GLI Validation Plan

GLI Ocean Team Leader

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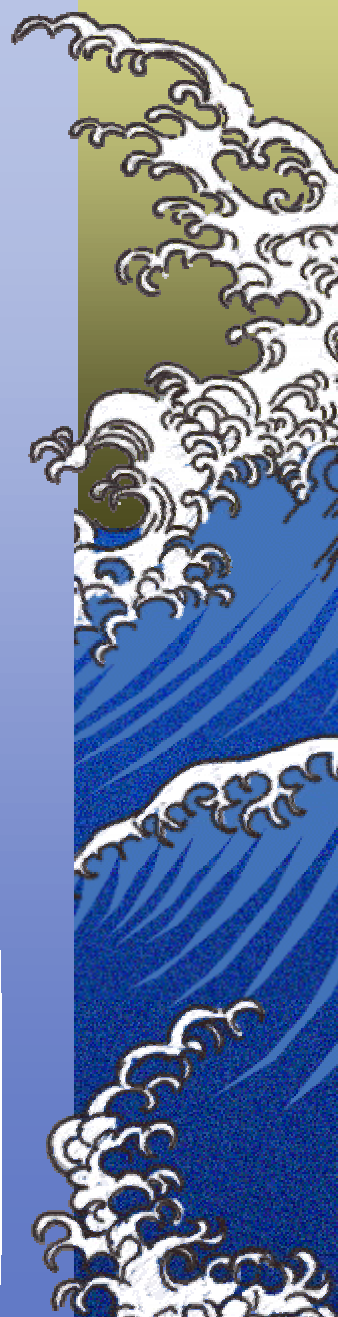
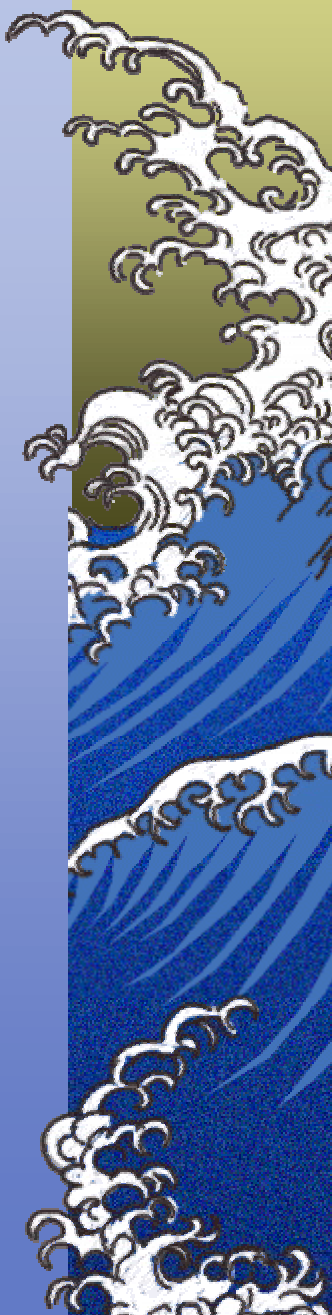


Product Items and Accuracy

Product Code	Algorithm Code	Physical Value Code	Physical Value	Product Accuracy	Sea-Truth Accuracy	Priority
NL_FR NL_LR	OTSK1a_FR OTSK1a_LR	NWLR	Normalized Water Leaving Radiance (Open Ocean)	×1.5	×1.1	1
			(Coastal Water)	×2.0	×1.1	2
		QF_OC	Quality Flag	-	-	
CS_FR CS_LR	OTSK2_FR OTSK5_FR OTSK7_FR OTSK6_FR OTSK2_LR OTSK5_LR OTSK7_LR OTSK6_LR	CHLA	Chlorophyll-a (Open Ocean)	×1.5	×1.1	1
			Chlorophyll-a (Coastal Water)	×2.0	×1.1	2
		CDOM	Absorption Coefficient of Colored Dissolved Material (440nm)	×2.0	×1.5	3
		K490	490nm Extinction Coefficient (Open Ocean)	×1.5	×1.1	1
			490nm Extinction Coefficient (Coastal Water)	×2.0	×1.1	3
		SS	Suspended Solid	×2.0	×1.5	3
ST_FR ST_LR	OTSK13_FR OTSK13_LR	SST_b	Bulk Sea Surface Temperature	0.6K	0.1K	1
		QF_ST	Quality Flag	-	-	



GLI Ocean Validation

Validation →→→→

↑ ↓

Vicarious Calibration Algorithm Tuning

↑ ↓

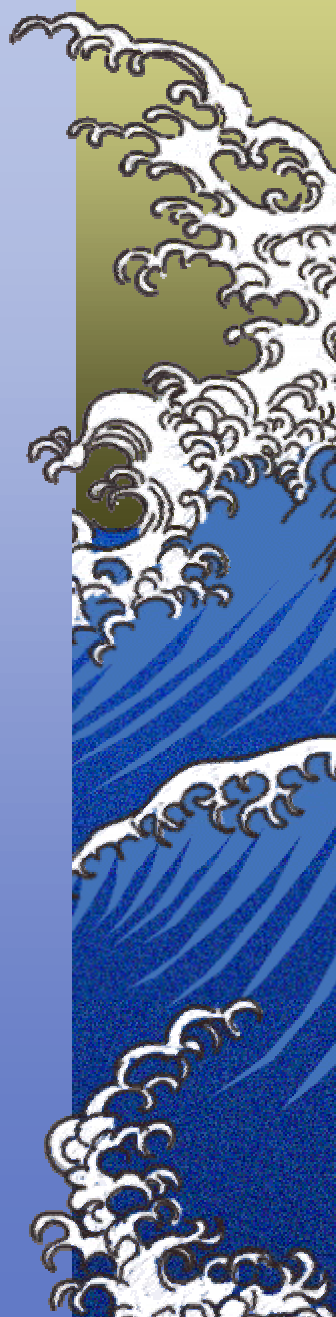
Match-up Data Set ←

↑

QC of In situ Data

↑

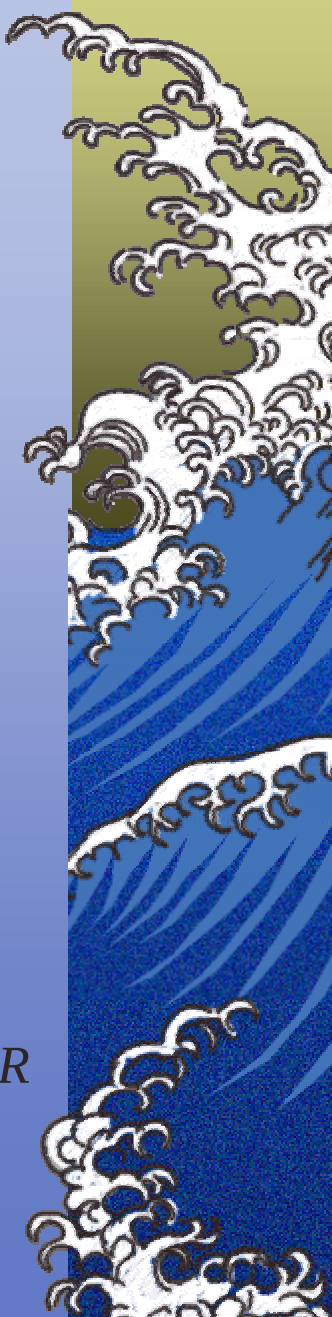
In situ Data Collection



GLI OCEAN Validation

- ***Atmospheric Correction***
  - *Comparison with other Satellite Data; SeaWiFS, MODIS*
  - *Comparison between L-2 Products and Truth Data Set*
  - *Vicarious Calibration*
    - *Optical Buoy Data (Ishigaki Buoy, MOBY) with Radiative Transfer Model*
    - *Statistical Method (e.g., Minimum radiance)*
- ***Bio-Optical Parameters***
  - *Comparison between L-2 Products and Truth Data Set*
  - *Comparison of Truth Data with Bio-optical Model*
- ***Sea Surface Temperature***
  - *Comparison between L-2 Products and Truth Data Set*
  - *Comparison with other satellite data; MODIS, ASTER, AVHRR*
  - *Vicarious Calibration*

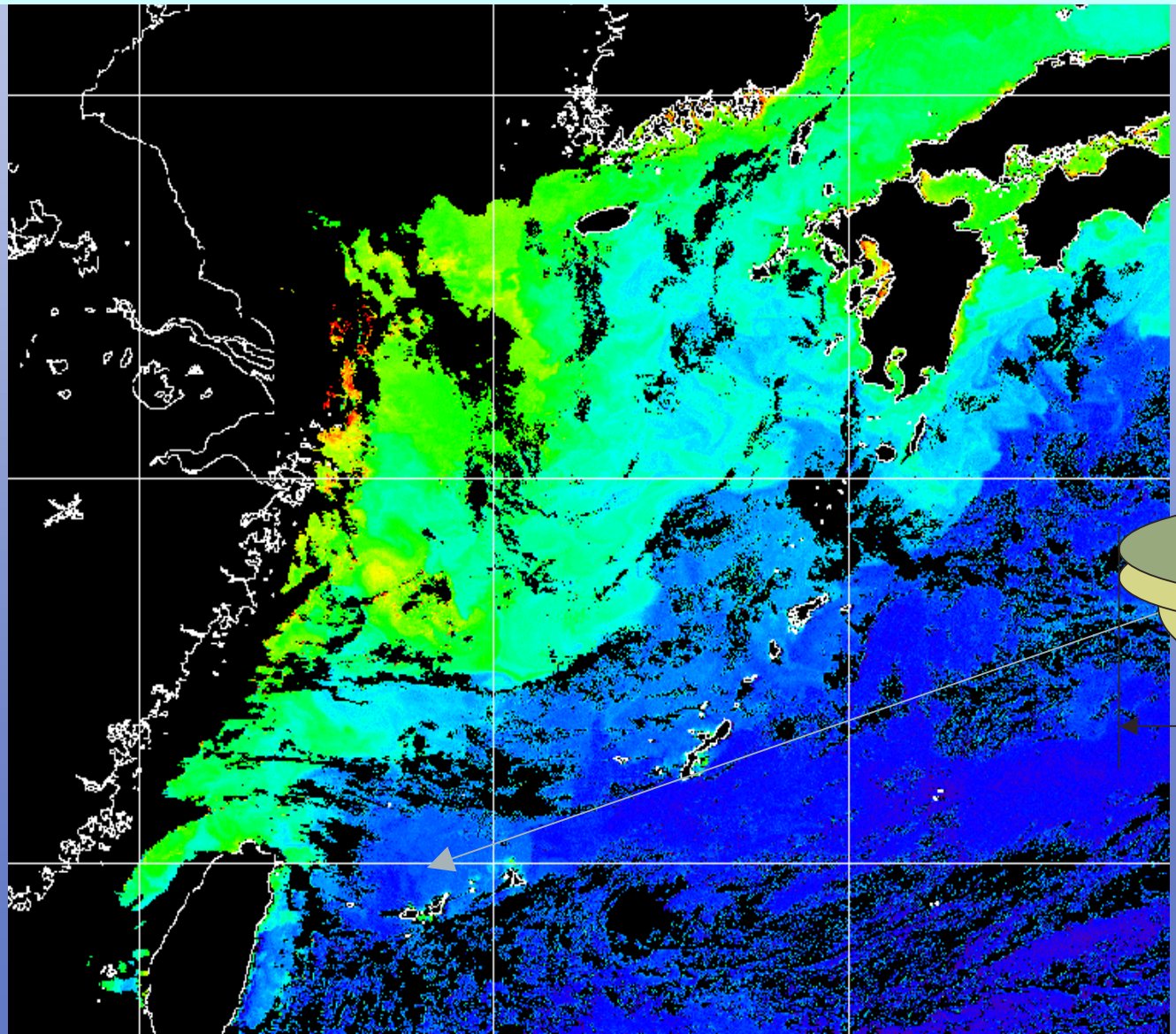
    Skin-SST Observation, atmospheric parameters, modeling

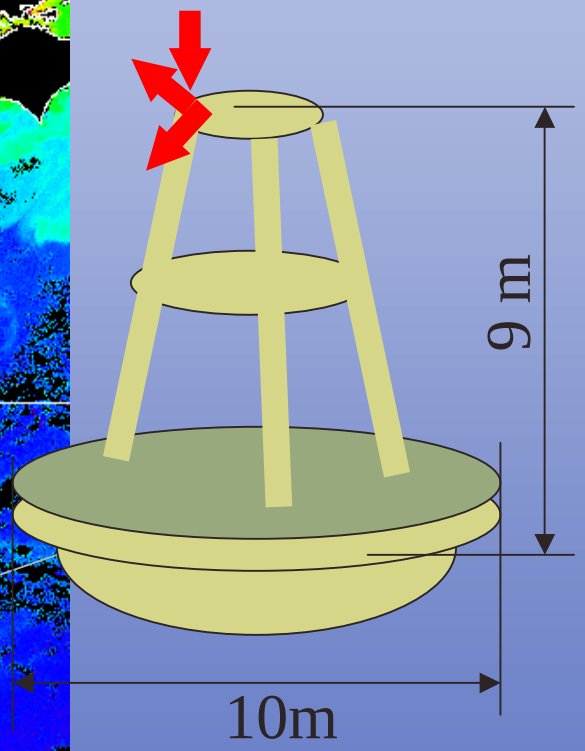


ADEOS-2 GLI Ocean Validation and Responsibilities for Each Function

Target Products	***Categories of validation data***	***Validation data acquisition and operation***					***GLI data search and match up data generation***			***Algorithm evaluation and improvement***			
		observation	process	quality control	formatting	archive	operation	archive	Open to validation PI via FTP	Data analysis	Operation test	Evaluation Version up request	
Ocean color *NL_FR (NL_LR) (nLw, τa) CS_FR (CS_LR) (CHLA, SS, CDOM, K490)*	Ishigaki buoy (nLw)	*EORC (Asanuma+RESTEC)*				*EORC/RESTEC (+part-time staff)*	*EORC/RESTEC (+part-time staff)*			*EORC (Asanuma, Murakami, Mitomi, Ocean PI, and CI) Operation test with GAIT*			*Ocean Group*
	MOBY (nLw)	*NASA*											
	Non-QC data from universities and voluntary ships	*Each organization*	*Ocean group leader (Ishizaka)*										
	QC-done data from JFA, PI and so on	*Each organization*											
	Other satellite data numerical simulation	*Other satellite data acquisition numerical simulation of $L_{TOA}{}^{\uparrow}$ (Murakami, Mitomi)*					*GLI data acquisition co-registration (Murakami, Mitomi)*		--	*EORC (Murakami, Mitomi, Asanuma, PI, and CI)*			
Sea surface temperature *ST_FR (ST_LR) SST_bulk*	GTS data	--	*JMA*	*NASDA/ Tohoku Univ.*		*EORC /RESTEC*	*EORC/RESTEC (+part-time staff)*		*Tohoku Univ.*	*Tohoku Univ.*	*EORC (Murakami+GAIT)*		*Ocean Group*
	Other SST observation data	*Each organization*	*Tohoku Univ.*								*EORC*		
	Other satellite data	--	*Other satellite data acquisition*				*GLI L2 or L3 process (EOC or EORC)*		--		*EORC*		

Vicarious Calibration on Mooring Buoy off Ishigaki Island

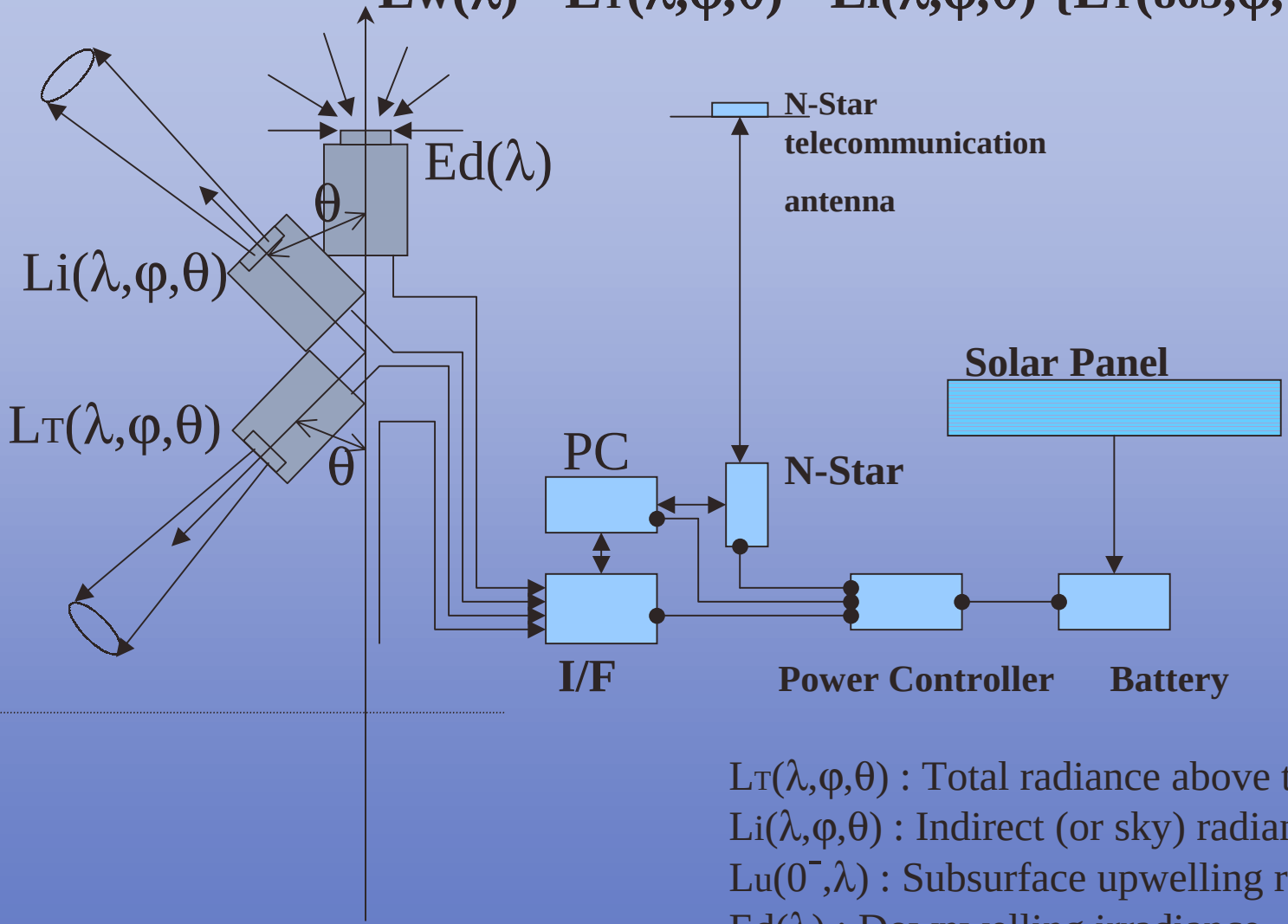




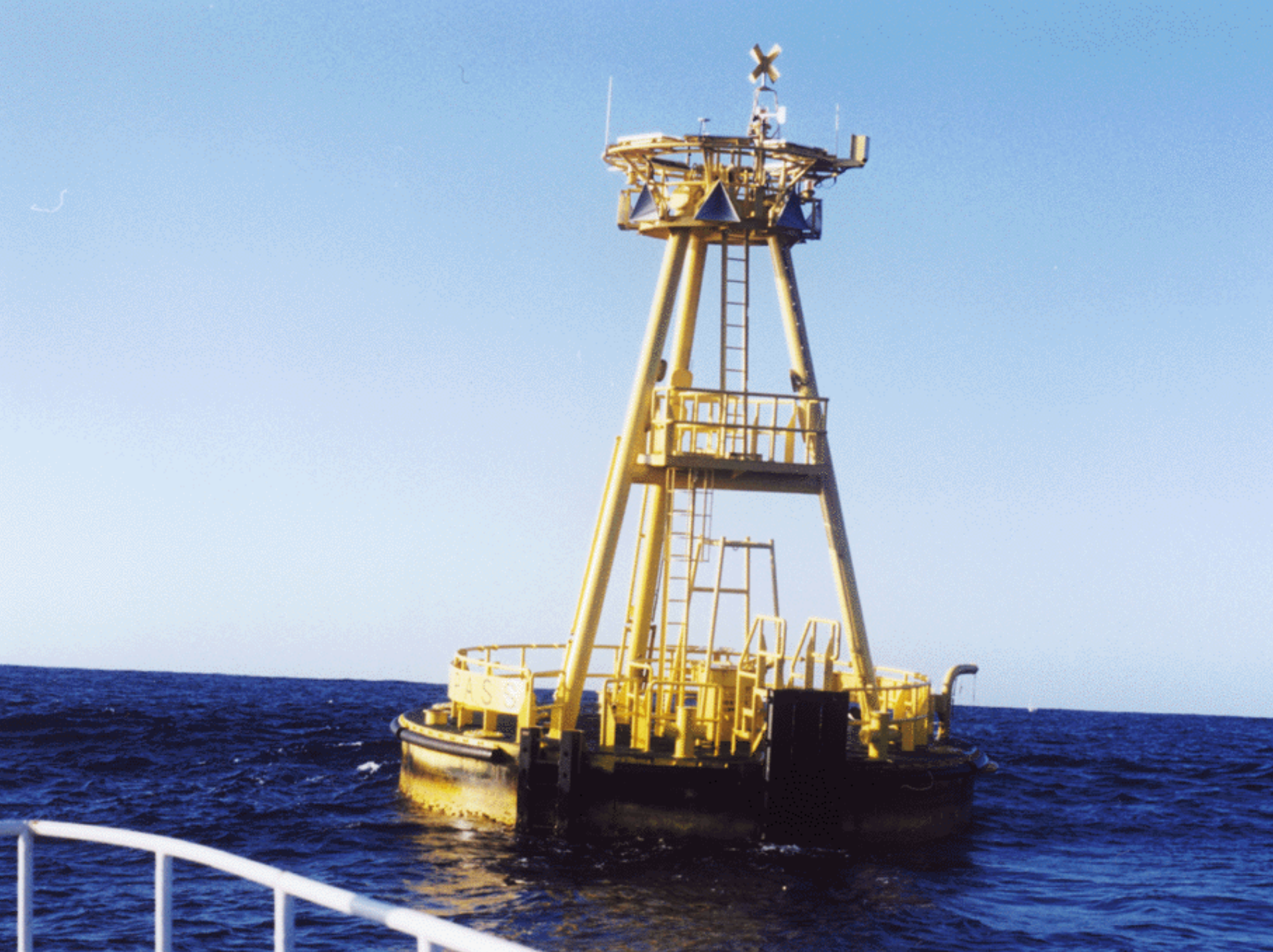
Vicarious Calibration from Mooring Buoy off Ishigaki Island

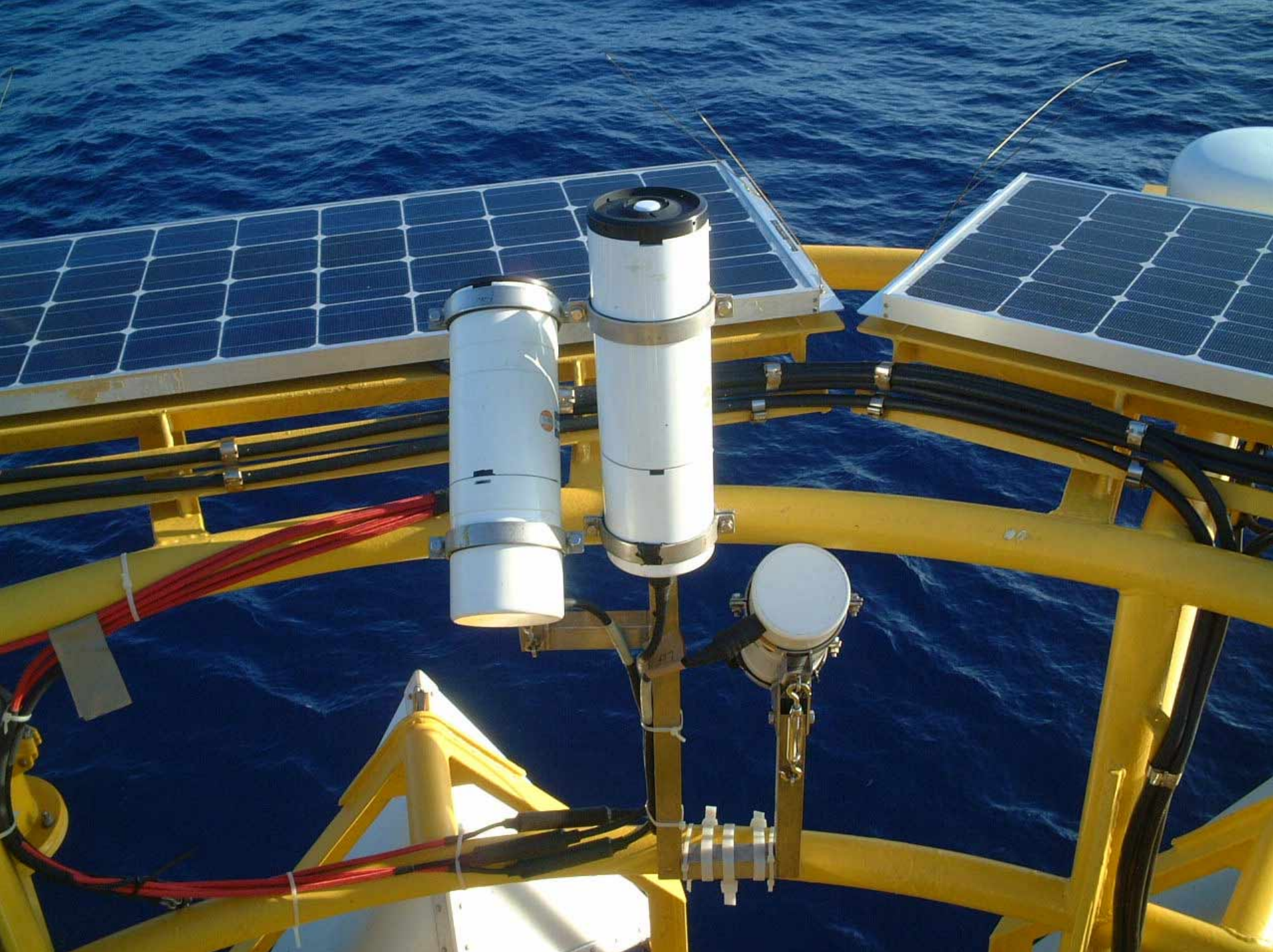
$$Lw(\lambda) = L_T(\lambda,\varphi,\theta) - Li(\lambda,\varphi,\theta)\ \{L_T(865,\varphi,\theta)/Li(865,\varphi,\theta)\}$$

Morel(1980)



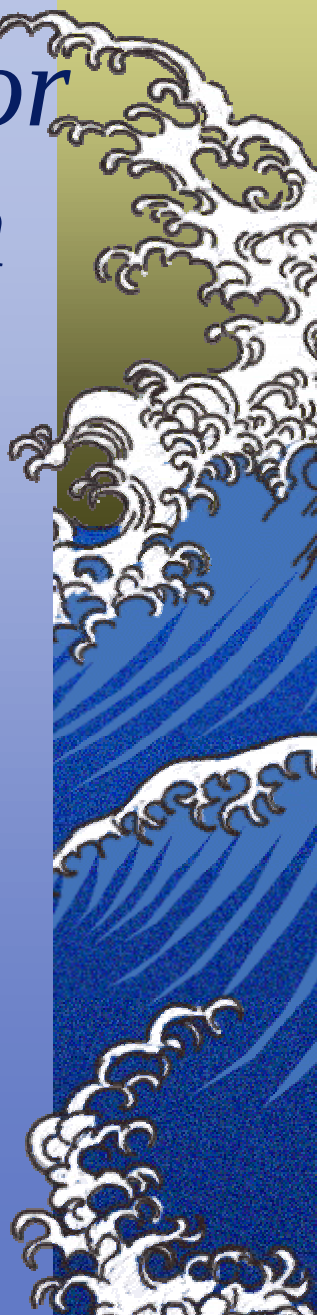
$L_T(\lambda,\varphi,\theta)$: Total radiance above the surface,
$Li(\lambda,\varphi,\theta)$: Indirect (or sky) radiance,
$Lu(0^-,\lambda)$: Subsurface upwelling radiance,
$Ed(\lambda)$: Downwelling irradiance,
φ : Azimuth angle,
θ : Zenith angle and off-nadir angle.





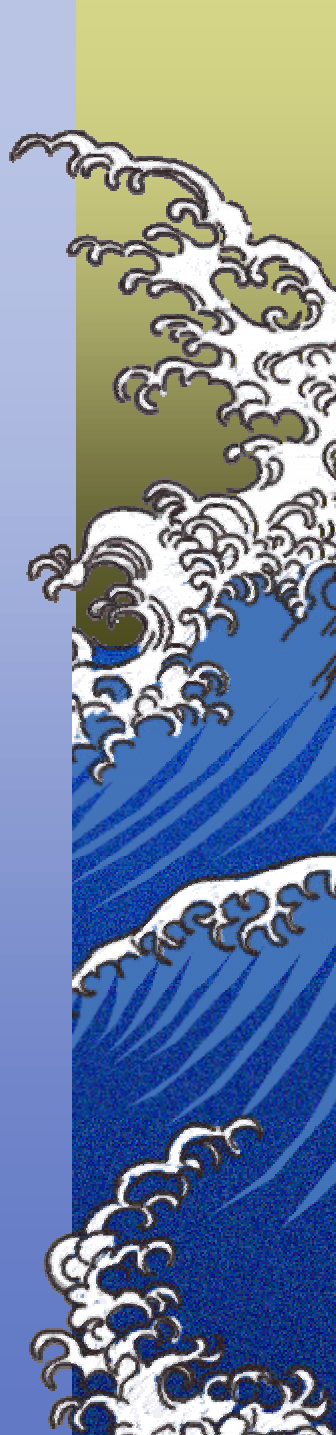
Observation Items and Methods for Ocean Color Product Validation

- Underwater Upward Radiance and Downward Irradiance (Underwater Spectral Radiometer)
- Upward Radiance and Downward Radiance/Irradiance (On-board Spectral Radiometer)
- Chlorophyll-a (Fluorometric Measurements, HPLC)
- SS (Weight Measurements of Filter)
- C-DOM (Spectral Absorption Measurements of Filtrate)



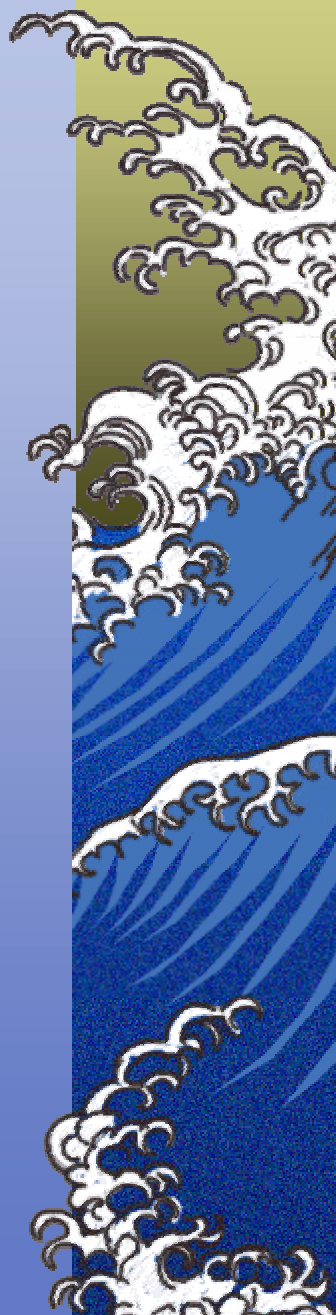
Geographical Coverage of Japanese PI/CoI's

- Northern North Pacific (Saitoh, others)
- Japan Sea (Saitoh, Ishizaka)
- East China Sea (Ishizaka)
- Seto Inland Sea (Hashimoto)
- Tokyo & Sagami Bay (Ishimaru)
- CREST Buoy (Saino)
- Ohmura & Ariake Bay (Ishizaka)
- Equatorial Pacific (Asanuma)
- Southern Ocean (Fukuchi)



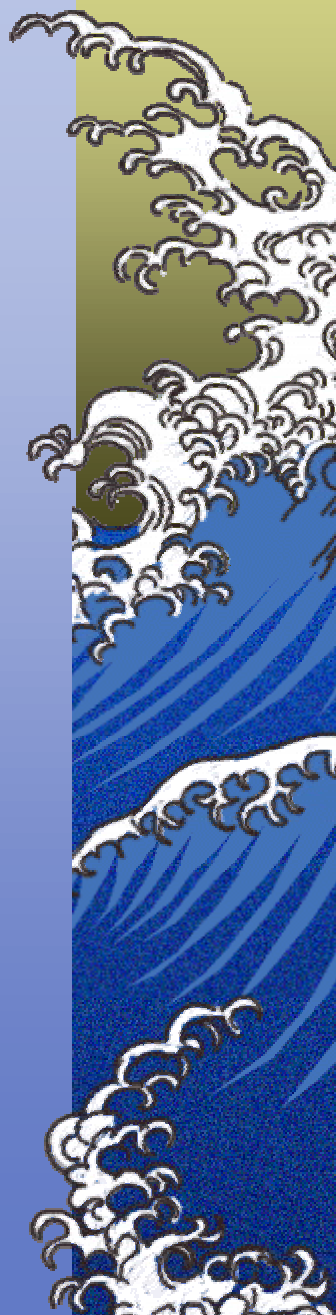
PI's from Other Countries

- Scripps Institute of Oceanography (Mitchell, Frouin)
- Northern Polar Region (Cota)
- South Pacific (Dupouy)
- Australia (Lynch)

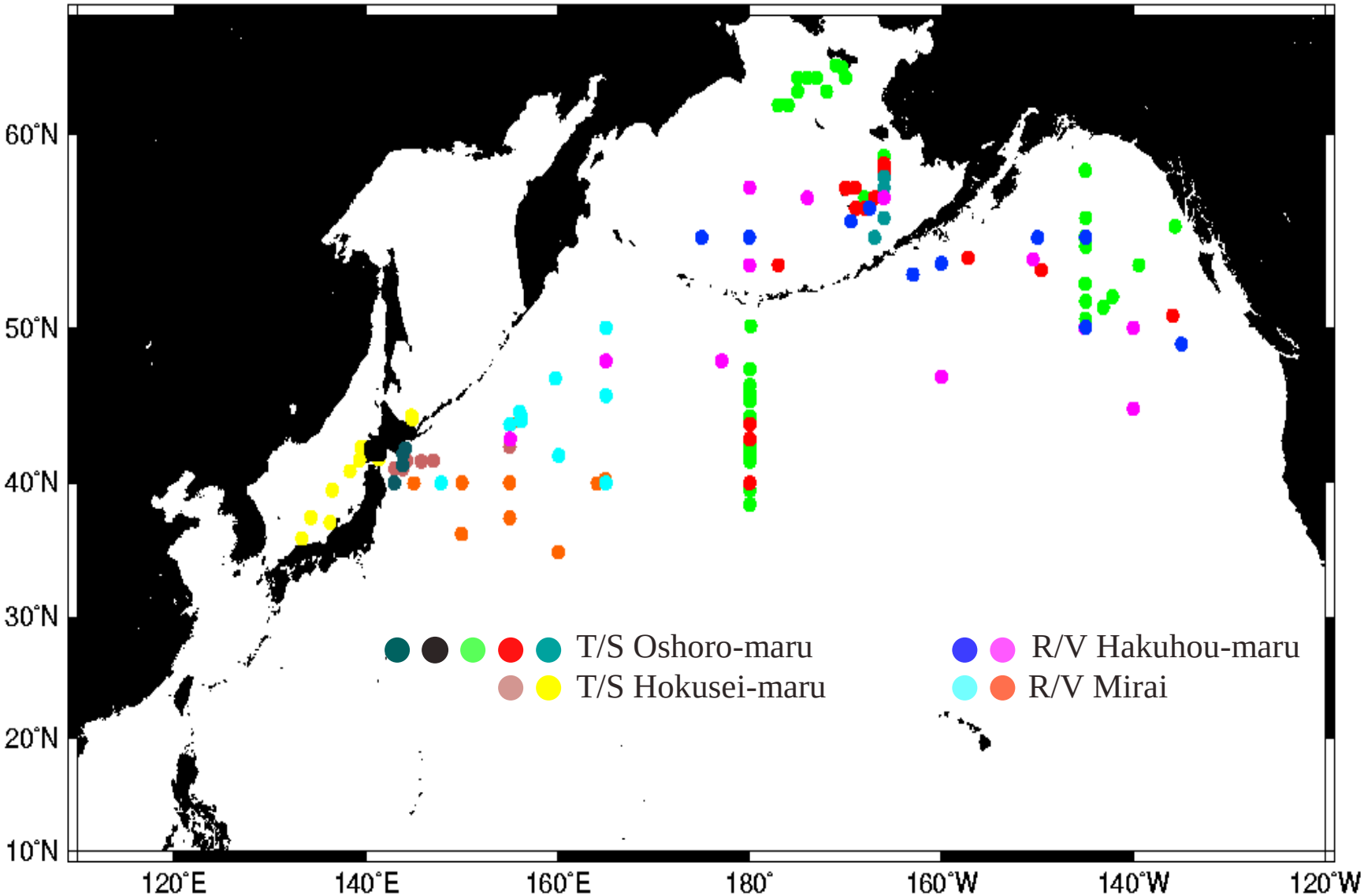


Other Possible Data Sources

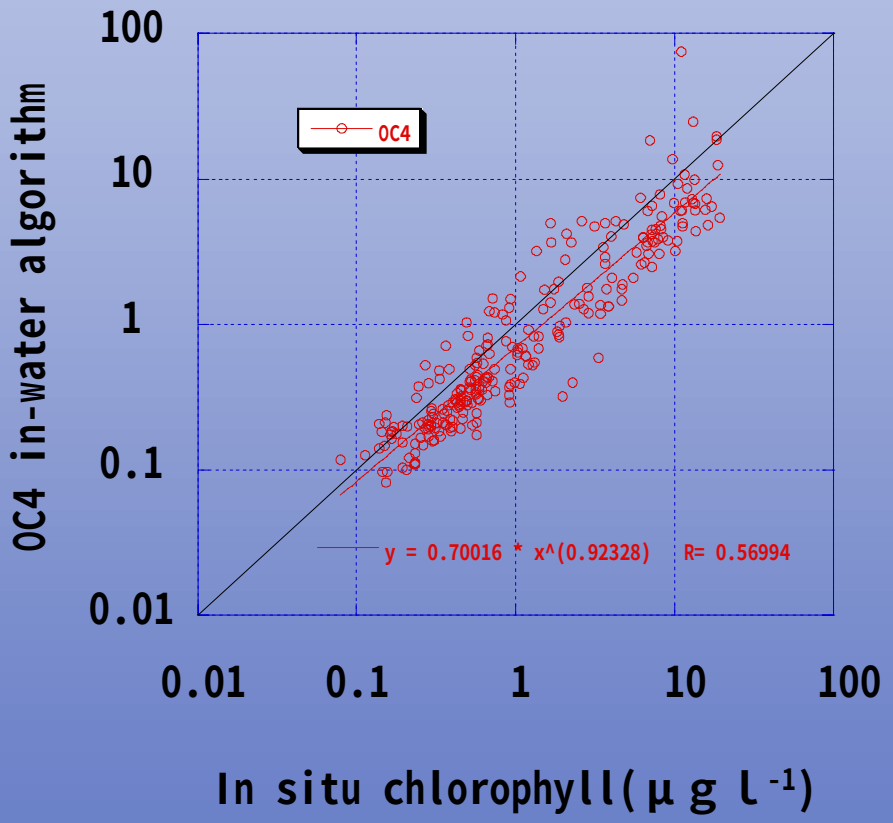
- NASA SIMBIOS (McClain)
- Research Institutes of Fisheries Agency
- Japan Fisheries Information Center
- Other International and National Collaborations

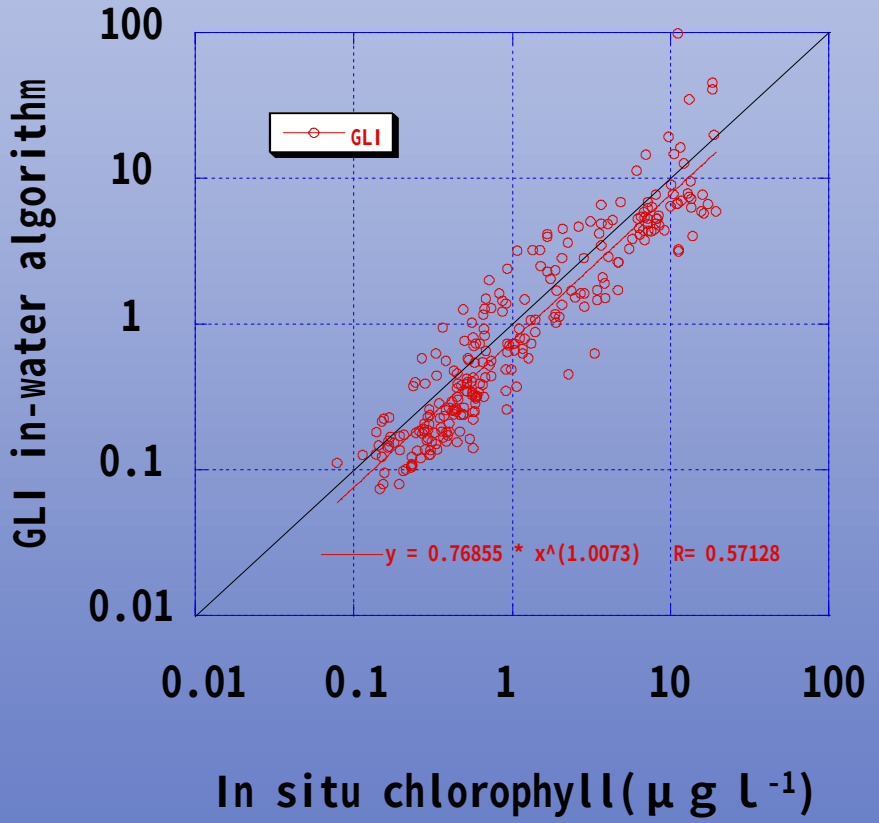


Bio-Optical Sampling Location by Hokkaido Univ. (1996-2000)

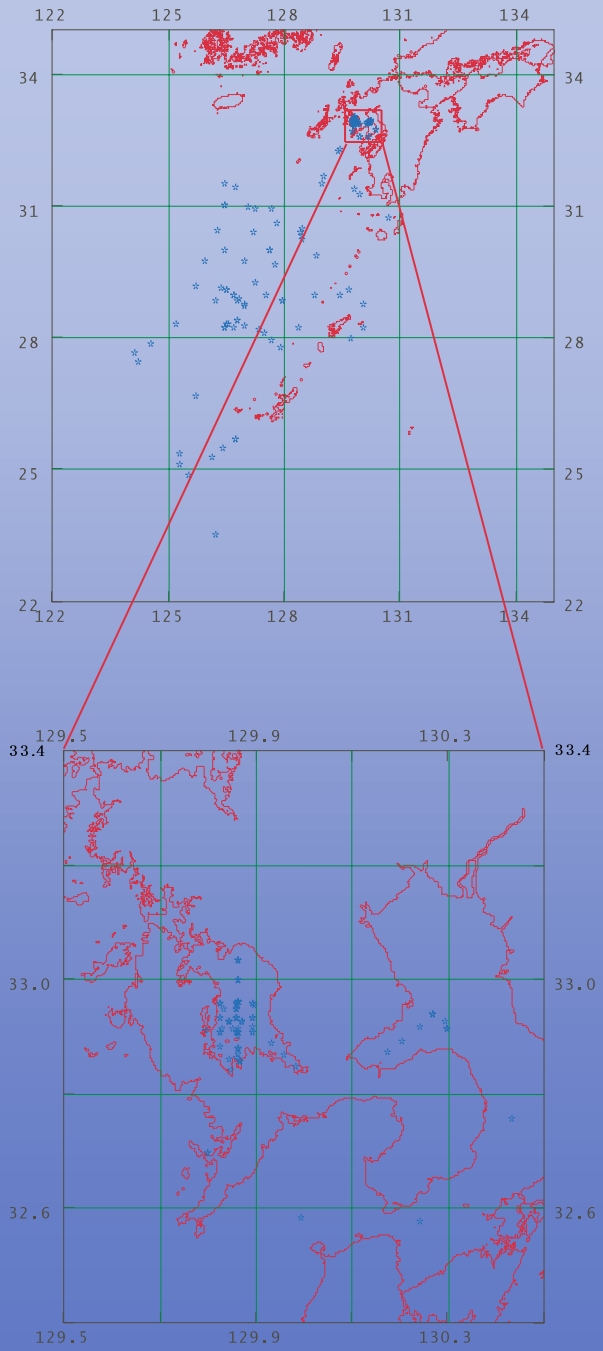


Verification of Chlorophyll-a In-Water Algorithms



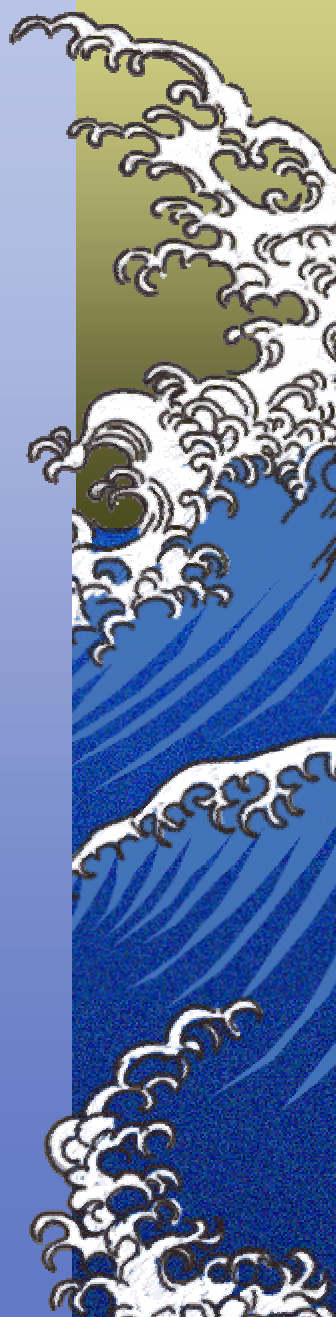


Bio-Optical Sampling Location by Nagasaki University

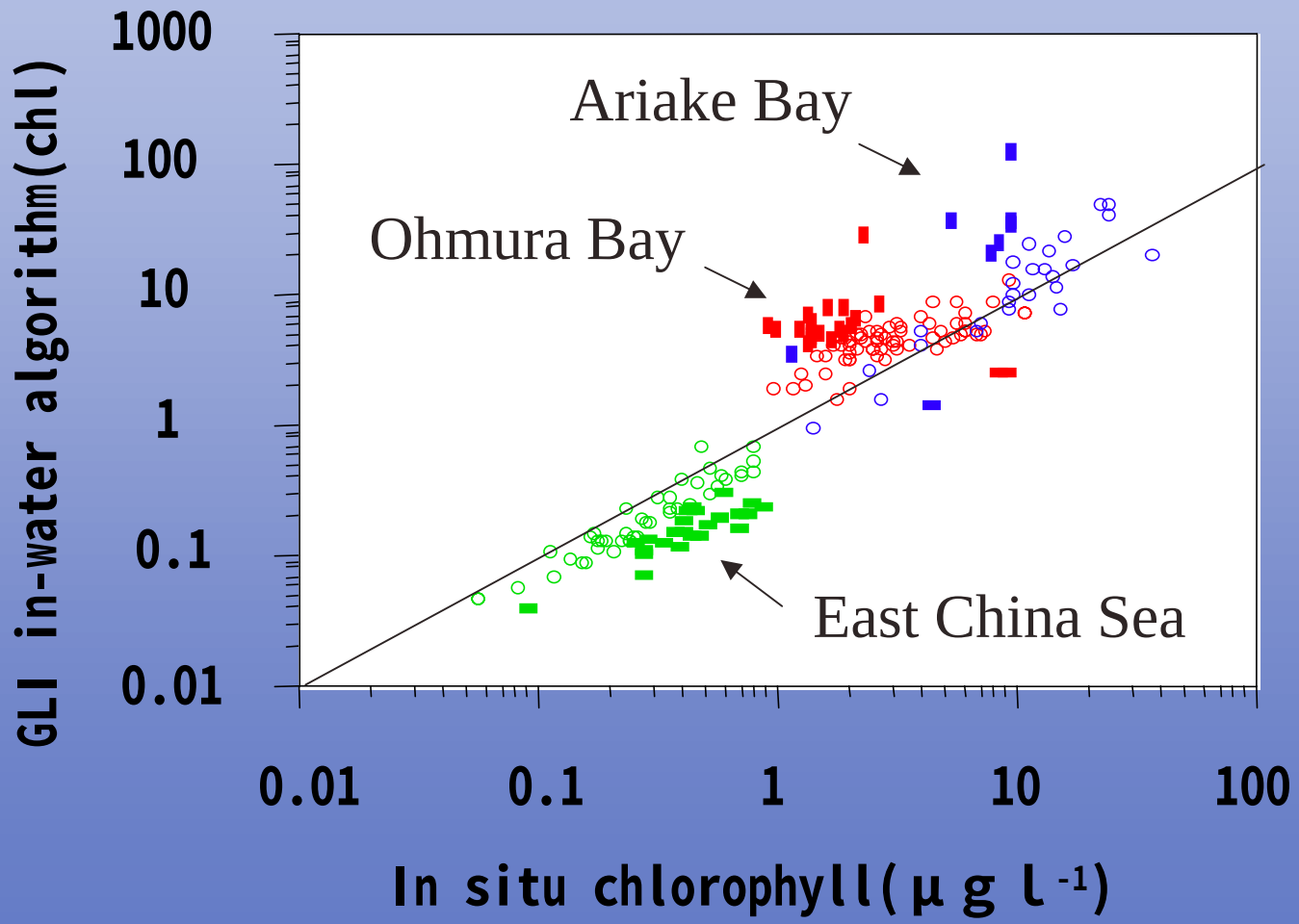


Ariake Bay (Red Tide)

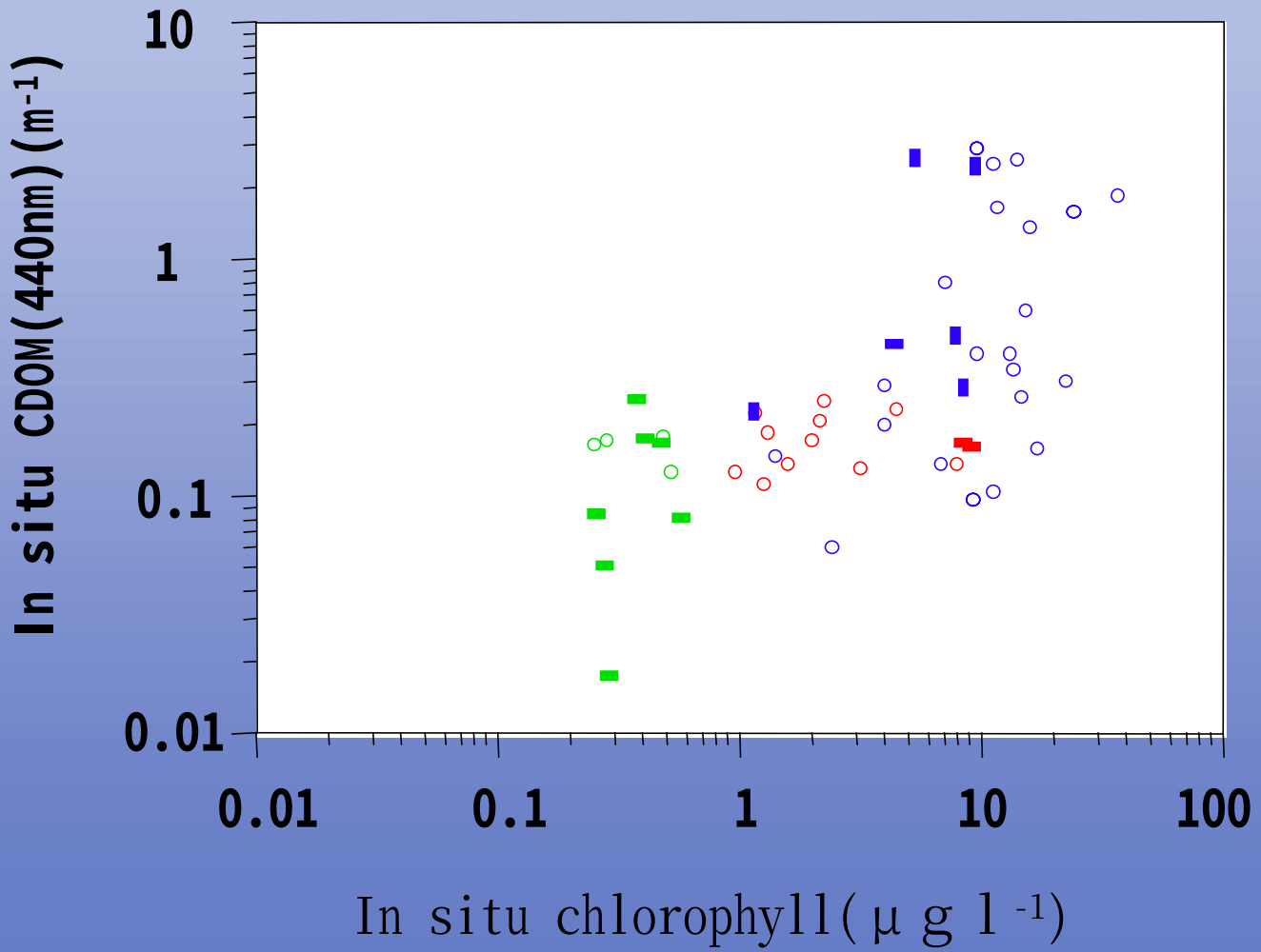
Reclam
Ar



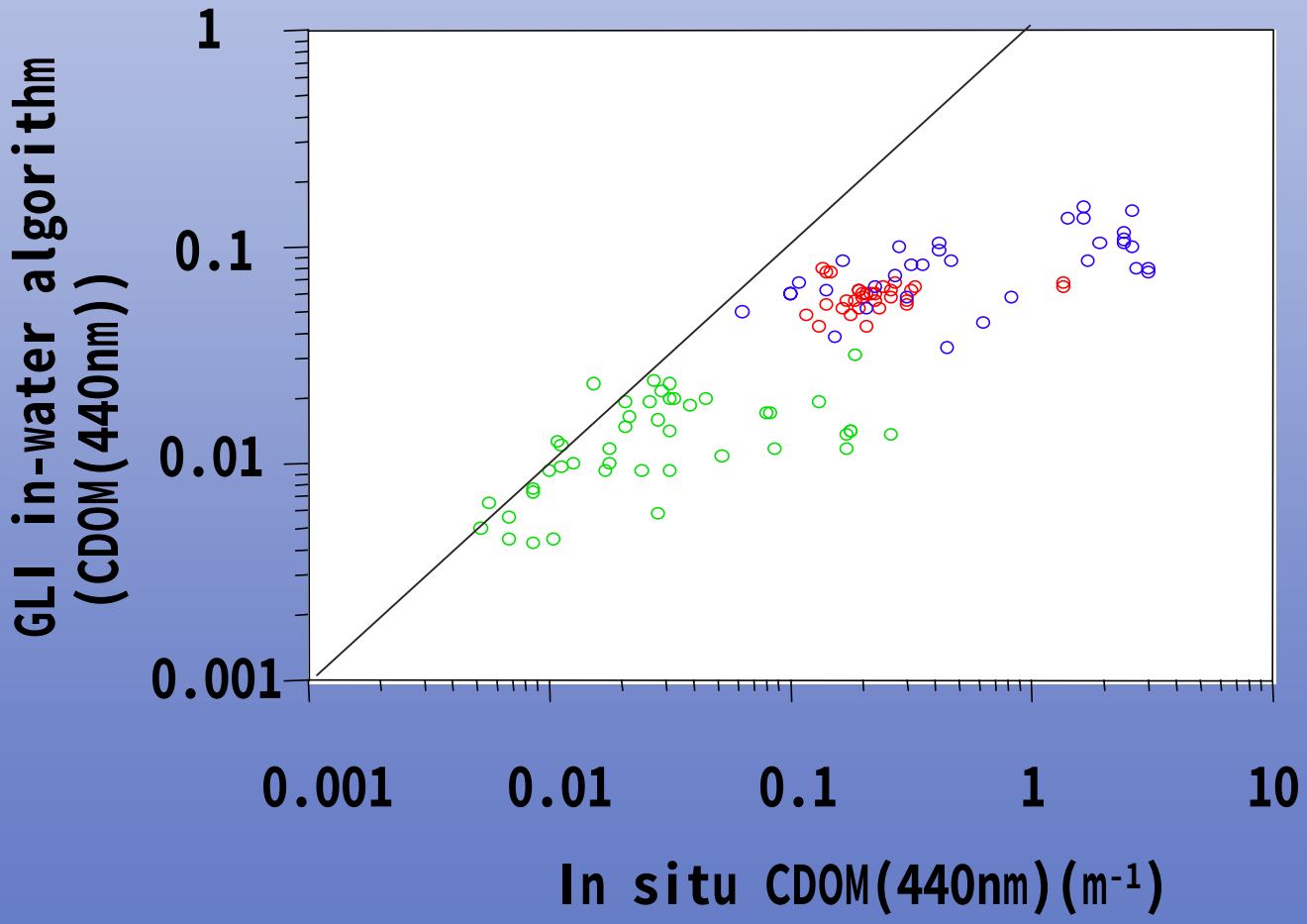
Verification of Chlorophyll-a In-Water Algorithms



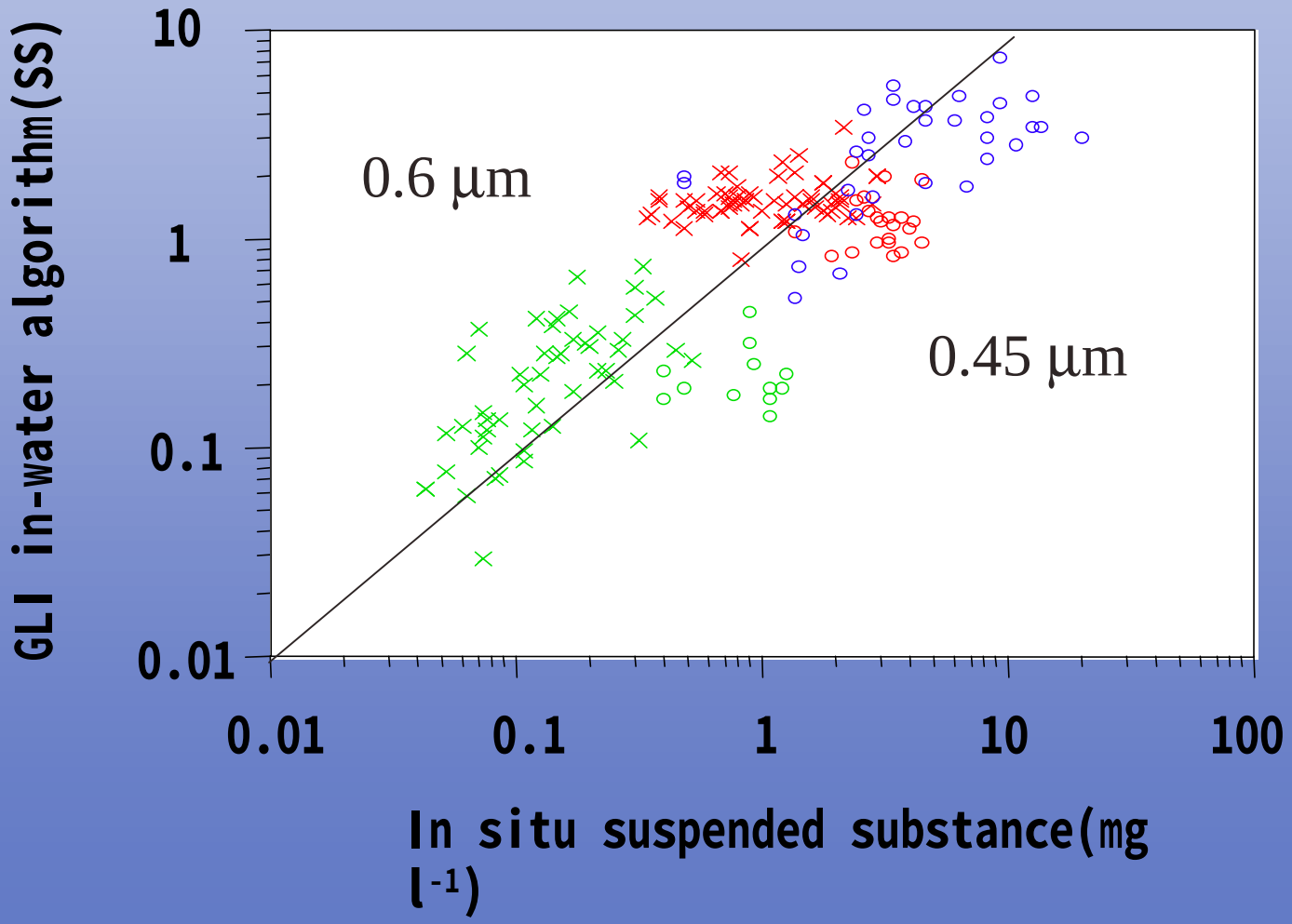
CDOM(440)-CHL


10
1
0.1
0.01
In situ CDOM(440nm)(m-1)
0.01
0.1
1
10
100
In situ chlorophyll(μg l-1)

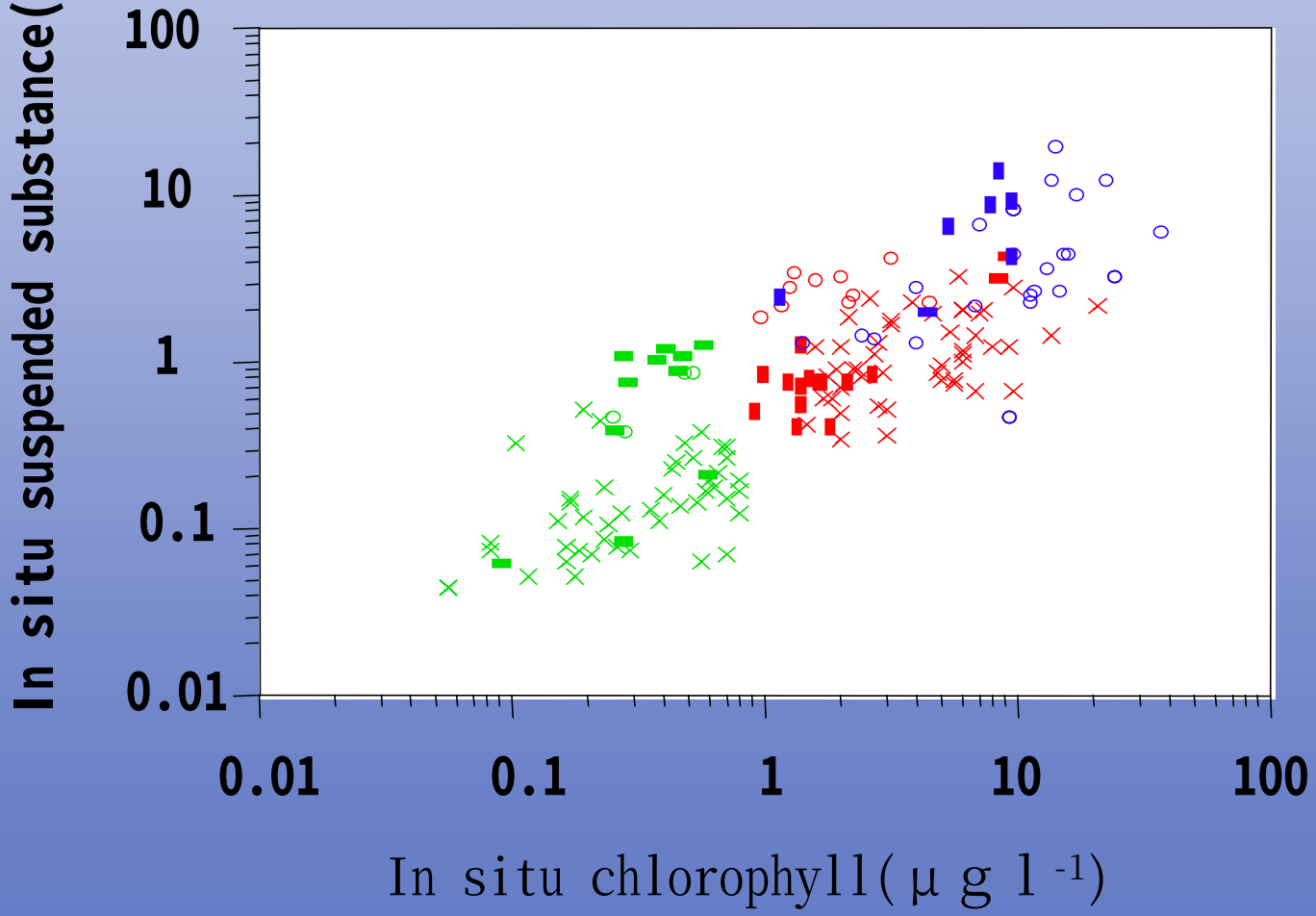
Verification of CDOM(440) In-Water Algorithms



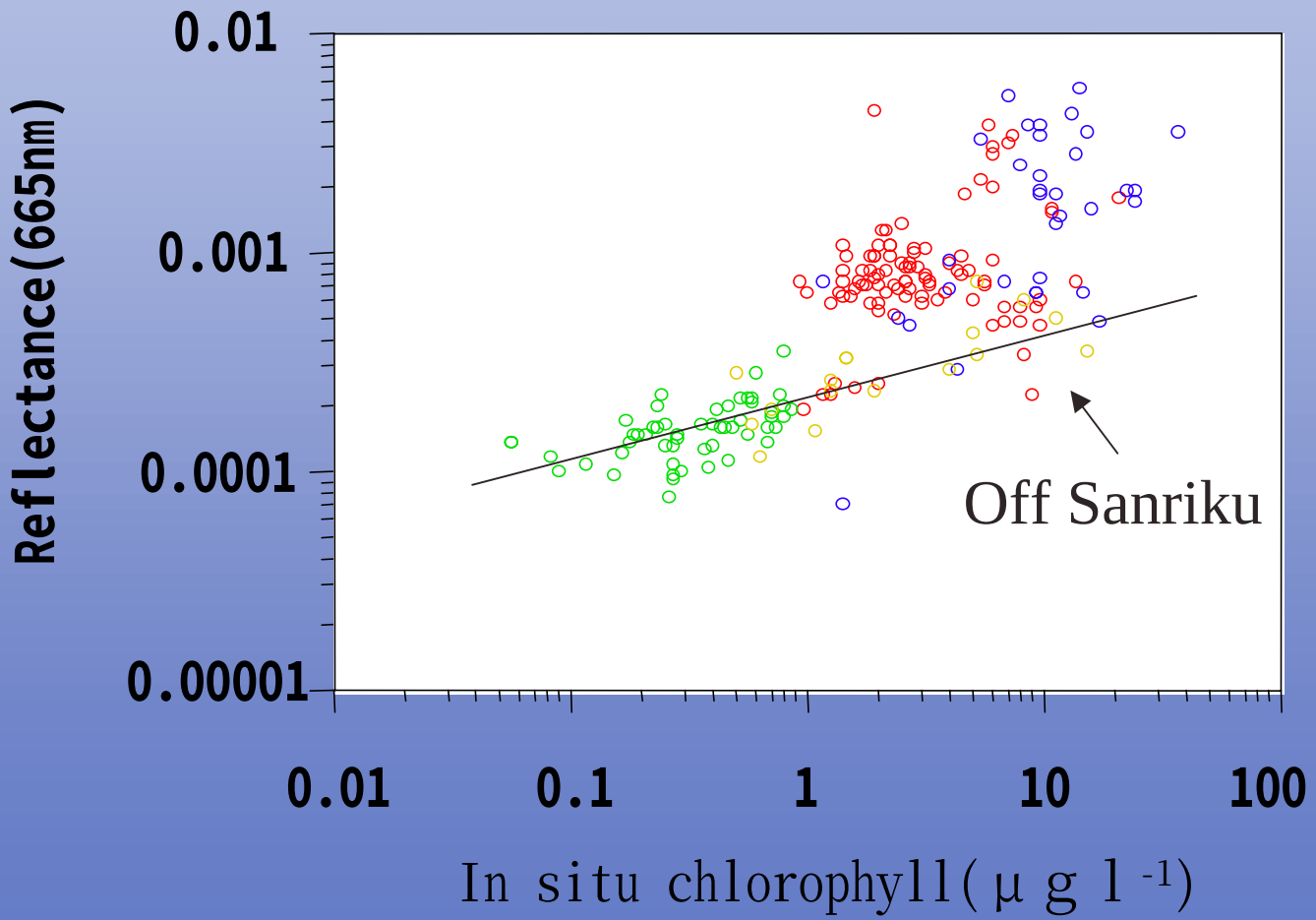
Verification of SS In-Water Algorithms



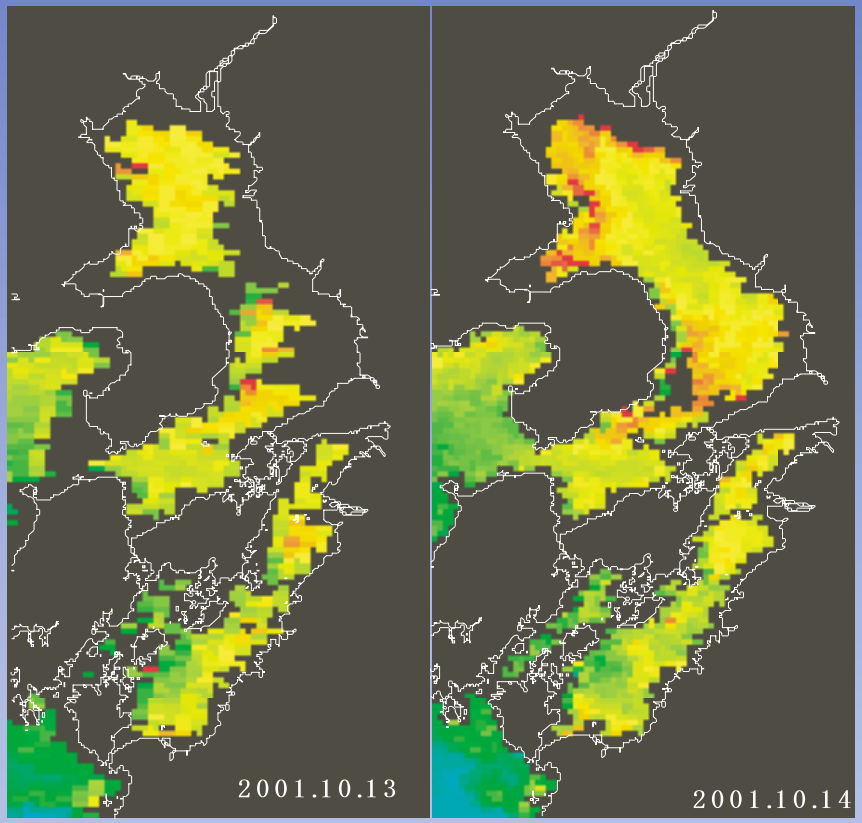
SS-CHL


In situ suspended substance(mg l-1)
100
10
1
0.1
0.01
0.01
0.1
1
10
100
In situ chlorophyll(μg l-1)

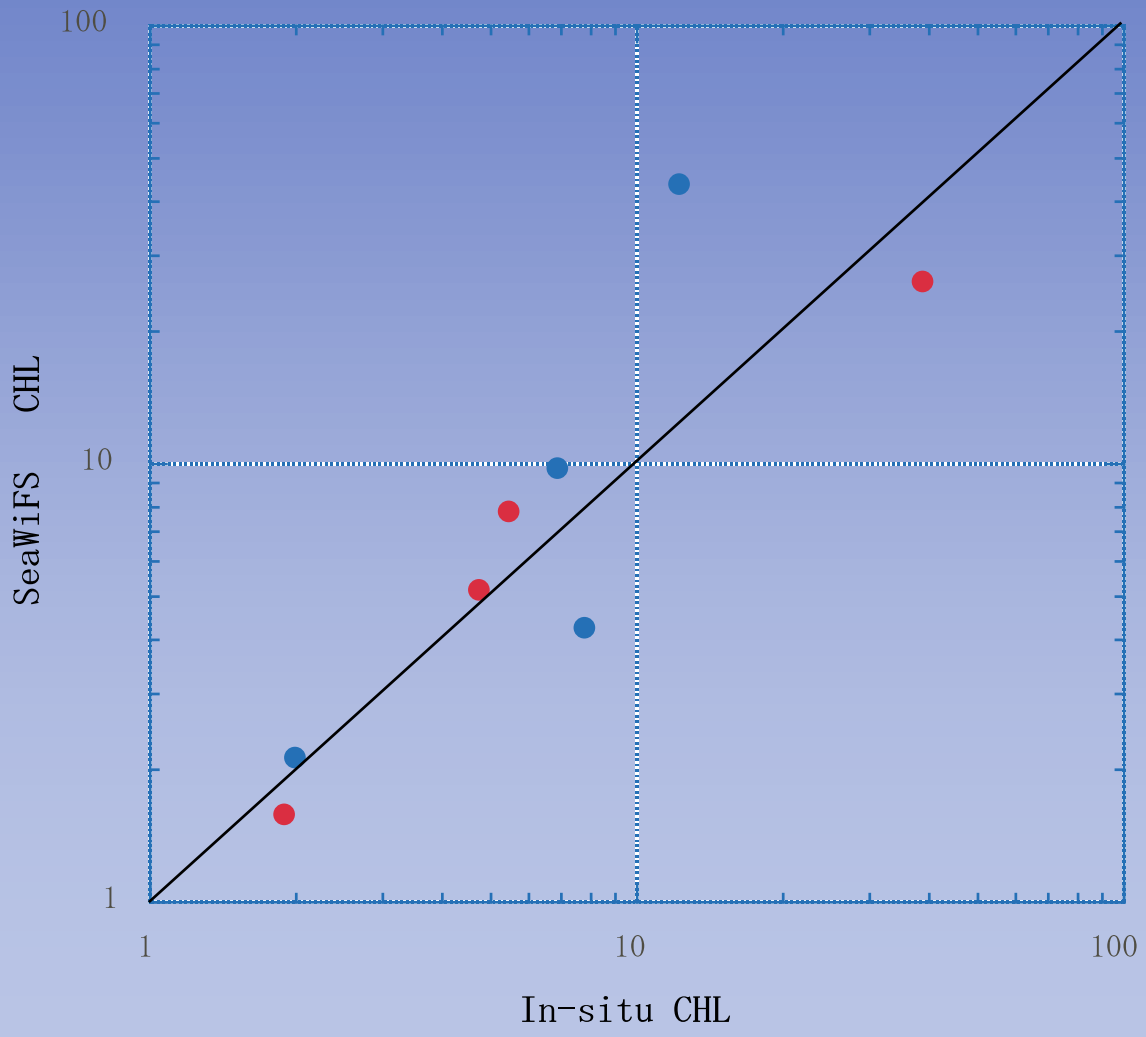
R(665)-CHL


0.01
0.001
0.0001
0.00001
Reflectance(665nm)
0.01
0.1
1
10
100
In situ chlorophyll(μg l-1)
Off Sanriku

SeaWIFS



SeaWiFS-In situ CHL (Ariake)



Ariake Ferry

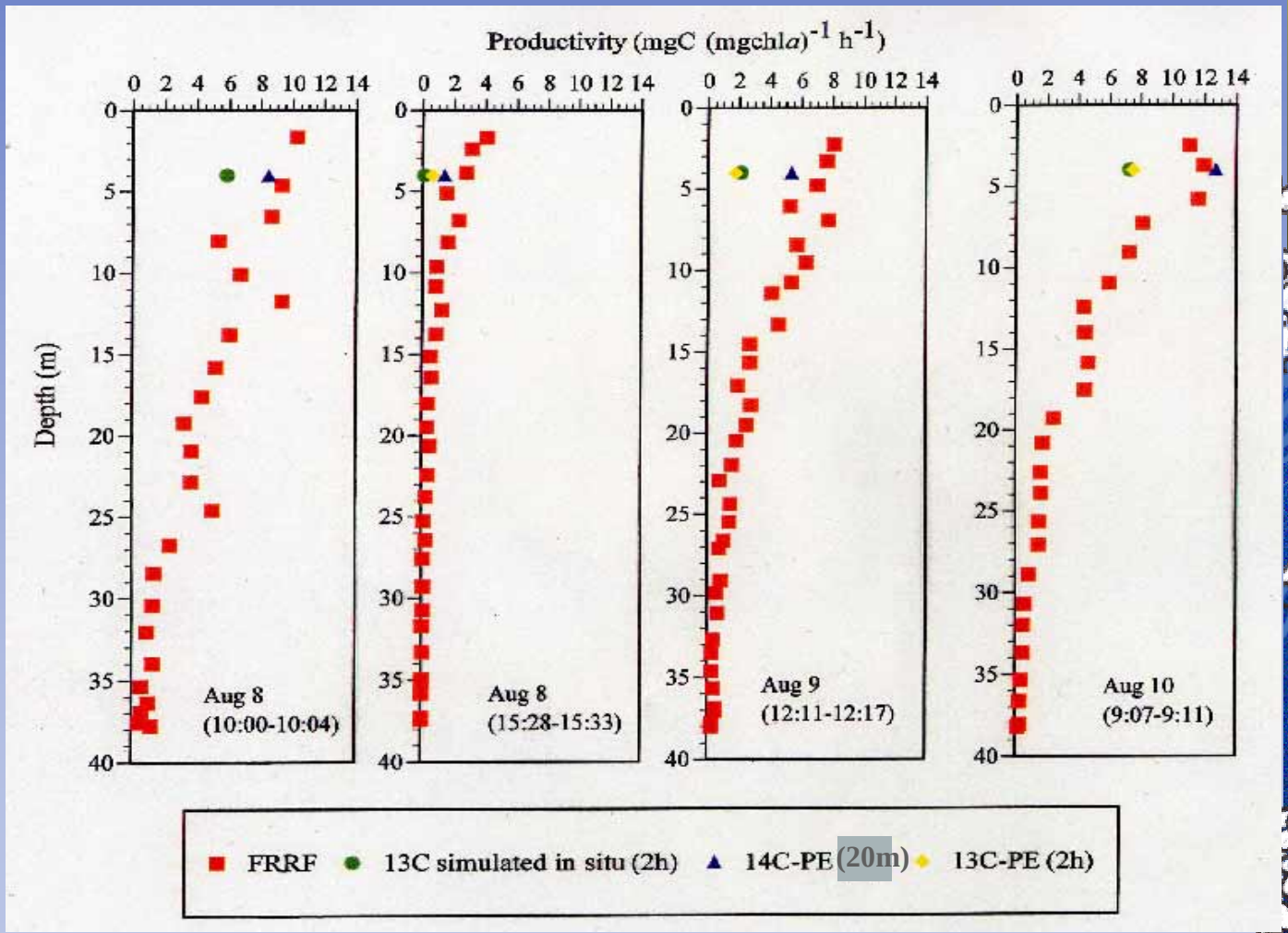
Ariake Ferry

Ariake Ferry

CREST Buoy

CREST Buoy

FRRF-C13,C14


Productivity (mgC (mgchla)$^{-1}$ h^{-1})
Depth (m)
0 2 4 6 8 10 12 14
0 5 10 15 20 25 30 35 40
Aug 8
(10:00-10:04)
Aug 8
(15:28-15:33)
Aug 9
(12:11-12:17)
Aug 10
(9:07-9:11)
FRRF
13C simulated in situ (2h)
14C-PE (20m)
13C-PE (2h)

Some Discussion Items during this Workshop

- *End-to-End Test*
- *Coordination of International Activities,*
  - *Initialization and Field Campaign*
- *Collaboration with Atmospheric Group*
- *Above Water Measurements*
- *Use of 250m Data*
- *Asian I-LAC Plan*