Coordinated efforts for using Himawari-8 AHI data for the earth's environmental monitoring

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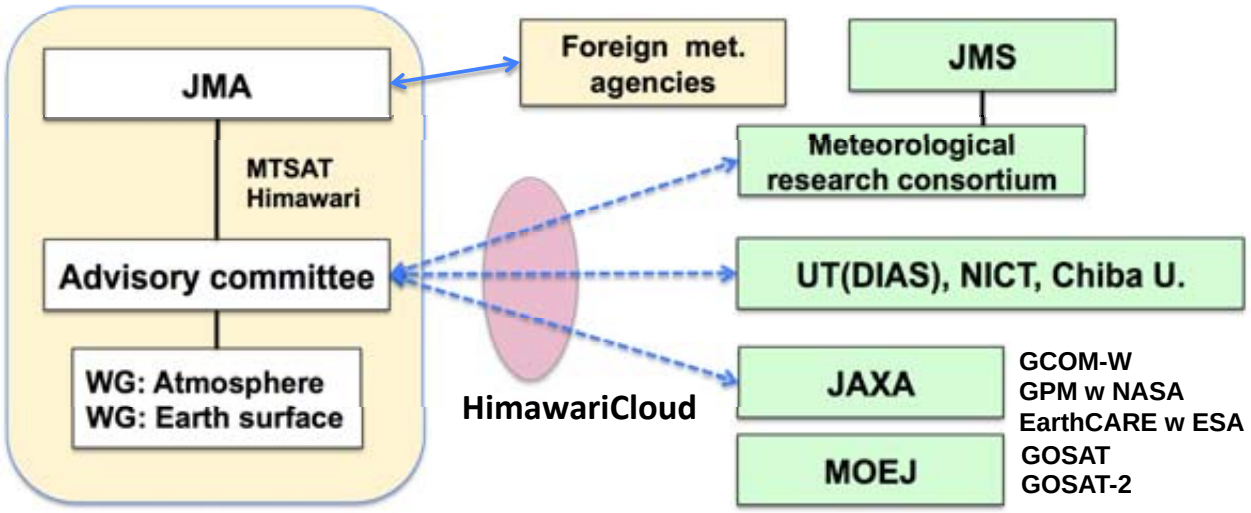
JMA Advisory Committee for Geos. Satellite Data Use

- Members: T. Nakajima (Chair), R. Oki, T. Koike, H. Shimoda, T. Takamura, Y. Takayabu, E. Nakakita, T.Y. Nakajima, K. Nakamura, Y. Honda
- WGs: T.Y. Nakajima (Atmosphere), Y. Honda (Earth surface)
- Data distributions to research community (430GB/day nc)
- Data use exploitation and community collaboration

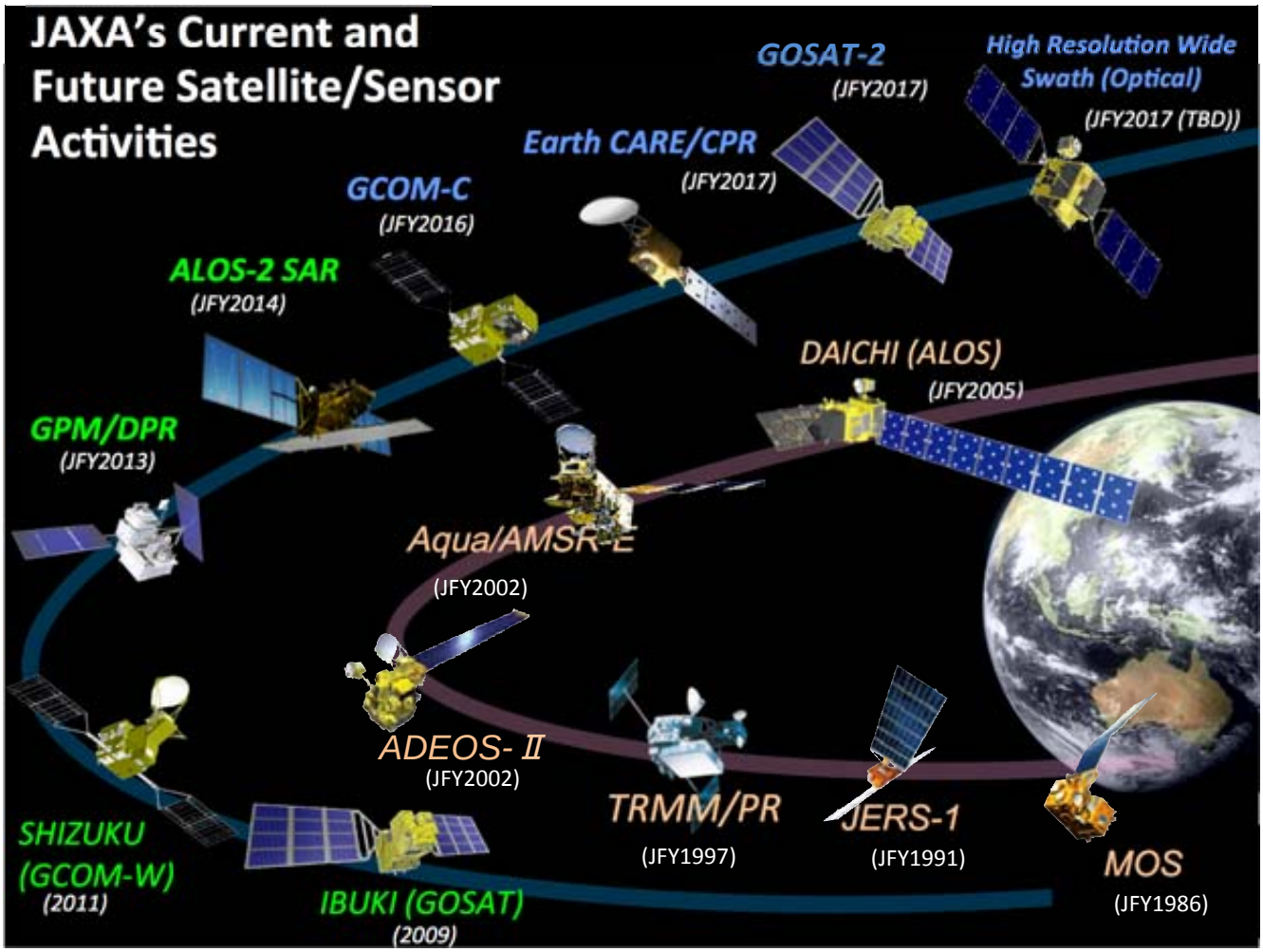


Research products (Atmospheric working group)

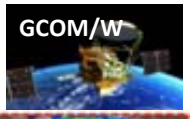
	Precip	Cloud					Aerosol					Radiation		
Investigators	IR	fraction,detect	characteristics	wind	assimilation	validation	characteristics	yellow sand	volcanic ash	assimilation	validation	clear sky	surface SW	validation
T.Y. Nakajima (Tokai U), chair		x	x			fraction								
H. Ishida (Yamaguchi U)		x	x											
H. Irie (Chiba U)						COD					x			x
H. Iwabuchi (Tohoku U)			x			x								
T. Ushio (Osaka U)	x			x										
R. Oki (JAXA)							x	x		x				
T. Kubota (JAXA)	x			x										
D. Goto (NIES)						x				x	x			x
H. Takenaka (U Tokyo)													x	
T. Nakajima (U Tokyo)							x			x				
A. Higurashi (NIES)														
H. Masunaga (Nagoya U)														
H. Ishimoto (JMA/MRI)			x				x		x					
K. Okamoto (JMA)					x									

Research products (Earth surface working group)

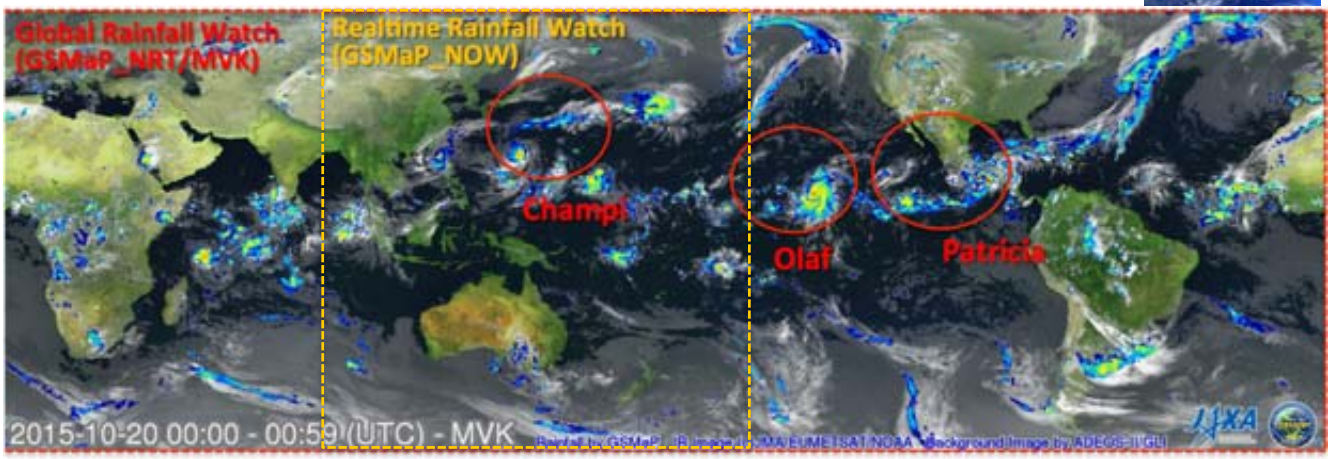
	Sensor		Precip	Cloud					Aerosol		Radiation				Surface			
Investigators	radiometric	geometric	IR	fraction,detect	characteristics	wind	assimilation	validation	characteristics	yellow sand	clear sky	SST	LST	validation	vegetation	ocean color	snow	sea ice
Y. Honda (Chiba U), chair																		
M. Kachi (JAXA)			x			x		rain						SST				
Y. Kajiwara (Chiba U)															x			
F. Kobashi (Tokyo U Marine)																		
J. Suzaki (Kyoto U)																		
M. Takagi (Kochi U Tech)		x													x			
W. Takeuchi (U Tokyo)																		
A. Higuchi (Chiba U)			x															
T. Hirata (Hokkaido U)																x		
M. Hori (JAXA)				x									snow				x	x
H. Murakami (JAXA)	x								x	x	x							
M. Moriyama (Nagasaki U)												x	x	LST				
M. Yamashita (KINSOKU)								fract.										
T. Aoki (JMA/MRI)																		



JAXA's Contribution to Forecasting



"GSMaP_NOW" over "Himawari-8" area start just now!
Global Satellite Mapping of Precipitation (GSMaP)



GSMaP (Global) observed Hurricane Patricia and Olaf, and Typhoon Champi: 20-24 Oct. 2015, hourly animation

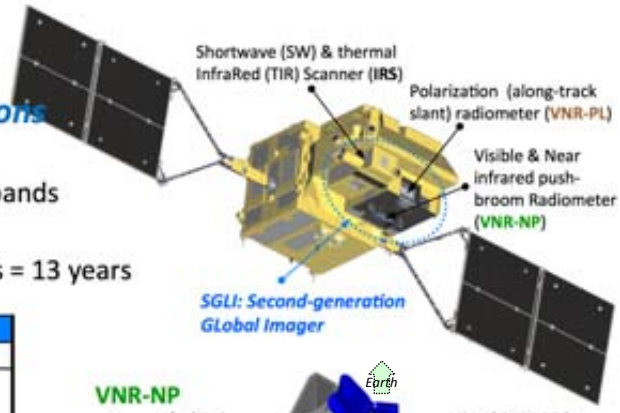
- Rapidly changing precipitation phenomena need frequent observations.
- Global rainfall map merging GPM Core Observatory, polar orbiting microwave radiometer/sounders, and geostationary infrared radiometers.

JAXA Global Rainfall Watch (4-hr delay) : http://sharaku.eorc.jaxa.jp/GSMaP
JAXA Realtime Rainfall Watch (Himawari-area): http://sharaku.eorc.jaxa.jp/GSMaP_NOW

GCOM-C1/ SGLI

Global land, coastal, and aerosol observations

- ✓ 250m resolution with 1150~1400km swath
- ✓ Polarization/along-track slant view of Red and NIR bands
- ✓ Descending local time: AM10:30
- ✓ Launch in JFY2016 (TBD); 5-year lifetime×3 satellites = 13 years



SGLI channels

	CH	λ	Δλ	L_{std}	L_{max}	SNR at Lstd	IFOV
		VN, P, SW: nm T: μm		VN, P: W/m²/sr/μm T: Kelvin		VN, P, SW: - T: NEΔT	m
1150km swath	VN1	380	10	60	210	250	1k/250
	VN2	412	10	75	250	400	1k/250
	VN3	443	10	64	400	300	1k/250
	VN4	490	10	53	120	400	1k/250
	VN5	530	20	41	350	250	1k/250
	VN6	565	20	33	90	400	1k/250
	VN7	673.5	20	23	62	400	1k/250
Multi-angle obs. for 674nm and 869nm	VN8	673.5	20	25	210	250	1k/250
	VN9	763	12	40	350	1200(@1km)	1k/250
	VN10	868.5	20	8	30	400	1k/250
	VN11	868.5	20	30	300	200	1k/250
	PL1	673.5	20	25	250	250	1km
	PL2	868.5	20	30	300	250	1km
1400km swath	SW1	1050	20	57	248	500	1km
	SW2	1380	20	8	103	150	1km
	SW3	1630	200	3	50	57	1k/250
	SW4	2210	50	1.9	20	211	1km
	TIR1	10.8	0.7	300	340	0.2	1k/500/250
	TIR2	12.0	0.7	300	340	0.2	1k/500/250

250m over the Land or coastal area, and 1km over offshore

250m-mode possibility

VNR-NP
- Non-polarization tree telescopes
- Each has the same 11 channels
- Diffuser CAL

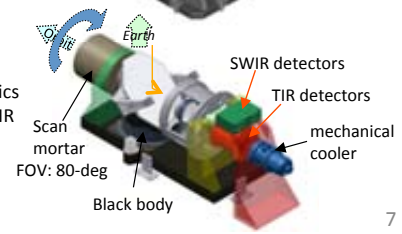
Total FOV: 70deg = 24deg × 3 telescopes (~1150km@nadir)

VNR-PL
- Polarization two (670nm and 865nm) telescopes
- Each has tree polarization-angle filters

FOV: 55deg (~1150km@±45deg along-track slant)

±45deg along-track slant observation

IRS
- Ritchey-Chretien Optics
- 4 SWIR & 2 TIR channels
- Black body & diffuser CAL



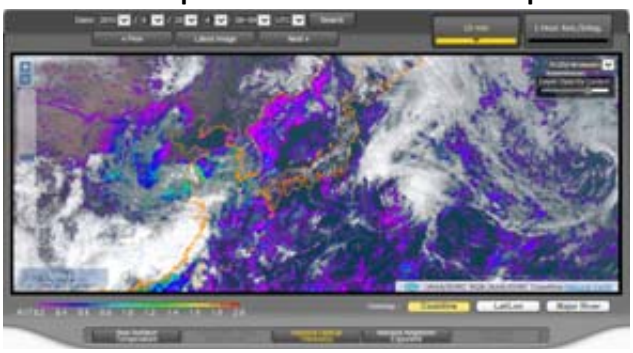
JAXA Himawari Monitor

http://www.eorc.jaxa.jp/ptree/index_j.html

- Opened the Webpage on 31st August
- Registration: 122 people (at 18th Oct)
- Shows images in the Webpage
- Disseminates Himawari Standard Data and Geophysical data via FTP
- Data can be achieved with simple user registration

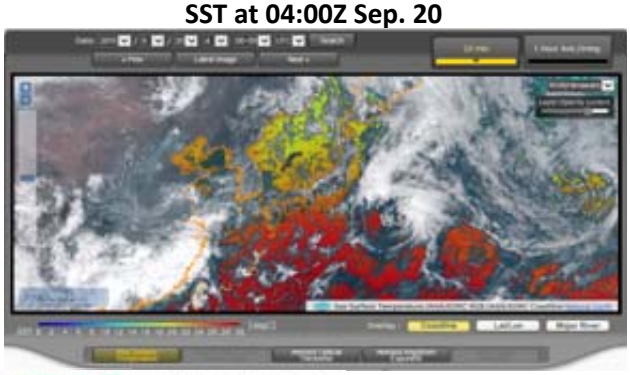
Example of JAXA Himawari Products

Aerosol Optical Thickness at 04:00Z Sep. 20

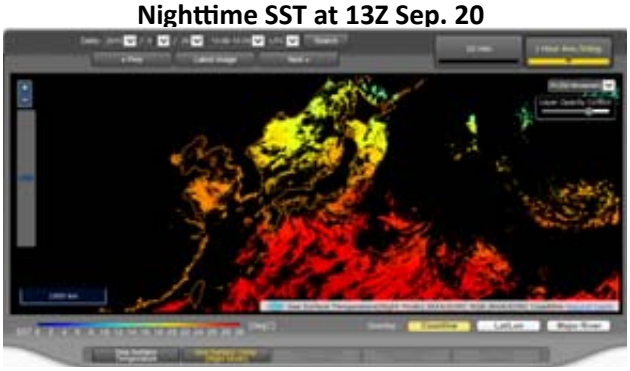


Aerosol Angstrom Exponent at 04:00Z Sep. 20

SST at 04:00Z Sep. 20



Nighttime SST at 13Z Sep. 20



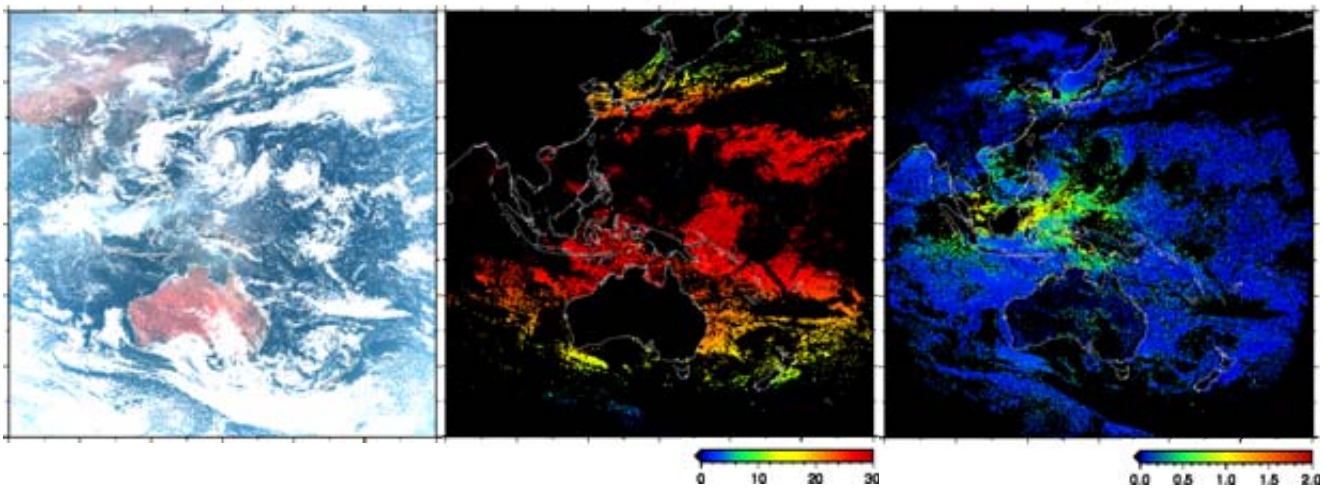
Aerosol products are retrieved by 2-ch method (Higurashi and Nakajima, 1999)

Himawari Images on 19-20th Oct. 2015

RGB Image
1020_0230

Sea Surface Temperature
1020_0000

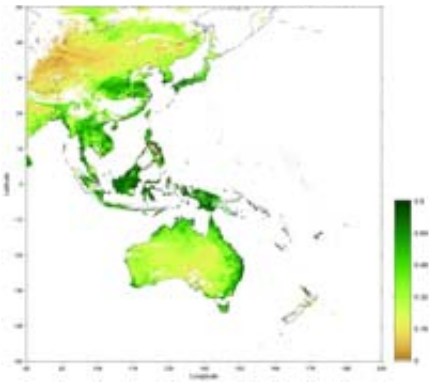
Aerosol Optical Thickness
1020_0230



(Courtesy to Dr. Higurashi and Dr. Fukuda for aerosol retrieval algorithm)

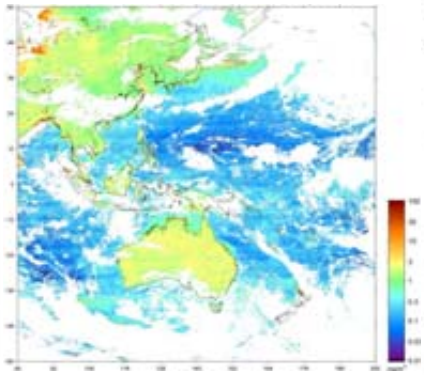
Research products

NDVI



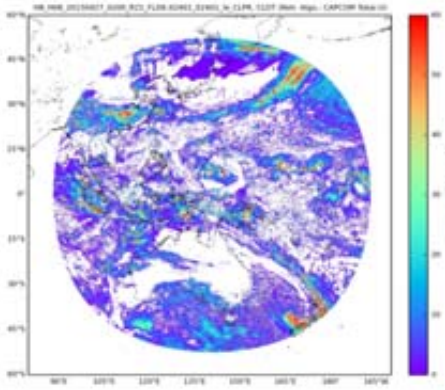
* Daytime Average

Chlorophyll-a（mg/m^3）



* Daytime Average

Cloud Optical Depth*1

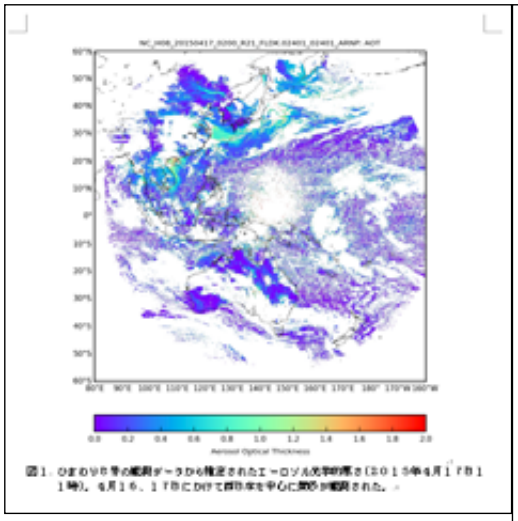


* Snap Shot

*1Courtecy of CAPCOM algorithm by Tokai University

MRI Aerosol Assimilation

Himawari-8 retrieval



Dust aerosol assimilation

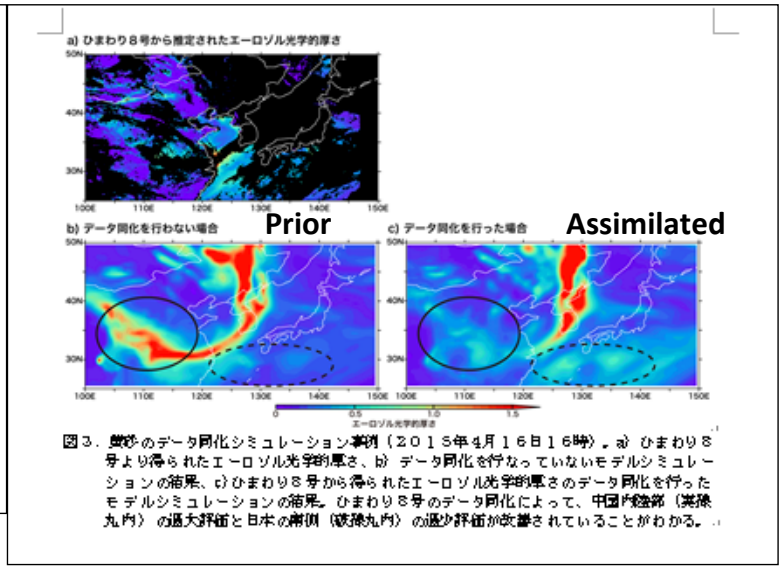
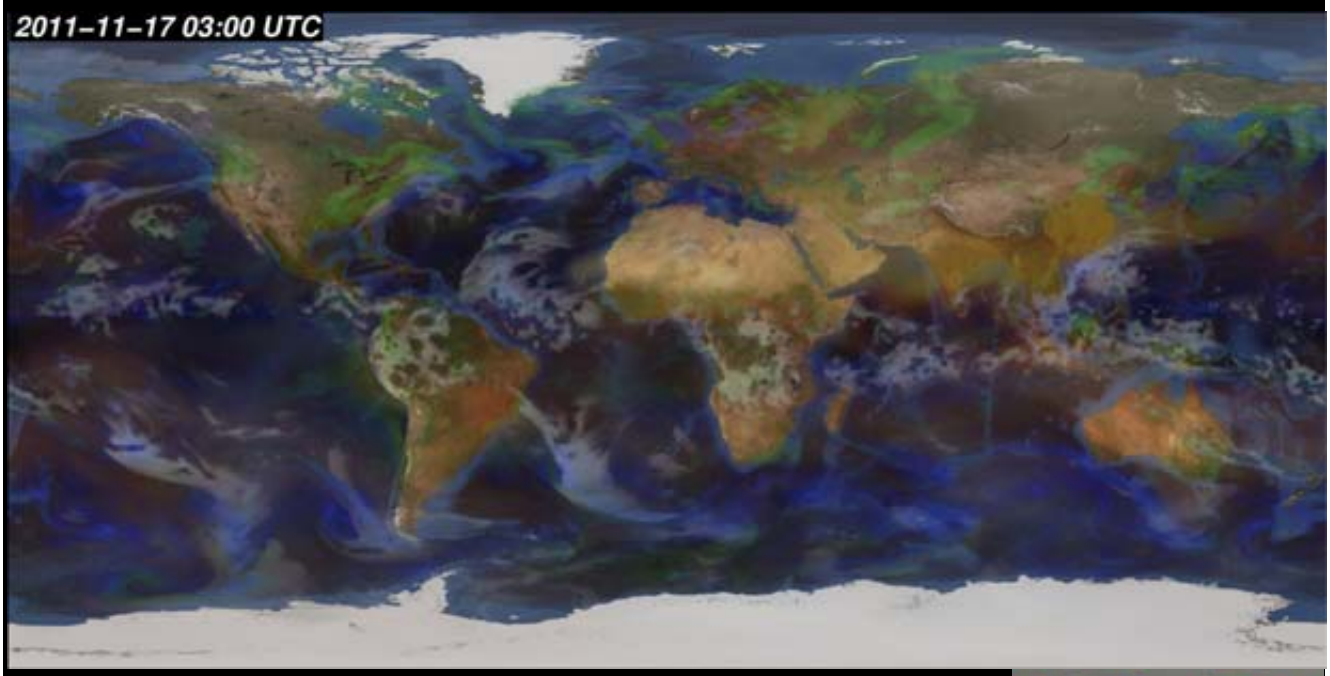


図３．黄砂のデータ同化シミュレーション事例（２０１５年４月１６日１６時）。a) ひまわり８号より得られたエーロゾル光学的厚さ、b) データ同化を行なっていないモデルシミュレーションの結果、c) ひまわり８号から得られたエーロゾル光学的厚さのデータ同化を行ったモデルシミュレーションの結果。ひまわり８号のデータ同化によって、中国内陸部（実線丸内）の過大評価と日本の南側（破線丸内）の過少評価が改善されていることがわかる。

K. Yumimoto @ MRI (2015)

3.5km aerosol simulation with NICAM-Chem



3.5km aerosol simulation with NICAM-Chem model on HPCI-K computer@RIKEN;
Aerosol optical thickness for carbon (red), sulfate (green), mineral dust (yellow) and sea salt (blue) aerosols.

Conclusions

- **Community effort for AHI analyses in collaboration with JMA**
- **Aerosol, cloud and surface parameters have been retrieved using the algorithms developed for JAXA LEO missions (GCOM-W, GCOM-C, GOSAT-2 and EarthCARE)**
- **"JAXA Himawari Monitor" website: (http://www.eorc.jaxa.jp/ptree/index_j.html).**
- **3.5km NICAM-Chem simulation on the K-computer; Data use for aerosol assim/prediction etc**