Global Change Observation Mission 2nd Research Announcement (GCOM-C1 First RA)

As the second Global Change Observation Mission (GCOM) research announcements (RA), the Japan Aerospace Exploration Agency (JAXA) announces the opportunity to conduct "development of retrieval algorithms for geophysical products", "fundamental data acquisition and validation preparation", and "application research directly connecting to the GCOM-C1 data".

1. Outline of the RA

GCOM-C1 satellite is planned to be launched in the winter period of Japanese Fiscal Year (JFY) 2013. Second generation Global Imager (SGLI) will be carried by the GCOM-C1 and have special features of wide spectral coverage from 380nm to 12um, high spatial resolution of 250m, field of view more than 1000km, two direction simultaneous observation, and polarization observation. GCOM-C1 mission aims to contribute of our knowledge improvement and prediction of global carbon cycle and radiation budget through the high accuracy observation about global vegetation, ocean color, temperature, cloud, aerosol, and polar regions by the SGLI.

This RA covers a four-year research period from JFY 2009 to JFY 2012. This RA emphasizes product development and acquisition of fundamental data for the algorithms (especially for new products, or significant improvement of existing products by new ideas), because the period corresponds to preparation period until 1-year of the GCOM-C1 launch.

Participation in this RA is open to all categories of domestic and foreign organizations including educational institutions (except for students), industries, non-profit institutions and Japanese Government agencies. (The funding to the foreign organization is basically limited to the case of special needs for the GCOM-C1 mission success.) After this RA, i.e. before one-year of the GCOM-C1 launch, we are planning to restart the RA to conduct researches more weighted to the operation and product validation during three years before and after the launch.

2. Proposal Preparation Instructions and Deadline

Proposal RA details and forms for proposals can be downloaded from the following URL. Proposers without access to the Web or who experience difficulty in using this site may contact GCOM RA office (see below) for assistance. The deadline for submitting proposals is March 31, 2009.

RA details and forms for proposals
http://suzaku.eorc.jaxa.jp/GCOM/ra/2ndra_info_e.html

3. GCOM RA Office

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4. GCOM-C1 Satellite and SGLI Sensor

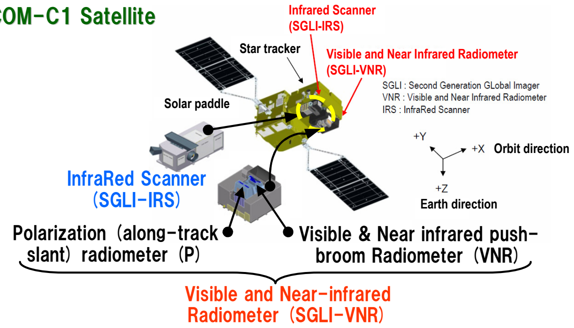
Outline of the GCOM-C1 satellite and SGLI sensor are described below. Also, you can find the table listing the geophysical parameters to be retrieved from SGLI's data in the backside.

GCOM-C1 Specification

GCOM-C SGLI characteristics (baseline of GCOM-C1 BBM design)	
Orbit (TBD)	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

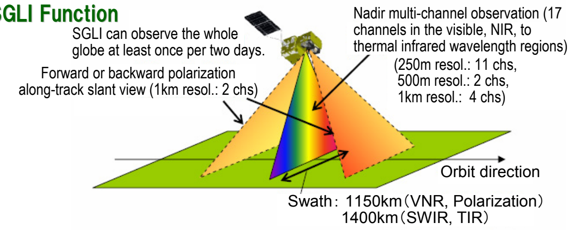
VN: Visible and Near infrared, P: Polarimetry, SW: Shortwave infrared, T: Thermal infrared

GCOM-C1 Satellite



GCOM is a long-term global change observation mission which consists of two satellite types and three consecutive generations with a one-year overlap, resulting in over a 13-year observation period. The two satellites are GCOM-W (Water) and GCOM-C (Climate). The GCOM-W1 satellite (to be launched in JFY2011) will carry the Advanced Microwave Scanning Radiometer-2 (AMSR2) to contribute to understanding the water and energy cycle. The GCOM-C1 satellite (planned to be launched in JFY2013) will be equipped with the Second-generation Global Imager (SGLI) to observe the Earth's atmosphere and surface for contributing to the understanding of the carbon cycle and radiation budget.

SGLI Function



SGLI will have functions of traditional nadir non-polarization observation with 17 spectral channels ranging from near-UV to thermal infrared region, two directional observation with two polarization channels at red and near-infrared wavelengths. With its wide swath over 1000km, SGLI can observe the earth's surface at high temporal and spatial resolution (observation frequency: once per two days, primary spatial resolution: 250m). These functions enable us to observe global vegetation parameters, cloud and aerosol properties, ocean color and temperature in coastal to outsea regions, snow and ice in the cryosphere with high accuracy.

SGLI Specification

SGLI channels						
CH	λ	$\Delta\lambda$	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
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	670	10	23	62	400	250
VN8	670	20	25	210	250	250
VN9	763	8	40	350	400	1000
VN10	865	20	8	30	400	250
VN11	865	20	30	300	200	250
P1	670	20	25	250	250	1000
P2	865	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

GCOM-C1 Product

※light blue: standard products, and white: research products

Area	Group	Product※	Description※
L. Land	L-1 Precise Geometric Corr.	Precise geometric correction	Radiance after the geometric correction with ground control point also taking into account the altitude of the pixel.
L. Land	L-2 Atmospheric Corrected Reflectance	Atmospheric corrected reflectance	Ground surface reflectance after the correction of the atmospheric effects such as scattering and absorption by molecules
L. Land	L-2 Atmospheric Corrected Reflectance	Vegetation index	Index parameter as a measure of density and activity of green vegetation. NDVI (calculated from red and near-infrared channel reflectances) and EVI (an extended vegetation index using visible channel reflectance) are expected.
L. Land	L-2 Atmospheric Corrected Reflectance	Land surface albedo	The ratio of upward reflected radiation energy divided by downward solar radiation energy estimated from the type of land cover and the surface reflectances at each channel.
L. Land	L-3 Land Primary Production	Fraction of Absorbed Photosynthetically Active Radiation	Fraction of photosynthetically active radiation (wavelength: 400-700nm) absorbed by vegetation.
L. Land	L-3 Land Primary Production	Leaf area index	The ratio of total upper leaf surface of vegetation divided by the surface area of the land on which the vegetation grows.
L. Land	L-3 Land Primary Production	Water stress trend	A trend of water stress on vegetation estimated from diurnal variation of the surface temperature.
L. Land	L-3 Land Primary Production	Land net primary production	The net absorbed carbon amount by land vegetation which is the difference between photosynthetically absorbed amount and emitted amount by the respiration.
L. Land	L-4 Above-ground Biomass	Above-ground biomass	Dry weight of above-ground biomass.
L. Land	L-4 Above-ground Biomass	Vegetation roughness index	A roughness index expressing 3-dimensional structure vegetation derived by multi-angle observation.
L. Land	L-4 Above-ground Biomass	Shadow index	Fraction of vegetation shadow which resulted from its 3-dimensional structure. This parameter is estimated using the wavelength dependence of the surface reflectances.
L. Land	L-5 Temperature	Surface temperature	Surface temperature of the land surface
L. Land	L-5 Temperature	Fire detection index	Position of fire detected using the radiation data at the thermal- and shortwave- infrared channels.
L. Land	L-6 Land Cover Type	Land cover type	Land cover type classified using vegetation indices and the surface reflectances at each channels.
A. Atmosphere	A-1 Cloud	Cloud flag/Classification	Cloud/Clear discrimination and the type of cloud cover.
A. Atmosphere	A-1 Cloud	Classified cloud fraction	Cloud fraction statistically derived for each cloud type.
A. Atmosphere	A-1 Cloud	Cloud top temp/height	Cloud top temperature and height derived from brightness temperature data at the thermal infrared channels.
A. Atmosphere	A-1 Cloud	Water cloud OT/effective radius	Optical thickness of water cloud and the size of cloud droplet.
A. Atmosphere	A-1 Cloud	Ice cloud optical thickness	Optical thickness of ice cloud.
A. Atmosphere	A-2 Aerosol	Aerosol over the ocean	Aerosol properties including optical thickness, size distribution (Angstrom Exponent), and the type of component.
A. Atmosphere	A-2 Aerosol	Land aerosol by near ultra violet	Optical thickness and an coefficient indicating the absorptivity of visible light by land aerosols.
A. Atmosphere	A-2 Aerosol	Aerosol by Polarization	Optical thickness and Angstrom Exponent derived from the polarization observations.
A. Atmosphere	A-3 Radiation Flux	Short-wave radiation flux	Downward and upward shortwave radiation flux at the ground surface (Radiation budget of shortwave radiation).
A. Atmosphere	A-3 Radiation Flux	Long-wave radiation flux	Downward and upward longwave radiation flux at the ground surface (Radiation budget of longwave radiation). Upward flux under cloudy weather condition will be estimated using the surface temperature derived by AMSR2 etc.
A. Atmosphere	A-3 Radiation Flux	Water cloud geometrical thickness	Geometrical thickness of water cloud derived using the radiance data at the oxygen band (763nm). Combined use of this parameter with cloud top height enable us to estimate cloud bottom height, which will then contributes to the improvement of the retrieval accuracy of the longwave radiation budget at the ground surface.
O. Ocean	O-1 Atmospheric Correction over Ocean	Normalized water leaving radiance	Water leaving radiances at each channels at the ocean surface after the correction of the atmospheric effects.
O. Ocean	O-1 Atmospheric Correction over Ocean	Atmospheric correction param.	Aerosol properties including optical thickness and Angstrom exponent necessary for the atmospheric correction.
O. Ocean	O-1 Atmospheric Correction over Ocean	Photosynthetically available radiation	Downward radiation at the wavelength of 400-700nm at the ocean surface which is available for phytoplankton.
O. Ocean	O-2 Ocean Color	Chlorophyll-a concentration	Concentration of a primal photosynthetical pigment in phytoplankton in the ocean surface layer.
O. Ocean	O-2 Ocean Color	Suspended solid concentration	The amount of suspended solid (SS) in the ocean surface layer expressed in a unit of dry weight per volume of the ocean water. SS is defined as a combined material of organic matter such as plankton and inorganic matter such as soil particles.
O. Ocean	O-2 Ocean Color	Colored dissolved organic matter	Absorption coefficient of colored dissolved organic matter (CDOM) in the ocean surface layer.
O. Ocean	O-2 Ocean Color	Inherent optical properties	Optical properties of ocean water such as absorption coefficients of plankton pigment, SS, CDOM, and scattering coefficients of SS, which are estimated using the normalized water leaving radiances.
O. Ocean	O-2 Ocean Color	Phytoplankton functional type	Fraction of individual phytoplankton groups characterized by the fixation type such as nitrogen fixation, silicate fixation, and carbon dioxide fixation, which are estimated using the normalized water leaving radiances.
O. Ocean	O-2 Ocean Color	Redtide	Discrimination of redtide using the characteristic of ocean color.
O. Ocean	O-3 Temperature	Sea surface temperature	Sea surface temperature (SST) of bulk water.
O. Ocean	O-4 Primary Productivity	Ocean net primary productivity	Carbon fixation ability of oceanic phytoplankton by photosynthesis (carbon emission by respiration is subtracted).
O. Ocean	O-4 Primary Productivity	Euphotic zone depth	The depth of ocean layer in which a substantial amount of light for the organism growth is available.
O. Ocean	O-5 Multi Sensor Merged Product	multi sensor merged ocean color	Ocean color data merged with multiple ocean color sensors' data such as NPOESS/VIIRS.
O. Ocean	O-5 Multi Sensor Merged Product	multi sensor merged SST	SST data merged with multiple sensors' SST data derived from AMSR-2 and NPOESS/VIIRS etc.
S. Cryosphere	S-1 Area/Distribution	Snow and Ice covered area	Snow and ice discrimination.
S. Cryosphere	S-1 Area/Distribution	Okhotsk sea-ice distribution	Sea ice distribution in Okhotsk Sea processed in near real-time
S. Cryosphere	S-1 Area/Distribution	Snow and ice classification	Snow and ice cover type (such as new snow/old snow, or first year ice/multi-year ice etc.)
S. Cryosphere	S-1 Area/Distribution	Snow covered area in forest and mountain	Snow covered area in forest and mountain regions where vegetation cover is likely mixed with snow.
S. Cryosphere	S-1 Area/Distribution	Ice sheet boundary monitoring	Position of major Ice sheet boundary.
S. Cryosphere	S-2 Surface Properties	Snow and ice surface Temperature	Surface temperature of snow and ice surface
S. Cryosphere	S-2 Surface Properties	Snow grain size of shallow layer	Snow grain size retrieved with the reflectance at 865nm channel. Retrieved sizes represent the snow property at a shallow layer of 0-30cm.
S. Cryosphere	S-2 Surface Properties	Snow grain size of subsurface layer	Snow grain size retrieved with the reflectance at 1050nm channel. Retrieved sizes represent the snow property at the subsurface layer which is upper than that with 865nm channel.
S. Cryosphere	S-2 Surface Properties	Snow grain size of top layer	Snow grain size retrieved with the reflectance at 1640nm channel. Retrieved sizes represent the property of the top snow layer.
S. Cryosphere	S-2 Surface Properties	Snow impurity	Ratio of impurity in snow such as soot and dust.
S. Cryosphere	S-3 Albedo	Snow and ice albedo	The ratio of upward reflected radiation energy divided by downward solar radiation energy estimated using the snow surface reflectances at each channel taking into account the atmospheric effect.
S. Cryosphere	S-3 Albedo	Ice sheet surface roughness	Roughness of the ice sheet (defined as the ratio of the height divided by the width of the roughness) derived by multi-angle observation.
C. Common	C-1 Clear/Cloud/Cryosphere discrimination	It is a common task for making most of SGLI products to discriminate between clear, cloud, snow/ice surfaces. However, it is also the fact that there is a necessity to develop a proper discrimination scheme specific for each algorithm. JAXA will promote sharing the knowledge of the spectral features of each observation target and the way to the discrimination as far as possible for further improving the performance of the individual algorithms.	
C. Common	C-2 Aerosol Correction	It is necessary to separate the component of the reflected light at a ground target from the light component of the atmospheric scattering (especially related to the aerosol properties A-2) in satellite observed radiances in order to estimate the surface reflectance (land, ocean, and snow). For this purpose, JAXA will promote sharing the knowledge of and exchange the processing technique of the radiative transfer process in the atmosphere-surface system.	
C. Common	C-3 Polarization Analysis	Observing polarized radiances is an unique function of SGLI. Besides the aerosol product by polarization (A-2), we will explore the development of new products to be derived with the polarization observation and their application. Because the polarization observation is a new function also from the point of view of hardware development, JAXA will promote the close cooperation with the calibration activities primarily conducted by JAXA.	
C. Common	C-4 Combined Global Environmental Change Analysis	It is necessary not only to cooperate with researches on the monitoring and prediction of the carbon cycle and radiative forcing, but also to improve the development scheme of our satellite products based on the needs requested by those researches and the knowledge obtained through the cooperation. JAXA will promote combined analysis with the results of numerical models and also promote the sharing of the knowledge and technique of individual research groups for future assimilation of satellite data in the model.	
C. Common	C-5 Consideration of SGLI Calibration Performance	Accuracy of satellite product is affected by both the sensor performance and the algorithm performance. It is necessary, therefore, to develop algorithms appropriate for actual SGLI performance to be achieved. For example, JAXA will promote close cooperation between the team evaluating the radiative transfer process in the algorithms and the teams conducting ground truth observations and vi-carious calibration. Also, JAXA will bridge the gap between system geometric correction and precise geometric correction teams to be conducted as a calibration activity.	