Agency Status Reports: JMA and JAXA

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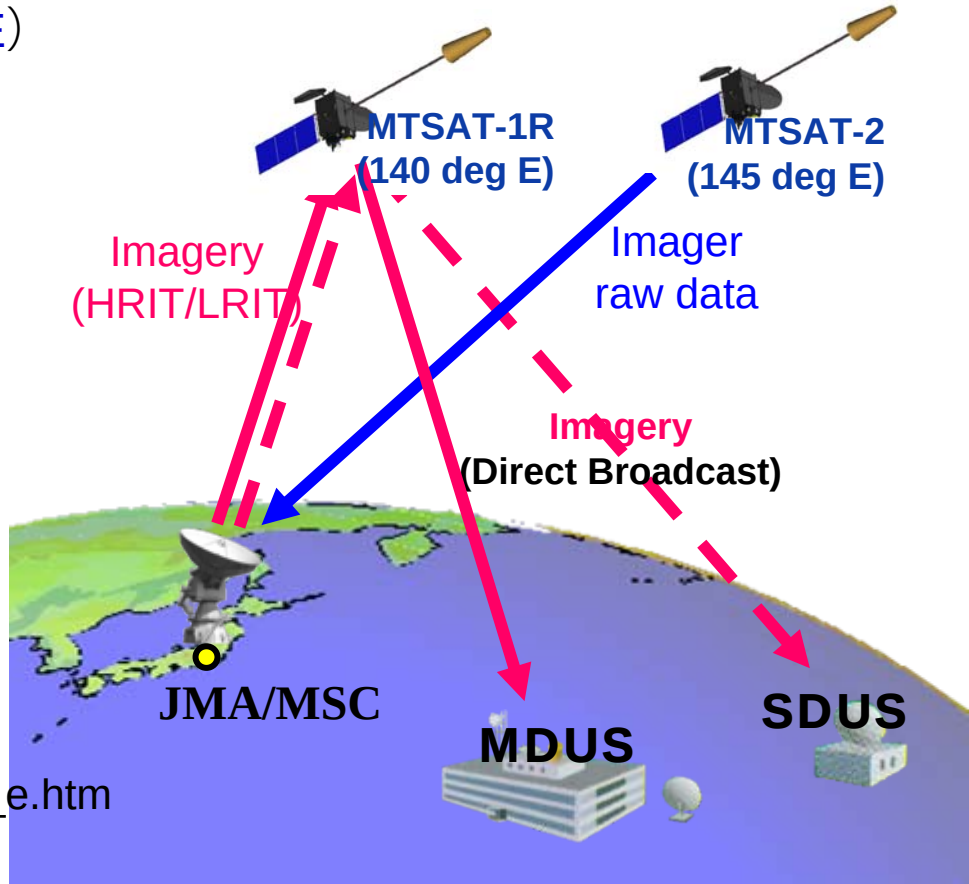
JMA

Status and plan of MTSAT (Himawari-6 & -7)

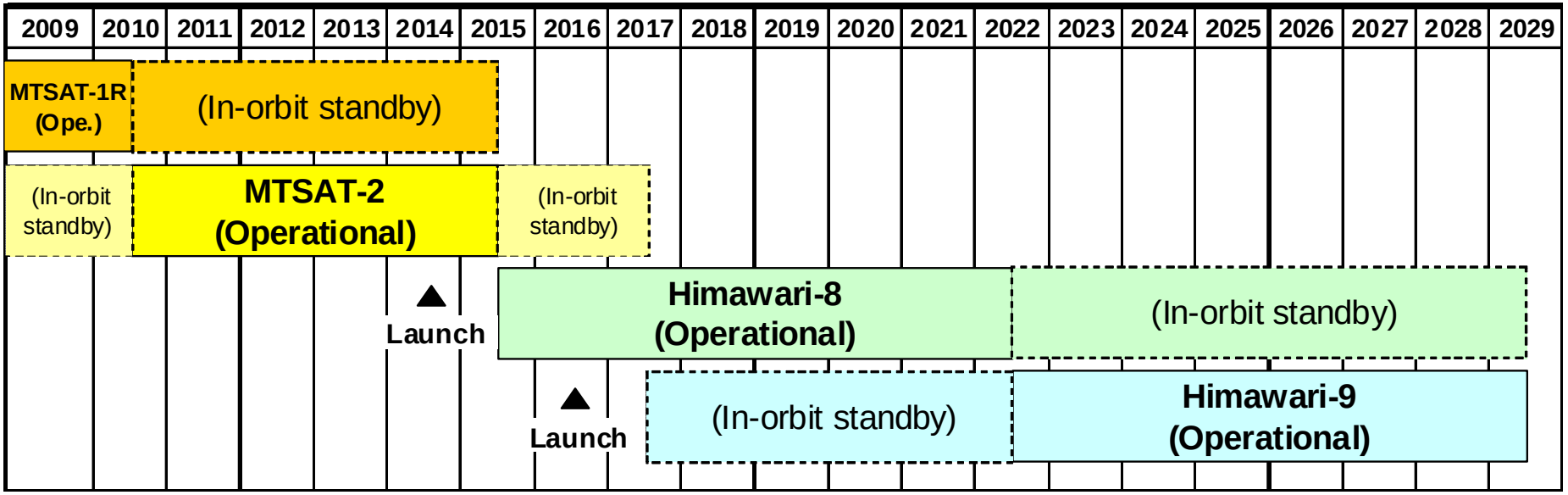
- MTSAT-1R (Himawari-6)
  - Launched on 26 February 2005, Start operation on 28 June 2005
  - Status: Fully operation (at 140° E) http://mscweb.kishou.go.jp/operation/
- MTSAT-2 (Himawari-7)
  - Launched on 18 February 2006, Start operation on 4 September 2006
  - Status: On standby in-orbit (at 145° E)
  - will become operational in July 2010
- After the switchover in July 2010
  - MTSAT-2 will acquire imagery at 145° E
  - MTSAT-1R will continue the dissemination service of HRIT & LRIT image data
    - LRIT data will include full disk images of visible band
  - MTSAT-1R will continue the operation of the Data Collection System (DCS)

http://mscweb.kishou.go.jp/notice/switch_over_e.htm



Himawari-8 & -9 : MTSAT follow-on

- JMA started a procurement process for next generation of geostationary satellites in 2009
  - Named HIMAWARI-8 & -9 (Japanese for sunflower)
- Two satellites are to be launched in 2014 & 2016
  - Built by Mitsubishi Electric corporation (MELCO)
  - Life time : 7 years of in-orbit operation out of a 14-year in-orbit period



Himawari-8 & -9

- Himawari-8 and -9 will each carry an imager with a capability comparable to that of GOES-R/ABI
  - Multi-channel capacity (16 channels)
  - High spatial resolution (0.5 - 1.0 km for visible, 1 km for near-infrared and 2 km for infrared)
  - Fast imaging (within 10 minutes for full disk)
  - Rapid scanning with flexible area selection and scheduling
- JMA plans to provide image data from Himawari-8 & -9 via the Internet rather than by direct.

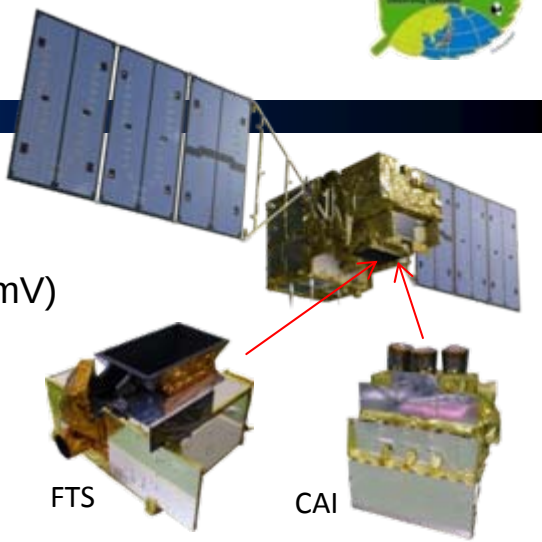
Imaging channels			
		Spatial resolution	Number of observational bands
	(< 0.7 microns)	0.5 km – 1.0 km	3
	NIR (0.7 – 3 microns)	1 km – 2 km	3
	IR (> 3 microns)	2 km	10
Observation			
	Scan capability	Full disk: normal operation Area: definable schedule and location	
	Imaging rate	< 10 min(Full disk)	
Lifetime of meteorological mission			
	7 years of in-orbit operation out of a 14-year in-orbit period		

JAXA

Recent Status of JAXA Earth Observing Instruments

- **GOSAT "IBUKI"/TANSO-FTS and TANSO-CAI**
  - Successfully launched by HII-A rocket on Jan. 23, 2009.
  - FTS L1B data was released on Oct. 30, 2009
  - CAI L1B data (calibrated radiance) on Nov. 19, and CAI L1B+ data (calibrated radiance with map re-sampling) were released on Nov. 25.
  - FTS and CAI L2 data (column-averaged mixing ratio of CO2 and CH4, CAI cloud flag) was released on Feb. 16, 2010.
- **TRMM/PR**
  - TRMM/PR suffered a lose of its original (A-side) electronics interface on May 29, 2009.
  - JAXA and NASA successfully switched electronics interface from the original A-side to the backup B-side on Jun. 17, 2009, and restarted the PR to resume observation.
  - All PR V6 B-side standard products from June 19, 2009 (the first granule of the B-side standard products) were released by both JAXA and NASA on Dec. 18, 2009.
  - http://www.eorc.jaxa.jp/TRMM/index_e.htm
- **Aqua/AMSR-E**
  - Antenna Drive Electronics (ADE) Control Unit of AMSR-E was swapped to its redundant unit (ADE-B) on Feb. 2, 2010. The cause is assumed to be some electrical problem in the unit. The parameter for ADE-B was set up on Feb. 5, 2010, and AMSR-E operation is resumed to normal.
  - All receiver systems (except 89GHz-A) are healthy and continuously gathering global brightness temperatures.
- NASA senior review assured Aqua and TRMM operation until 2014.

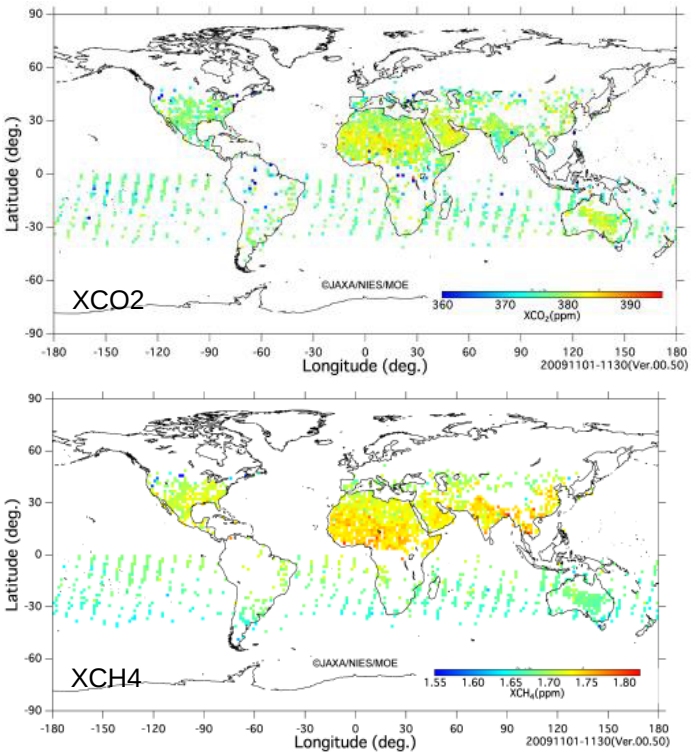
Greenhouse gases Observing SATellite (GOSAT)



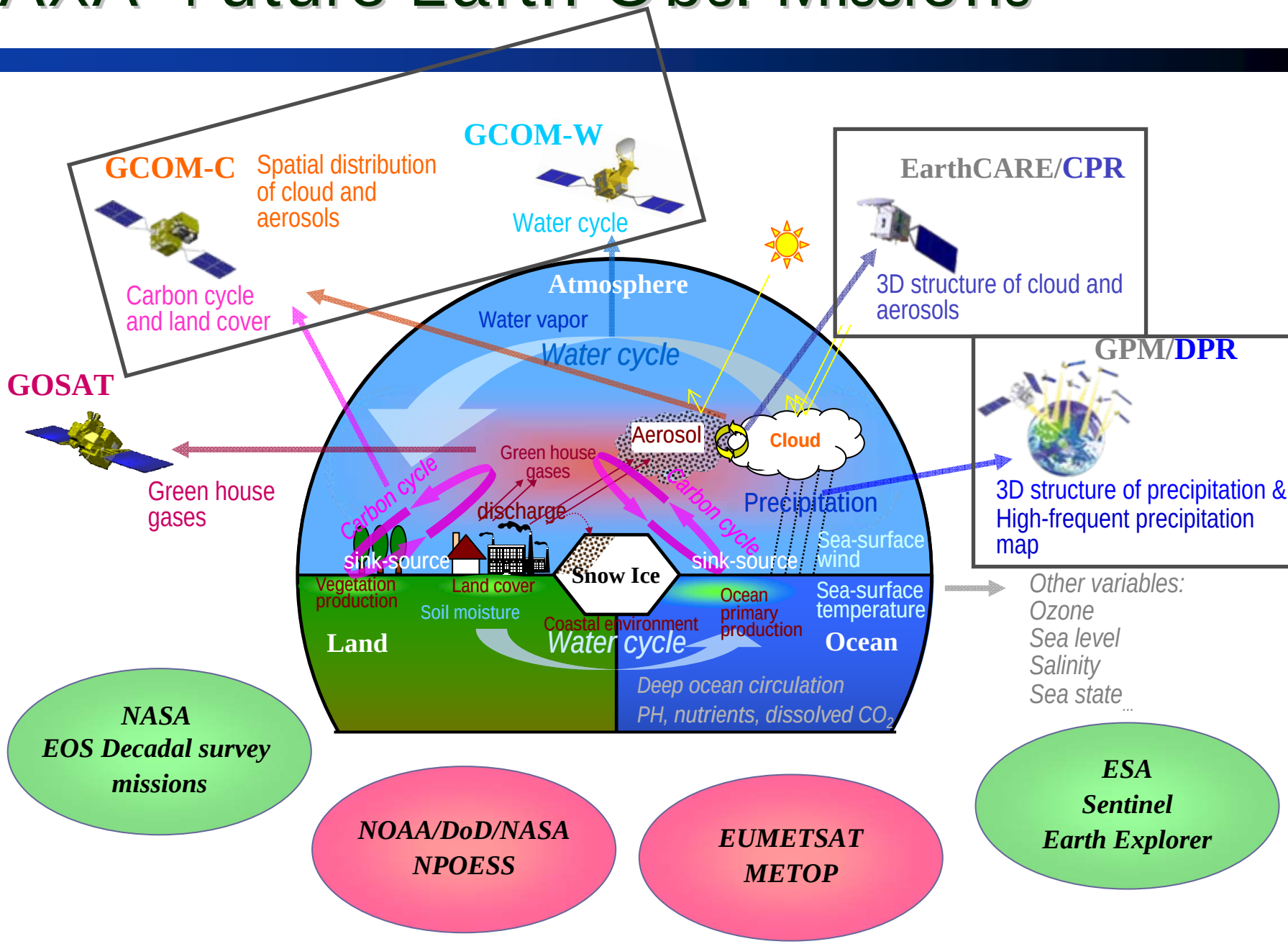
Mission Target

1. To observe CO2 and CH4 column density
   - at 100-1000km spatial scale (with scanning mechanical)
   - with relative accuracy of 1% for CO2 (4ppmv in 3 months average; target 1ppmV) and 2% for CH4.
   - during the Kyoto Protocol's first commitment period (2008 to 2012).
2. To reduce sub-continental scale CO2 annual flux estimation errors by half
   - 0.54GtC/yr→0.27GtC/yr

GOSAT Characteristics		
Launch	Jan 23, 2009 (by H2A-15 rocket)	
Orbit	Sun synchronous orbit 3 days revisit Local time 13:00 +/- 15min (12:47 Mar 17)	
Mission Life	5 years	
Mission Instruments	Thermal And Near infrared Spectrometer for carbon Observation (TANSO)	
	Fourier Transform Spectrometer (FTS)	Cloud and Aerosol Imager (CAI)
Swath	790km (Nominal: 5 points cross track)	750-1000km
Resolution	10.5km	0.5-1.5km
Spectral Coverage	B1: 0.75-0.78 um B2: 1.56-1.72 um B3: 1.92-2.08 um B4: 5.5-14.3 um B1-3 polarization bands	B1: 0.38 um B2: 0.67 um B3: 0.87 um B4: 1.62 um
Spectral Resolution	0.2 cm^{-1}	20nm



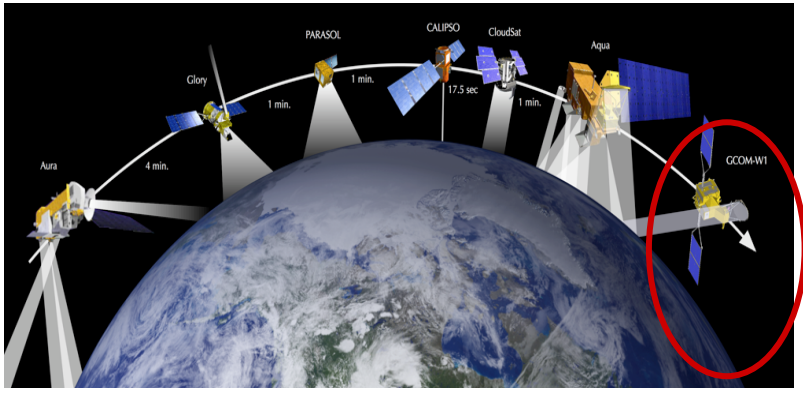
JAXA' Future Earth Obs. Missions



GCOM-W

- GCOM-W1 (Oct.2011~) will carry MW imager : AMSR2
  - Deployable main reflector system with 2.0m diameter
    - Achieve 20% finer resolution than AMSR-E with 1.6m reflector
  - Frequency channel set is identical to that of AMSR-E except 7.3GHz channel for RFI mitigation
- GCOM-W1 will join A-train
- Future Planning: GCOM-W2 study (2014~)
  - The study of AMSR2 improvement for GCOM-W2 (e.g. addition of 160GHz and/or 183GHz channels) is underway.
  - The feasibility study of US provided Dual-Frequency Scatterometer installation on GCOM-W2 is also underway.

AMSR2 Channel Set					
	Center Freq. [GHz]	Polarization	Beam width [deg] (Ground res. [km])	Reference: Ground res of AMSR-E	Sampling interval [km]
	6.925/7.3	V and H	1.8 (35 x 62)	43 x 74 km	10
	10.65		1.2 (24 x 42)	30 x 51 km	
	18.7		0.65 (14 x 22)	16 x 27 km	
	23.8		0.75 (15 x 26)	18 x 31 km	
	36.5		0.35 (7 x 12)	8 x 14 km	
	89.0		0.15 (3 x 5)	4 x 6 km	5



GCOM-C1

- GCOM-C1(2014~) will carry SGLI (Second Generation Global Imager)
- The SGLI features are finer spatial resolution (250m (VNI) and 500m (T)) and polarization/along-track slant view channels (P), which will improve land, coastal, and aerosol observations.

GCOM-C SGLI characteristics (Current baseline)	
Orbit	Sun-synchronous (descending local time: 10:30) Altitude: 798km, Inclination: 98.6deg
Launch Date	Jan. 2014 (HII-A)
Mission Life	5 years (3 satellites; total 13 years)
Scan	Push-broom electric scan (VNR: VN & P) Wisk-broom mechanical scan (IRS: SW & T)
Scan width	1150km cross track (VNR: VN & P) 1400km cross track (IRS: SW & T)
Digitalization	12bit
Polarization	3 polarization angles for P
Along track direction	Nadir for VN, SW and T, +45 deg and -45 deg for P
On-board calibration	VN: Solar diffuser, Internal lamp (PD), Lunar by pitch maneuvers, and dark current by masked pixels and nighttime obs. SW: Solar diffuser, Internal lamp, Lunar, and dark current by deep space window T: Black body and dark current by deep space window All: Electric calibration

Multi-angle obs. for 674nm and 869nm

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

SGLI channels

CH	λ	Δλ	L_{std}	L_{max}	SNR at Lstd	IFOV
	VN, P, SW: nm T: μm		VN, P: $W/m^2/sr/\mu m$ T: Kelvin		VN, P, SW: - T: NEΔT	m
VN1	380	10	60	210	250	250
VN2	412	10	75	250	400	250
VN3	443	10	64	400	300	250
VN4	490	10	53	120	400	250
VN5	530	20	41	350	250	250
VN6	565	20	33	90	400	250
VN7	*673.5*	*20*	23	62	400	250
VN8	*673.5*	20	25	210	250	250
VN9	763	*12*	40	350	*1200*	1000
VN10	*868.5*	20	8	30	400	250
VN11	*868.5*	20	30	300	200	250
P1	*673.5*	20	25	250	250	1000
P2	*868.5*	20	30	300	250	1000
SW1	1050	20	57	248	500	1000
SW2	1380	20	8	103	150	1000
SW3	*1630*	200	3	50	57	250
SW4	2210	50	1.9	20	211	1000
T1	10.8	0.7	300	340	0.2	500
T2	12.0	0.7	300	340	0.2	500

250m-mode possibility ~15min /path (TBC)

GPM (Global Precipitation Measurement)

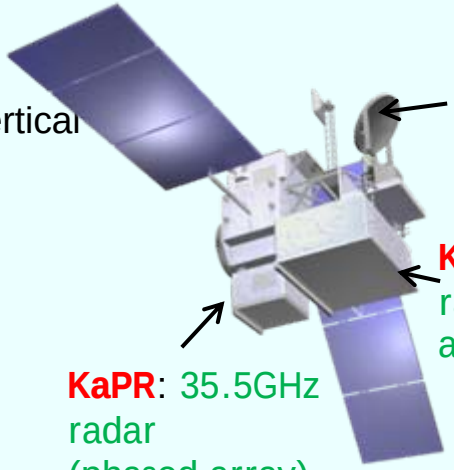
- Core satellite and several satellites will make formation flight to realize frequent observation of global precipitation with high accuracy.
- Dual-frequency Precipitation Radar (DPR) on a core satellite and MW radiometers on constellation satellites will measure precipitation rate.

Core Satellite

Objective:

- ➢ Understanding the horizontal and vertical structure of precipitation system
- ➢ Drop size distribution measurement
- ➢ Improvement of precipitation rate accuracy with constellation satellites

- DPR (JAXA, NICT) (13.6, 35.5GHz)
- GMI （NASA）
- Launch in 2013 by H-IIA
- Non-Sun-synchronous orbit, inclination: 65deg., altitude: 407 km



Constellation Satellites

Objectives:

- ➢ Observation frequency
- ➢ Science, social applications

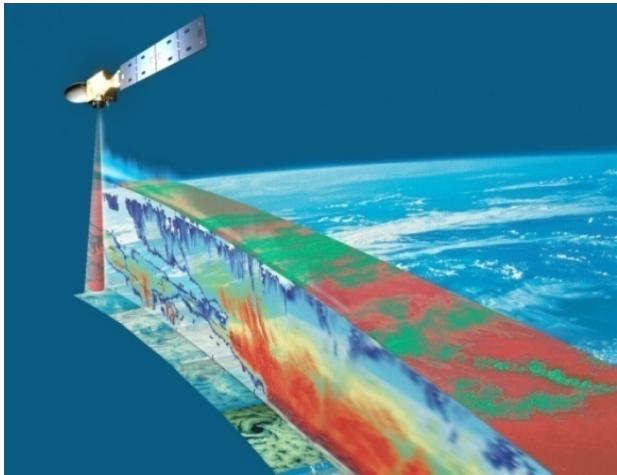
- Cooperation with constellation satellite providers; JAXA, NASA, NOAA, etc.
- 3 hourly observation of 80% of the globe.
- Launch around 2013 by each organization

◆ A proto-type for GPM : **GSMaP** (Global Satellite Mapping for Precipitation)

- ☐ Hourly global precipitation dataset with 0.1x0.1 degree resolution
- ☐ Combine precipitation retrievals from MW radiometers currently available with moving vectors from geostationary IR images
- ☐ JAXA/EORC providing NRT precipitation (GSMaP NRT) about 4-hour after observation
- ☐ **http://sharaku.eorc.jaxa.jp/GSMaP**

EarthCARE/Cloud Profiling Radar (CPR)

- A joint European-Japanese mission to better understand the interactions between cloud, radiative and aerosol processes that are major uncertainty in NWP and climate models
- Synchronized observation with 4 sensors provides measurements of cloud, aerosol vertical distribution, micro-physics properties, and the vertical velocity of convective motion.
  - **Cloud Profilling Radar （CPR）** :: JAXA provides in cooperation with NICT
  - Backscatter Lidar（ATLID）
  - Multi-Spectral Imager （MSI）
  - Broadband Radiometer （BBR）
- Launch in 2013
- Advantages over Cloudsat
  - Higher sensitivity: -30 dBZ => -35 dBZ
  - Doppler velocity => observe vertical velocity in clouds and discriminate between clouds and rain
  - Better synchronization of radar and lidar



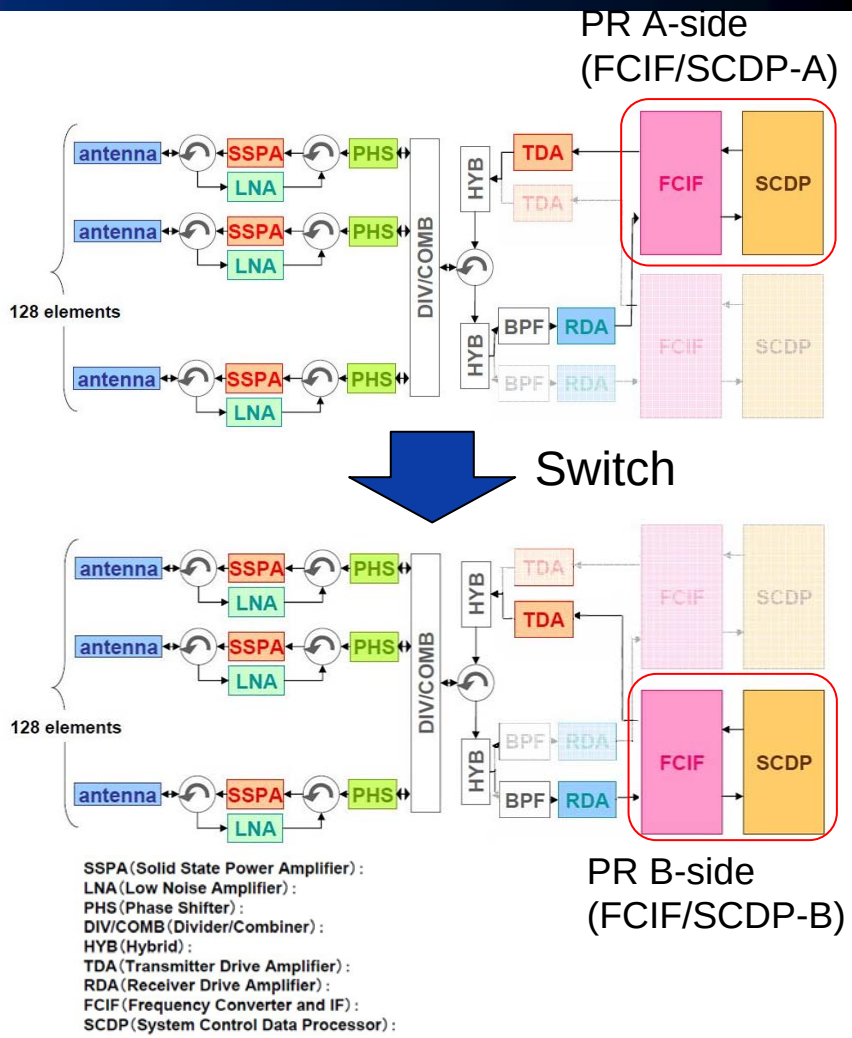
NICT : National Institute of Information and Communications Technology

End

backup

TRMM PR Data Loss and Recovery

- May 29, 2009: PR experienced a major anomaly, resulting in a loss of data. JAXA and NASA inferred that the FCIF/SCDP (Frequency Converter and IF/System Control Data Processor) units were not working normally.
- Jun. 17, 2009: JAXA and NASA successfully switched the FCIF/SCDP units from the original A-side (FCIF/SCDP-A) to the backup B-side (FCIF/SCDP-B) and restarted the PR to resume observation.
- Jun. 19, 2009: The first granule of the B-side standard products was acquired just after the PR panel temperatures were stabilized.
- Since B-side electronics have slightly different characteristics than the A-side, JAXA has been carefully investigating the best way to calibrate the PR so as to maintain continuity with the A-side driven measurements. This has required not only internal calibration information but also several external calibrations.
- Dec. 18, 2009: All PR V6 B-side standard products from June 19, 2009 were released by both JAXA and NASA.



Note: Not only switching FCIF/SCDP from A-side to B-side, but also switching TDA and RDA to the redundant units were made.

See TRMM web site for more detail: **http://www.eorc.jaxa.jp/TRMM/index_e.htm**

AMSR-E Major Instrument Events

- Loss of 89GHz A receiver output
  - AMSR-E has two 89GHz receiver systems (A/B) to increase sampling density.
  - Output from 89GHz A receiver was stopped (November 4, 2004).
  - Science and operational impact was minimized through utilization of 89GHz-B.
- ADA Torque Increase
  - Gradual torque increase of Antenna Driving Assembly (ADA) had started since summer 2006. After the rapid increase in summer 2007, ADA torque is showing repeated fluctuation, which is typically caused by lubricant deterioration.
- ADE switch-over to B-side
  - Antenna Drive Electronics (ADE) control unit was switched to its redundant unit (ADE-B) due to the possible electrical problem (February 2, 2010 UTC).
  - After uploading the command to set appropriate parameters for ADE-B, AMSR-E resumed its nominal operation (February 5, 2010 UTC).
- Current status and future
  - All receiver systems (except 89GHz-A) are healthy and continuously gathering global brightness temperatures.
  - NASA senior review assured Aqua operation until 2014. GCOM-W1 with AMSR2 is scheduled for launch in November 2011.

Trend of ΔT with AMSR-E Status