

Cruise Summary

1. Cruise Information

(1) **Cruise ID:** MR19-02

(2) **Vessel:** R/V MIRAI

(3) **Cruise Title**

The observational study to construct and to extend the western Pacific super site network

(4) **Chief Scientist**

Tetsuichi Fujiki (JAMSTEC)

(5) **Representative of the Science Party**

MR19-02 Akira Nagano (JAMSTEC)

(6) **Research Titles**

MR19-02 The observational study to construct and to extend the western Pacific super site network

(7) **Cruise Period**

2019/05/24 - 2019/06/14

(8) **Ports of departure/call/arrival**

SHIMIZU - SEKINEHAMA

(9) **Research Area**

The western North Pacific

2. Overview of the Observation

(A) Study of "Nutrient Missing Source" in the oligotrophic region

Based on the comparison study of biogeochemistry in the northwestern North Pacific eutrophic subarctic region and oligotrophic subtropical region (K2S1 project), it was clarified that biological activity in the subtropical region is comparable to or slightly larger than that in the subarctic region. In order to verify the support mechanism of biological activity, that is the mechanism of nutrient supply, time-series sediment trap

experiment was initiated in 2014 at about 4900 m of the station KEO. This station is the time-series station maintained by National Ocean and Atmosphere Administration (NOAA) Pacific Marine Environmental Laboratory (PMEL). Surface buoy with meteorological sensors and physical oceanographic sensors have been deployed at station KEO since 2004. Therefore, these time-series data of meteorology and physical oceanography can be utilized to interpret time-series variability in sediment trap data. Owing to simultaneous analysis of time-series data obtained by NOAA surface buoy and JAMSTEC sediment trap between 2014 and 2016, it was verified that mesoscale cyclonic eddy potentially plays a role in nutrient supplier (Honda et al. PEPS 2018). In order to evaluate other potential mechanisms such as typhoon and aeolian dust input, sediment trap experiment and another time-series observation has been continued at station KEO.

During this cruise, at station KEO, we observed vertical profiles in biogeochemical components such as nutrients, carbon chemistry, phytoplankton pigments and primary productivity late May. In addition, in order to study marine particulate organic carbon (POC) optically, backscatter meters with fluorometer were deployed at station KEO and other stations. By analyzing backscatter meters' data and chlorophyll and POC measured onboard (and on land laboratory later), empirical equations for estimating POC and chlorophyll with backscatter meter will be proposed in near future and temporal variability in POC and its vertical attenuation will be discussed.

**(B) Time-series observations for marine ecosystem dynamics research
in the subarctic western North Pacific**

The subarctic western North Pacific is a cyclonic upwelling gyre (western subarctic gyre; WSG) that extends from the northeast of Japan to near the international dateline. To investigate the spatial and temporal variability of biogeochemical processes in the WSG, time-series observations have been carried out since 1997 at stations KNOT (44°N, 155°E) and /or K2 (47°N, 160°E) in the WSG, indicating that ocean acidification was rapidly progressing in this gyre. However, the effect of ocean acidification on lower trophic levels in this region is not well understood. To better understand the response of lower trophic level ecosystem to multiple environmental stressors (e.g., warming, acidification and deoxygenation), we conducted the following observations and operations during this cruise

- (1) Recovery and deployment of hybrid profiling buoy system
- (2) CTD cast and water sampling/biochemical analysis
- (3) Assessment of phytoplankton productivity by fast repetition rate fluorometry
- (4) Observation of zooplankton biomass by acoustic zooplankton fish profiler
- (5) Zooplankton sampling by using the VMPS, ORI and NORPAC nets
- (6) Particle collection by using in situ filtration system
- (7) On-deck incubation experiments
- (8) Measurements of shortwave and longwave radiation

- (9) Upper ocean current measurements by shipboard ADCP
- (10) Sea surface water sampling
- (11) Deployment of biogeochemical Argo floats
- (12) Rain sampling
- (13) Meteorological observations
- (14) Satellite image acquisition