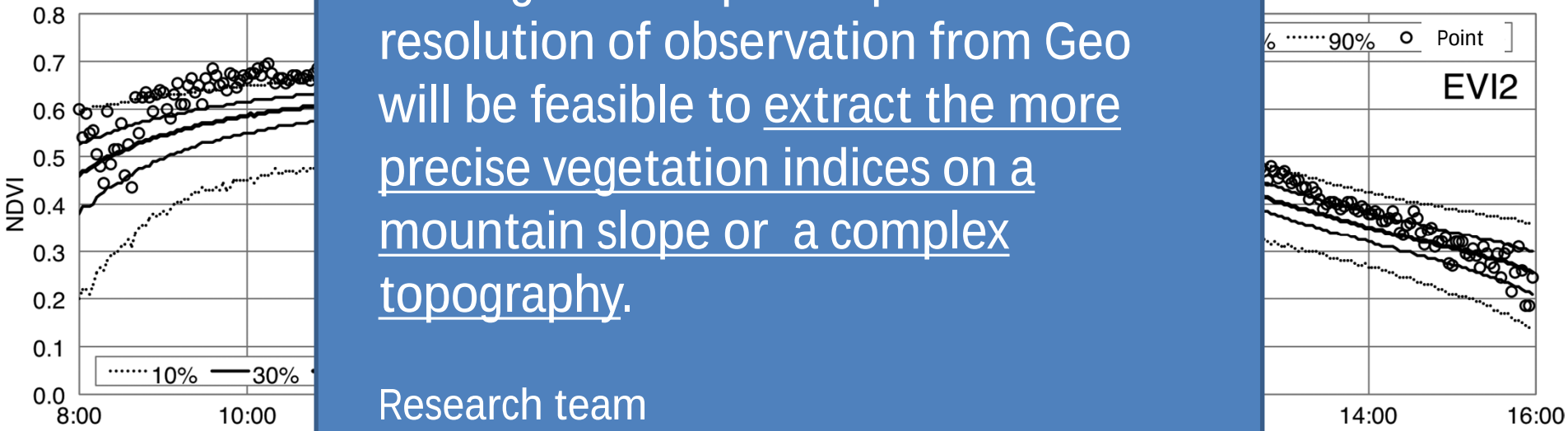
http://geoapplications.org/

Australian Government
Bureau of Meteorology

Preliminary Results of Non-meteorological Applications Development from Himawari-8

Vegetation Indices retrieval

Daily fluct… …n Indices



NDVI：…

EVI2：… 11:40

- While ND… h angle, EVI2 is r…
- Characte… x due to sun zeni…

… Vegetation Index

… Vegetation Index

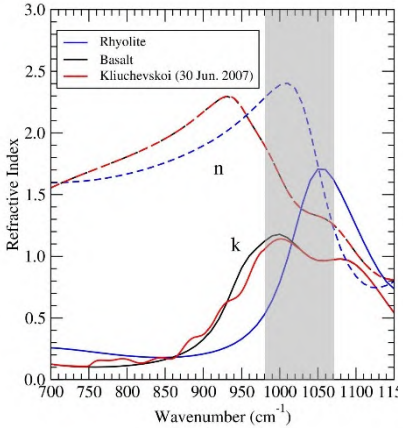
A preliminary study, not in printed……
The highter temporal/spacial resolution of observation from Geo will be feasible to extract the more precise vegetation indices on a mountain slope or a complex topography.

Research team
[1] Masayuki Matsuoka, Rie Honda, Kochi University
[2] Masataka Takagi, Kochi University of Technology
[3] Atsuko Nonomura, Hitoshi Moria, Kagawa University
[4] Hirotaka Yoshioka, Aichi Prefectural University

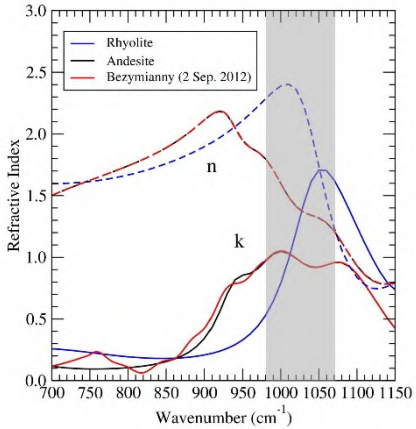
Volcanic Ash Retrieval

A Characteristic Features of Volcanic Ash will be depend on Volcanoes

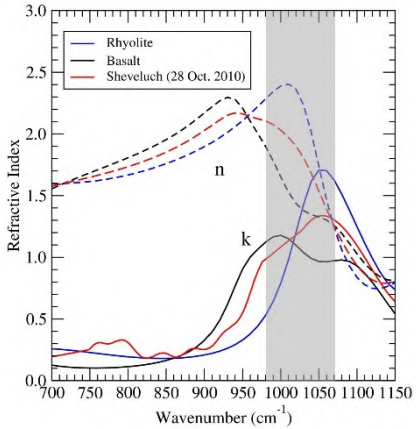
Kliuchevskoi
Sangeang-Api



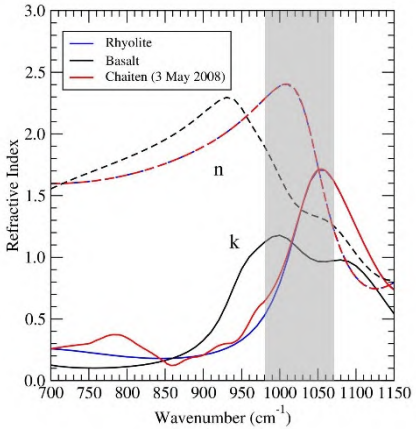
Kirishimayama
Bezymianny

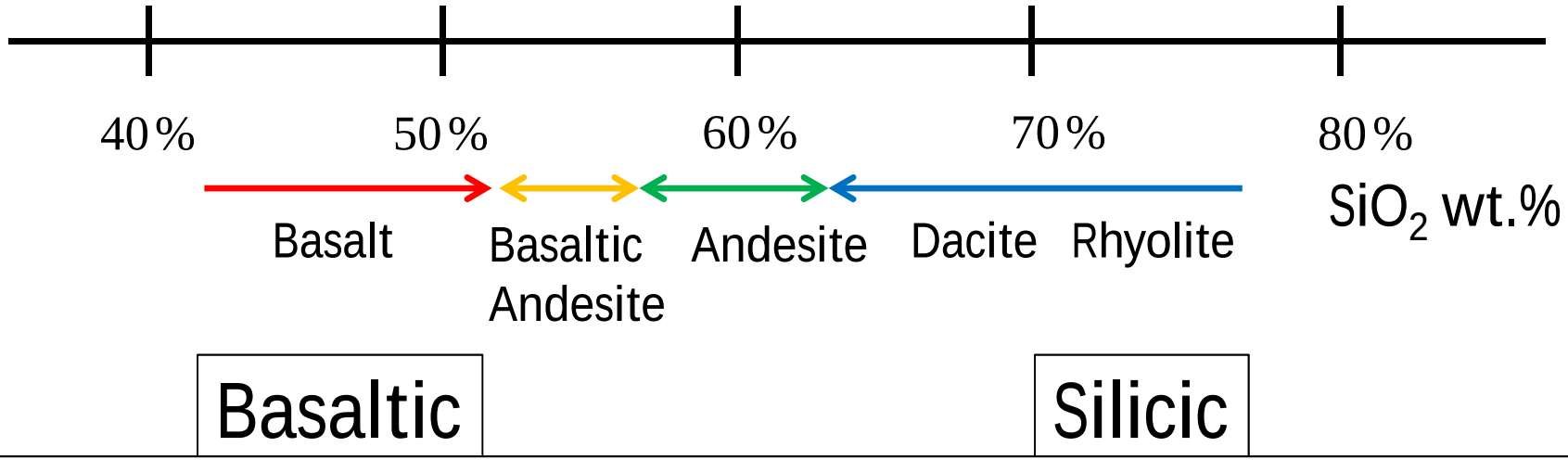


Sheveluch
(Kelut)



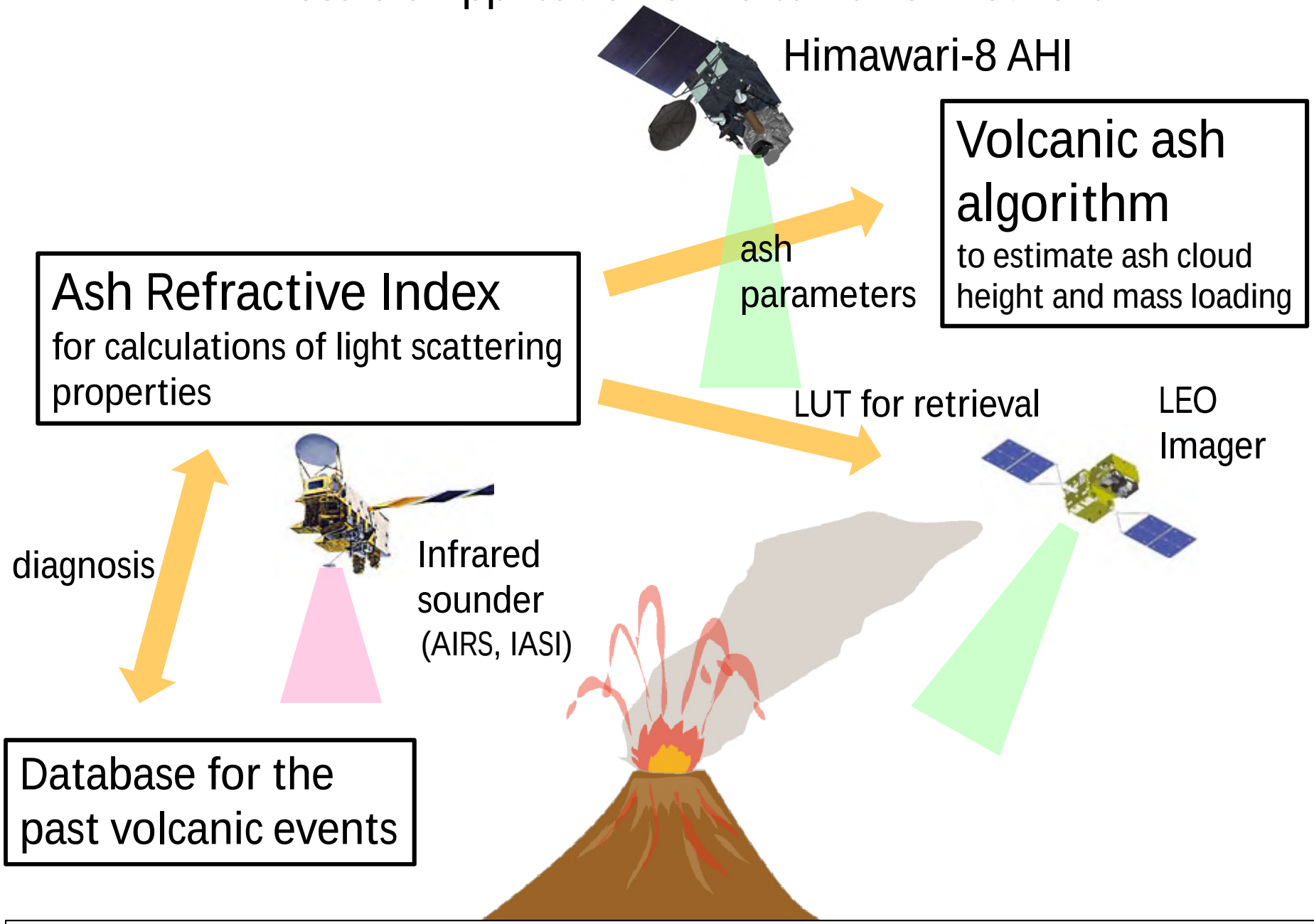
Chaiten
Puyehue-Cordon Caulle





Ishimoto, Refractive index of volcanic ash material estimated from the data of satellite infrared sounder, presented in JpGU Meeting 2015.

A Possible Application of Volcanic Ash Retrieval



Ishimoto, Refractive index of volcanic ash material estimated from the data of satellite infrared sounder, presented in JpGU Meeting 2015.

Thank you !!

For the further discussion, please visit

“Session 7 : One Year of Himawari 8”

4:00 PM-5:30 PM, Thursday, 14

Room 252/254

(New Orleans Ernest N. Morial Convention Center)