Status of
Global Change Observation Mission
(GCOM)

October 2000

Office of Earth Observation Systems
NASDA

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Idea of GCOM

- Change of development philosophy from technology-driven development to mission-oriented development.
- Minimum 15-year observation requirement for global change.
  – El nino (Several years)
  – Climate change (Inter-annual to decadal)
  – Solar activities (11years

- Idea of GCOM
  – Continuos and systematic observation of physical parameters necessary for research and prediction of global climate change, climate variability, and global environment change.
  – Target at constructing a system with optimum instruments and spacecrafts for the parameters.

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Goal of GCOM

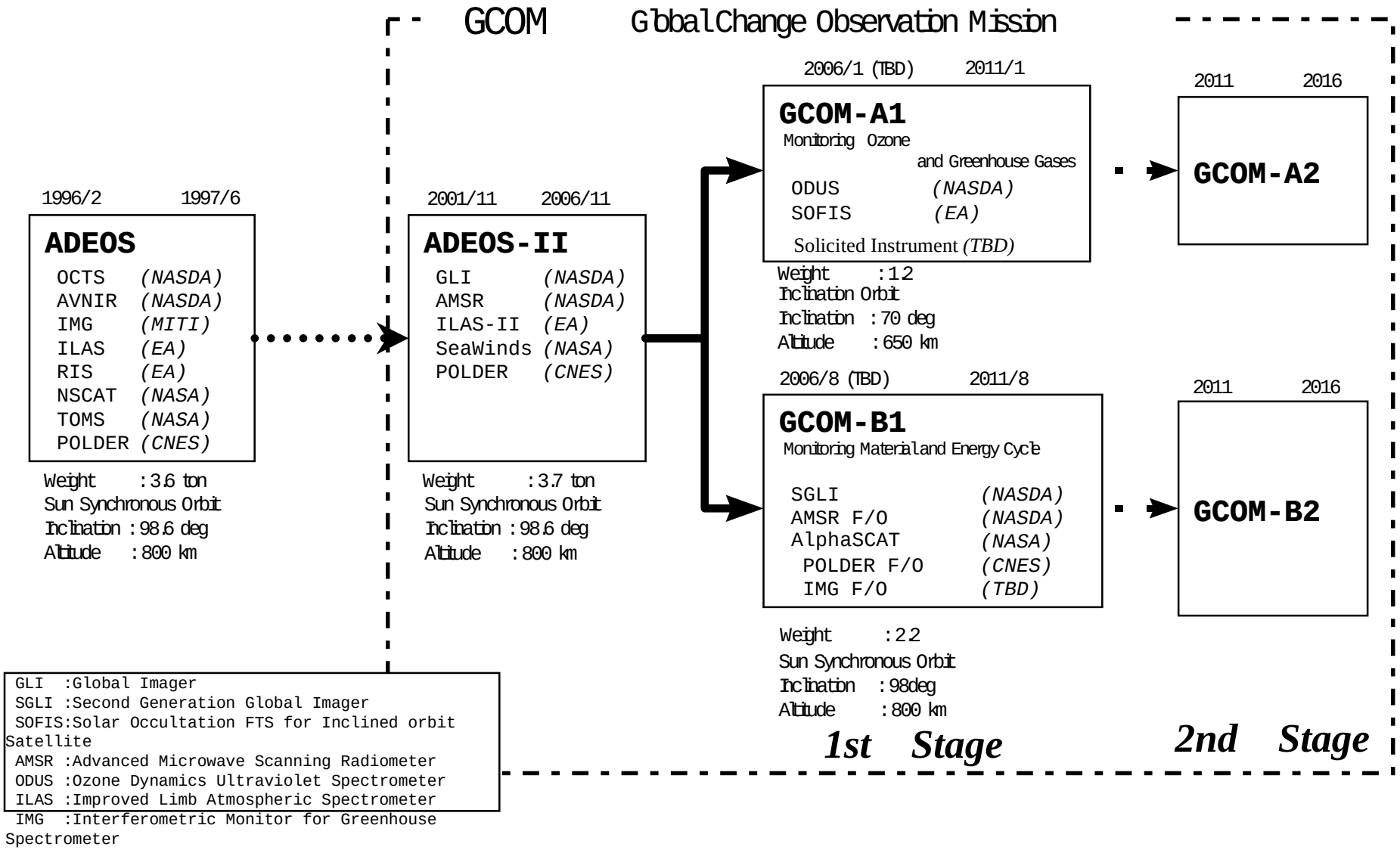
(1) Understanding material energy cycle, atmosphere-ocean interaction, radiative forcing, ozone and GHG circulation mechanism, atmospheric chemistry

(2) Charactering and predicting medium-to long-term climate changes

(3) Charactering and predicting ozone layer and global tropospheric atmospheric environment.

- Contribution to process study and prediction of global change phenomena and preservation of global environments.

Concept of Satellite Plans for Realizing Global Change Observation Mission



Continuity of GCOM Physical Parameters and Instruments

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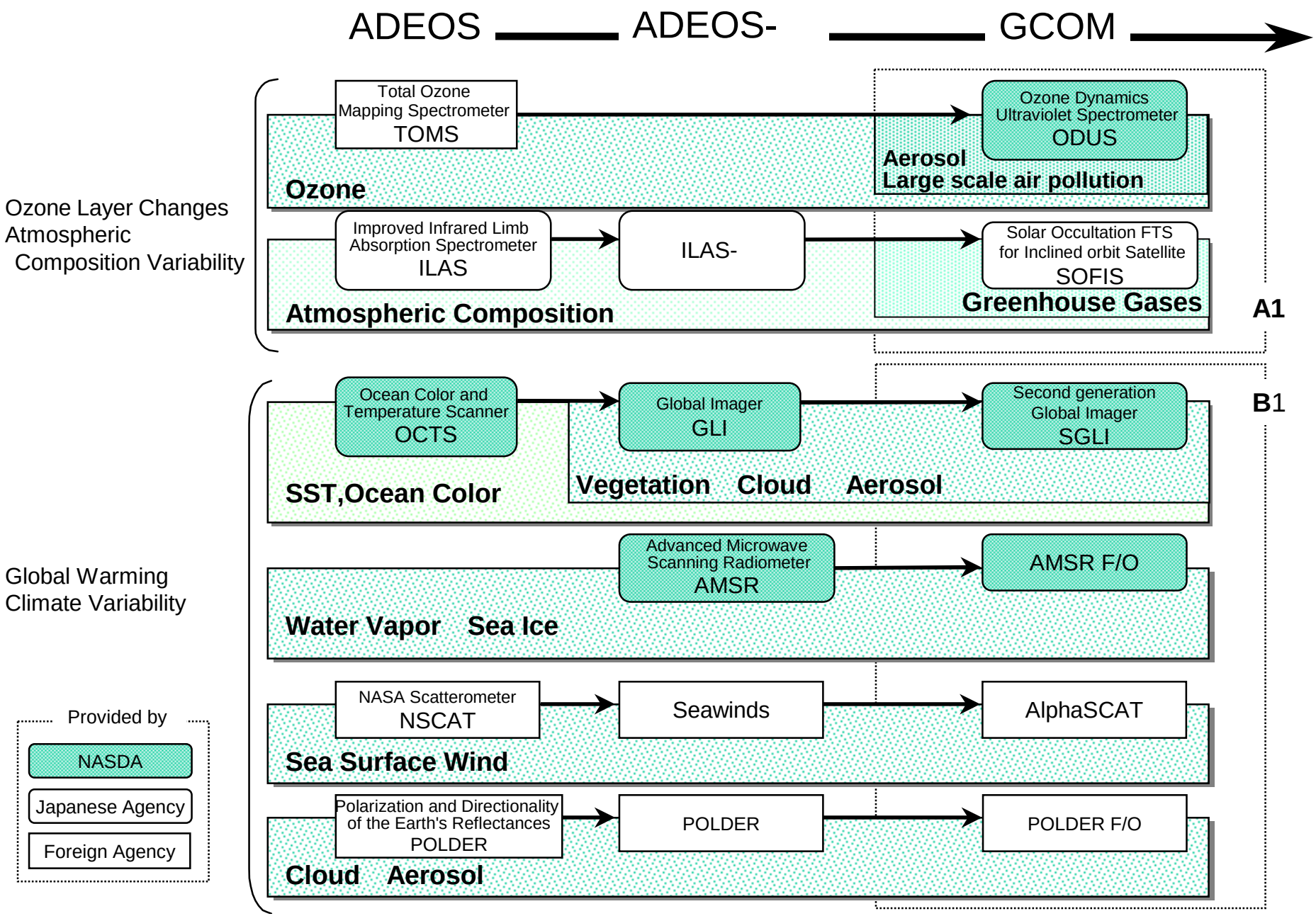
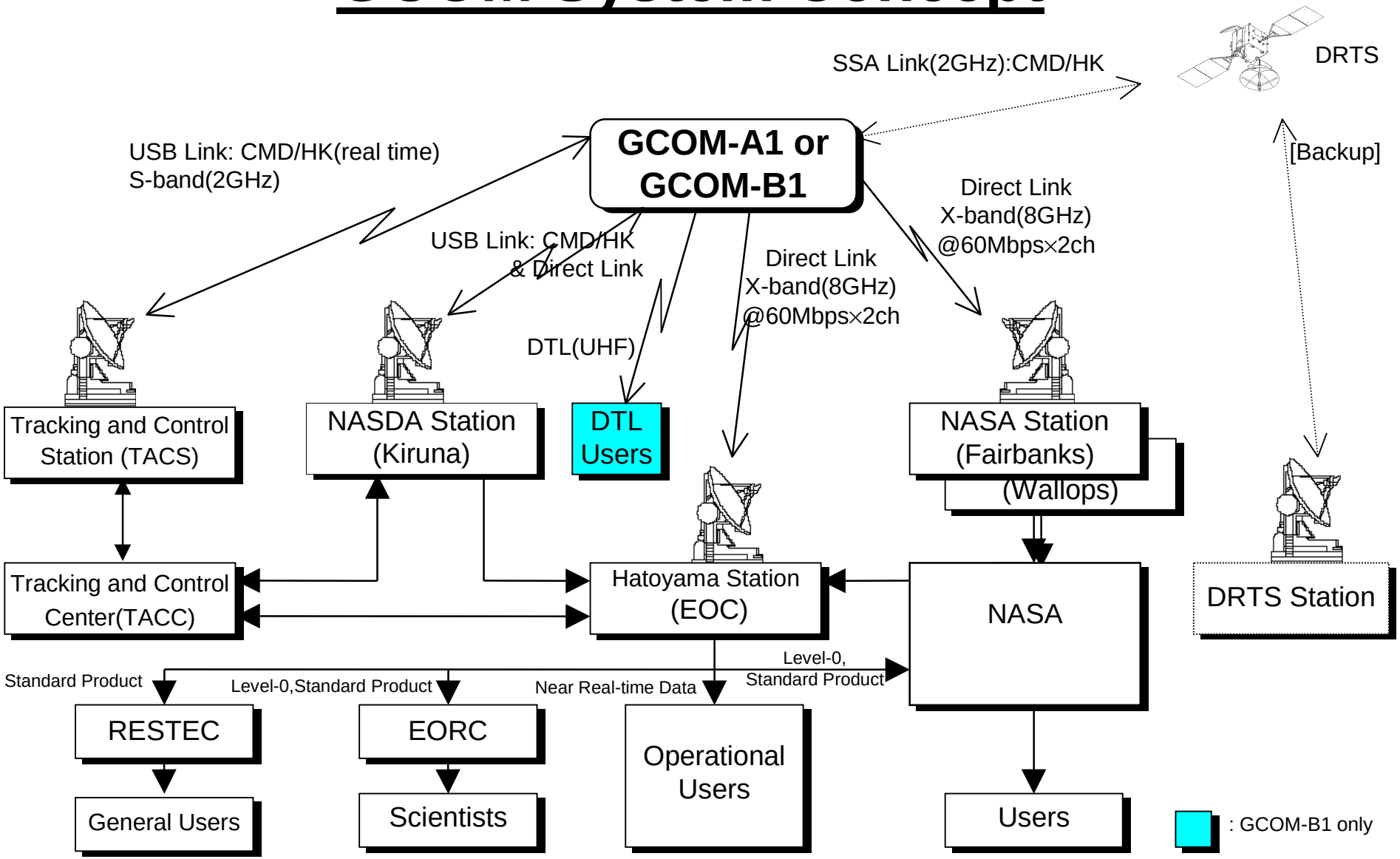


GCOM System Concept



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Mission of GCOM Spacecrafts

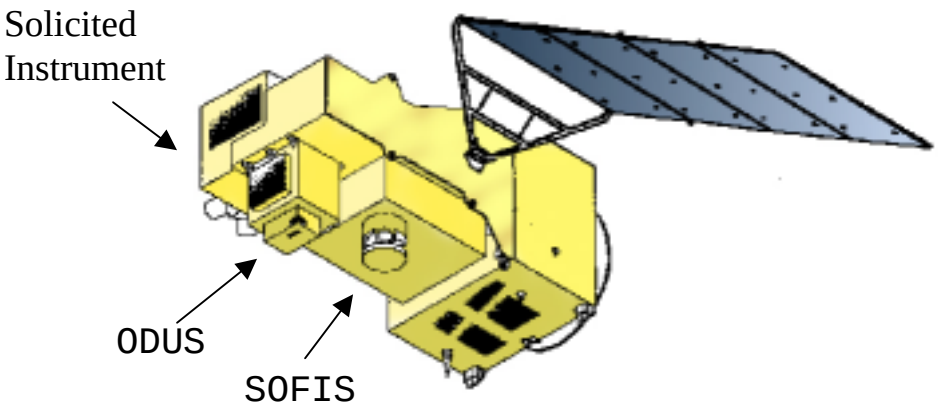
GCOM-A1

- Contributing to elucidation of transport mechanism of greenhouse gases, transport process of ozone, mechanism of ozone layer depletion,
- Radiative forcing (greenhouse gases, aerosols, tropospheric ozone)
- Monitoring of ozone layer, and large scale air pollution

GCOM-B1

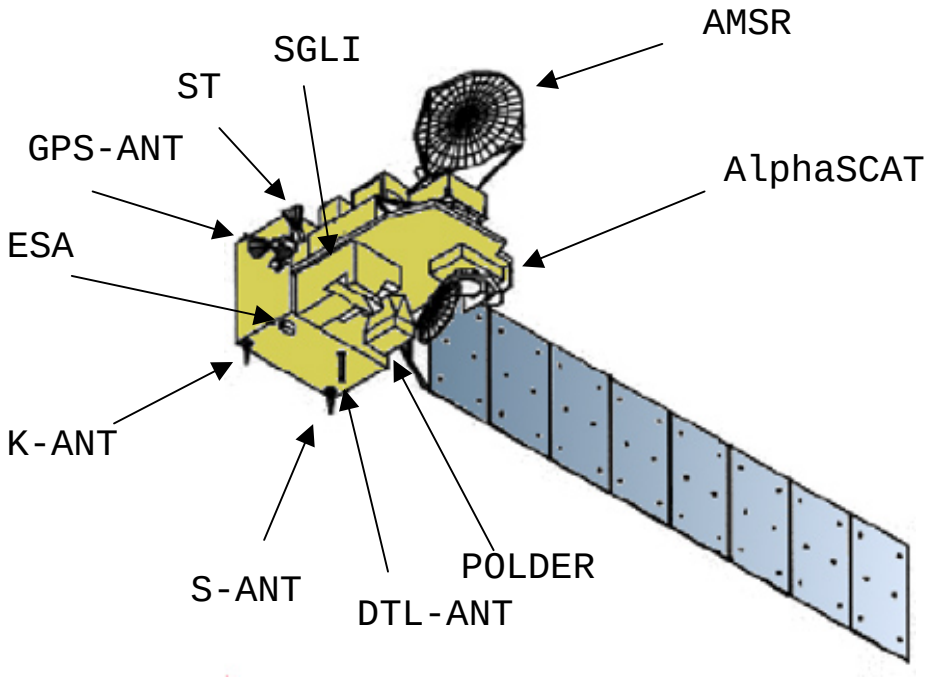
- Contributing to process study of atmosphere/ocean interactions and radiative forcing of cloud and aerosol, etc., research and prediction of global warming and mid-term and long-term climate variabilities, by observing water vapor, phytoplankton, aerosol, and sea surface wind, etc.

GCOM-A1, B1 Outlook



GCOM-A1

GCOM-B1



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Major Characteristics

Item		GCOM-A1	GCOM-B1
Orbit	Type	Non-Sunsynchronous	Sunsynchronous
	Altitude	650km	800km
	Inclination	70deg.	98deg.
	Period	98minutes	101minutes
	Local Sun Time	----	AM 10:00±15(TBD)
Launch Payload		1200kg	2200kg
Instruments Weight		315kg	770kg
Designed Life		≥3years	
Propellant		for 5years	
Communication/C&DH			
(1)Telemetry/Command		USB(DRTS Compatible)	USB(DRTS Compatible)
(2)Instruments Data(Science Data)		8GHz band: 60Mbps	8GHz bnad: 2×60Mbps
Electrical Power(EPS)			
(1)Bus Voletage		28V unregulated bus	28V unregulated bus
(2)Battry		NiCd 35AH×2	NiCd 35AH×3
(3)Solar Cell Paddle		Rigid Paddle	Rigid Paddle
(4)Power(EOL)		1300W	3200W
Attitude & Orbit Control(AOCS)			
(1)Attitude Control		3 Axis Zero-momentum	
(2)Sensor		GPS receiver , Star Tracker , Earth Sensor etc.	

GCOM Instruments

GCOM-A1	ODUS		
	Ozone Dynamics Ultraviolet Spectrometer	Solar Occultation FTS for Inclined orbit Satellite	
Wave Length (Frequency)	306-420nm 232 Ch.	3-13 m 753-784 nm	
IFOV	20 km	1km (Vertical)	
Swath Width	2300km	-	
Weight Allocation	55kg	200kg	Max. 60kg
Physical parameters	Ozone , Aerosol SO_2, NO_2, Albedo , UV-B	Atmospheric Composition	
Provider	NASDA	Environment Agency Government of Japan	

GCOM-B1				
	Second generation Global Imager	Advanced Microwave Scanning Radiometer Follow on		Polarization and Directionality of the Earth's Reflectances Follow on
Wave Length (Frequency)	380nm - 12.0 m 36Ch.	6.295GHz, 10.65GHz 18.7GHz, 23.8GHz 36.5GHz, 50.3GHz 52.8GHz, 89.0GHz	13.4GHz	443,490,565,670,763 765,865,910(nm) 443,670,865(nm /Polarization Angle)
IFOV	250m ,1km ,	7-50km	20km	7km x 6km
Swath Width	1600km	1600km	1600km	1700km
Weight Allocation	350kg	250kg	160kg	50
Physical parameters	SST,Ocean Color Vegetation,Cloud,Aerosol	Water Vapor , Precipitation Snow and Ice , Soil Moisture Sea Surface Wind , SST	Wind Vectors	Cloud , Aerosol
Provider	NASDA	NASDA	JPL	CNES

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Proposed Instruments for GCOM-A1

Sensor Name	COALA	SWIFT	REFIR	MOST	GGM	ASTRO	GRAS
Science Object	O3 profiles	Wind and ozone in statrosphere	Water vapor, Earth radiation	ClO, N2O, O3, O2, H2O	O2, CO2, CH4	Temperature, water vapor	Temperature, water vapor
IFOV	1-2Km (0.014 x 0.17)	2Km (1 x 2)	10-20Km	1,2,4,8,16,32MHz	6 Km	0.5 - 1.0 Km	0.5 - 1.0 Km
Wavelength	Ultraviolet 250-350nm Visible 420-675nm	8 - 9 micro meter	spectrometer 100-1000cm-1 Radiometer : 3- 30 micro meter Imager (REI) : 10.5 - 12.5 micro meter Imager (RAI) : 0.58-12.5 micro meter	500, 487, 325GHz	736.6nm, 1.6 and 2.0 micro meter	L-band (1.2GHz and 1.6GHz)	L-band (1.2GHz and 1.6GHz)
Mass	25Kg	71Kg	66Kg	62Kg	20Kg or less	12Kg	12Kg
Power	20W	85W	55W	403W	2.7W	35W	27W
Data rate	50Kbps	105Kbps	33.5Kbps	?	13Kbps	20Kbps	70Kbps
Frequency	280 per day	7000 per day		?	?	15MB / orbit	> 1000 per day
Agency	CNES, ESA	ESA	ASI	CNES	CSIRO	ASI	ESA

Outcome of Instrument Evaluation and Selection

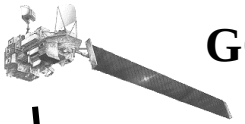
GCOM Instrument Evaluation Board endorsed scientific necessity of GPS occultation instruments and recommend the following priority of instrument selection

1. SWIFT + GRAS
2. SWIFT
3. GGM + GRAS
4. COALA + GRAS

NASDA will select the instrument and announce the selection result by the end of this year (2000).

Ground Segment Concept

- GCOM ground segment consists of Mission Operations System and Earth Science Data System;
  - Mission Operations Systems
    - satellite operations, data reception, recording and L0 processing
  - Earth Science Data System
    - Earth Observation Information System (EOIS)
      - L1-L3 standard processing, archive and distribution, information services
    - Analysis Processing System
      - algorithm development, research processing, cal/val
- Separate but common infrastructure for EOIS processing system and Analysis Processing System to facilitate system development and frequent algorithm changes
- Flexible and low cost system architecture to cope with hardware upgrade and system version ups
- High speed data reprocessing and distribution
- Simultaneous development with satellite development



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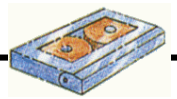
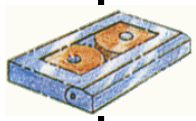
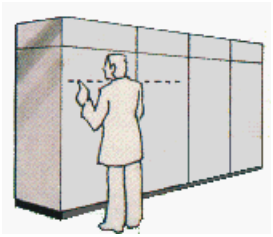
Reception & Recording
- Reception & recording
- Mission Operation management

Level 0





Level 0



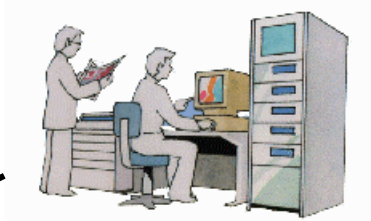
Archive

Mission Operation System

Product

Data Analysis System
- Algorithm development
- Cal & Val

Algorithm
Cal & Val info.



Earth Observation Information System
- Data processing
- Data set generation
- User services (search and order)
- Data distribution
- Near real time processing

Product

Users
- Researchers
- Operational users
- International users

etc.

Earth Science Data System

GCOM Data Flow

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GCOM study status

- Being JFY2000 conceptual study of Sensors (ODUS and SGLI) and Ground segment
- Ongoing Algorithm development of ODUS
- Finished conceptual study team activities for GCOM-A1 and published GCOM-A1 study report (in Japanese)
- Starting JFY 2000 conceptual study of GCOM-A1 satellite from the end of this October
- Starting JFY2000 conceptual study of SGLI after making an agreement with GCOM/SGLI science team for SGLI baseline specification (Oct/E)

GCOM budget status

- NASDA JFY2001 budget will be very tight and NASDA satellites projects following to ADEOS-II may be postponed
- GCOM-A1 and B1 launch will be delayed also development schedule need to be revised
- JFY2001 budget for GCOM is same level as JFY2000 budget (about 2 million US dollars)

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Way Ahead

- Redefine overall GCOM missions, including GCOM-A1, B1, A2, B2 and other missions such as ATMOS-A1/GPM, Earth Care
- Feasibility study on GCOM implementation from financial perspective
- Establish scenario to develop GCOM satellite bus with new satellite bus technologies
- After above studies, NASDA will decide to start the GCOM-A1 development plan