Updates of the aerosol prediction in Japan Meteorological Agency

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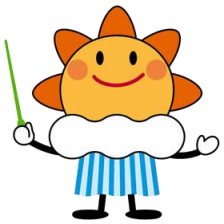


21 October 2014

6th ICAP working group meeting, NCAR Foothills Laboratory

気象庁 Japan Meteorological Agency

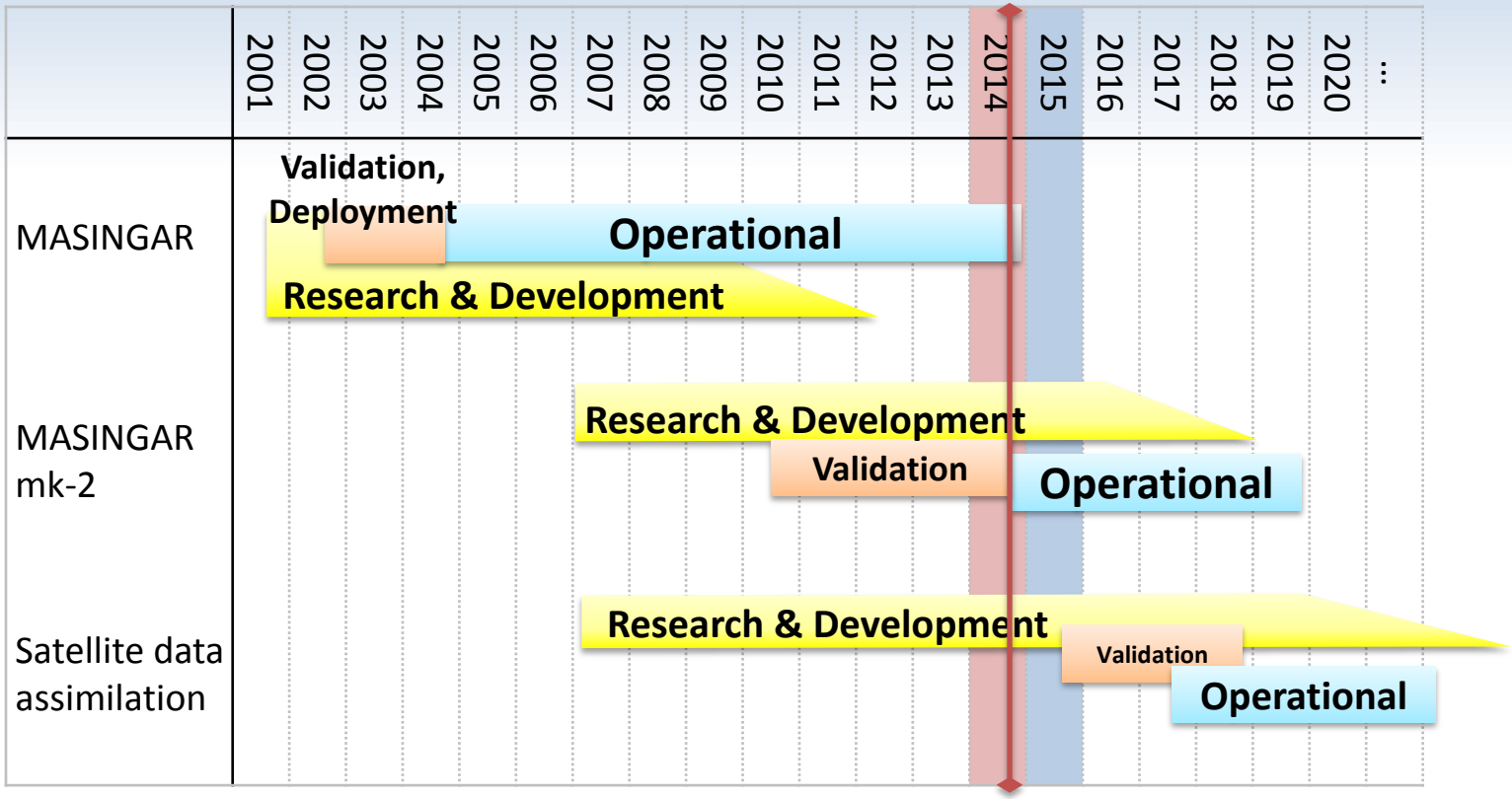
JMA

Outline

- Updates of JMA
  - the operational global aerosol prediction
  - Plans for operational aerosol data assimilation
- Topics
  - **Himawari-8** was launched successfully on 7 October 2014.
  - **JAXA-MRI-NIES-RIAM joint research project**
  - **Smokes from Russian forest fires** reached Japan in July.

➔ Validations of the operational dust prediction model will be given by Akinori Ogi of JMA.

Update of the global aerosol prediction

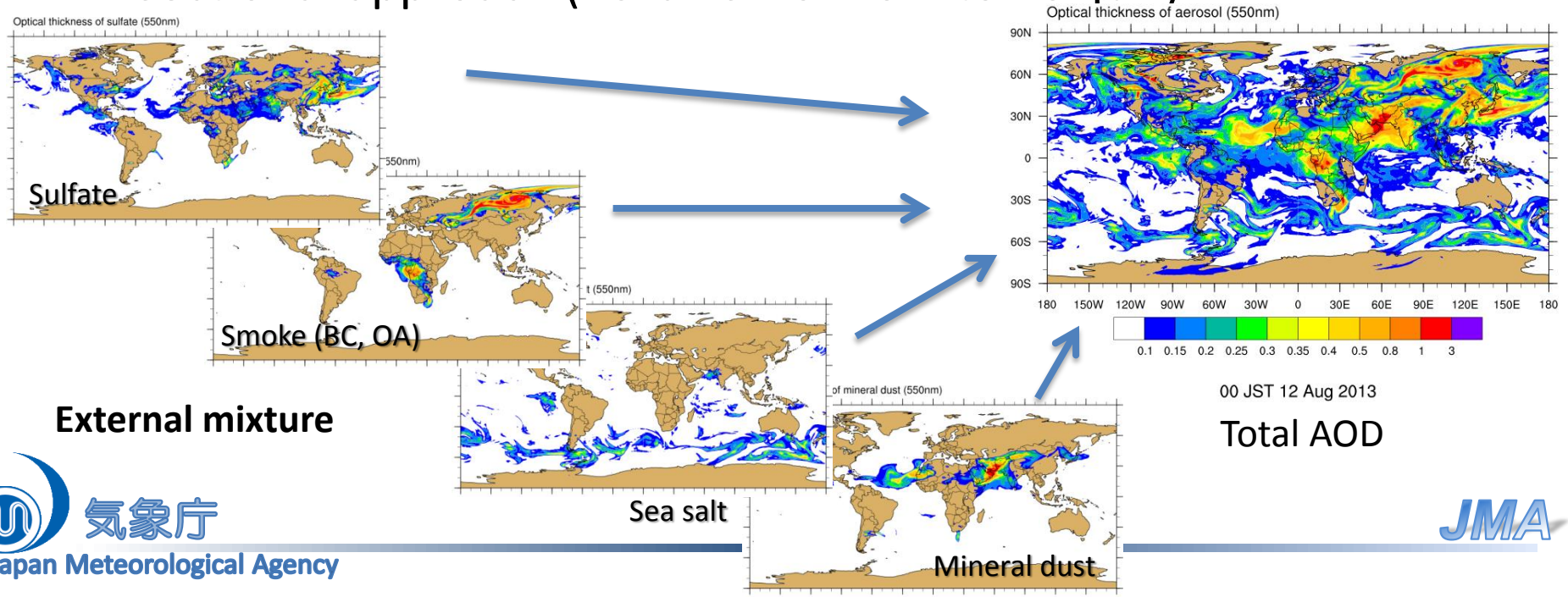


- 2014 Update to new version of aerosol model: (Horizontal TL159 (about 1.125°)
- 2015 Horizontal resolution will be increased to TL319 (about 0.56°).

Global aerosol model MASINGAR mk-2

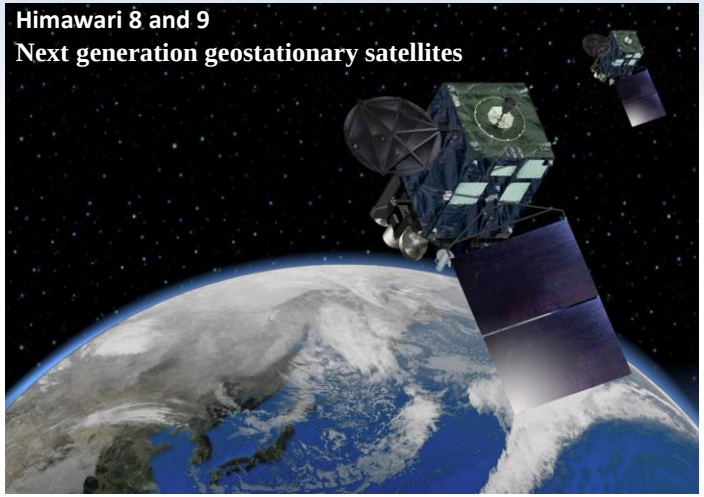
(Model of Aerosol Species in the Global Atmosphere)

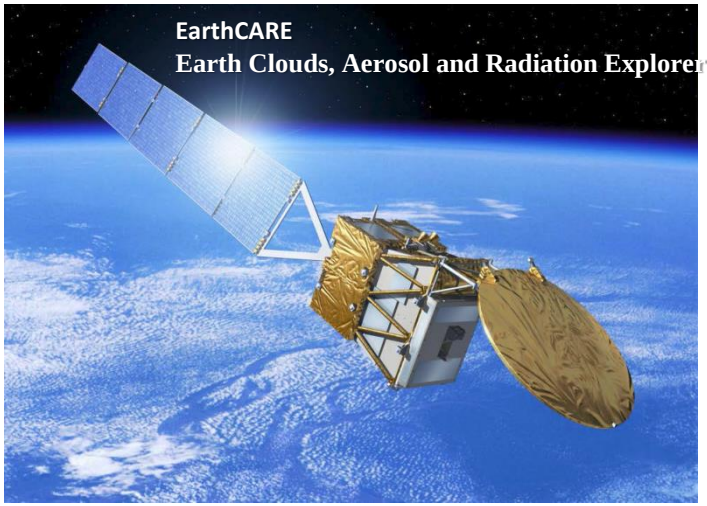
- Sulfate, black carbon, organics, sea salt, and mineral dust are included
  - The emission flux of sea-salt, mineral dust, and dimethylsulfide are predicted based on the surface properties calculated by the atmospheric model.
  - Particle size distributions of sea salt and dust are expressed by sectional approach (10-bins from 0.2 to 20 μm)



Plans of operational data assimilation

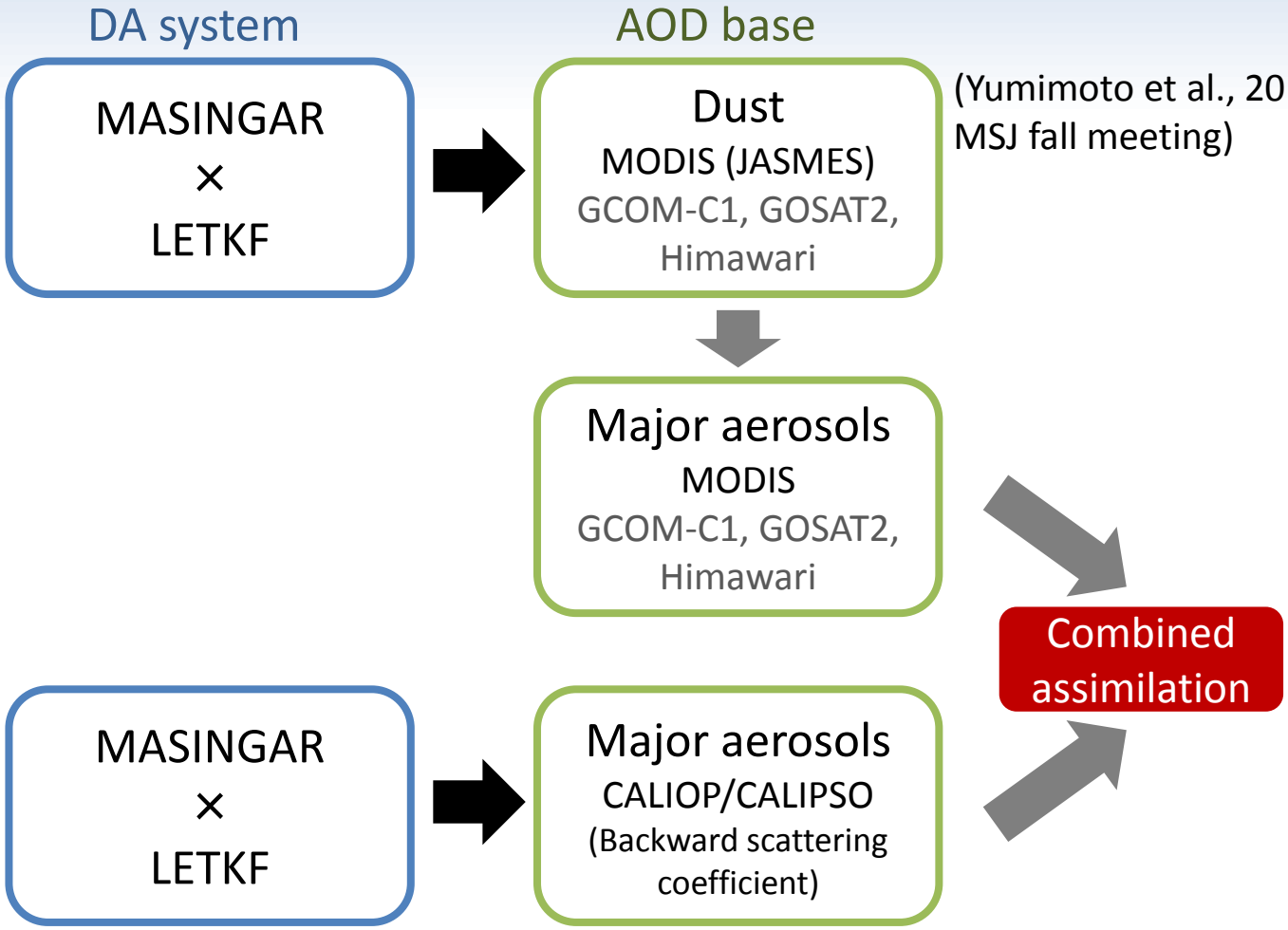
- From 2017, data assimilation using satellite imagers (MODIS, Himawari 8/9, VIIRS, GCOM-C1)
  - DA experiments of AOD by satellite imagers are under way.
- The R&D of aerosol lidar data assimilation continues.
  - An OSSE experiment of EarthCARE/ATLID is on-going (Cooperation with JAXA).





Development plan of aerosol DA

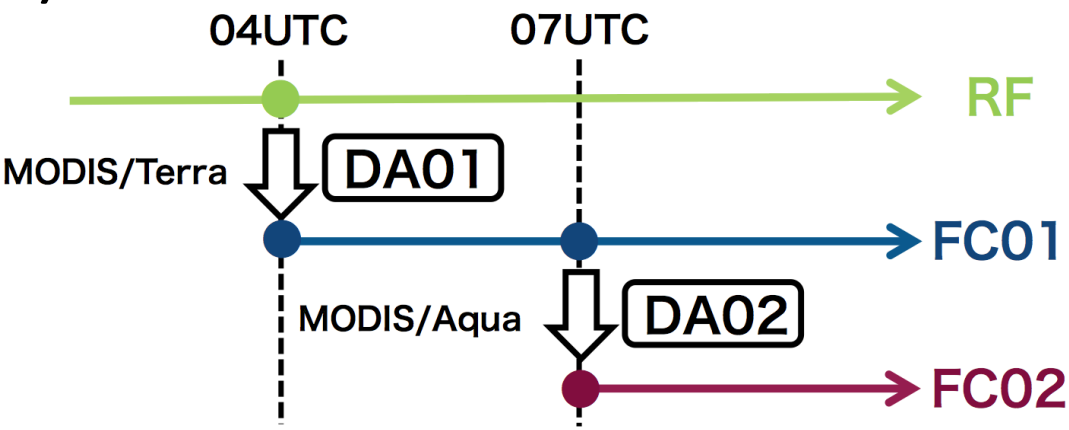
- Imager



- Lidar

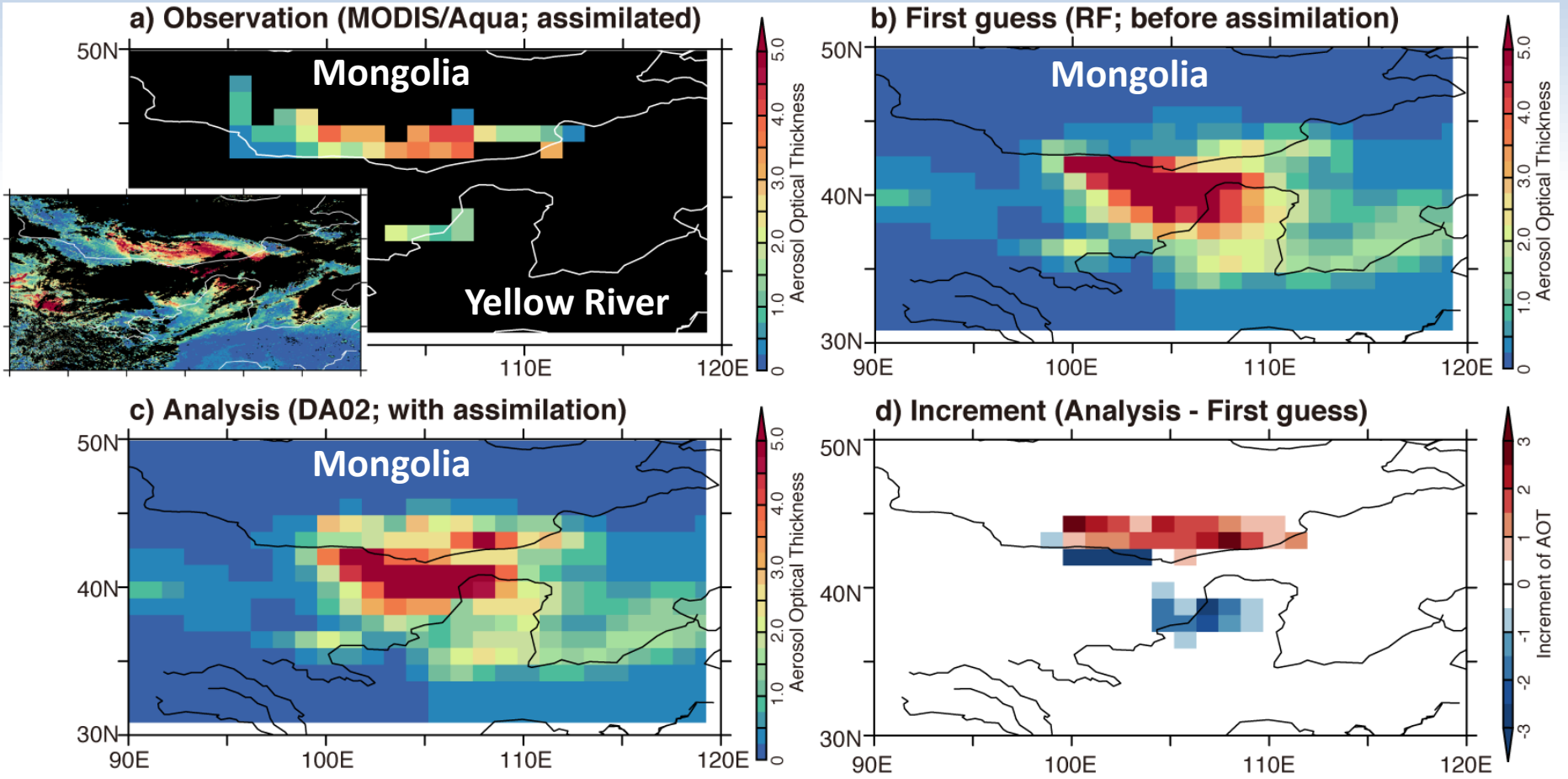
Experiment: data assimilation with MODIS

- Data assimilation using MODIS AOD by JASMES (JAXA EORC)
- Experiment:
  - 19-24 March 2010
    An intense dust
    case
  - Model resolution:
    TL159L48 (~1.125 deg)
  - Ensemble size: 50 members



(Yumimoto et al. 2014, MSJ fall meeting)

Experiment: data assimilation with MODIS



March 19, 2010

(Yumimoto et al. 2014, MSJ fall meeting)

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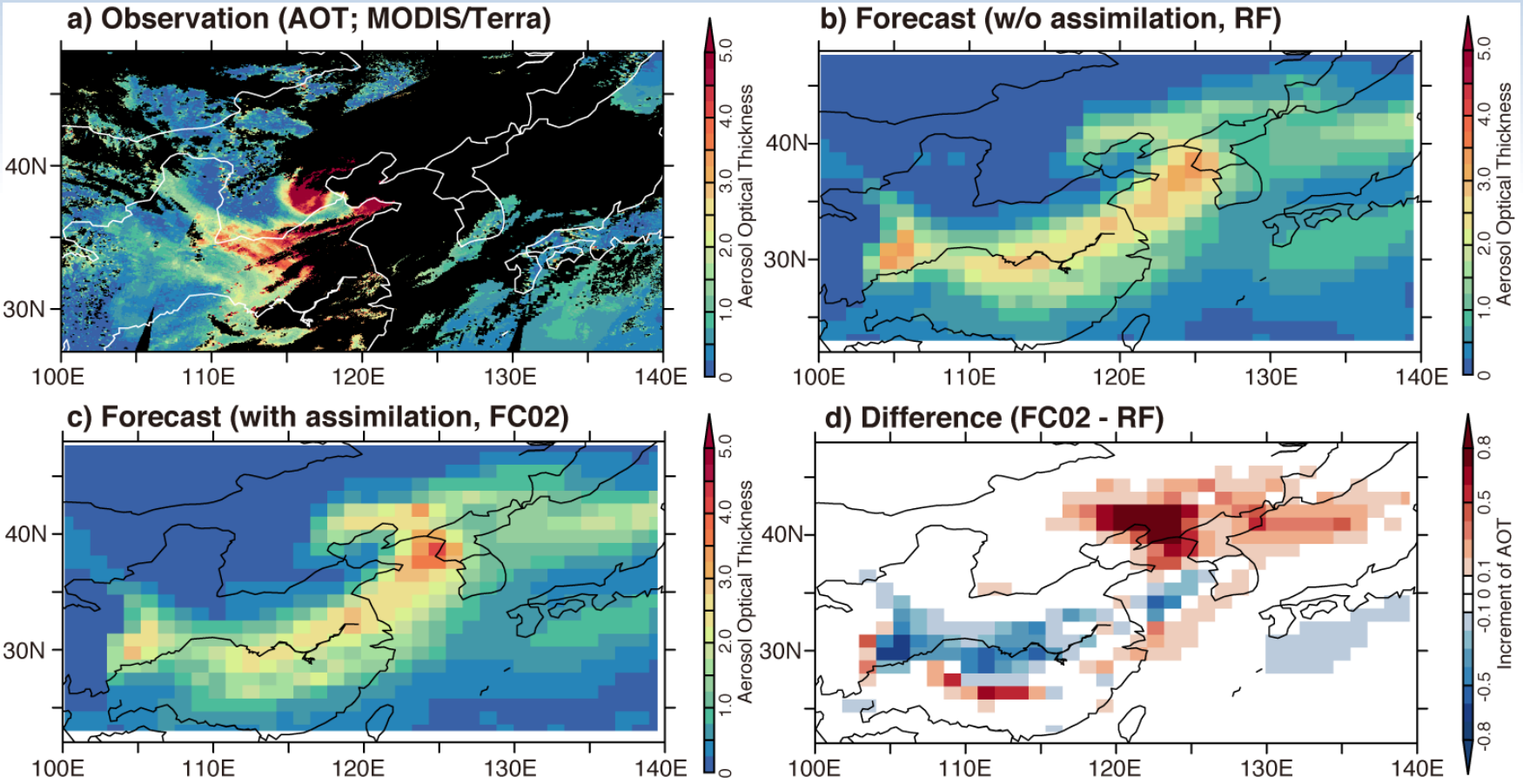
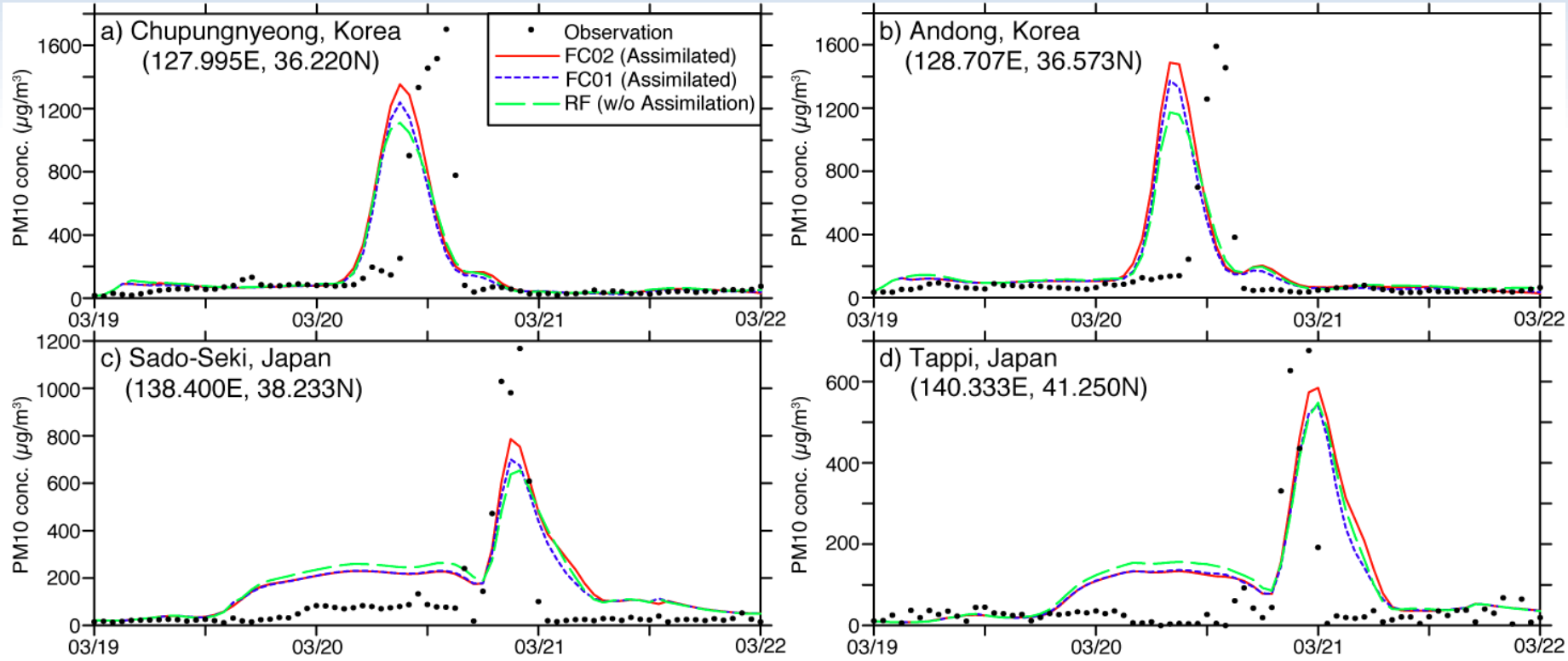
Experiment: data assimilation with MODIS



March 20, 2010

(Yumimoto et al. 2014, MSJ fall meeting)

Experiment: data assimilation with MODIS

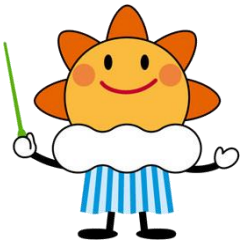


- Comparison with surface observations

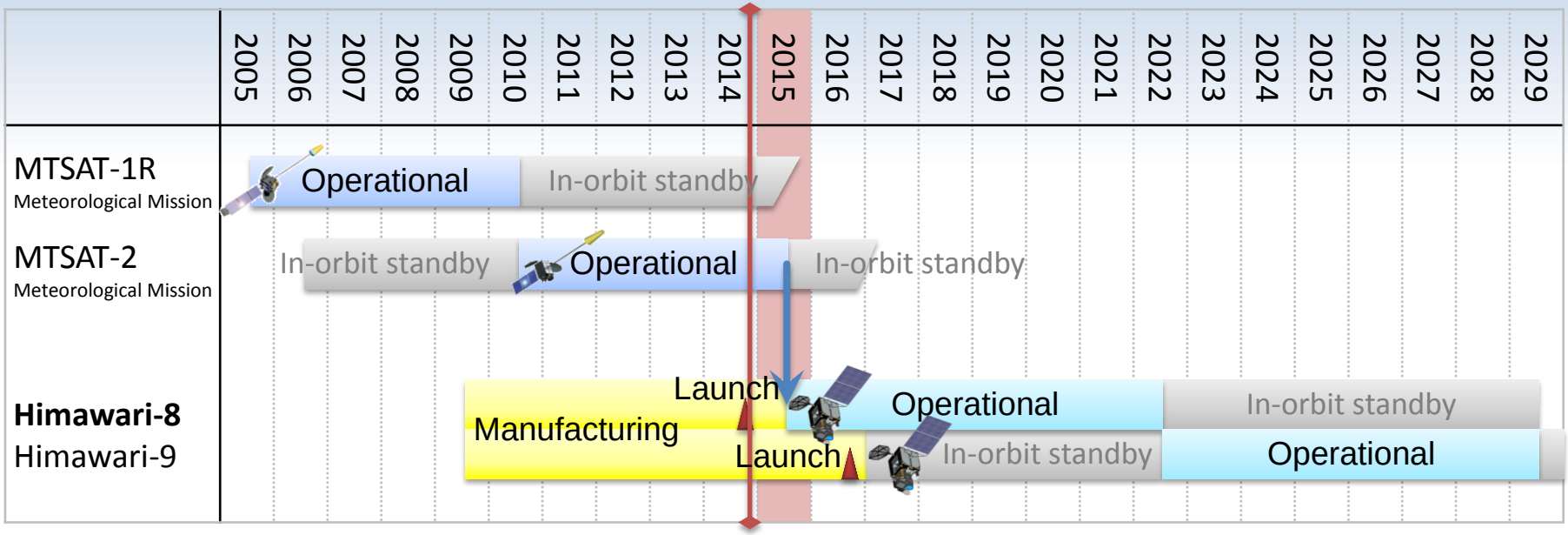
(Yumimoto et al. 2014, MSJ fall meeting)

Topics

- The new generation geostationary satellite **Himawari-8** was successfully launched.
- **JAXA-MRI-NIES-RIAM joint research project** started.
- **Smokes from Russian forest fires** reached Japan in July.



Transition of operational meteorological geostationary satellites in JMA



- The new geostationary satellite **Himawari-8 was successfully launched** on October 7, 2014. It will begin its operation in 2015.
- **Himawari-9** will be launched in 2016.

Specification of Himawari-8/9 Imager (AHI)

MTSAT-1R/2 → VIS: 1km, IR: 4km

AHI = Advanced Himawari Imager

	Band	Wavelength [μm]	Spatial Resolution	
VIS	1	0.46	1Km	RGB band Composited
	2	0.51	1Km	
	3	0.64	0.5Km	
	4	0.86	1Km	NIR
	5	1.6	2Km	
	6	2.3	2Km	
IR4	7	3.9	2Km	
IR3	8	6.2	2Km	Water vapor
	9	7.0	2Km	
	10	7.3	2Km	
	11	8.6	2Km	SO_2
	12	9.6	2Km	O_3
IR1	13	10.4	2Km	Atmospheric Windows
	14	11.2	2Km	
IR2	15	12.3	2Km	
	16	13.3	2Km	CO_2

Similar to ABI for GOES-R, but 0.51 μm(Band 2) instead of ABI's 1.38 μm

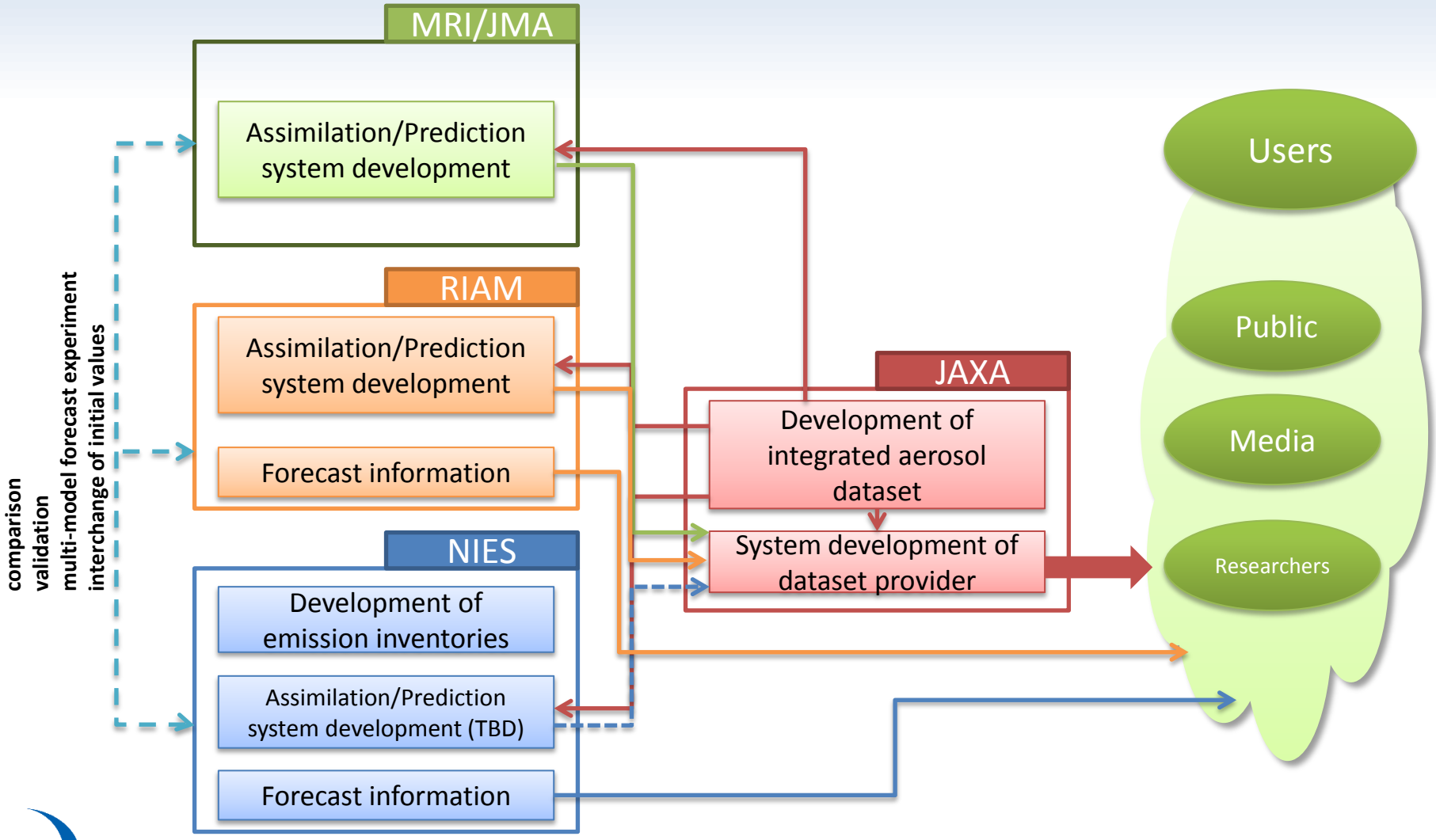
Products

- Volcanic Ash
- Global Instability Index
- Nowcasting
- Typhoon Analysis
- Atmospheric Motion Vector
- Clear Sky Radiance
- Sea Surface Temperature
- Yellow Sands
- Snow and Ice Coverage

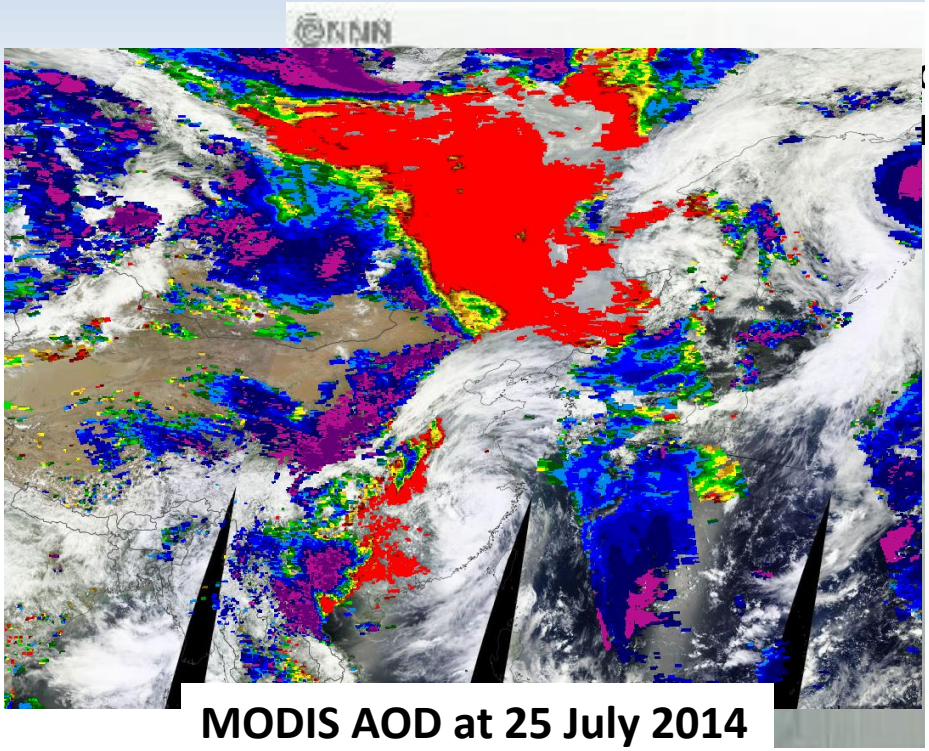
JAXA-MRI-NIES-RIAM joint research project

- A joint research project for the aerosol data assimilation was launched this June.
- Motivation and objectives
  - Cooperate for development and application of aerosol data assimilation by the space agency and meteorological agency and research institute/university in Japan.
  - Accelerate the effective use of satellite sensors:
    - Himawari-8/9, GCOM-C1, EarthCARE, GOSAT2.
    - Joint development of retrieval algorithms and observation operators.

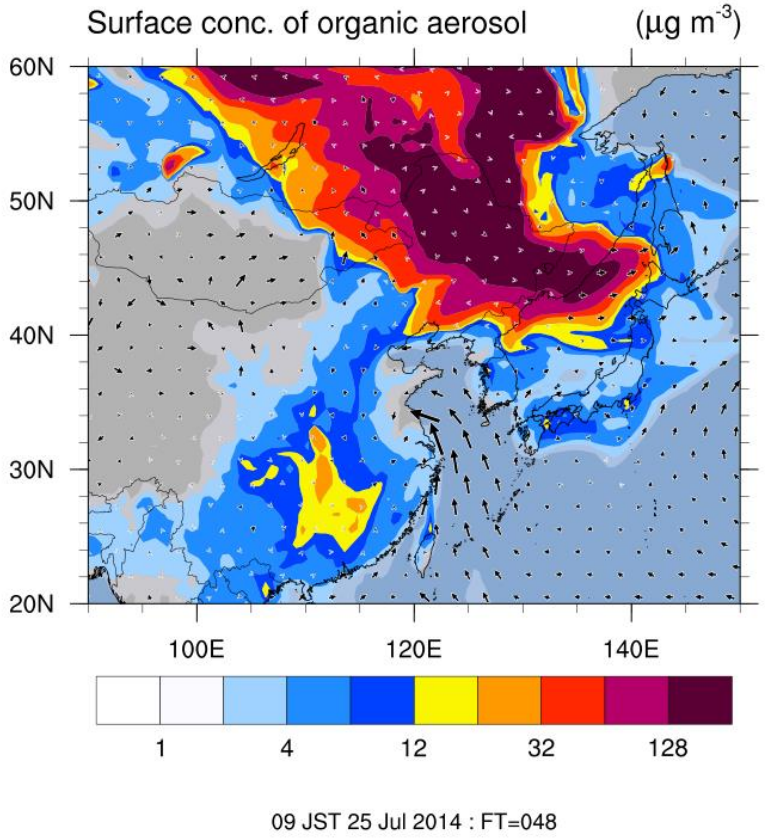
JAXA-MRI-NIES-RIAM joint research



Smokes from Siberian forest fires in July 2014

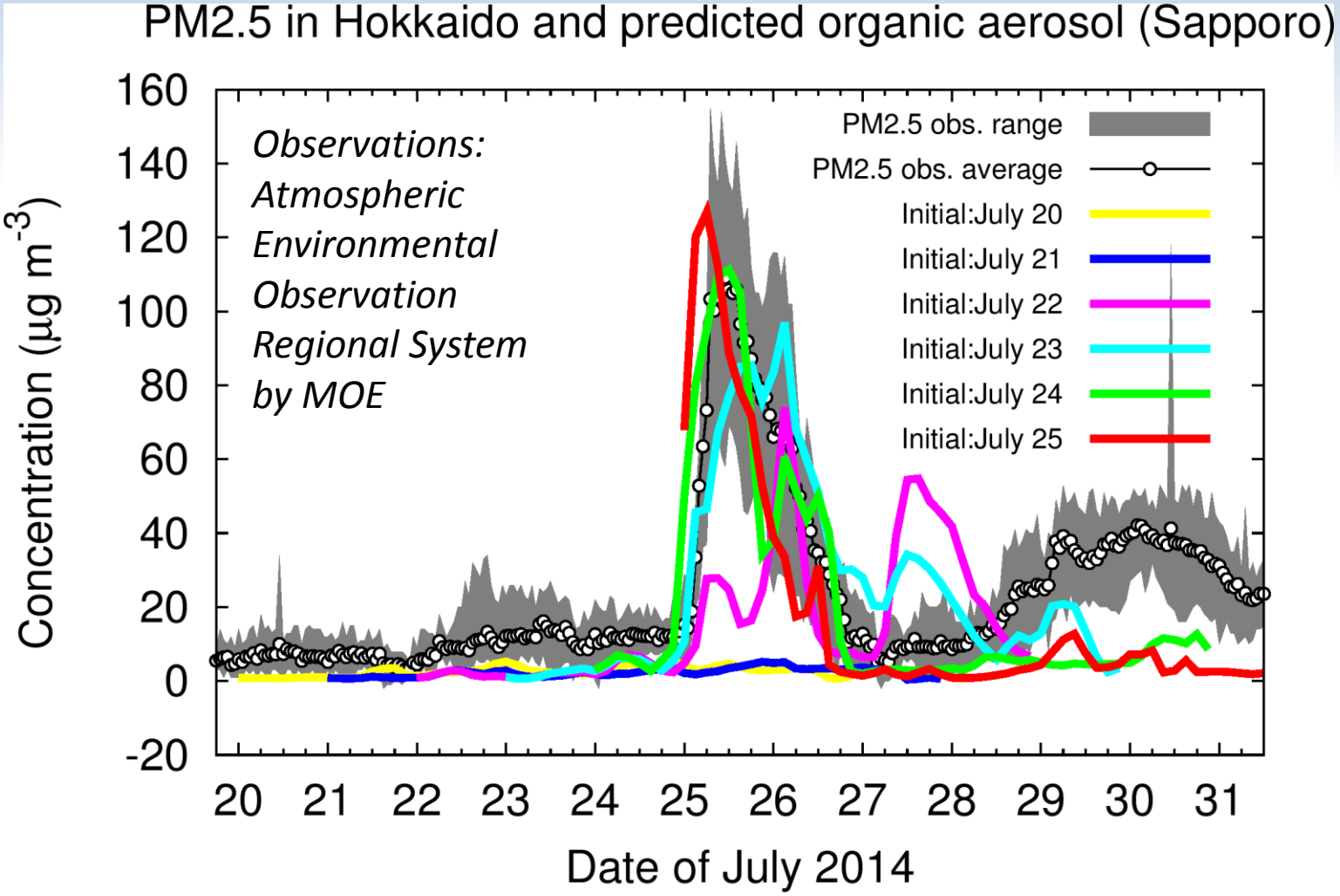


MODIS AOD at 25 July 2014



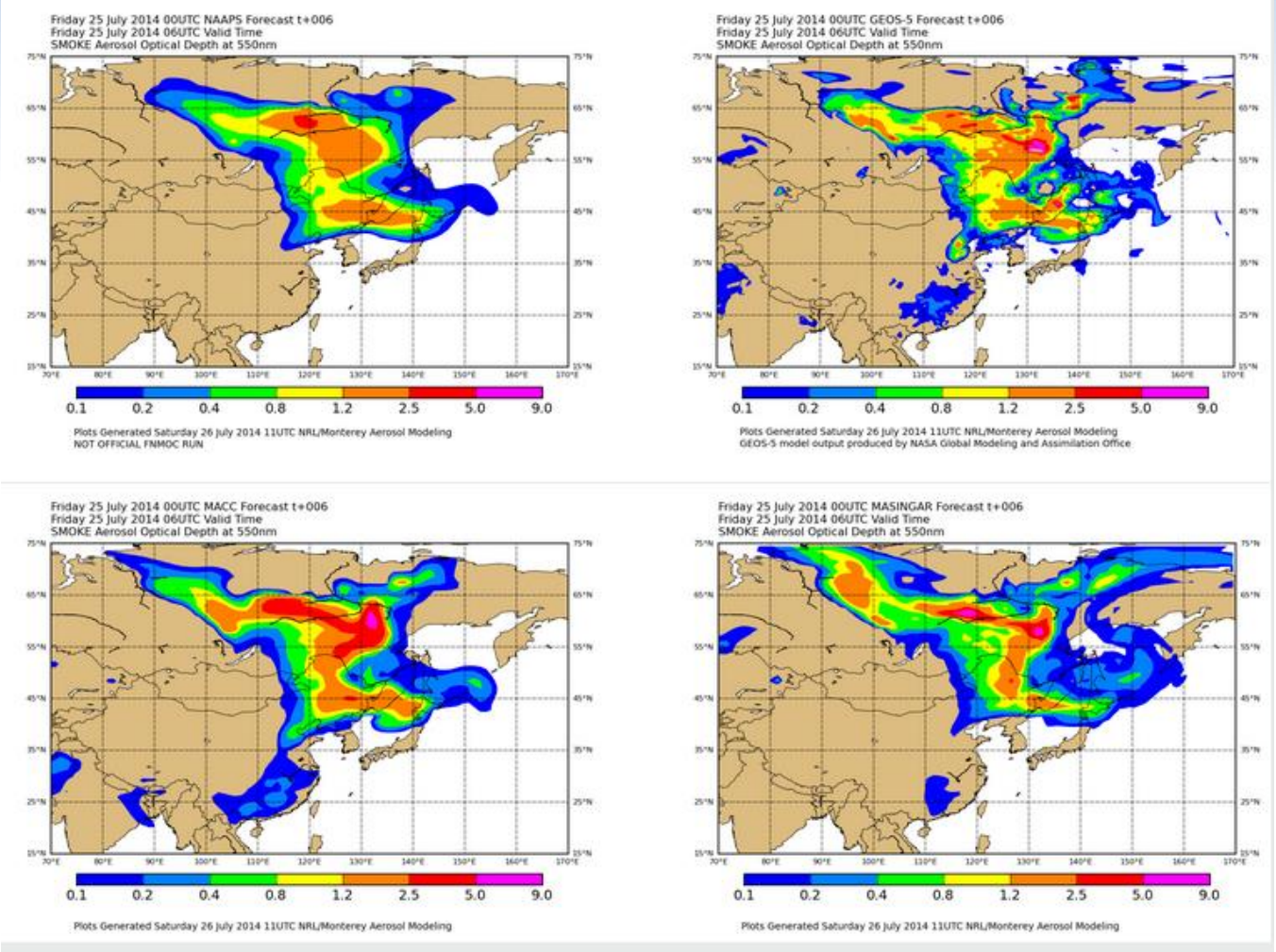
- On July 25 2014, smokes from Russian fires reached northern part of Japan.
- MRI aerosol model prediction successfully captured the transport of the smoke (thanks to GFASv1.0).

Comparison of surface concentration



The arrival of smoke was predicted about 2 days before it was observed.

Smoke aerosol on July 25 2014 by ICAP models



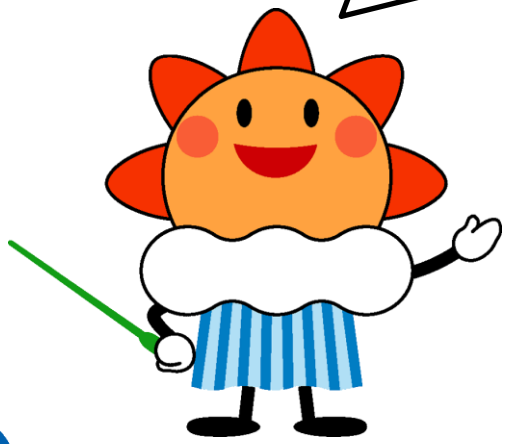
The ICAP models successfully captured the smoke.

Summary

- JMA will upgrade the dust aerosol prediction model in this November.
- JMA's operational aerosol data assimilation will start in 2017. We will develop combined data assimilation of satellite imager and lidar observations.
- The geostationary meteorological satellite, Himawari-8 was successfully launched on October 7, 2014. We hope to use AOD from Himawari-8 for data assimilation.
- JAXA and MRI/JMA starts joint research program for aerosol data assimilation with NIES and RIAM.
- Smoke from Siberian biomass burning was predicted observed in Northern Japan.

Thank you for your attention.

Next, Ogi-san will talk about the updated Asian dust prediction model and its validations.



Thanks to:

- ***Atmospheric Environment and Applied Meteorology Division, MRI, JMA***
- ***Atmospheric Environment Division, Global Environment and Marine Department , JMA***
- ***Meteorological Satellite Center, JMA***
- ***The Environment Research and Technology Development Fund***