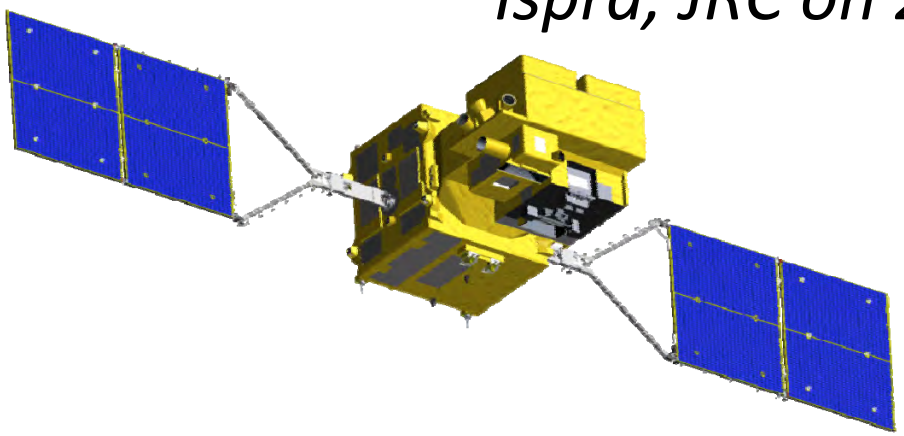
Plan of the Japanese OCR (GCOM-C) calval

JAXA/EORC

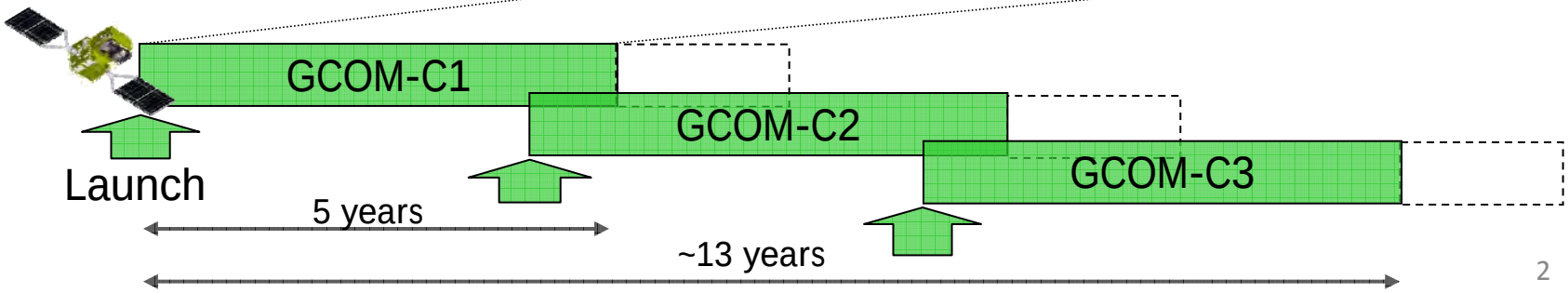
Hiroshi Murakami

Ispra, JRC on 21 Thursday 2010

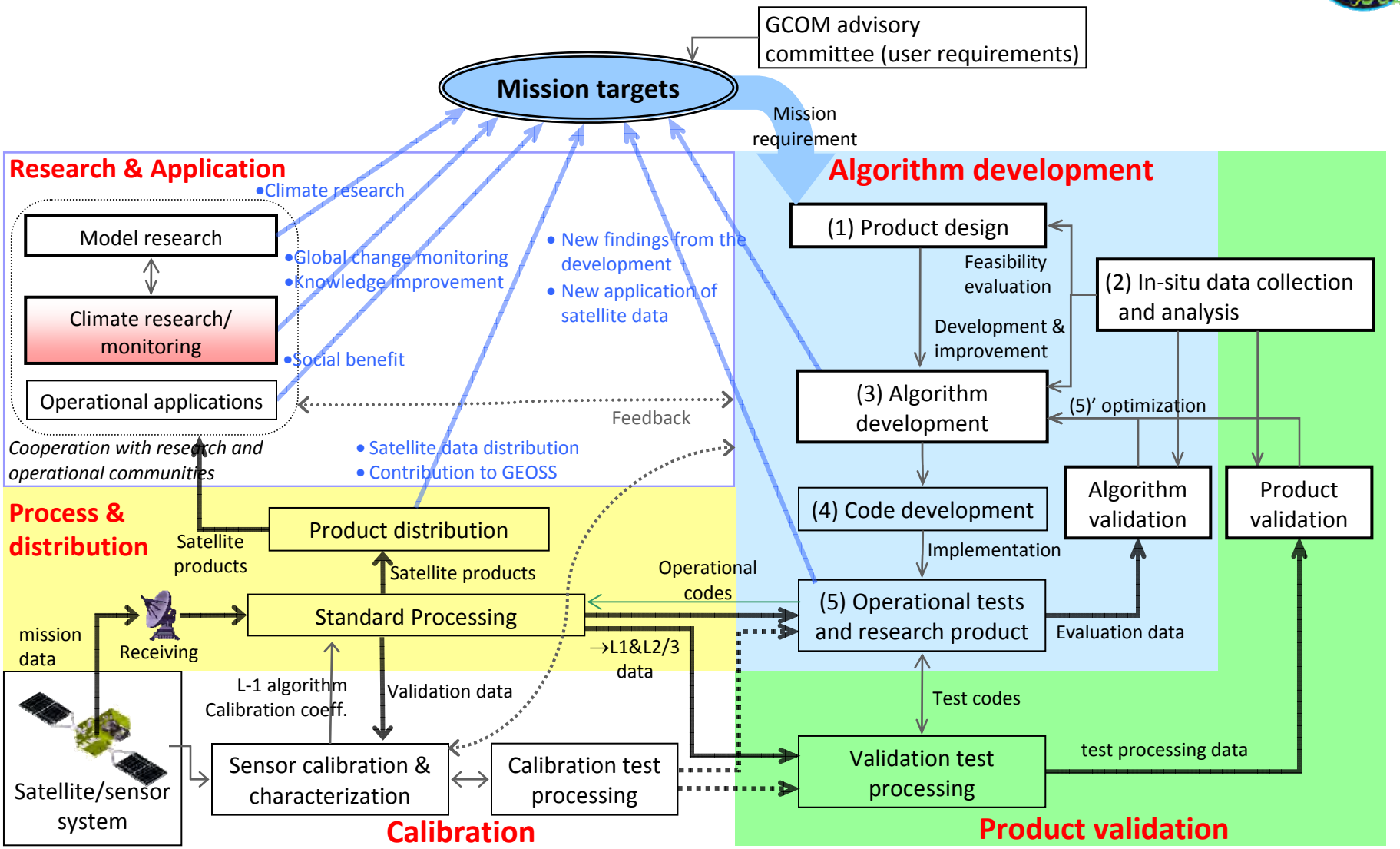


1. Milestones of GCOM-C

Japanese Fiscal Year Apr~	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Sensor development & calibration	1. Design and trial manufacturing		2. Sensor manufacturing & tests				3. Initial calibration	4. Operation phase				
	BBM		EM		PFM						C2 Launch♦	
	Phase-A	Phase-B	Phase-C		Phase-D							
	Project start		System PDR	System CDR		GCOM-C1 launch♦		Data Release			Mission result evaluation	
Research Announcement	RA#1♦					♦RA#2			♦RA#3			
Product version ups & Software implementation					Selection	Ver.0 ♦	Ver.1 ♦		Ver.2 ♦	Ver.2.5 ♦	Ver.3♦ for C-1&2	
	Analysis using existing satellite data			Inplementation-1 Performance test		Imple. -2 Operation test	Intensive Cal/Val phase		Improvement with product version up		Implement for C2	Version-ups & improvement
Algorithm development & improvement	**1. Initial development**		**2.Performance development**		**3. Operational algorithm**		**4. Post-launch development and improvement phase**					
	Development of algorithm performance and operational code											
	•Preparation study •Investigation of candidates		•Theoretical performance and applicability		•Selection & development of operational algorithm		•Product validation and improvement •Achievement of GCOM-C science targets •New algorithm and usage •Succession to the GCOM-C2					



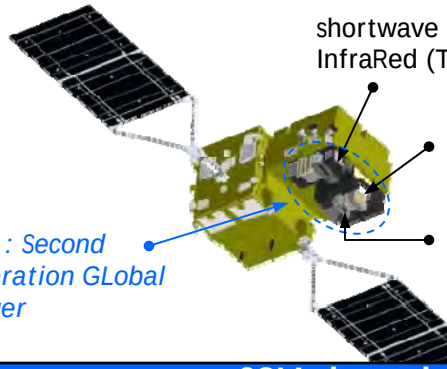
GCOM-C Research systems



Blue arrows show contribution to the mission targets. Black tick and thin arrows are satellite data (including calibration/ supplementary data) and other information or codes.

Satellite orbit and SGLI specification

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.



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

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 (LED, halogen), Lunar by pitch maneuvers (~once/month), 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

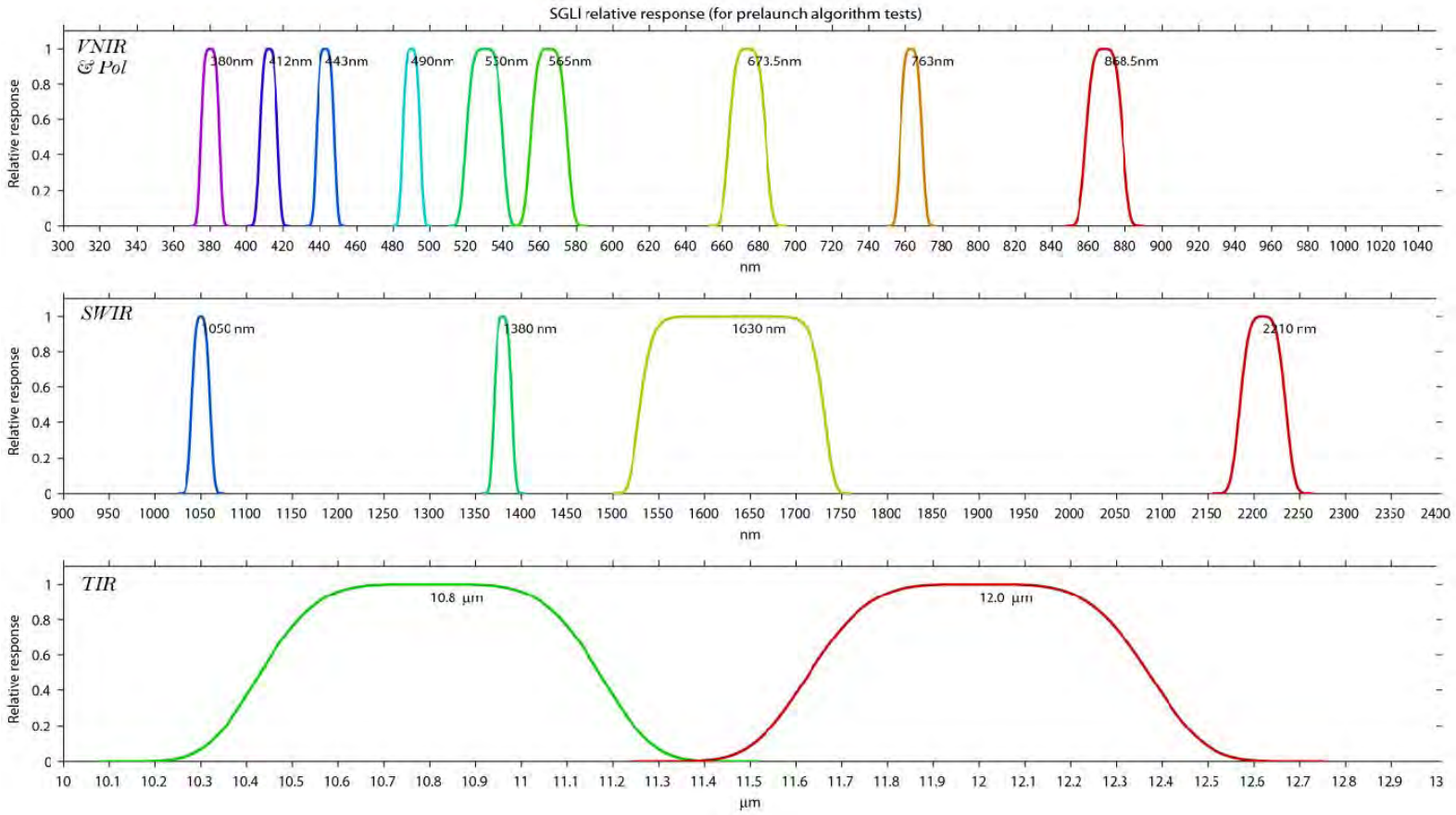
Multi-angle obs. for 674nm and 869nm

SGLI channels

CH	λ	Δλ	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	*673.5*	*20*	23	62	400	250
VN8	*673.5*	20	25	210	250	250
VN9	763	*12*	40	350	*1200*	1000/250
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	500/250
T2	12.0	0.7	300	340	0.2	500/250

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

SGLI Relative Spectral Response (spec. for pre-launch algorithm development)



Band weighted solar irradiance
using Thuilier 2002 solar irradiance spectrum
(almost identical to Thuillier 2003)

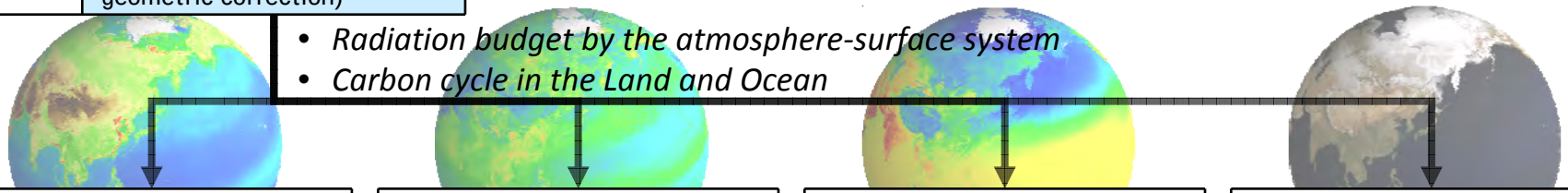
Band,	CWL(nm),	W/m2/um
VN01,	380.0,	1096.9063,
VN02,	412.0,	1709.0137,
VN03,	443.0,	1895.9035,
VN04,	490.0,	1939.3376,
VN05,	530.0,	1849.8627,
VN06,	565.0,	1799.1876,
VN07,	673.5,	1498.5248,
VN08,	673.5,	1498.5248,
VN09,	763.0,	1245.8318,
VN10,	868.5,	956.2338,
VN11,	868.5,	956.2338,
SW01,	1050.0,	653.3587,
SW02,	1380.0,	363.7635,
SW03,	1630.0,	239.5436,
SW04,	2210.0,	84.0204,

GCOM-C Observation Products

Standard and *research products*

Common	
Radiance	• TOA radiance (including system geometric correction)

- *Radiation budget by the atmosphere-surface system*
- *Carbon cycle in the Land and Ocean*



Land	
Surface reflectance	• Precise geometric correction
	• Atmospheric corrected reflectance
Vegetation and carbon cycle	• Vegetation index
	• Above-ground biomass ECV
	• Vegetation roughness index
	• Shadow index
	• Fraction of Absorbed Photosynthetically available radiation ECV
	• Leaf area index ECV
Temp.	• Surface temperature
Application	Land net primary production
	Water stress trend
	Fire detection index ECV
	Land cover type ECV
	Land surface albedo ECV

Atmosphere	
Cloud ECV	• Cloud flag/Classification
	• Classified cloud fraction
	• Cloud top temp/height
	• Water cloud optical thickness /effective radius
	• Ice cloud optical thickness
	Water cloud geometrical thickness
Aerosol ECV	• Aerosol over the ocean
	• Land aerosol by near ultra violet
	• Aerosol by Polarization
Radiation budget ECV	Long-wave radiation flux
	Short-wave radiation flux

Ocean	
Ocean color ECV	• Normalized water leaving radiance
	• Atmospheric correction parameter
	• Photosynthetically available radiation
	Euphotic zone depth
In-water	• Chlorophyll-a conc.
	• Suspended solid conc.
	• Colored dissolved organic matter
In-water	Inherent optical properties
Temp.	• Sea surface temp. ECV
Application	Ocean net primary productivity
	Phytoplankton functional type
	Redtide
	multi sensor merged ocean color
	multi sensor merged SST

Cryosphere	
Area/ distribution	• Snow and Ice covered area ECV
	• Okhotsk sea-ice distribution
	Snow and ice classification
	Snow covered area in forest and mountain
Surface properties	• Snow and ice surface Temperature
	• Snow grain size of shallow layer
	Snow grain size of subsurface layer
	Snow grain size of top layer
	Snow and ice albedo ECV
	Snow impurity
	Ice sheet surface roughness
Boundary	Ice sheet boundary monitoring ECV

Blue: standard products

Red: research products

Principal Investigators of GCOM-C

- *The first research period: 2009-2012*
- *The science team, including international participation, has been organized in July 2009 (35 Principal Investigators including 6 foreign PIs from US, France, UK, and Australia).*
- *Algorithm development, in-situ data acquisition, and application research using other satellite data are conducted by collaboration among JAXA/EORC and the PI members*

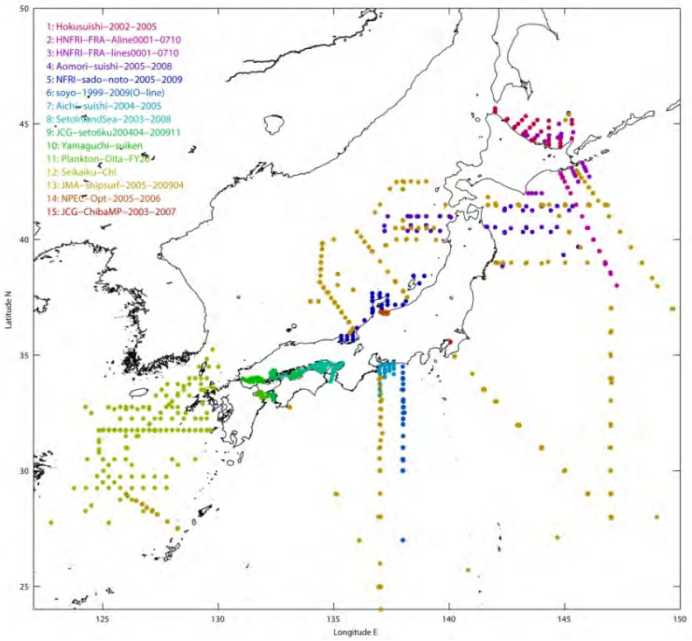
Area	PI name	Organization
Land	Y. Honda (land reflectance val)	Chiba Univ.
	K. Nasahara (NPP, LAI, Flux..)	Tsukuba Univ.
	K. Kajiwara (biomass by BRF)	Chiba Univ.
	Q-X. Wang (evapotranspiration)	NIES
	A. Ono (water stress, shadow index)	JAXA/EORC
	S. Furuumi (UPDM index)	Narasaho college
	K. Fukue (land cover)	Tokai Univ.
	N. Soyama (land cover)	Tenri Univ.
	M. Moriyama (LST, fire detection)	Nagasaki Univ.
	M. Tasumi (crop coefficient)	Miyazaki Univ.
	K. Ichii (model)	Fukushima Univ.
	T. Kaneko (volcano)	Tokyo Univ. ERI
	R. Suzuki (LAI, time series)	JAMSTEC
	A. Huete (vegetation index)	Sydney Univ.
	T. Miura (vegetation time series)	University of Hawaii at Manoa
	M. Takagi (local land cover, GCP)	Kochi Univ. of Technology
	K. Mabuchi (model)	Meteorological Research Institute
	K. Nakau (fire detect., burned area)	JAXA/EORC

Area	PI name	Organization
Atmosphere	Takashi Nakajima (cloud)	Tokai Univ.
	M. Kuji (cloud thickness)	Nara Women's Univ.
	N. Schutgens (aerosol, SKYNET)	Tokyo Univ.
	I. Sano (pol aerosol, Atm Corr.)	Kinki Univ
	Y. Mano (non spherical)	Meteorological Research Institute
	J. Riedi (pol cloud)	LOA - Univ. Lille1/CNRS
Ocean	M. Toratani (atmos. corr)	Tokai Univ.
	R. Frouin (atmos. corr. function)	Scripps Institution of Oceanography
	T. Hirawake (NPP/PFT)	Hokkaido Univ.
	T. Hirata (IOP, PFT, model)	Plymouth Marine Laboratory
	J. Ishizaka (redtide, ONPP)	Nagoya Univ.
	F. Sakaida (SST)	Tohoku Univ.
	S. Saitoh (fishery application)	Hokkaido Univ.
	H. Kawamura (coastal monitoring)	Tohoku Univ.
	T. Iida (polar area biology)	National Institute of Polar Research
Cryosphere	T. Aoki (snow size impurity)	Meteorological Research Institute
	K. Stamnes (snow size temperature)	Stevens Institute of Technology

Red: PI team leader
Blue: Group leaders

In-situ observations

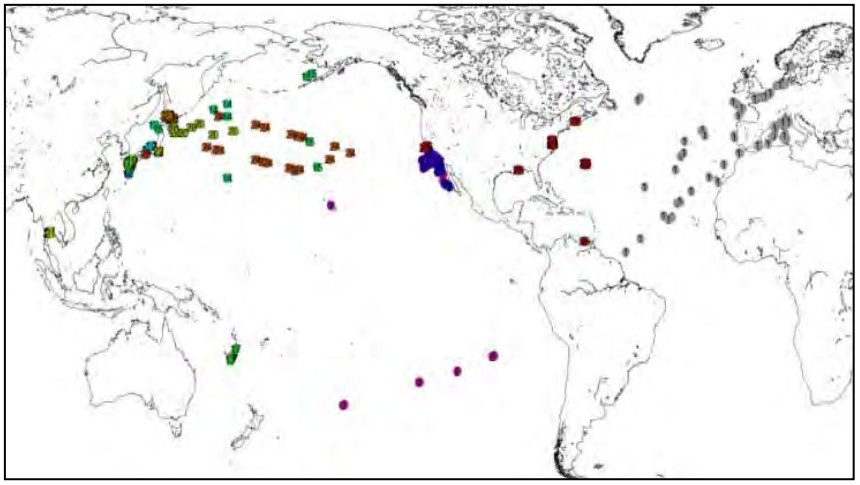
Locations of the in-situ observations 2004-2009



Current cruises:

- Tokyo bay (Sakuno, Koibuchi, Kobayashi, Kawasaki)
  - 3 cruises/year (CHL, SS, CDOM, nLw, IOP)
- Ise-bay (Ishizaka)
  - more than 1/year (nLw, CHL)
- Funka-bay (Hirawake, Saitoh)
  - about 10 cruises/year (nLw, CHL, IOP)
- Japan Fishery Agency
  - 1-4/year (nLw (limited lines), CHL)
- Japan Meteorological Agency (web)
  - 4/year (CHL)
- East China Sea
  - Framework of YOC (with Korea and China, 1998-2006)

Locations of the in-situ observations for GLI (2003)



- GLI and OCTS validation/vi-cal was conducted by collaboration with other program/projects
- GCOM-C needs the similar collaboration under the framework of CEOS
- Collaboration with NOAA (MOBY)
- Collaboration for GOCI through KJWOC
- nLw (IW-profiler and TriOS) with Microtops Sunphotometer
- insufficient IOP measurements

Possible collaboration items

- **Algorithm comparison**
  - Attendance to the CoastColour: a champion user, in-situ contribution, and algorithm comparison (PML)
  - *Other possibilities; Common validation data*
- **Product interoperability**
  - Parameter definition, file format (HDF5)
  - *Collaboration with SeaDAS?*
- **CEOS framework**
  - Use the CEOS common sites for vicarious calibration
  - *Joint field campaign after GCOM-C launch?*
- **IOCCG**
  - HAB, uncertainties, and new level-1 requirement working groups
- **GCOM-C data availability**
  - Free of charge for internet acquisition
  - The standard products (including Levels 1, 2 and 3) will be distributed with free of charge from the JAXA portal data which is a common system for several other missions (Search&download, and FTP get)
  - Re-distribution by users is limited to pre-defined users (to identify users by JAXA)
  - All L0 at Svalbard