Cruise Summary

1. Cruise information

   Cruise ID: KS-21-12

   Name of Vessel: R/V Shinsei-maru

   Title of cruise: Interdisciplinary research program in the Tsushima Warm Current — Part I: 3D visualization of wind-generated fine-scale internal waves associated with oceanic eddies

   Chief scientist: Yusuke Kawaguchi [AORI, Univ. Tokyo]

   Cruise period: from June 25th, 2021 to July 2nd, 2021

   Ports: Kochi, Kochi Pref. (departure) to Maizuru, Kyoto Pref. (arrival)

   Research area: Yamato Basin in the Sea of Japan

2. Overview of Research Activities

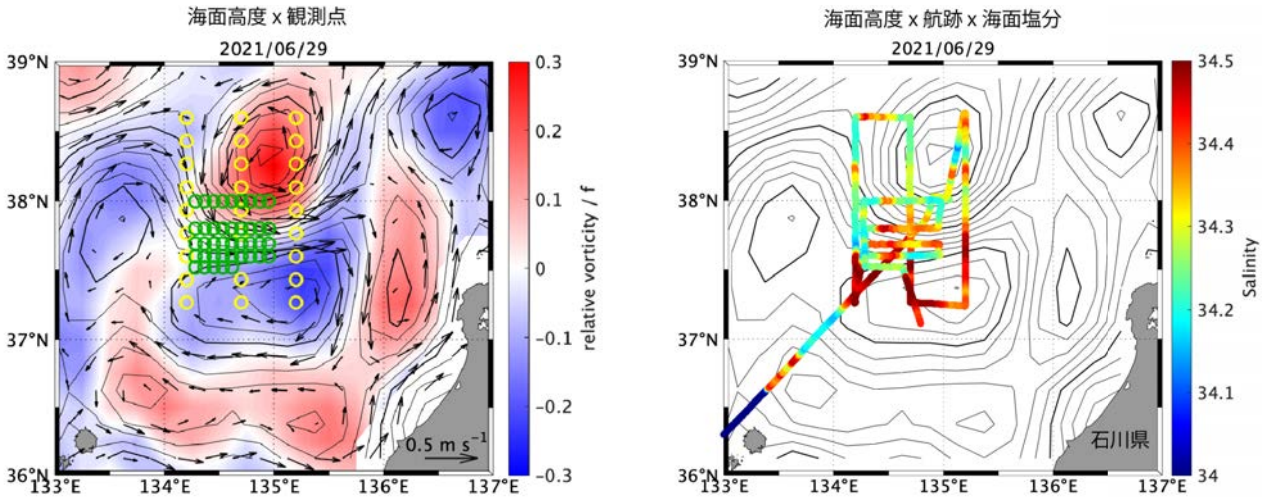
2.1. Physical oceanographic investigation of oceanic eddies that captures internal waves and micro-scale turbulent energy

- Reveal three-dimensional structure and distribution of internal wave packets and its kinetic energy in the context of larger-scale, meso- and/or submeso-scale features, with a special focus on the linkage between wave packet and geostrophic vorticity.
- Collected a number of vertical profiles of microscale turbulence and basic CTD variables using VMP-250 (Rockland Science, Inc.); oceanic current was recorded underway the ship trajectory with 75kHz ship-mounted ADCP (Ocean Surveyer, RDI).
- Multiple vertical slices of turbulent variables across mesoscale warm-core eddy were obtained during the cruise. Pronounced level of turbulent kinetic energy (TKE) was found as overlapped with geostrophic structure in the background that forms the main baroclinicity. Relationship between relative vorticity and TKE distribution will be pursued in the future analyses in more detail.

2.2. Short-term mooring survey of sinking particles under influence of warm-core eddy

- To clarify a linkage between geochemical downward flux of particles and physical features represented by quai-geostrophic current and propagating internal waves, both related to a warm-core ring steadily observed in the Yamato Basin.
- Mooring instrumentation equipped with a couple of sediment traps at middle and deep sites was deployed during early part of KS-21-12, and then successfully recovered during KS-21-13. The data record is nearly two weeks in length. Physical variables such as oceanic current and temperature/salinity were properly collected by using a Longranger ADCP and SeaBird CTD sensors at high frequency of 1 min in sampling rate.
- For the two-weeks observation, preliminary results are shortly described. From the digital records, mainly of physical part, horizontal current and TS properties tend to be governed by 1) relatively slow geostrophic dynamics,

related to the warm-core ring, and 2) short-term oscillations due to near-inertial waves. Chemical analysis is mostly still in progress and to be reported in near future.



Figures: (Left) observational stations (yellow for L-line; green for S-line), with satellite-based absolute dynamic topography (ADT) in color contours and with ADT-based geostrophic current in black vector. (Right) ship track, with surface salinity in color.