Basic Characteristics of ASTER TIR

Aperture	240 mm
Telescope Optics	Reflective (Newtonian)
Detector	HgCdTe(10 elements / band)
Cooler	Stirling Cycle (80 K)
Spectral Band	5 bands

Band	Center	Width
10	8.30μm	0.35μm
11	8.65	0.35
12	9.10	0.35
13	10.6	0.7
14	11.3	0.7

Spatial Resolution / Swath	90 m / 60 k m
Cross-track Pointing	Scan Mirror ±8.55°
NEΔT	≤ 0.3 K
Digitization	12 bits
Radiometric Calibration	One blackbody, no deep space view

$$T_{water\ surface} = a + \sum_{i=10}^{14} b_i T_i$$

a, b_i : Empirical coefficients

T_i : Brightness temperature at band i

- The effect of the atmosphere will be compensated by the use of Split-Window-like algorithm.
- At-launch version of coefficients will be determined by the simulation using radiative transfer codes and atmospheric models.
- At-launch version will be replaced with new values after field campaigns in Japan.

Reference:

Matsunaga, T., Water surface temperature estimation using linear equations of brightness temperature observed by Advanced Spaceborne Thermal Emission and Reflection Radiometer/Thermal Infrared Radiometer(ASTER TIR) - Preliminary evaluation of estimation error with atmospheric temperature and humidity data around Japan-, Journal of Remote Sensing Society of Japan, Vol. 16, No. 5, pp. 404-415, 1996.

MODIS SST for ASTER SST

- Radiometric calibration
  - ASTER has only one blackbody and no deep space observation capability. Thus, two-point calibration is not available.

- ASTER SST algorithm validation
  - It is difficult for ASTER oceanography working group to obtain enough validation data for ASTER SST algorithm validation.

ASTER for MODIS SST

- Sub-pixel cloud fragment
  - ASTER can locate cloud fragments as small as 15 m (VNIR), 30 m (SWIR), and 90 m (TIR) which MODIS cannot identify.

- Detailed structure of oceanic fronts and so. on.
  - ASTER can act as "ZOOM-UP" lens for MODIS and show detailed thermal structures of sea surface phenomena while MODIS provides synoptic view of the same event.

Proposal for ASTER-MODIS Joint Observation

- Objective
  - Validate ASTER SST with MODIS SST.
  - Study sub-pixel phenomena in a MODIS pixel

- Location
  - Pacific Ocean, off the coast of Shikoku Island, Japan
  - 260 km(NS) by 430 km(EW)

- Frequency: three times per year

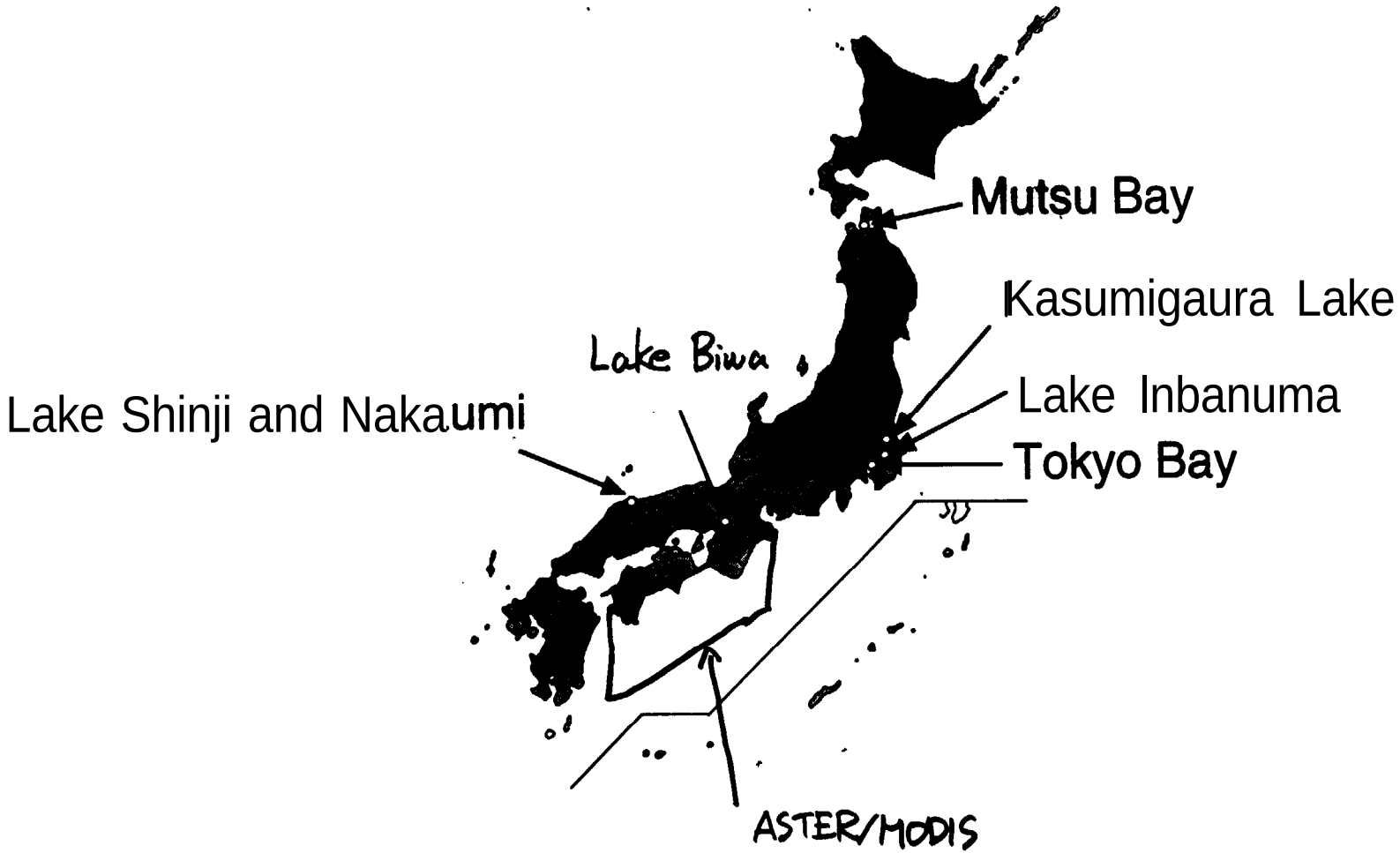
- ASTER Observation: Image strip between Shikoku and Kuroshio current
  Shikoku Island : Ground control point
  Coastal Water : “Cold” target
  Kuroshio Water : “Hot” target

- ASTER Oceanography working group has sent a Science Team Acquisition Request(STAR) for Shikoku.

- Availability of MODIS SST data...

ASTER Oceanography Validation Sites in Japan

Geological Survey of Japan



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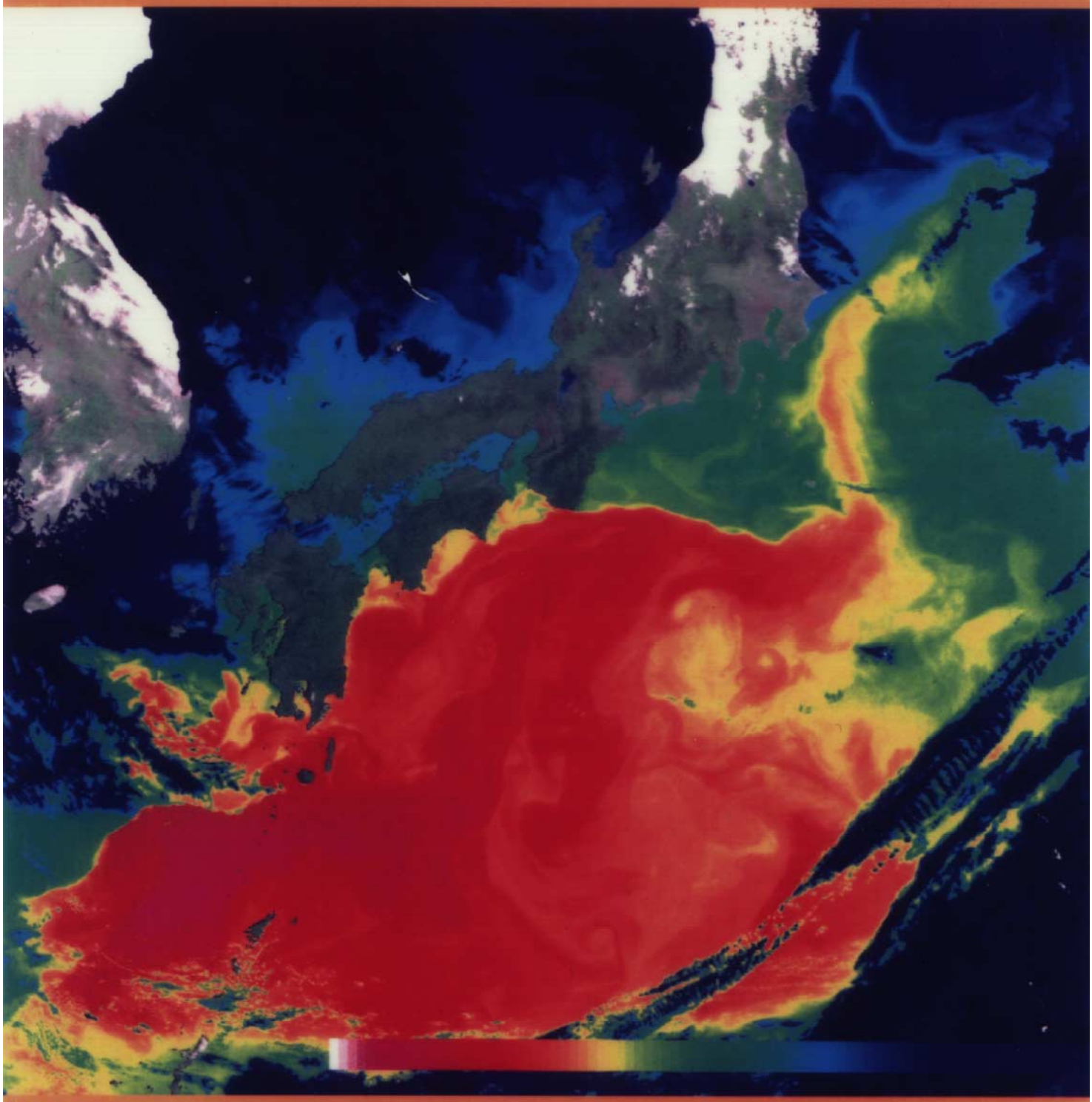

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