

Future Mission Study to Measure Sea Surface Height and Ocean Currents in JAXA

Akihisa Uematsu, Masatomo Harada, Ryoko Nakamura, Kai Matsui, and Hiroshi Nakayama
Japan Aerospace Exploration Agency (JAXA), Tsukuba, Ibaraki, Japan.

Abstract

The Japan Aerospace Exploration Agency (JAXA) has started a new future mission study regarding cooperation between marine and space fields. As ocean observations by remote sensing satellites, main observation targets are sea surface temperature, ocean color, sea surface height, ocean currents, salinity, and so on. Measurement of sea surface height and ocean currents derived from sea surface height anomaly are important in various fields, for example, marine environment, fishery, marine safety, and ship operation. As the next step, observation of sea surface height is considered as a candidate for the new mission. JAXA has started a future mission study of a satellite mission measuring sea surface height, mainly for administrative and operational use. A cross-track Interferometric Synthetic Aperture Radar (CT-InSAR) is a candidate. A mission requirement will be documented in 2011. In this presentation, we will report on the current status of the mission study.

Introduction

The key parameters of ocean observations are below;

- Sea Surface Color
- Sea Surface Temperature
- Sea Surface Salinity
- Sea Surface Wind
- Sea Surface Height

In the past and current oceanic missions of Japan, the observation of Sea Surface Height (SSH) has not been achieved by any satellites. In this poster we report the conceptual study of the observations of the Sea Surface Height by satellites from the viewpoint of user needs and technical feasibility.

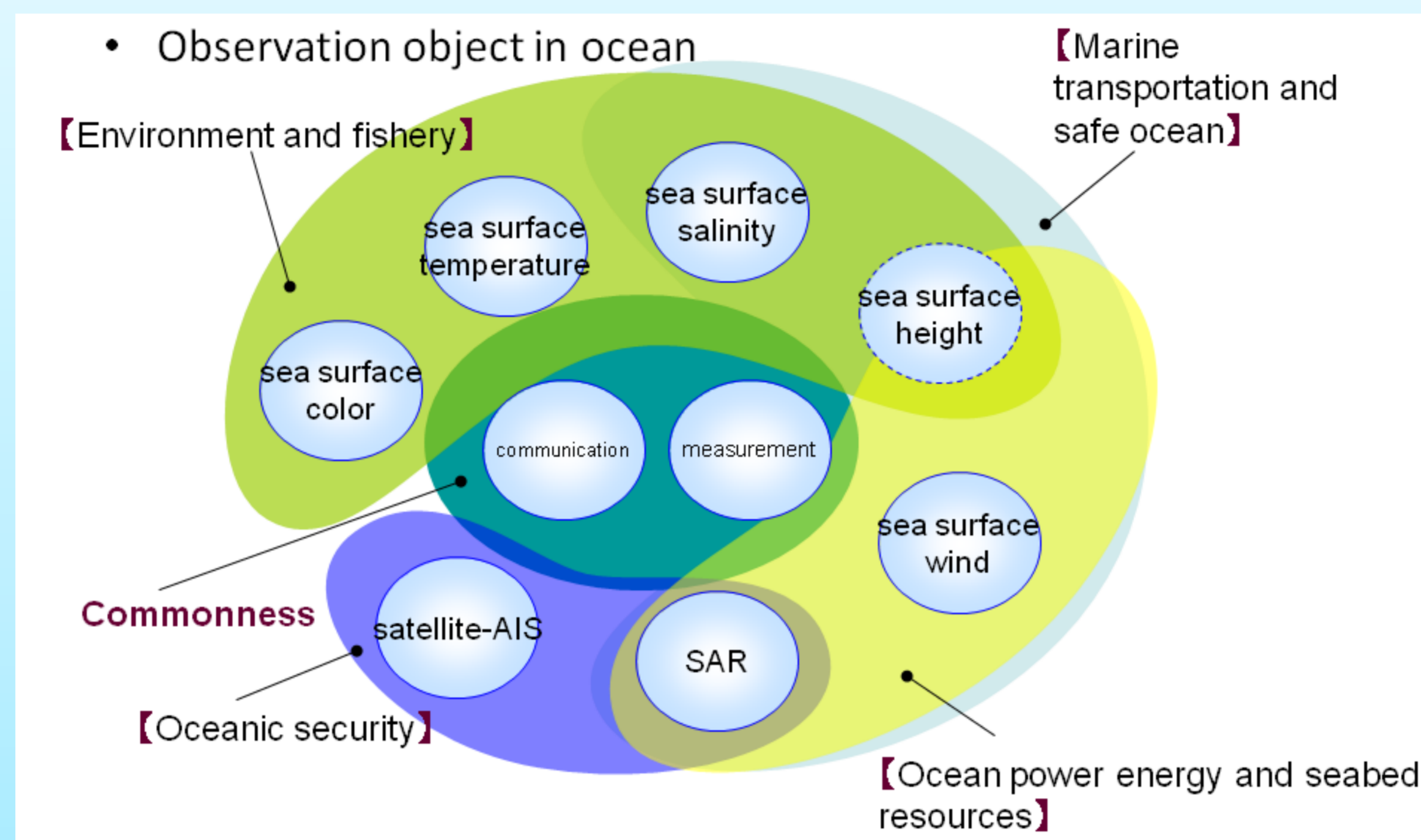


Fig. 1 The key parameters of ocean observations

Table 1 Past and current oceanic missions of Japan

		Past and current oceanic missions					
		MOS(1987-1995)	ADEOS(1996-1997)	ADEOS2(2002-2003)	GCOM-W(2011~)	GCOM-C(2013~)	
SSC	MESSR VTIR	→	OCTS	→	GLI	→	SGLI
SST	MSR	→	→	→	AMSR	→	AMSR2
SSW			NSCAT	→	SEAWINDS		
High Reso	SAR OPS				PALSAR		
		JERS-1(1992-1998)			ALOS(2006~)		

Why we need to measure SSH.

In order to Investigate the administrative & operational needs

- Establishment of 4 meetings
- Consist of the members related to ministry, fishing industry, ship industry and research

- Environment and fishery
- Marine transportation and safe ocean
- Ocean power energy and seabed resources
- Oceanic security

Needs in discussion

- Objective sea area : Coastal area
 - Objective physical value: Ocean Currents
- ⇒ **Observation of the SSH is necessary.**

Administrative and operational needs concerning current

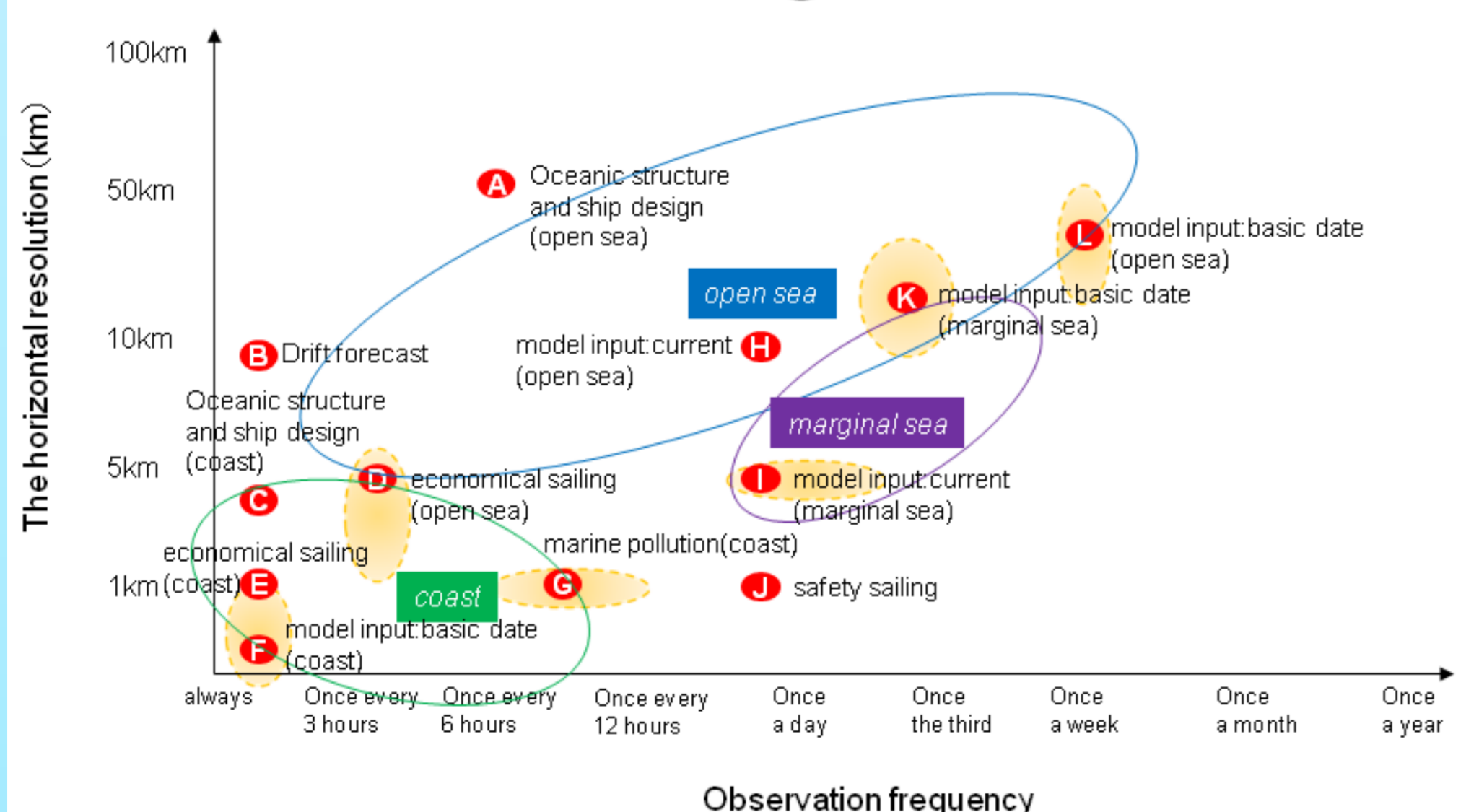


Fig. 2 Administrative and operational needs concerning current

Target & Sensor

To construct mission requirement, an altimetry technical study team has been established. Members are Japanese experts using altimeter data. We surveyed requirements of altimetry (temporal/spatial resolution, accuracy, sampling, etc.) for various oceanic phenomena, in order to select mission target and construct mission requirement.

- Temporal and spatial scale of phenomena
- Temporal and spatial resolution of altimetry observation
- Distances from coastline • Accuracy

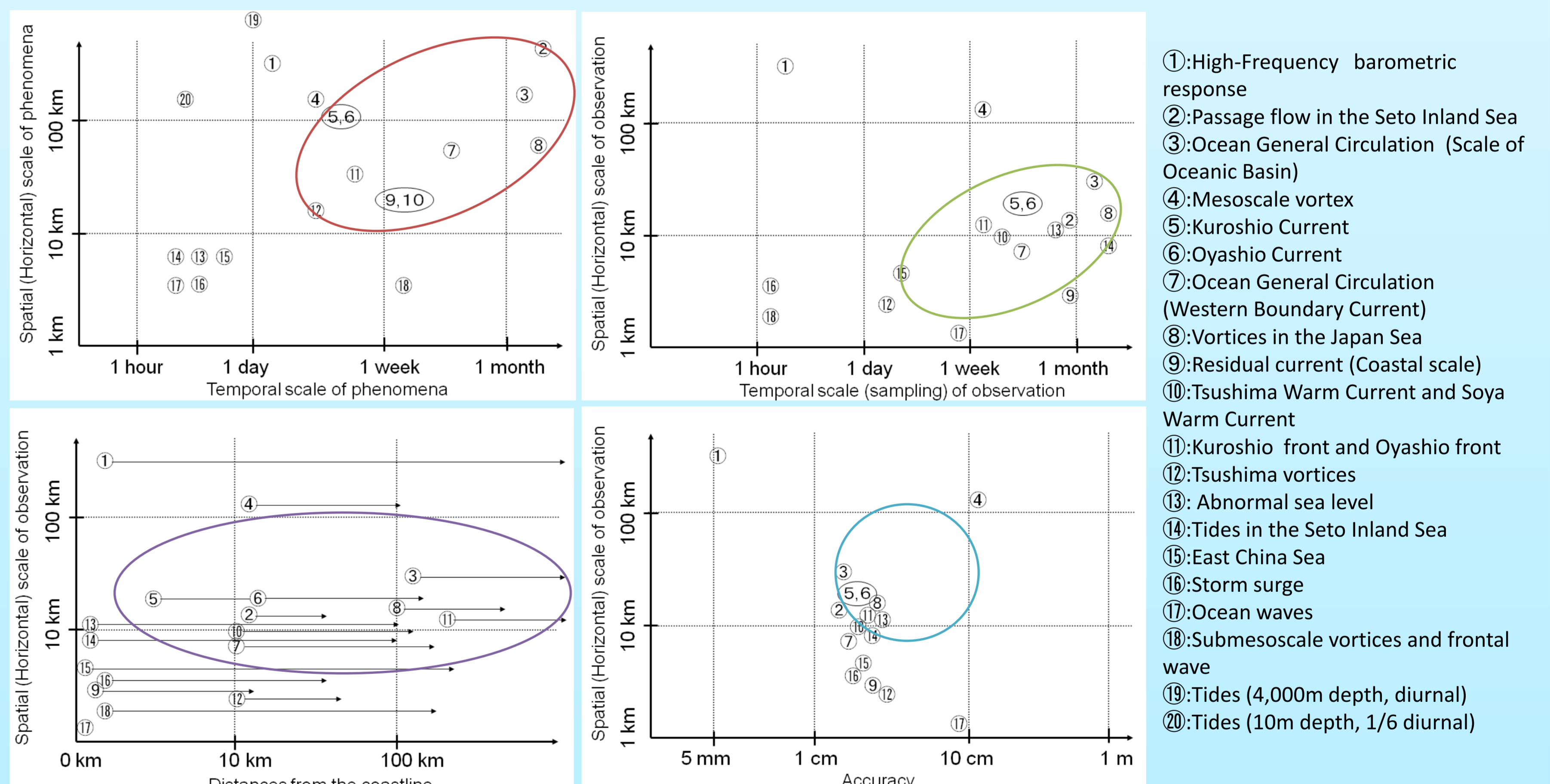


Fig. 3 Survey of the requirements for various oceanic phenomena

➔ Main target is coastal area, in which human activity is concentrated, and much more users are expected.

- < 40-50 km from the coastline • 10-100 km spatial scale observation

- **Sensor type: Cross-Track Interferometric SAR (CT-InSAR)**

We are analyzing systematic parameters

- Baseline length, frequency, transmit power, antenna size, etc. related to following performance (TBD)
 - Swath (20-60 km), Horizontal resolution (1-5km), and Accuracy (< 10 cm, sensor only).
- In parallel, We are also studying total size of satellite system, orbit selection, and precise orbit determination.

Summary

JAXA has started a future mission study of a satellite mission measuring sea surface height. Administrative and operational needs have been investigated. Also, requirements of altimetry for various oceanic phenomena have been surveyed. We have defined that the main target is coastal area, and selected sensor type as cross-track interferometric SAR.

Mission requirement will be documented in the middle of 2011, and we will make a mission definition review.