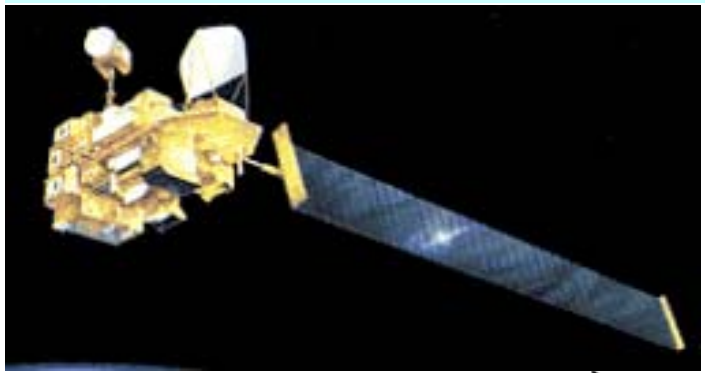
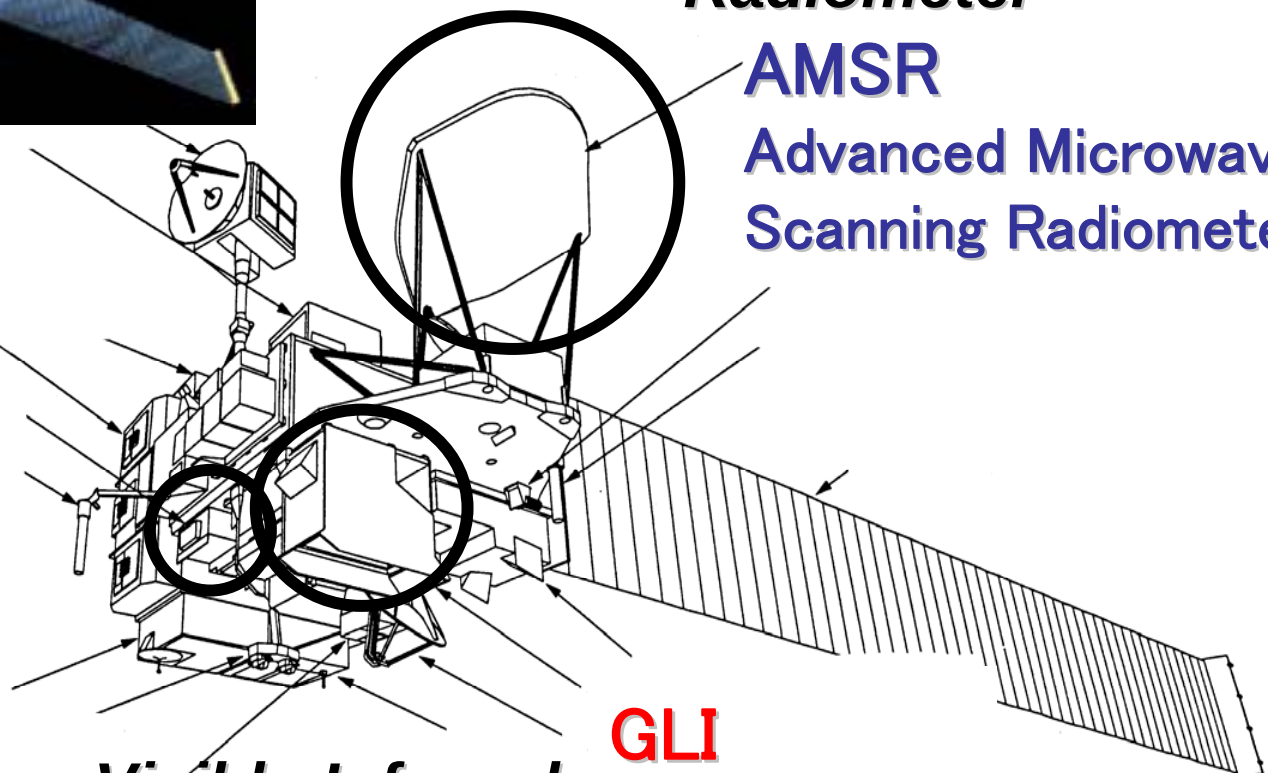
ADEOS-IIミッションと海洋学・海洋気象学
(ADEOS-II Mission and Oceanography/Marine Meteorology)

川村 宏
(東北大学大気海洋変動観測研究センター 教授)
Hiroshi Kawamura
(Tohoku University, Center for Atmospheric and Oceanic Studies, Professor)

ADEOS-II for Ocean Science
Three Ocean Sensors On One Platform !!





Microwave Radiometer

AMSR

Advanced Microwave Scanning Radiometer

Scattrometer

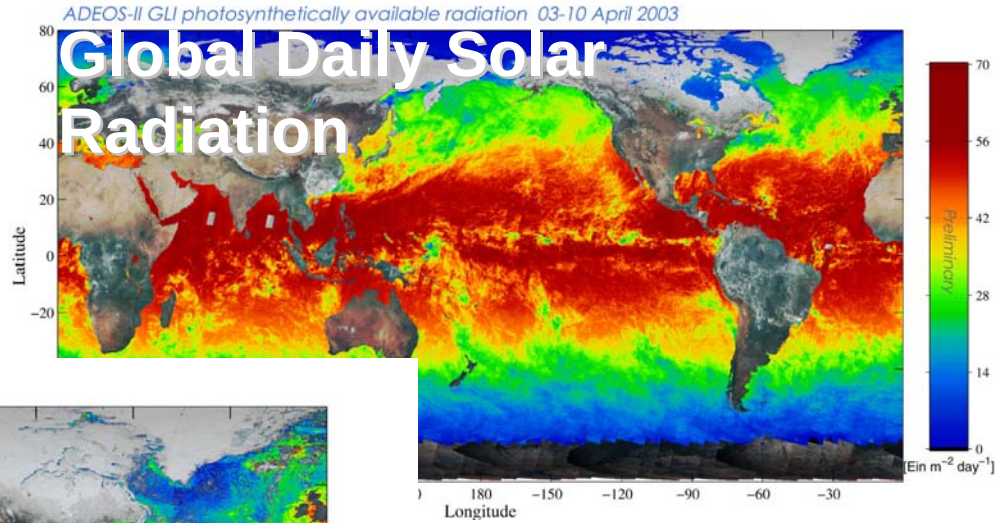
SeaWinds

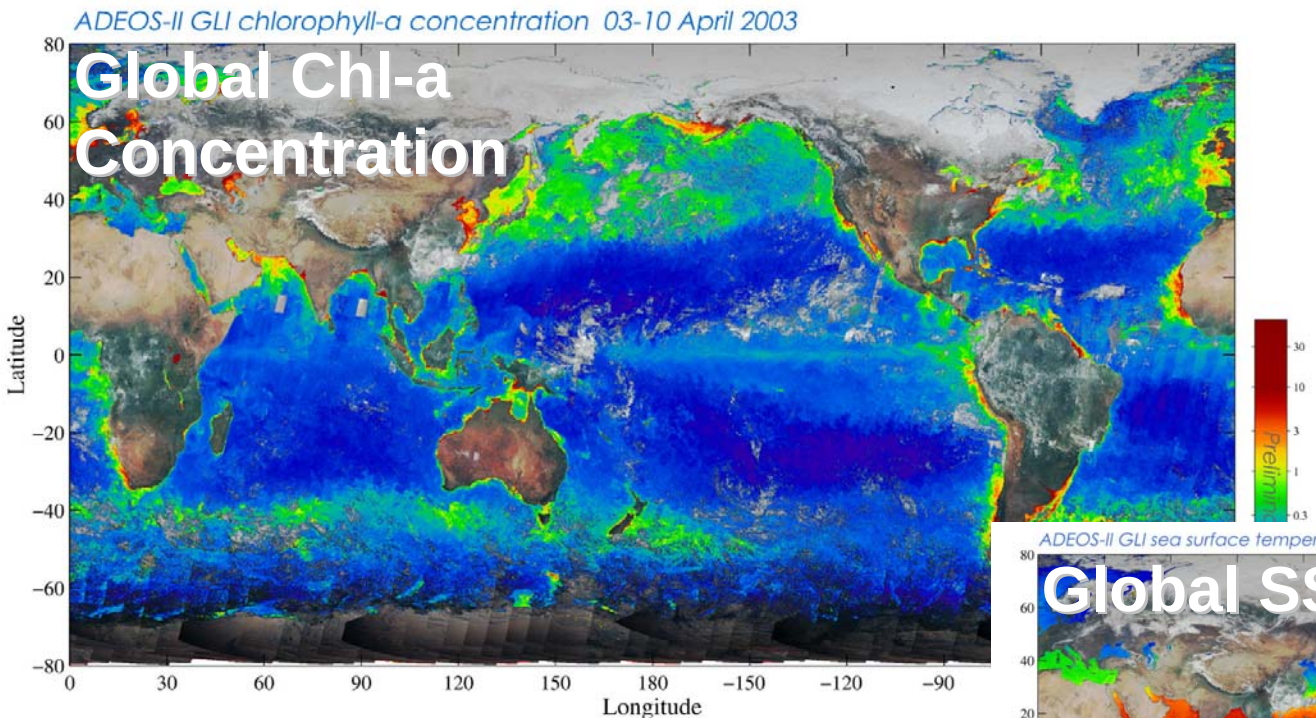
GLI

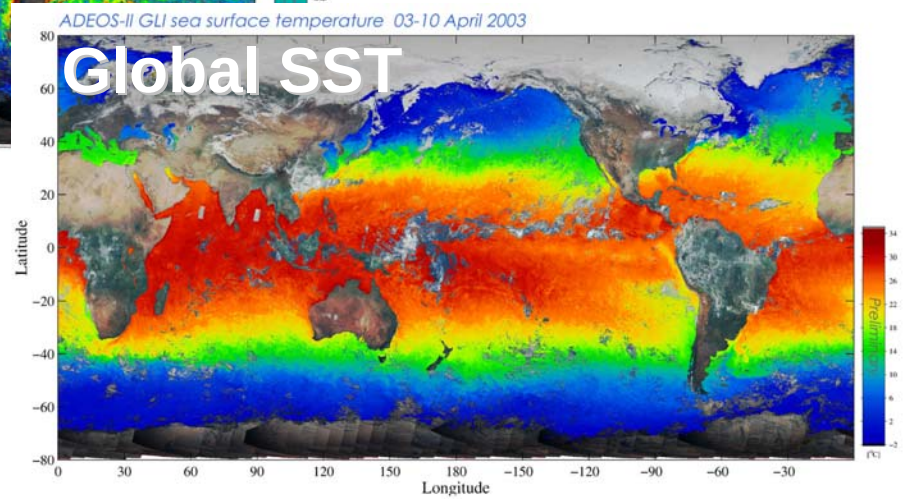
Global Imager

Visible-Infrared Radiometer

GLI
Global Ocean Products

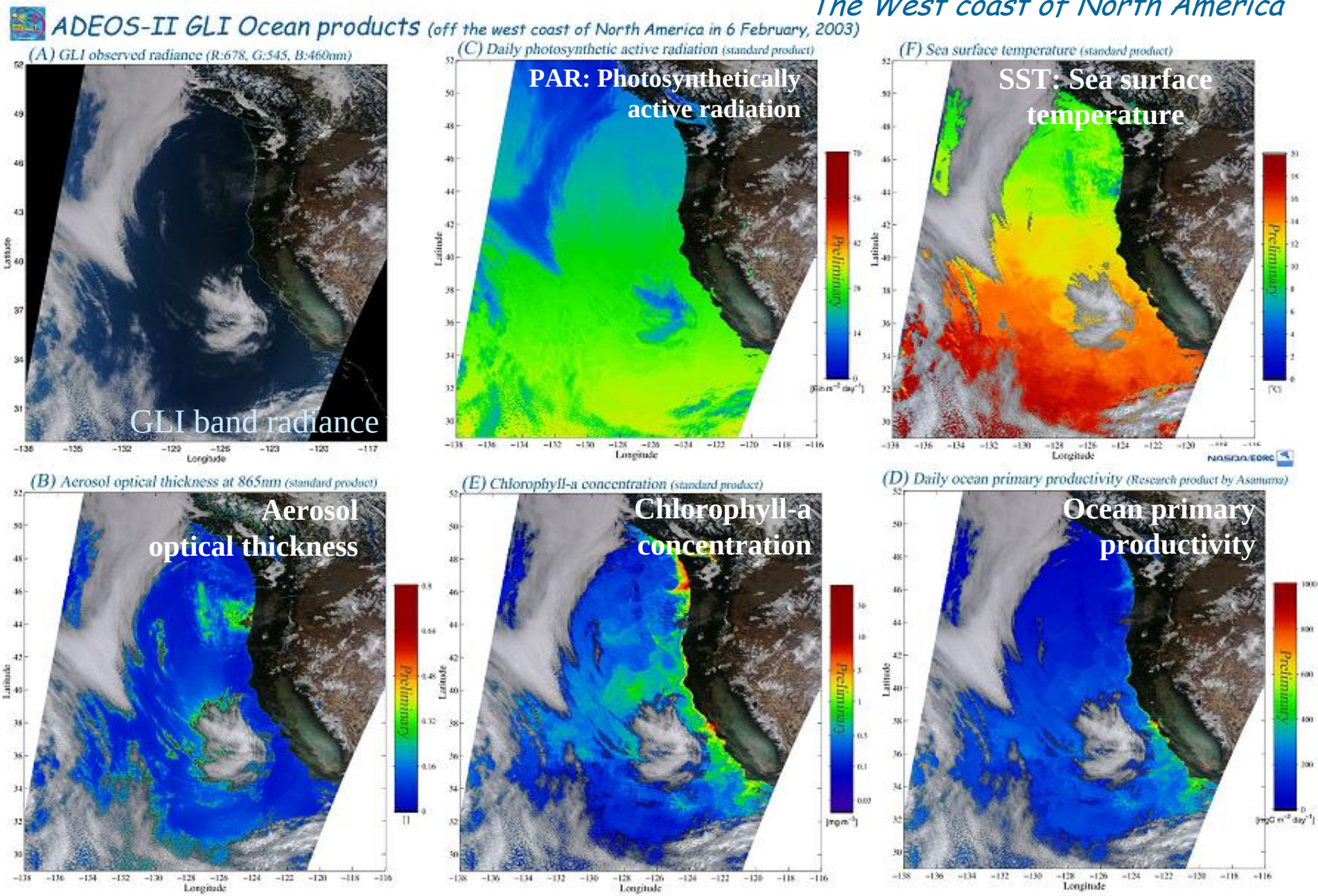






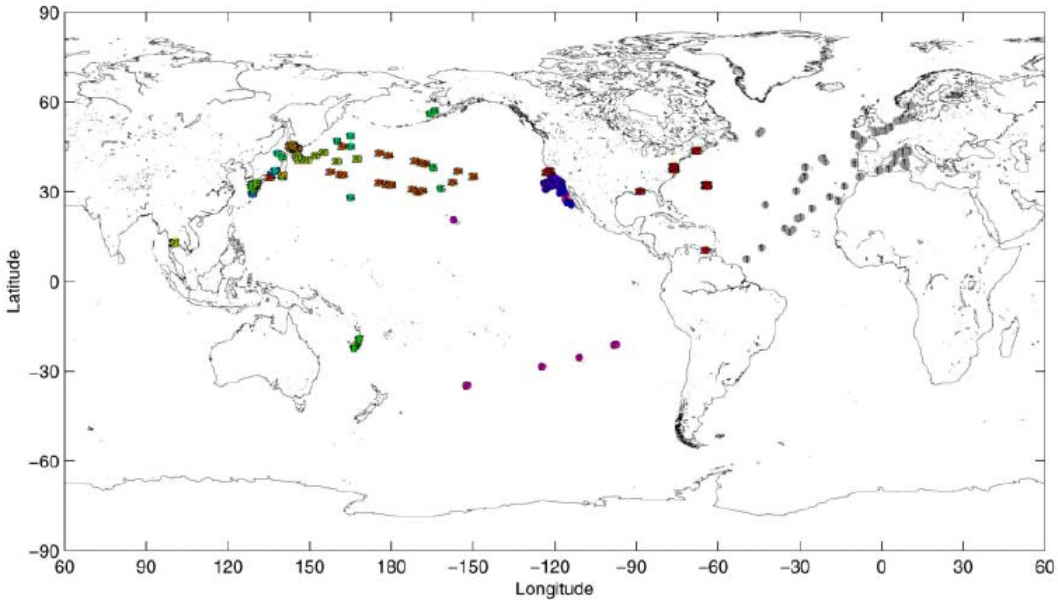
GLI ocean products for the global coastal seas

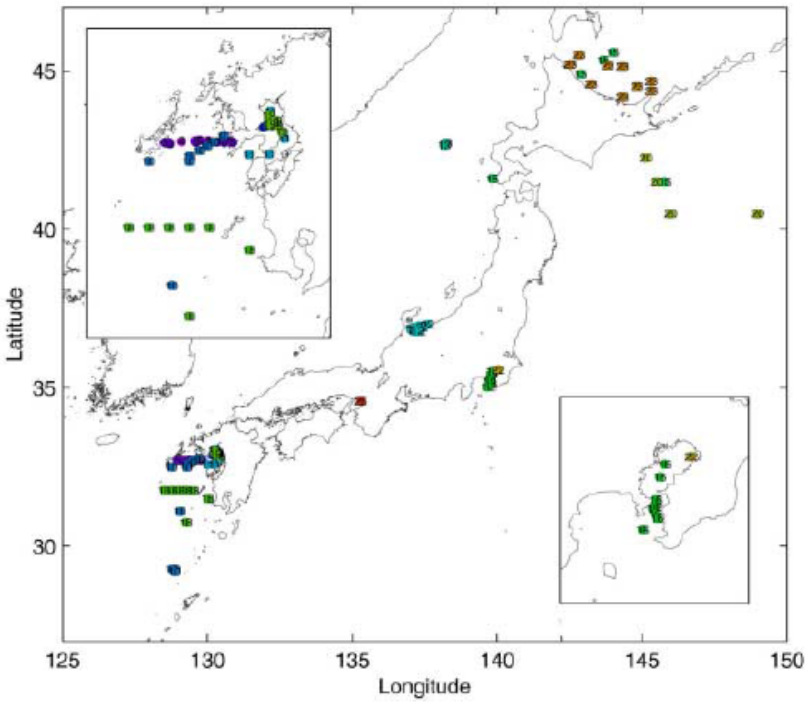
The West coast of North America

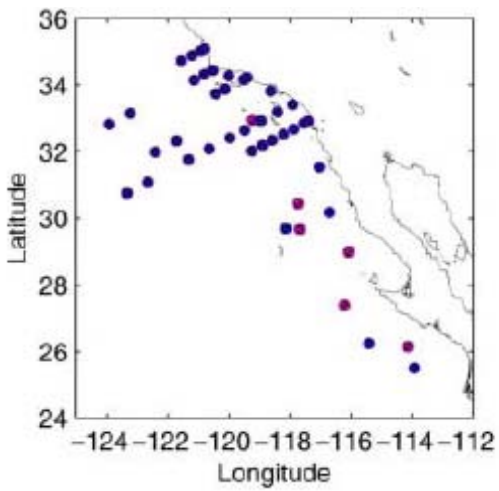


Validation of ADEOS-2 GLI ocean color products using *in-situ* Observations

By Murakami and 22 authors





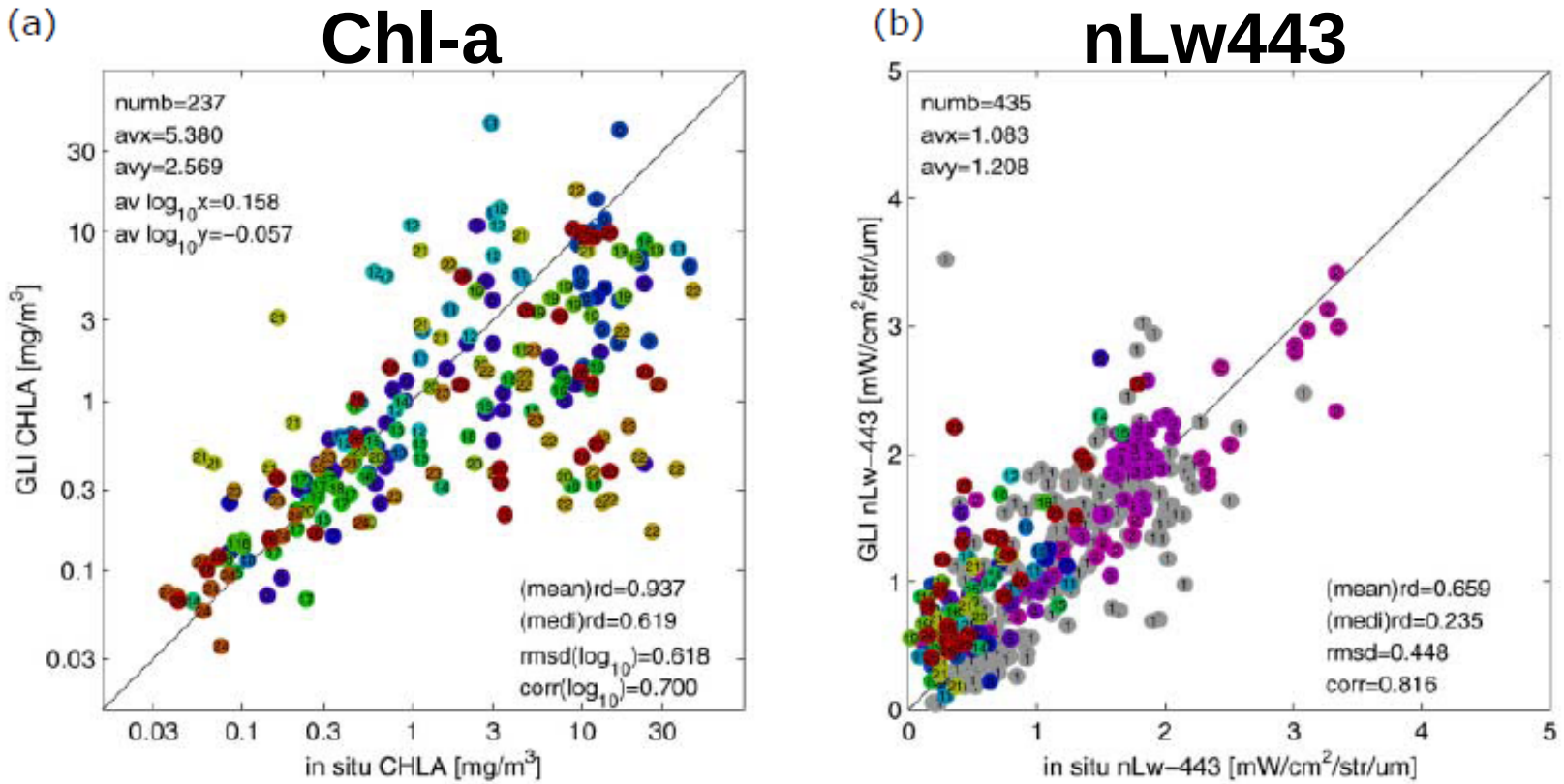


- In situ observations collected for the GLI Cal/Val

- International cooperation with scientists and institutions

Validation of ADEOS-2 GLI ocean color products using *in-situ* Observations

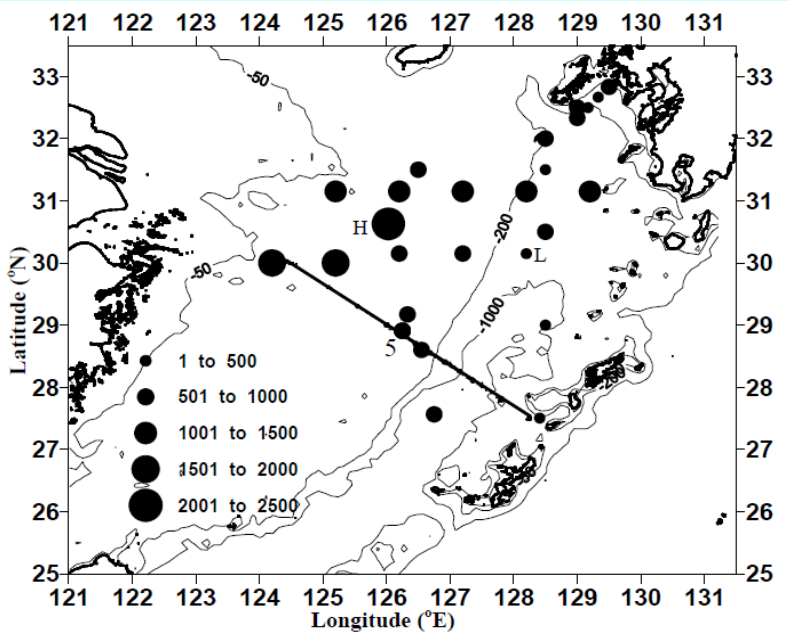
By Murakami and 22 authors



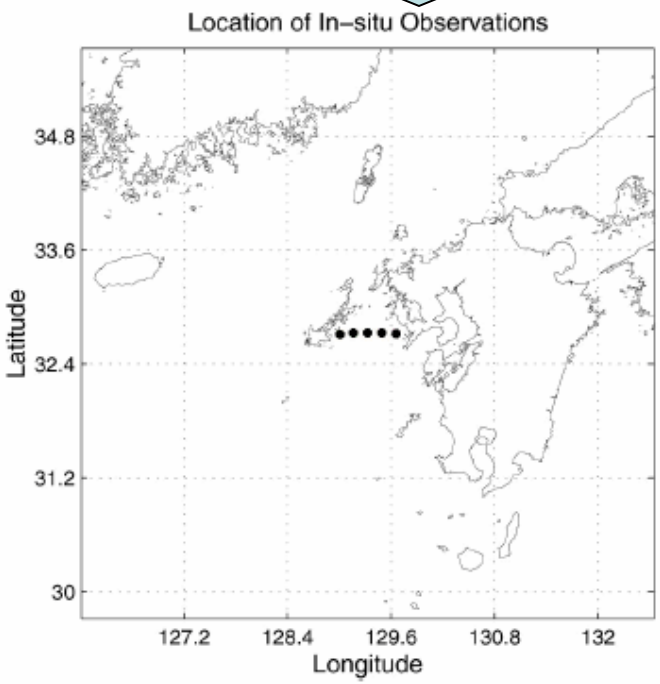
- GLI ocean products (normalized water leaving radiances and ocean parameters (e.g., Chlorophyll-a concentration) are well characterized in the global oceans

Activities for GLI Ocean Color algorithm development and product validation

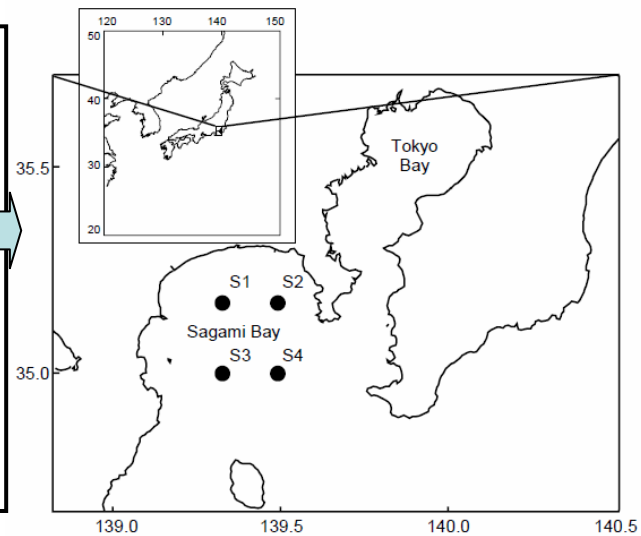
Optimal Primary Production Model and Parameterization in the Eastern East China Sea By Siswanto, Ishizaka and Yokouchi



Atmospheric correction scheme for GLI with absorptive aerosol correction
By Toratani, Fukushima, Murakami and Tanaka

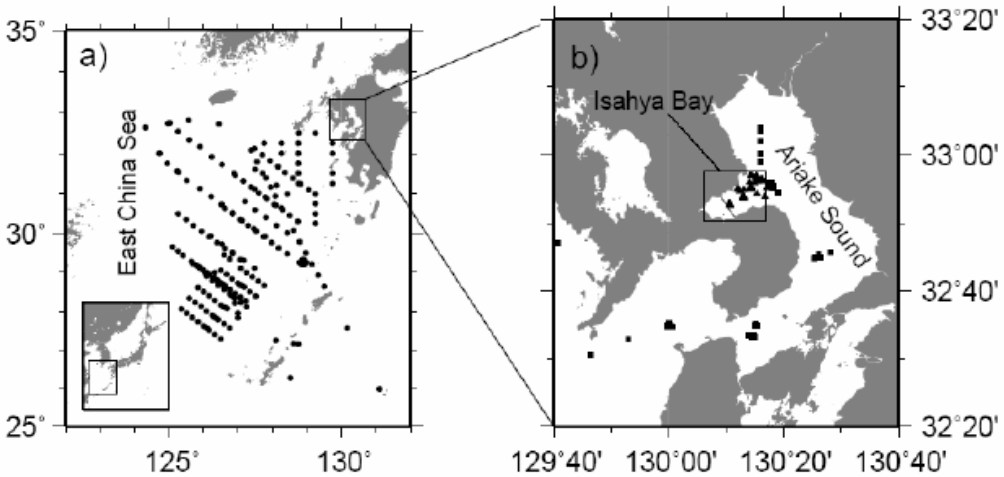


Verification of Vertically Generalized Production Model and Estimation of Primary Production in the Sagami Bay, Japan
By Ishizaka et al.

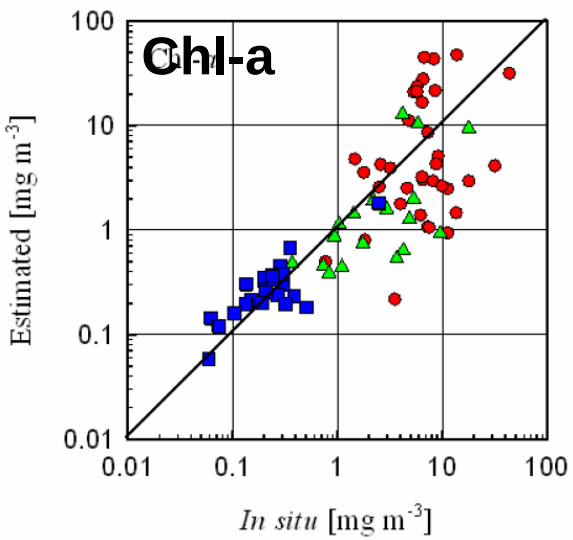


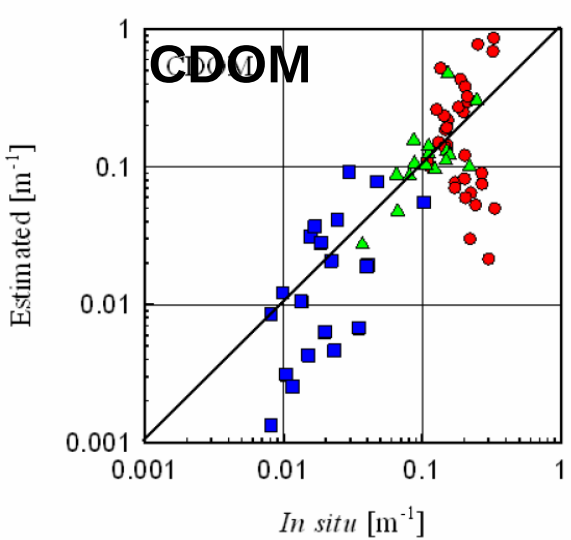
Developing an In-water Algorithm for GLI Using Neural Network Technique with Optical Model Based on Optical Properties in East China Sea, Ariake Sound and Isahaya Bay

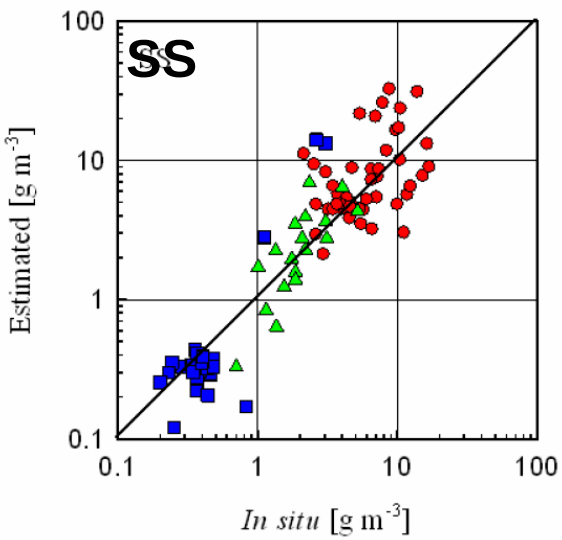
By Tanaka et al.



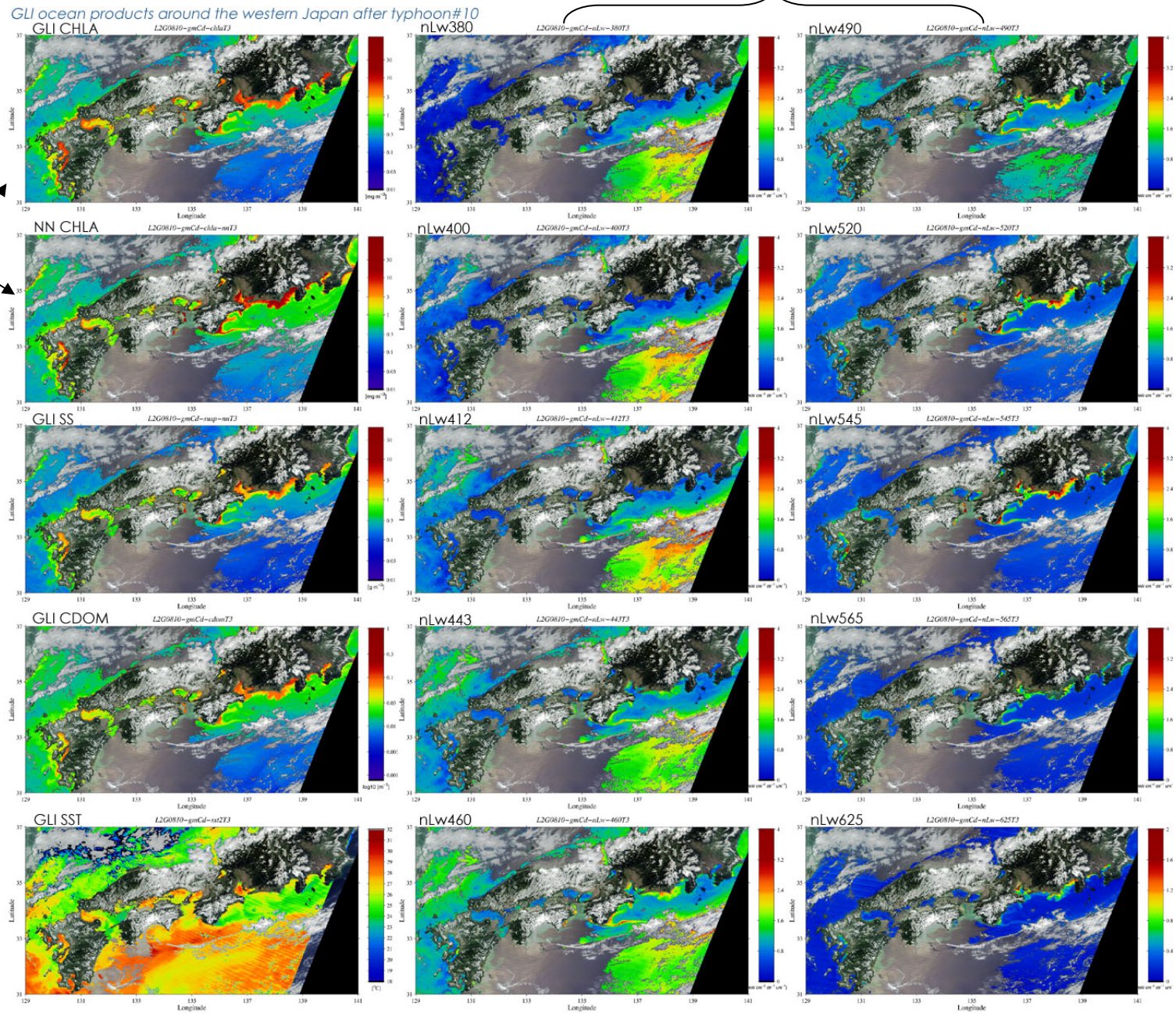
- Neural Network Based in water algorithm development
- NN trained by the intensive in situ observations





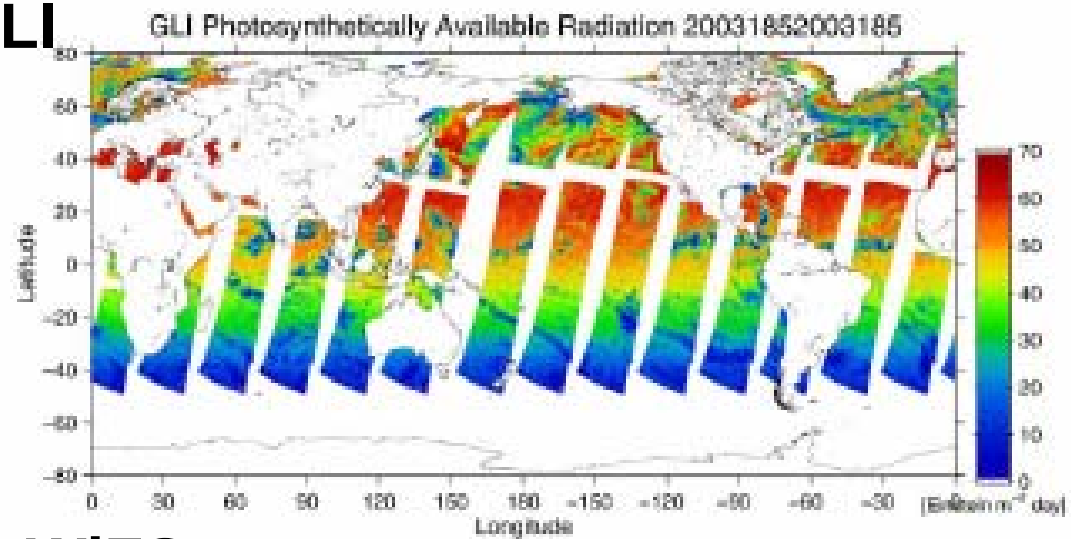


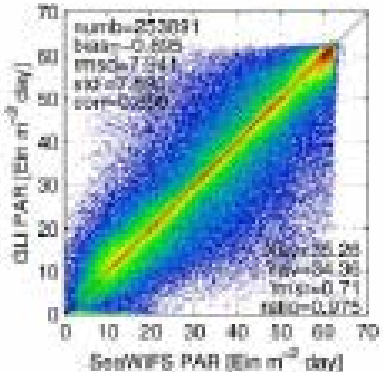
GLI product on 10 August 2003



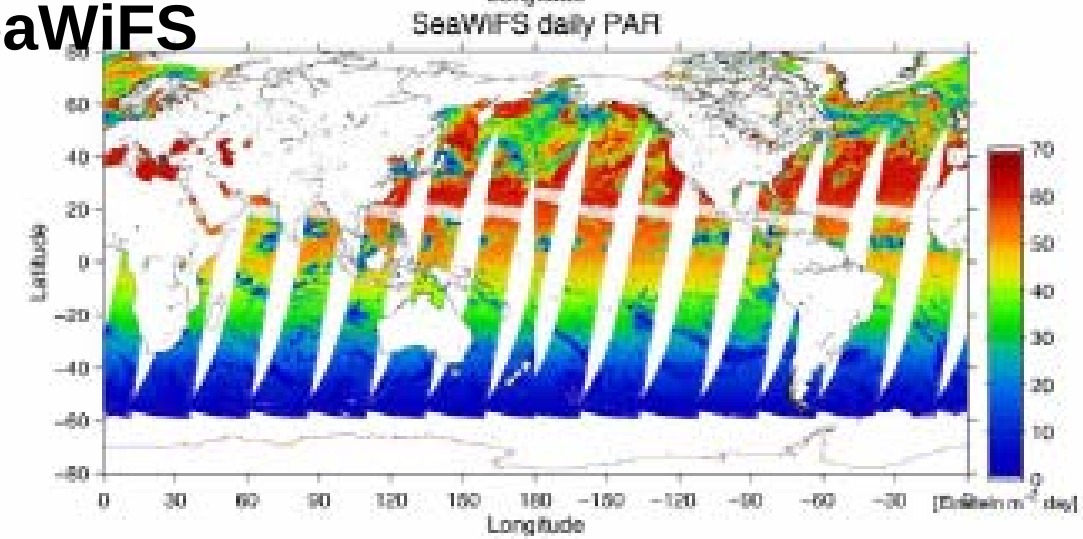
Estimating Photosynthetically Available Radiation at the Ocean Surface from ADEOS-II Global Imager Data by *Frouin and Murakami*

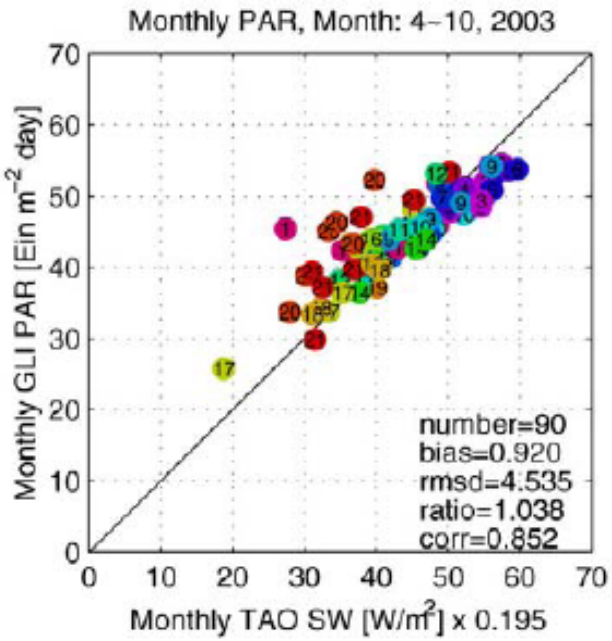
GLI



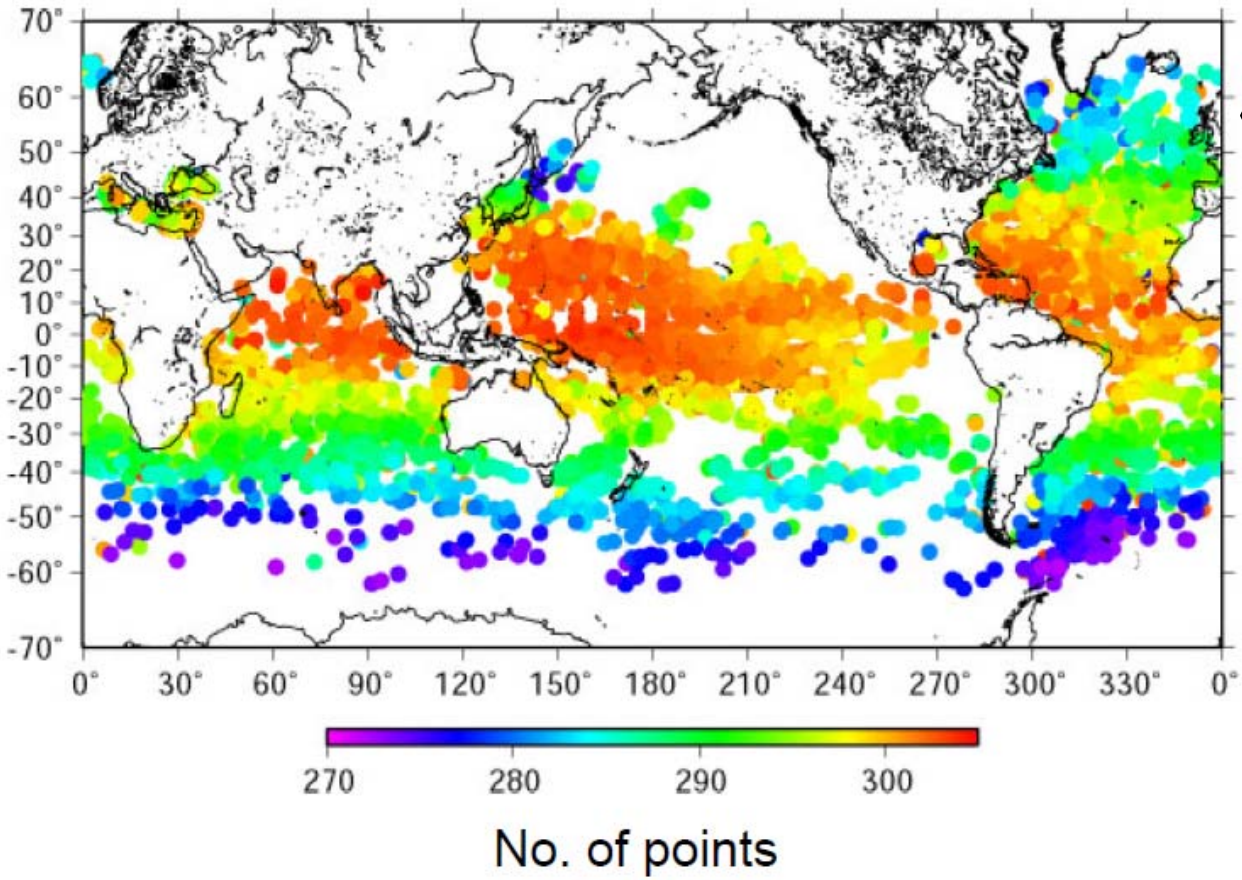


SeaWiFS



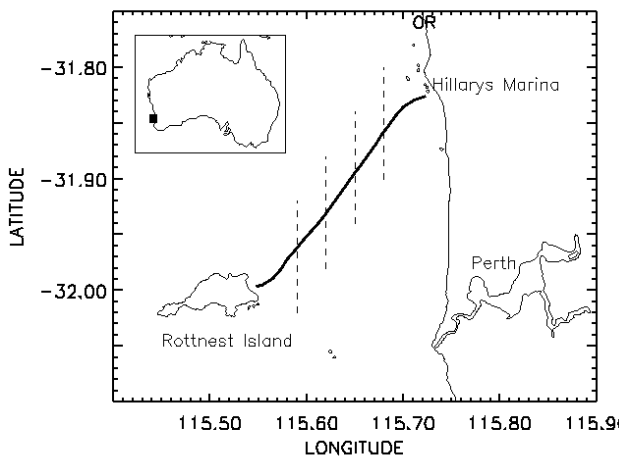


Activities for GLI SST algorithm development and validation



Sea surface temperature observation by Global Imager (GLI)/ADEOS-II -Algorithm and accuracy of the product
By Sakaida et al.

Validation of GLI and Other Satellite-Derived Sea Surface Temperatures Using Data from the Rottnest Island Ferry, Western Australia
By Barton and Pearce



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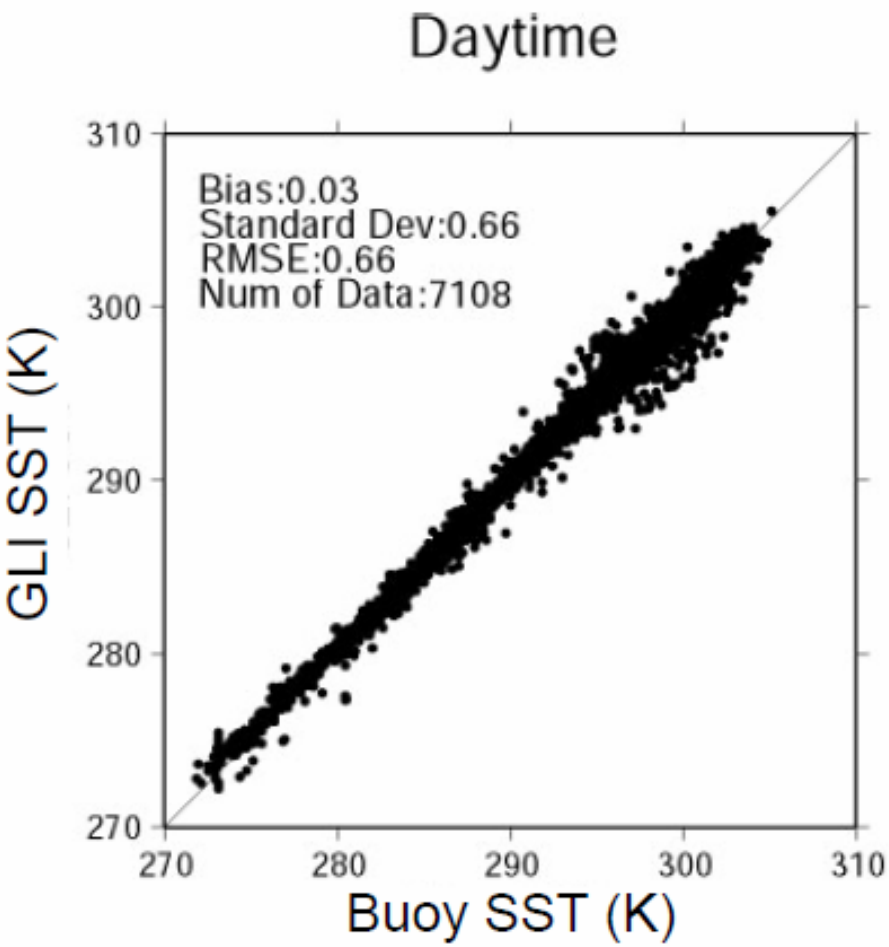
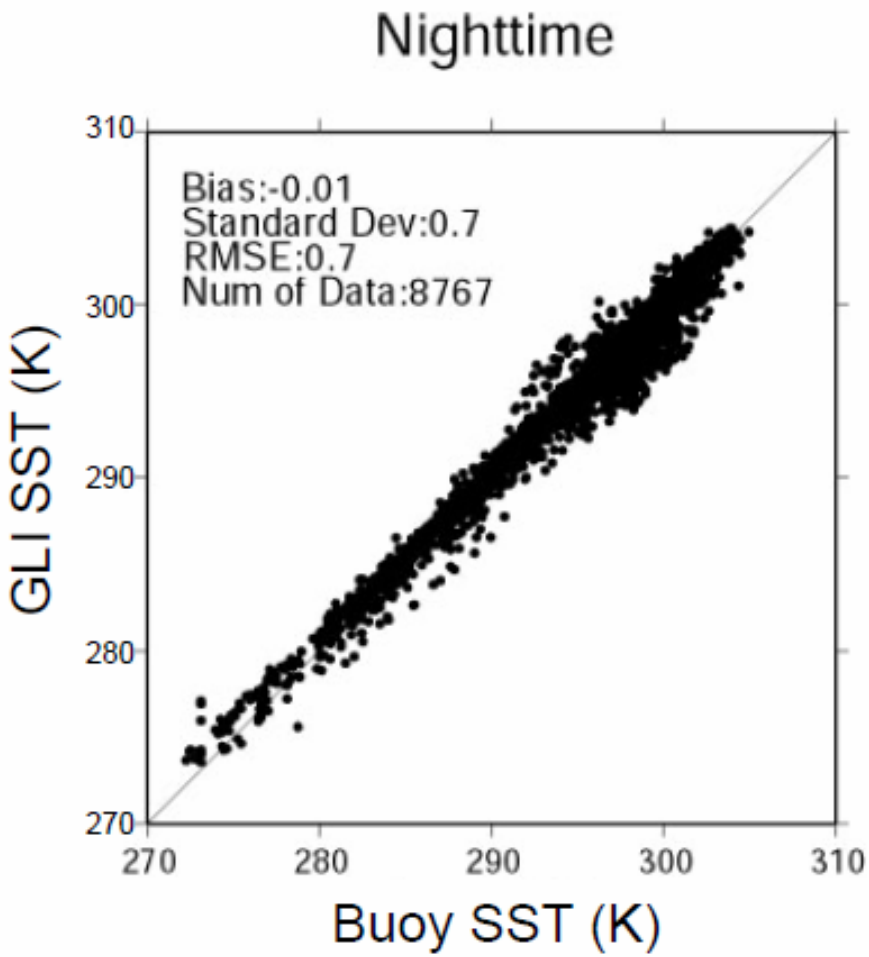
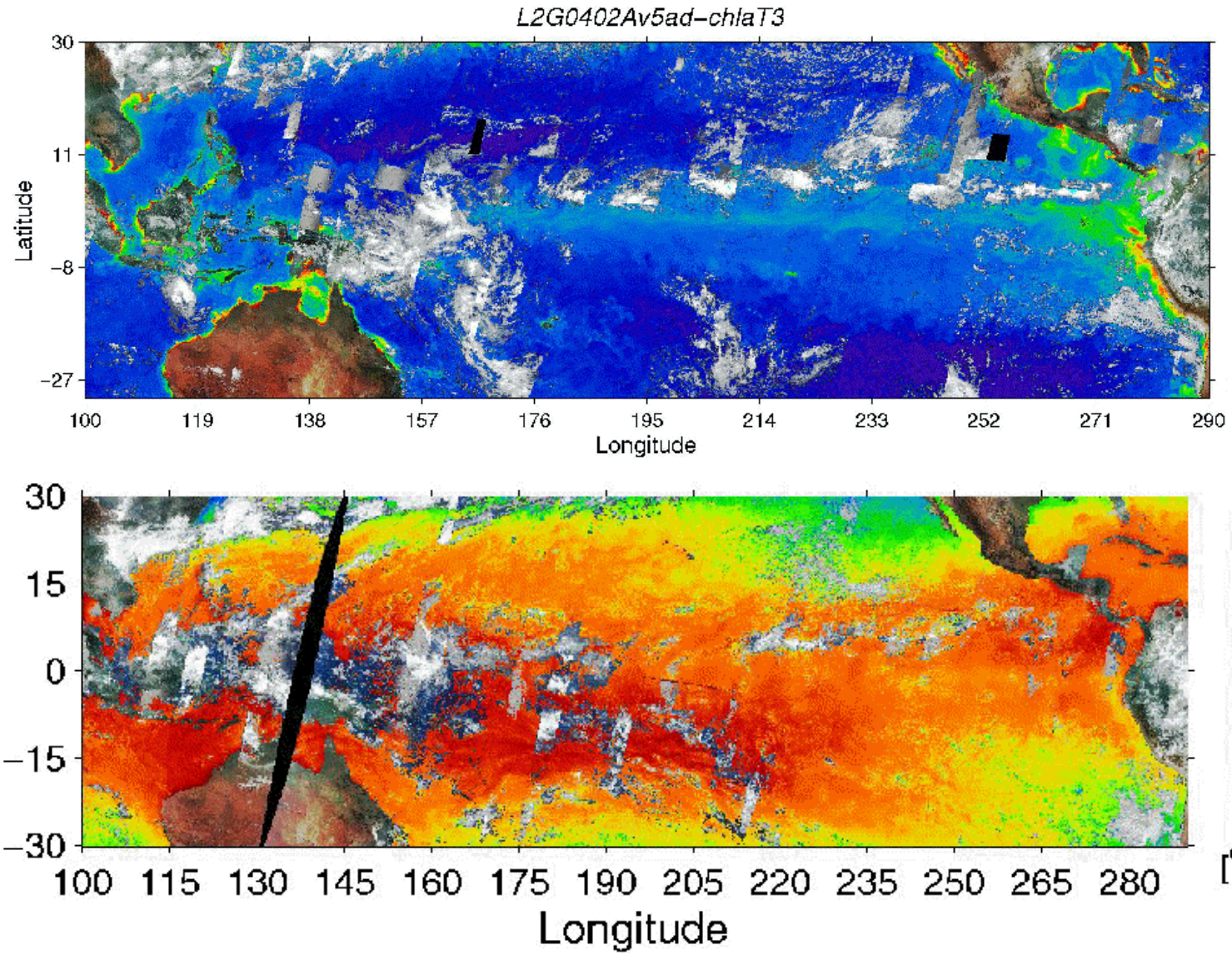




GLI Chl-a and SST time series; Equatorial Pacific

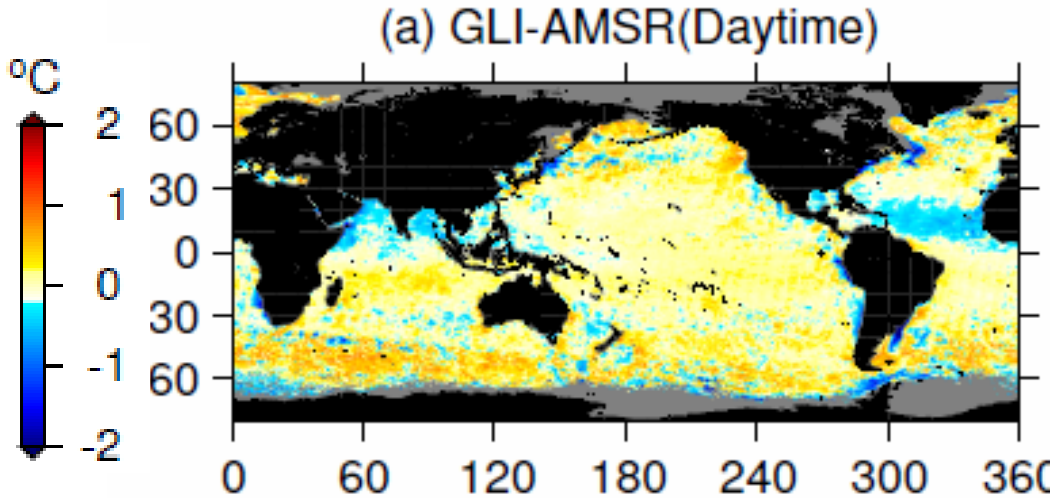


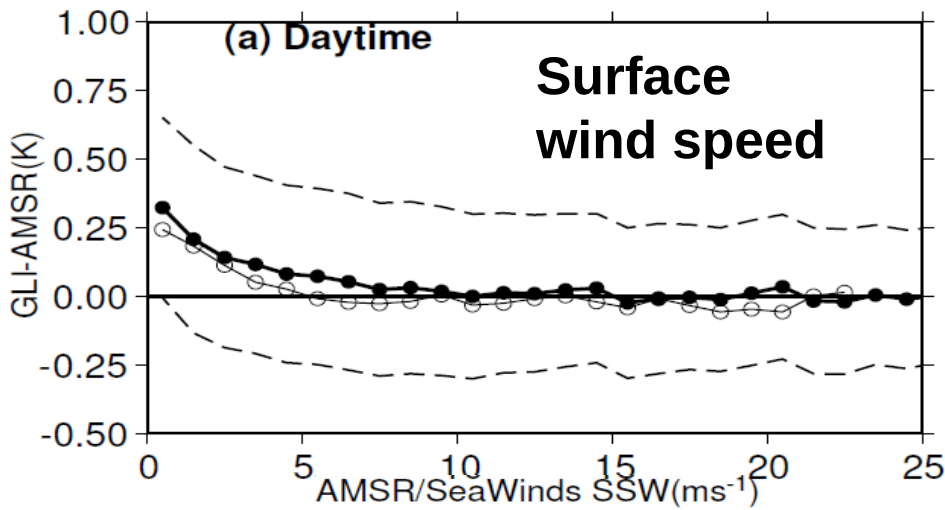
Difference characteristics of sea surface temperature observed by GLI and AMSR aboard ADEOS-II *by Hosoda et al.*

- Comparison of simultaneous IR (GLI) and MW SST (AMSR) observations

-Simultaneous SeaWinds winds for difference mechanism

- No measurable bias





Ocean Theme: GODAE SST Project

<u>GODAE has a fundamental dependence of SST data and products</u>

In particular, global perspective of GODAE demanded attention to the many gaps in present products (many not quantified) and improved representation of observational errors in data products

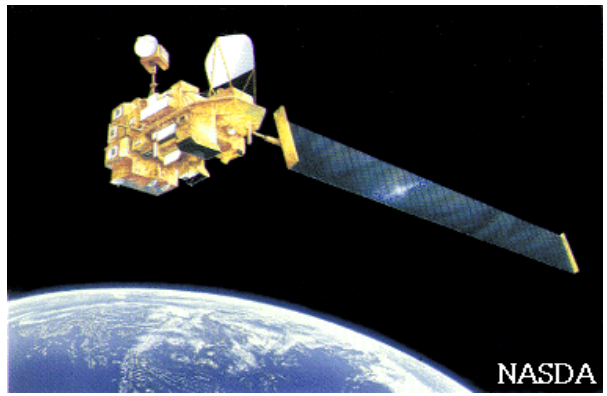
Cloud Mask for IR Measurement and Diurnal Cycling of SST (Including the Bulk-Skin Problem)

<u>Increase its temporal and spatial resolution largely</u>

Less than 10km and Less than 24 hours Cloud-free products

ADEOS-II SST

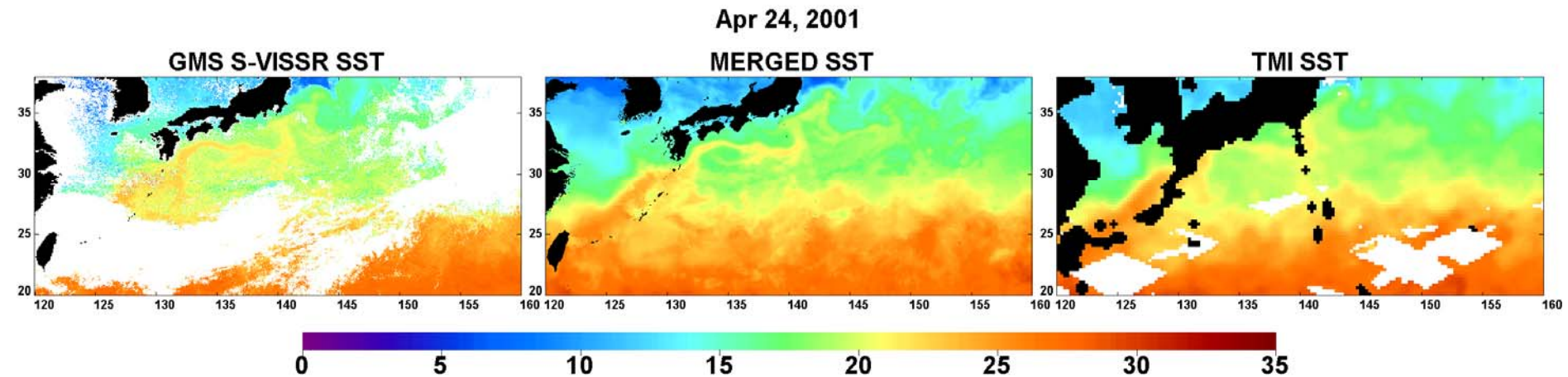
ADEOS-II SST: Combination of infrared, microwave and *in situ* SSTs (1998)



- **GLI infrared SSTs:**
  - High accuracy, fine spatial resolution, wide coverage
- **AMSR microwave SSTs:**
  - Retrieval of SSTs under clouds, wide coverage
- ***In situ* SSTs:**
  - Standard and reliable SSTs, anchor points for the satellite SSTs

GODAE High Resolution SST Project

New Generation SST Ver.1.0 (2001)



Geostationary Met. Satellite
Hourly Infrared

AVHRR、VIRS

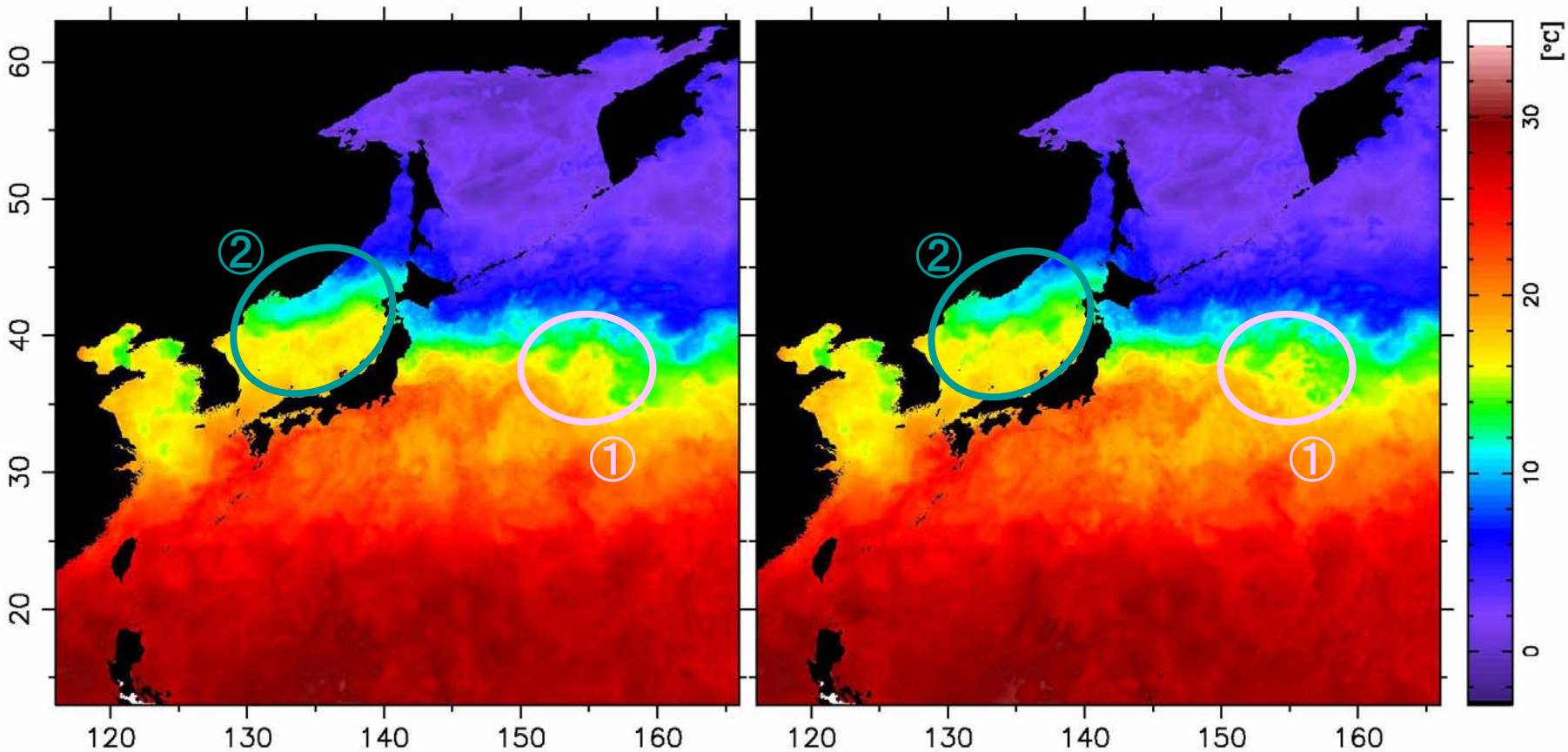
Merging by objective analyses

TMI SST
Microwave SST
Cloud free

Cloud-free, High Resolution, Quality-Controlled
5 Km Spatial Resolution, Daily SST Product

New Generation Sea Surface Temperature on 31 May 2003 (Infrared/Microwave Merged SSTs)

Present Version merged SST → NGSST + GLI･AMSR

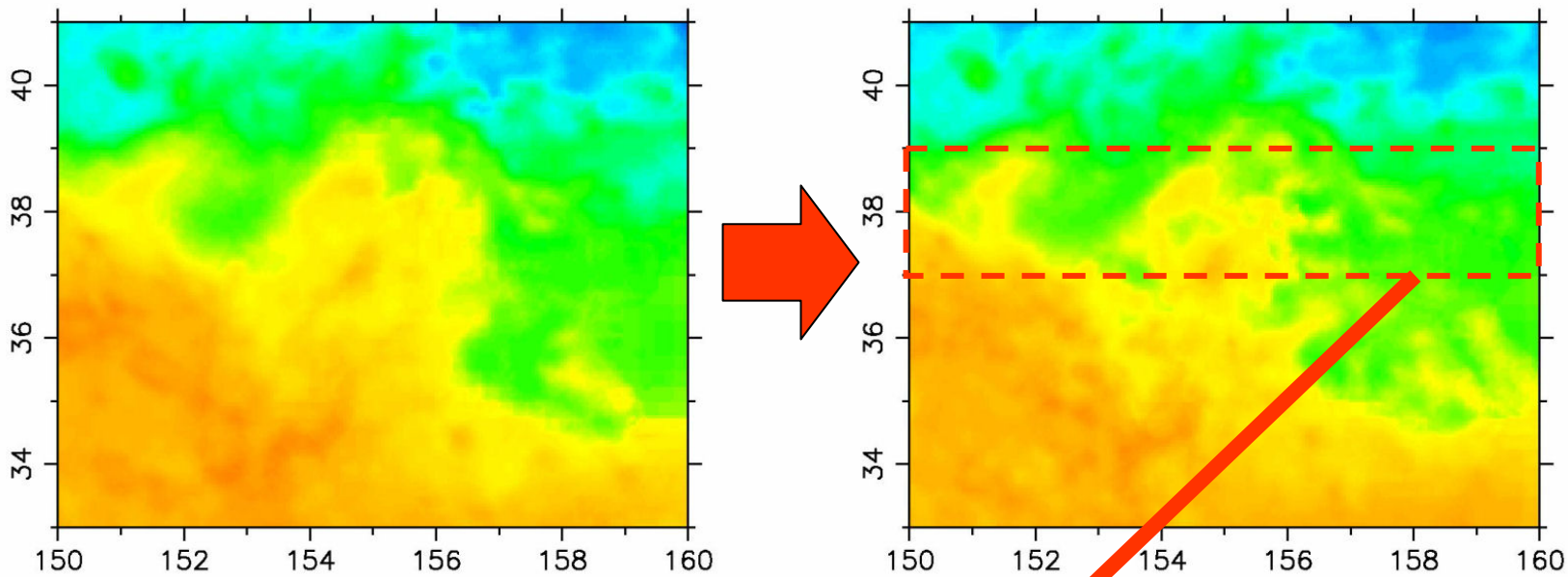


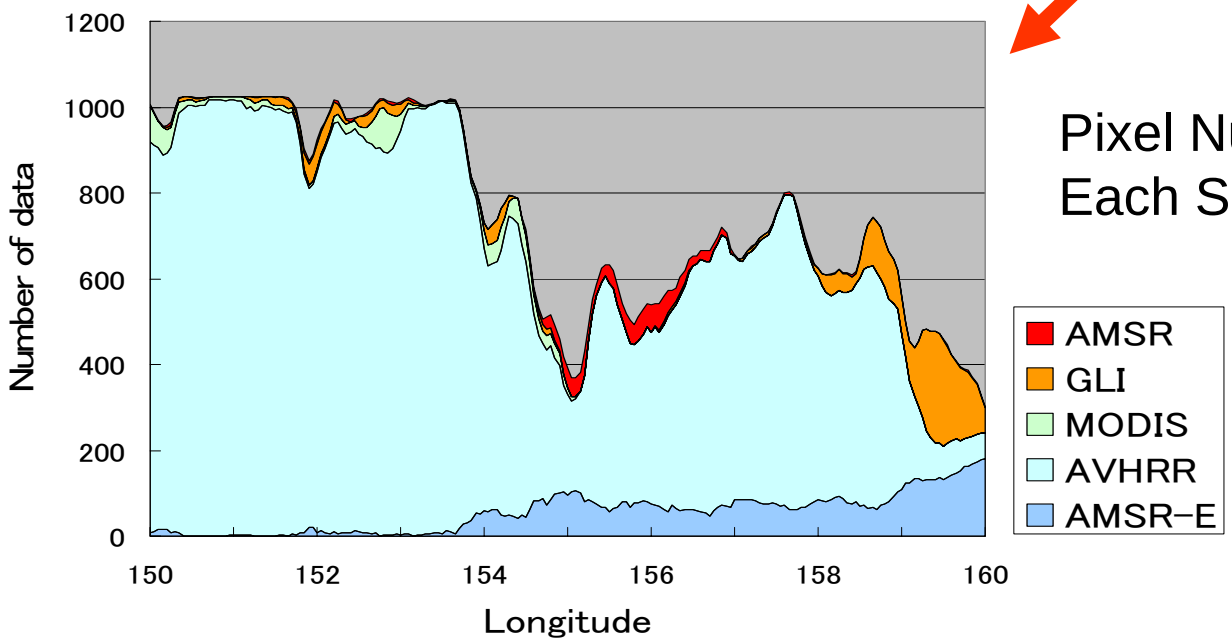
http://www.ocean.caos.tohoku.ac.jp/~merge/sstbinary/actvalbm.cgi?eng=1

①

Present Version merged SST

NGSST ＋ GLI･AMSR



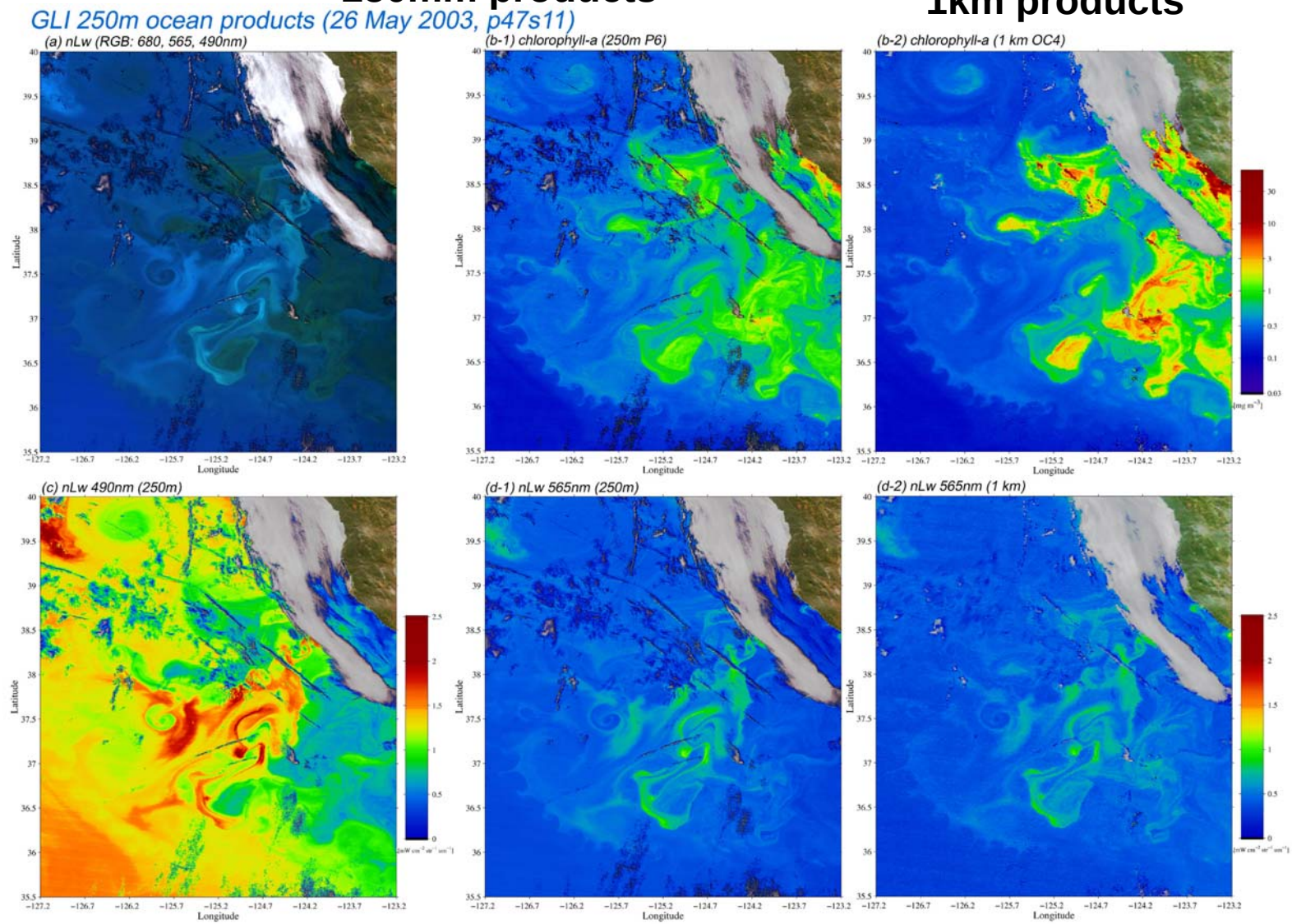


Pixel Numbers of Each Sensors

GLI 250m Color Products: New directions for coastal monitoring

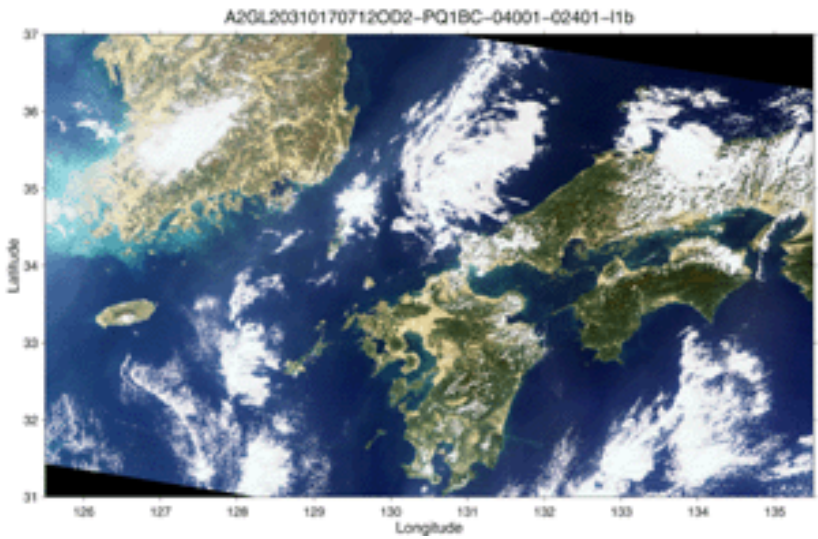
250mm products

1km products

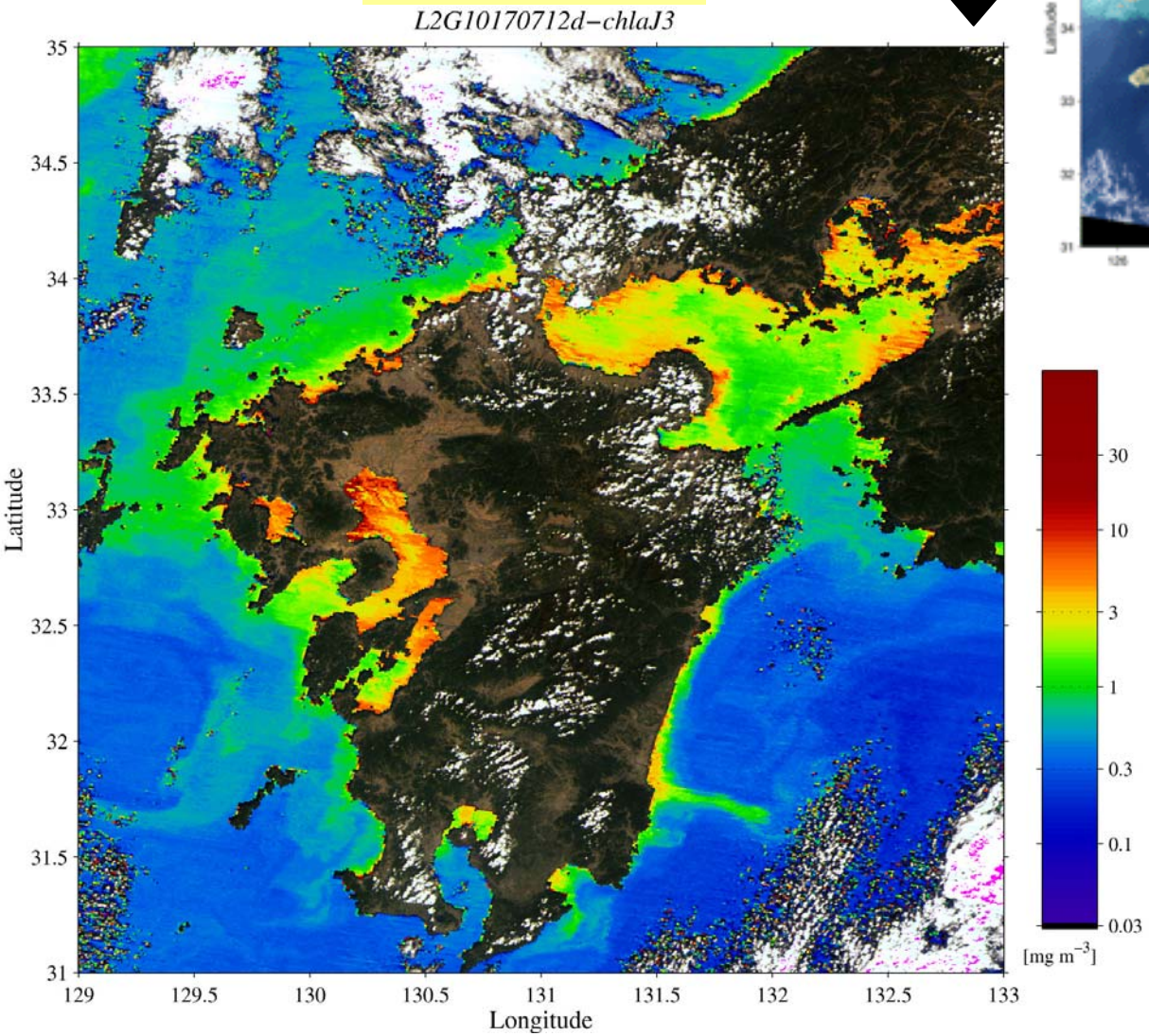


GLI 250m Observations

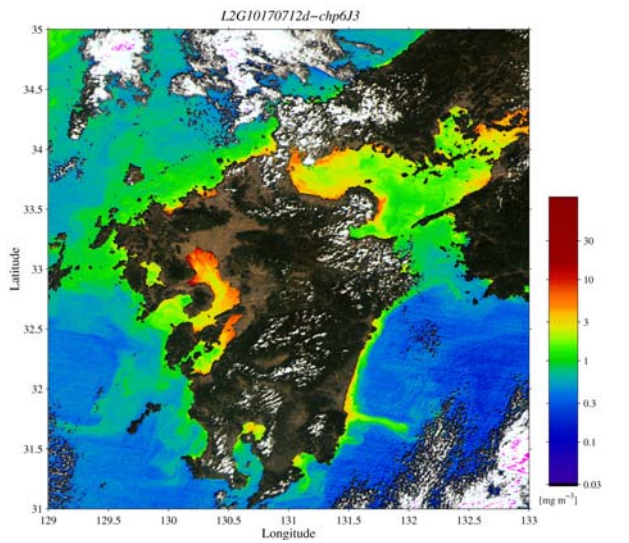
250mRGB Composite



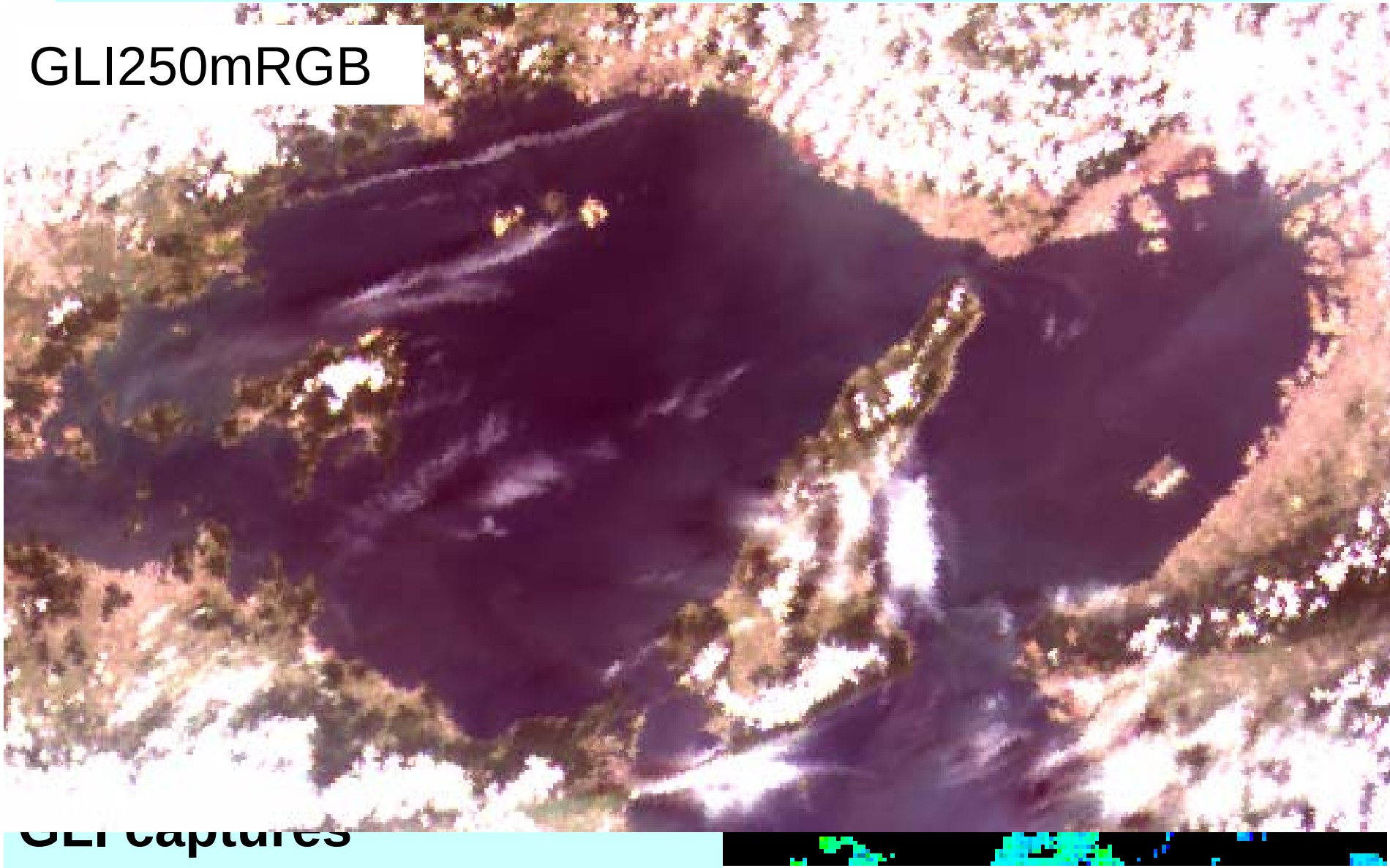
250m Chl-a



1km Chl-a



GLI Detection of the Red-Tide Phenomena



GLI captures the Red-Tide phenomena!!

Remote Sensing Requirements
(from WMO/CEOS Database)

"USE"	"Requirement"	"Hor Res"	"HR Min"	"Obs Cycle	"OC Min"	"Delay of avai	"DA Min"	"Acc - RMS"	"AC Min"
GOOS Climate - large scale	Ocean chlorophyll	25 km	100 km	1 d	3 d	1 d	3 d	0.1 % (Max)	0.5 % (Ma
GOOS Climate - large scale	Ocean dynamic topography	100 km	300 km	10 d	30 d	10 d	30 d	2 cm	5 cm
GOOS Climate - large scale	Ocean salinity	200 km	500 km	10 d	30 d	10 d	30 d	0.1 psu	1 psu
GOOS Climate - large scale	Sea surface bulk temperature	10 km	300 km	6 h	720 h	6 h	720 h	0.1 K	1 K
GOOS Climate - large scale	Sea-ice cover	10 km	100 km	1 d	6 d	0.125 d	1 d	2 % (Max)	10 % (Max
GOOS Climate - large scale	Wind speed over sea surface (horizontal)	25 km	100 km	24 h	168 h	24 h	168 h	1 m/s	2 m/s
GOOS Climate - large scale	Wind vector over sea surface (horizontal)	25 km	100 km	24 h	168 h	24 h	168 h	1 m/s	2 m/s
GOOS Climate - mesoscale	Ocean dynamic topography	25 km	100 km	7 d	30 d	2 d	15 d	2 cm	10 cm
GOOS Surface	Dominant wave direction	10 km	30 km	1 h	6 h	2 h	4 h	10 degrees	20 degree
GOOS Surface	Dominant wave period	10 km	30 km	1 h	6 h	2 h	4 h	0.5 s	1 s
GOOS Surface	Sea surface bulk temperature	1 km	10 km	6 h	12 h	2 h	4 h	0.1 K	2 K
GOOS Surface	Sea-ice thickness	25 km	100 km	1 d	6 d	1 d	6 d	50 cm	100 cm
JGOOS-III	Geoid	250 km	500 km	240 mo	360 mo	12 y	24 y	2 cm	5 cm
Marine biology (coastal water)	Aerosol (total column) size	1 km	10 km	24 h	48 h	3 h	7 h	0.1 µm	1 µm
Marine biology (coastal water)	Ocean chlorophyll	1 km	5 km	1 d	3 d	3 d	7 d	5 % (Max)	20 % (Max
Marine biology (coastal water)	Photosynthetically Active Radiation (PAR)	1 km	5 km	0.04 d	1 d	3 d	7 d	5 % (Max)	20 % (Max
Marine biology (coastal water)	Sea surface bulk temperature	1 km	5 km	24 h	48 h	3 h	7 h	0.1 K	0.5 K
Marine biology (open ocean)	Aerosol (total column) size	4 km	50 km	24 h	48 h	3 h	7 h	0.1 µm	1 µm
Marine biology (open ocean)	Air pressure over sea surface	50 km	100 km	24 h	48 h	3 h	7 h	10 hPa	15 hPa
Marine biology (open ocean)	Ocean chlorophyll	10 km	50 km	1 d	3 d	3 d	7 d	0.1 % (Max)	0.5 % (Ma
Marine biology (open ocean)	Ocean yellow substance absorbance	1 km	5 km	1 d	2 d	3 d	7 d	5 % (Max)	20 % (Max
Marine biology (open ocean)	Ozone profile - Total column	50 km	200 km	24 h	48 h	3 h	7 h	10 DU	20 DU
Marine biology (open ocean)	Photosynthetically Active Radiation (PAR)	10 km	50 km	0.04 d	1 d	3 d	7 d	5 % (Max)	20 % (Max
Marine biology (open ocean)	Sea surface bulk temperature	10 km	50 km	24 h	48 h	3 h	7 h	0.1 K	0.5 K
Marine biology (open ocean)	Specific humidity profile - Total column	Missing	Missing	24 h	Missing	3 h	7 h	Missing	Missing
Marine biology (open ocean)	Wind vector over sea surface (horizontal)	4 km	50 km	24 h	48 h	3 h	7 h	2 m/s	5 m/s

Spatial Resolution

Temporal Resolution

ADEOS-II Availability for Oceanography and Marine Meteorology

Ocean Parameter / ADEOS-II	Chl-a	Sea Surface Height	Ocean Salinity	Sea Surface Temp.	Surface Winds	Surface Wave
GLI	○	Altimeter	Salinity Sensor	○		Altimeter SAR
AMSR				○	○	
SeaWinds					○	

Ocean Parameter / ADEOS-II	Aerosol Size	PAR (Solar Rad.)	Specific Humidity	Sea-Ice	Geoid	CDOM
GLI	○	○		○	Geoid mission	○
AMSR			○	○		
SeaWinds				○		

New Interdisciplinary Research and Applications from GLI Ocean Products Family

- Physical-biological interaction processes
- High-frequency small-scale coastal processes
- High-resolution bio-geochemical ocean processes
- Global basin-scale bio-geochemical processes

Contributions to the IGOS

1) Ocean Theme
2) Global Carbon Observation Theme
3) Coastal Theme

J.Oceanography: Special Issue for ADEOS-II (2006)

Barton and Pearce (2005): Validation of GLI and Other Satellite-Derived Sea Surface Temperatures Using Data from the Rottnest Island Ferry, Western Australia

Frouin and Murakami (2005): Estimating Photosynthetically Available Radiation at the Ocean Surface from ADEOS-II Global Imager Data

Hosoda et al. (2005): Difference characteristics of sea surface temperature observed by GLI and AMSR aboard ADEOS-II

Ishizaka et al. (2005): Verification of Vertically Generalized Production Model and Estimation of Primary Production in the Sagami Bay, Japan

Murakami and 22 authors(2005): Validation of ADEOS-2 GLI ocean color products using in-situ Observations

Sakaida et al. (2005): Sea surface temperature observation by Global Imager (GLI)/ADEOS-II Algorithm and accuracy of the product

Siswanto, Ishizaka and Yokouchi (2005): Optimal Primary Production Model and Parameterization in the Eastern East China Sea

Tanaka et al. (2005): Developing an In-water Algorithm for GLI Using Neural Network Technique with Optical Model Based on Optical Properties in East China Sea, Ariake Sound and Isahaya Bay

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