Progress Report on the GCOS Implementation Plan
Japan

This report is presented in accordance with the invitation by UNFCCC SBSTA to submit to the GCOS Secretariat additional information on the national activities with respect to the GCOS implementation plan through the request by the Director of the GCOS Secretariat in his letter of 2 April 2008.

Japan has reported its national activities with regard to the systematic observations in its National Communications submitted to the UNFCCC in 2006. Readers are advised to refer to this report, as necessary.

Chapter 1: Common issues

1. Enhancement of National Coordination

The Japan Meteorological Agency (JMA) and the Ministry of the Environment started in 2006, the operation of the Office for Coordination of Climate Change Observation (OCCCO) to support Japanese Alliance for Climate Change Observation (JACCO). Its objective is to develop a comprehensive and integrated climate change observation system that takes user needs into consideration.

In order to achieve this objective, JACCO will (1) identify requirements for climate observations based on the need for monitoring and prediction of climate change, (2) coordinate the observation plans of each organization so that the whole observation system meets the requirements in the most efficient and effective manner, and (3) issue annual implementation plans for climate change observation by the relevant organizations. This initiative is expected to enhance the capability to capture and predict the direct and indirect effects of climate change on a timelier basis.

2. World Data Center for Greenhouse Gases (WDCGG)

JMA operates the World Data Center for Greenhouse Gases (WDCGG), in the framework of WMO Global Atmospheric Watch (GAW), which archives data for greenhouse gases (e.g. CO2, CH4, CFCs, N2O, surface ozone) observed under GAW and other programmes and provides the data through its website to various institutes for climate monitoring and research.

The Center also provides analyses of such data as a major contribution to the WMO Greenhouse Gas Bulletin, which reports to UNFCCC on the current status and trends of the greenhouse gases in the world.

3. Support for developing countries

JMA operates the Quality Assurance/Science Activity Centre (QA/SAC) for Asia and the South-West Pacific under the GAW programme, which oversees the quality of the data for carbon dioxide (CO2), methane (CH4) and total ozone from the GAW observation network. As part of the activities of QA/SAC, JMA exchanges experts with observing sites in the region to give technical support for

observation and data quality assurance: JMA received experts from Malaysia and the Republic of Korea in 2005 and 2007, respectively.

JMA also hosts the World Calibration Centre (WCC) for Methane in Asia and the South-West Pacific and the Regional Dobson Calibration Centre (RDCC) for Asia for total ozone measurement in the framework of GAW to maintain calibration standards and provide instrument calibration.

4. Reanalysis project

JMA and the Central Research Institute of Electric Power Industry (CRIEPI) conducted a 26-year reanalysis project referred to as Japanese 25-year Reanalysis (JRA-25). JMA has been also operating real-time climatic assimilation system named JMA Climate Data Assimilation System (JCDAS), for diagnosis of the present climate state.

Chapter 2: Atmospheric essential climate variables

Table 1a. National contributions to the surface-based atmospheric essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs[a]	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
GCOS Surface Network (GSN)	Air temperature	14*	14*	14*	14*	14*
	Precipitation	13	13	13	13	13
Full World Weather Watch/Global Observing System (WWW/GOS) surface network	Air temperature, air pressure, wind speed and direction, water vapour	156*	156*	156*	156*	156*
	Precipitation	155	155	155	155	155
Baseline Surface Radiation Network (BSRN)	Surface radiation	2*	2*	2*	2*	2*
Solar radiation and radiation balance data	Surface radiation	13	13	13	13	13
Ocean drifting buoys	Air temperature, air pressure	3 (except air temperature)	3 (except air temperature)	3 (except air temperature)	3 (except air temperature)	All of the past platforms (except air temperature)
Moored buoys	Air temperature, air pressure					
Voluntary Observing Ship	Air temperature,	5	5	5	5	All of the past platforms

Climate Project (VOSClim)	air pressure, wind speed and direction, water vapour					
Ocean Reference Mooring Network and sites on small isolated islands	Air temperature, wind speed and direction, air pressure					
	Precipitation					

* Including one Antarctica station (SYOWA).

Table 1b. National contributions to the upper-air atmospheric essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
GCOS Upper Air Network (GUAN)	Upper-air-temperature, upper-air wind speed and direction, upper-air water vapour	7*	7*	7*	7*	7*
Full WWW/GOC Upper Air Network	Upper-air-temperature, upper-air wind speed and direction, upper-air water vapour	17*	17*	17*	17*	17*

* Including one Antarctica station (SYOWA).

Table 1c. National contributions to the atmospheric composition

Contributing networks specified in the GCOS implementation plan	ECVs	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
World Meteorological Organization/ Global Atmosphere Watch	Carbon dioxide	3	3	3	3	3
	Methane	3	3	3	3	3

(WMO/GAW) Global Atmospheric CO2 & CH4 Monitoring Network	Other greenhouse gases	4	4	4	4	4
WMO/GAW ozone sonde network[a]	Ozone	4	4	4	4	4
WMO/GAW column ozone network[b]	Ozone	5	5	5	5	5
WMO/GAW Aerosol Network[c]	Aerosol optical depth	3	3	5	3	0
	Other aerosol properties	1	0	1	0	0

[a] Including SHADOZ, NDACC, remote sensing and ozone sondes.
[b] Including filter, Dobson and Brewer stations.
[c] Including AERONET, SKYNET, BSRN and GAWPFR.

Table 2. Global products requiring satellite observations - atmospheric essential climate variables

ECVs/ Global products requiring satellite observations	**Fundamental climate data records required for product generation (from past, current and future missions)**
Surface wind speed and direction Surface vector winds analyses, particularly from reanalysis	Passive microwave radiances and scatterometry Microwave brightness temperature to derive sea surface wind speed and radar backscatter to derive wind vector. Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016(planned)
Upper-air temperature Homogenized upper-air temperature analyses: extended MSU-equivalent temperature record, new record for upper-troposphere and lower-stratosphere temperature using data from radio occultation, temperature analyses obtained from reanalyses	Passive microwave radiances, GPS radio occultation, high-spectral resolution IR radiances for use in reanalysis
Water vapour Total column water vapour over the ocean and over land, tropospheric and lower stratospheric profiles of water vapour	Passive microwave radiances, UV/VIS radiances, IR imagery and soundings in the 6.7um band, microwave soundings in the 183 GHz band Microwave brightness temperature to derive total column water vapor Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned)
Cloud properties Cloud radiative properties (initially key ISCCP products)	VIS/IR imagery, IR and microwave soundings GMS-1,2,3,4 VIS(0.5-0.9um, 1.25km) Mar,1981-Jun,1995 GMS-5 VIS(0.5-0.9um, 1.25km) Jun,1995-May,2003 GOES-9 VIS(0.5-0.9um, 1.25km) May,2003-Jun,2005 MTSAT-1R VIS(0.5-0.9um, 1km) Jun,2005-current GMS-1,2,3,4 IR(10.5-12.5um, 5km) Mar,1981-Jun,1995 GMS-5 IR(10.5-11.5um, 5km) Jun,1995-May,2003 GMS-5 IR(11.5-12.5um, 5km) Jun,1995-May,2003 GOES-9 IR(10.5-11.5um, 5km) May,2003-Jun,2005 GOES-9 IR(11.5-12.5um, 5km) May,2003-Jun,2005 MTSAT-1R IR(10.5-11.5um, 4km) Jun,2005-current MTSAT-1R IR(11.5-12.5um, 4km) Jun,2005-current

	MTSAT-2 VIS(0.5-0.9um, 1km) 2010-2015 (planned) MTSAT-2 IR(10.5-11.5um, 4km) 2010-2015 (planned) MTSAT-2 IR(11.5-12.5um, 4km) 2010-2015 (planned) Microwave brightness temperature to derive total column cloud liquid water. Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) GCOM-C/SGLI: 2013-2017 (planned) TRMM VIRS(0.63-12um,2km) Dec,1997-Aug,2001 (pre-boost) TRMM VIRS(0.63-12um,2.4km) Aug,2001-current (post-boost) Vertical structure of cloud layers and microphysical properties EarthCARE/CPR 94.05GHz, 2013-2016(planned) EarthCARE/MSI(0.65~12um, 0.5km) 2013-2016 (planned)
Precipitation Improved estimates of precipitation, both as derived from specific satellite instruments and as provided by composite products	Passive microwave radiances, high-frequency geostationary IR measurements, active radar (for calibration) GMS-1,2,3,4 IR(10.5-12.5um, 5km) Mar,1981-Jun,1995 GMS-5 IR(10.5-11.5um, 5km) Jun,1995-May,2003 GMS-5 IR(11.5-12.5um, 5km) Jun,1995-May,2003 GOES-9 IR(10.5-11.5um, 5km) May,2003-Jun,2005 GOES-9 IR(11.5-12.5um, 5km) May,2003-Jun,2005 MTSAT-1R IR(10.5-11.5um, 4km) Jun,2005-current MTSAT-1R IR(11.5-12.5um, 4km) Jun,2005-current GMS-5 WV(6.5-7.0um, 5km) Jun,1995-May,2003 GOES-9 WV(6.5-7.0um, 5km) May,2003-Jun,2005 MTSAT-1R WV(6.5-7.0um, 4km) Jun,2005-current MTSAT-2 IR(10.5-11.5um, 4km) 2010-2015 (planned) MTSAT-2 IR(11.5-12.5um, 4km) 2010-2015 (planned) MTSAT-2 WV(6.5-7.0um, 4km) 2010-2015 (planned) Microwave brightness temperature to derive surface precipitation Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) (swath data) TRMM PR (13.6GHz, 4.3km(horizontal), 250m(vertical)) Dec,1997-Aug,2001 (pre-boost) TRMM PR (13.6GHz, 5km(horizontal), 250m(vertical)) Aug,2001-current (post-boost) TRMM TMI (10-85GHz V/H, 38.3-4.4km) Dec,1997-Aug,2001 (pre-boost) TRMM TMI (10-85GHz V/H, 38.3-4.4km) Aug,2001-current (post-boost) GPM DPR (13.6&35.5GHz, 5km) 2013-2016 (planned) GPM GMI (10-183GHz) 2013-2016 (planned) (temporal/horizontal averaged data) TRMM PR (5-deg (horizontal), 5 levels (vertical), monthly) Dec.,1997-current TRMM PR (0.5-deg (horizontal), 3 levels (vertical), monthly) Dec.,1997-current TRMM TMI (5-deg, monthly) Dec.,1997-current (Multi-sensor/satellite product) TRMM 2B31 (PR-TMI combined swath data) (4.3km) Dec,1997-Aug,2001 (pre-boost) TRMM 2B31 (PR-TMI combined swath data) (5km)

	Aug,2001-current (post-boost) TRMM 3B31 (PR-TMI combined monthly data) (5-deg, monthly) Dec.,1997-current TRMM 3B42 (TRMM and others satellites combined) (0.25-deg, 3-hour) Dec.,1997-current TRMM 3B43 (TRMM and other data sources) (0.25-deg, mothly) Dec.,1997-current GSMaP_MWR (Microwave radiometer combined) (0.25-deg., 6-hourly) Jan.,1998-current GSMaP_MVK (Multi-satellite combined product) (0.1-deg., hourly) Jan.,2003-current Vertical structure of light precipitation EarthCARE/CPR 94.05GHz, 2013-2016(planned)
Earth radiation budget Top-of-atmosphere Earth radiation budget on a continuous basis	Broadband radiances, spectrally-resolved solar irradiances, geostationary multi spectral imagery Broadband Radiances EarthCARE/BBR (10km) 2013-2016(planned)
Ozone Profiles and total column of ozone	UV/VIS and IR microwave radiances
Aerosol properties Aerosol optical depth and other aerosol properties	VIS/NIR/SWIR radiances GMS-1,2,3,4 VIS(0.5-0.9um, 1.25km) Mar,1981-Jun,1995 GMS-5 VIS(0.5-0.9um, 1.25km) Jun,1995-May,2003 GOES-9 VIS(0.5-0.9um, 1.25km) May,2003-Jun,2005 MTSAT-1R VIS(0.5-0.9um, 1km) Jun,2005-current MTSAT-1R SWIR(3.5-4.0um, 4km) Jun,2005-current MTSAT-2 VIS(0.5-0.9um, 1km) 2010-2015 (planned) MTSAT-2 SWIR(3.5-4.0um, 4km) 2010-2015 (planned) GCOM-C/SGLI: 2013-2017 (planned) Vertical structure of Aerosol layers and microphysical properties EarthCARE/ATLID 355nm, 2013-2016(planned) EarthCARE/MSI(0.65~12um, 0.5km) 2013-2016 (planned)
Carbon dioxide, methane and other long-lived greenhouse gases Distribution of greenhouse gases, such as CO2 and CH4, of sufficient quality to estimate regional sources and sinks	NIR/IR radiances GOSAT NIR(0.757-0.775 um, 1.56-1.72um,1.92-2.08um, 10.5km) 2009-2014 (planned) GOSAT IR(5.56-14.3um,10.5km) 2009-2014 (planned)
Upper-air wind Upper-air wind analyses, particularly from reanalysis	VIS/IR imagery, Doppler wind lidar GMS-3,4 IR(10.5-12.5um, 5km) Mar,1987-Jun,1995 GMS-5 IR(10.5-11.5um, 5km) Jun,1995-May,2003 GOES-9 IR(10.5-11.5um, 5km) May,2003-Jun,2005 MTSAT-1R IR(10.5-11.5um, 4km) Jun,2005-current GMS-5 WV(6.5-7.0um, 5km) Jun,1995-May,2003 GOES-9 WV(6.5-7.0um, 5km) May,2003-Jun,2005 MTSAT-1R WV(6.5-7.0um, 4km) Jun,2005-current MTSAT-2 IR(10.5-11.5um, 4km) 2010-2015 (planned) MTSAT-2 WV(6.5-7.0um, 4km) 2010-2015 (planned)
Atmospheric reanalyses	Key FCDRs and products identified in this report, and other data of value to the analyses **Product :** Clear Sky Radiance (CSR)

	FCDR: IR and VIS channel images acquired by GMS-5, GOES-9 and MTSAT-1R GMS-5 VIS(0.5-0.9um, 1.25km) Jun,1995-May,2003 GOES-9 VIS(0.5-0.9um, 1.25km) May,2003-Jun,2005 MTSAT-1R VIS(0.5-0.9um, 1km) Jun,2005-current GMS-5 IR(10.5-11.5um, 5km) Jun,1995-May,2003 GMS-5 IR(11.5-12.5um, 5km) Jun,1995-May,2003 GOES-9 IR(10.5-11.5um, 5km) May,2003-Jun,2005 GOES-9 IR(11.5-12.5um, 5km) May,2003-Jun,2005 MTSAT-1R IR(10.5-11.5um, 4km) Jun,2005-current MTSAT-1R IR(11.5-12.5um, 4km) Jun,2005-current MTSAT-2 VIS(0.5-0.9um, 1km) 2010-2015 (planned) MTSAT-2 IR(10.5-11.5um, 4km) 2010-2015 (planned) MTSAT-2 IR(11.5-12.5um, 4km) 2010-2015 (planned) **(Note)** The JMA/MSC's CSR is determined for each 16 x 16 infrared pixels *square lattice* that corresponds to approximately 60 x 60 km2 resolution at the SSP. For each 16 x 16 pixels *square lattice*, the CSR is calculated by taking the average of the radiance/brightness temperatures from the cloud-free *clear* pixels, which are discriminated by using SST as auxiliary reference data and VIS data. Also included in the CSR product are the ratio of the clear pixels, the standard deviation of the radiance and the brightness temperatures from the clear pixels, the center latitude and longitude of the clear pixels, satellite zenith and solar zenith angles of the center of the clear pixels, and land/sea flag.

- JMA applies the GCMPs to GSN and WWW/GOS surface network for ensuring high quality and homogeneity of data and meta-data. (A3)
- JMA incorporates atmospheric pressure sensors into all drifting buoys. (A5)
- Three-hourly mean sea level pressure and wind speed and direction data from GSN stations of Japan are available in WDC Acheville. (A10)
- JMA operates the WWW/GOC radiosonde network in full compliance with the GCMPs and coding conventions, and provides real-time upper-air data with no quality problems. (A17)
- JMA submits metadata records and inter-comparisons for all radiosonde observations to WDC Acheville. (A18)
- JMA is developing a precipitable water product derived from observation data from the GPS Earth Observation Network System (GEONET) that is composed of approximately 1,200 ground-based GPS receivers in Japan and operated by the Geographical Survey Institute. (A21)

Chapter 3: Oceanic essential climate variables

Table 3a. National contributions to the oceanic essential climate variables – surface

Contributing networks specified in the GCOS implementation plan	ECVs	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record

						available in international data centres
Global surface drifting buoy array on 5x5 degree resolution	Sea surface temperature, sea level pressure, position-change-based current	3	3	3	3	All of the past platforms
GLOSS Core Sea-level Network	Sea level	15*	15*	15*	15*	2
Voluntary observing ships (VOS)	All feasible surface ECVs	546	546	Equal to or more than the current number	546	All of the past platforms
Ship of Opportunity Programme	All feasible surface ECVs	35	35	Equal to or more than the current number	35	All of the past platforms

* Including one Antarctica station (SYOWA).

Table 3b. National contributions to the oceanic essential climate variables – water column

Contributing networks specified in the GCOS implementation plan	ECVs	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record available in international data centres
Global reference mooring network	All feasible surface and subsurface ECVs					
Global tropical moored buoy network	All feasible surface and subsurface ECVs					
Argo network	Temperature, salinity, current	390	390	390	390	390
Carbon inventory survey lines	Temperature, salinity, ocean tracers, biogeochemistry variables	2	2	2	2	2

Table 4. Global products requiring satellite observations – oceans

ECVs/ Global products requiring satellite observations	Fundamental climate data records required for product generation (from past, current and future missions)
Sea Ice Sea ice concentration	Microwave and visible imagery Microwave brightness temperature to derive sea ice concentration Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) GCOM-C/SGLI: 2013-2017 (planned)
Sea Level Sea level and variability of its global mean	Altimetry
Sea Surface Temperature Sea surface temperature	Single and multi-view IR and microwave Imagery GMS-1,2,3,4 IR(10.5-12.5um, 5km) Mar,1981-Jun,1995 GMS-5 IR(10.5-11.5um, 5km) Jun,1995-May,2003 GMS-5 IR(11.5-12.5um, 5km) Jun,1995-May,2003

	GOES-9 IR(10.5-11.5um, 5km) May,2003-Jun,2005 GOES-9 IR(11.5-12.5um, 5km) May,2003-Jun,2005 MTSAT-1R IR(10.5-11.5um, 4km) Jun,2005-current MTSAT-1R IR(11.5-12.5um, 4km) Jun,2005-current MTSAT-2 IR(10.5-11.5um, 4km) 2010-2015 (planned) MTSAT-2 IR(11.5-12.5um, 4km) 2010-2015 (planned) Microwave brightness temperature to derive sea surface temperature Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) GCOM-C/SGLI: 2013-2017 (planned) TRMM TMI (10-85GHz V/H, 38.3-4.4km) Dec,1997-Aug,2001 (pre-boost) TRMM TMI (10-85GHz V/H, 38.3-4.4km) Aug,2001-current (post-boost) TRMM VIRS(0.63-12um,2km) Dec,1997-Aug,2001 (pre-boost) TRMM VIRS(0.63-12um,2.4km) Aug,2001-current (post-boost)
Ocean Colour Ocean colour and oceanic chlorophyll-a concentration derived from ocean colour	Multi-spectral VIS imagery GCOM-C/SGLI: 2013-2017 (planned)
Sea State Wave height and other measures of sea state (wave direction, wavelength, time period)	Altimetry
Ocean Salinity Research towards the measurement of changes in sea surface salinity	Microwave radiances
Ocean Reanalyses Altimeter and ocean surface satellite measurements	Key FCDRs and products identified in this report, and other data of value to the analyses

- JMA annually reports the metadata of Japanese VOSClim ships to WMO. (O6)
- Hourly data for all the 15 coastal tide gauges operated by Japan are submitted to the Permanent Service for Mean Sea Level (PSMSL). (O13)
- JMA observes sea-surface salinity by its research vessels on the regular hydrographic lines in the western North Pacific registered on the International Ocean Carbon Coordination Project (IOCCP) and WCRP Climate Variability and Predictability Project (CLIVAR). (O15)
- JMA participates in the International Ocean Carbon Coordination Project (IOCCP) and provides surface pCO2 data through the world data centers such as World Data Centre for Greenhouse Gases (WDCGG) and Carbon Dioxide Information Analysis Center (CDIAC). (O17)

Chapter 4: Terrestrial essential climate variables

Table 5. National contributions to the terrestrial domain essential climate variables

Contributing networks specified in the GCOS implementation plan	ECVs	Number of stations or platforms currently operating	Number of stations or platforms operating in accordance with the GCMPs	Number of stations or platforms expected to be operating in 2010	Number of stations or platforms providing data to the international data centres	Number of stations or platforms with complete historical record

						available in international data centres
GCOS baseline river discharge network (GTN-R)	River discharge	1129	1129	1129	379	0
GCOS Baseline Lake Level/ Area/Temperature Network (GTN-L)	Lake level/area/ temperature					
WWW/GOS synoptic network	Snow cover					
GCOS glacier monitoring network (GTN-G)	Glaciers mass balance and length, also ice sheet mass balance					
GCOS permafrost monitoring network (GTN-P)	Permafrost borehole-temperatures and active-layer thickness					

Table 6. Global products requiring satellite observations – terrestrial

ECVs/ Global products requiring satellite observations	**Fundamental climate data records required for product generation (from past, current and future missions)**
Lakes Maps of lakes, lake levels, surface temperatures of lakes in the Global Terrestrial Network for Lakes	VIS/NIR imagery and radar imagery, altimetry, high-resolution IR imagery ALOS/AVNIR-2: Oct 2006-Current ALOS/PALSAR: Oct 2006-Current GCOM-C/SGLI: 2013-2017 (planned)
Glaciers and ice caps Maps of the areas covered by glaciers other than ice sheets, ice sheet elevation changes for mass balance determination	High-resolution VIS/NIR/SWIR optical imagery, Altimetry ALOS/AVNIR-2: Oct 2006-Current
Snow cover Snow areal extent	Moderate-resolution VIS/NIR/IR and passive microwave imagery Microwave brightness temperature to snow water equivalence or snow depth. Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) GCOM-C/SGLI: 2013-2017 (planned)
Albedo Directional hemispherical (black sky) albedo	Multispectral and broadband imagery GMS-1,2,3,4 VIS(0.5-0.9um, 1.25km) Mar,1981-Jun,1995 GMS-5 VIS(0.5-0.9um, 1.25km) Jun,1995-May,2003 GOES-9 VIS(0.5-0.9um, 1.25km) May,2003-Jun,2005 MTSAT-1R VIS(0.5-0.9um, 1km) Jun,2005-current MTSAT-1R SWIR(3.5-4.0um, 4km) Jun,2005-current MTSAT-2 VIS(0.5-0.9um, 1km) 2010-2015 (planned)

	MTSAT-2 SWIR(3.5-4.0um, 4km) 2010-2015 (planned) GCOM-C/SGLI: 2013-2017 (planned)
Land cover Moderate-resolution maps of land-cover type, high-resolution maps of land-cover type, for the detection of land-cover change	Moderate-resolution multispectral VIS/NIR imagery, high-resolution multispectral VIS/NIR imagery ALOS/AVNIR-2: Oct 2006-Current GCOM-C/SGLI: 2013-2017 (planned)
fAPAR Maps of fAPAR	VIS/NIR imagery GCOM-C/SGLI: 2013-2017 (planned)
LAI Maps of LAI	VIS/NIR imagery GCOM-C/SGLI: 2013-2017 (planned)
Biomass Research towards global, above-ground forest biomass and forest biomass change	L band/P band SAR, Laser altimetry ALOS/PALSAR: Oct 2006-Current GCOM-C/SGLI: 2013-2017 (planned)
Fire disturbance Burnt area, supplemented by active fire maps and fire radiated power	VIS/NIR/SWIR/TIR moderate-resolution multispectral imagery GCOM-C/SGLI: 2013-2017 (planned)
Soil moisture[a] Research towards global near-surface soil moisture map (up to 10 cm soil depth)	Active and passive microwave Microwave brightness temperature to derive near-surface soil moisture. Aqua/AMSR-E: May 2002-Current GCOM-W/AMSR2: 2012-2016 (planned) TRMM PR (13.6GHz, 0.1-deg, monthly) Dec,1997-current TRMM TMI (10-85GHz V/H, 38.3-4.4km) Dec,1997-Aug,2001 (pre-boost) TRMM TMI (10-85GHz V/H, 38.3-4.4km) Aug,2001-current (post-boost)