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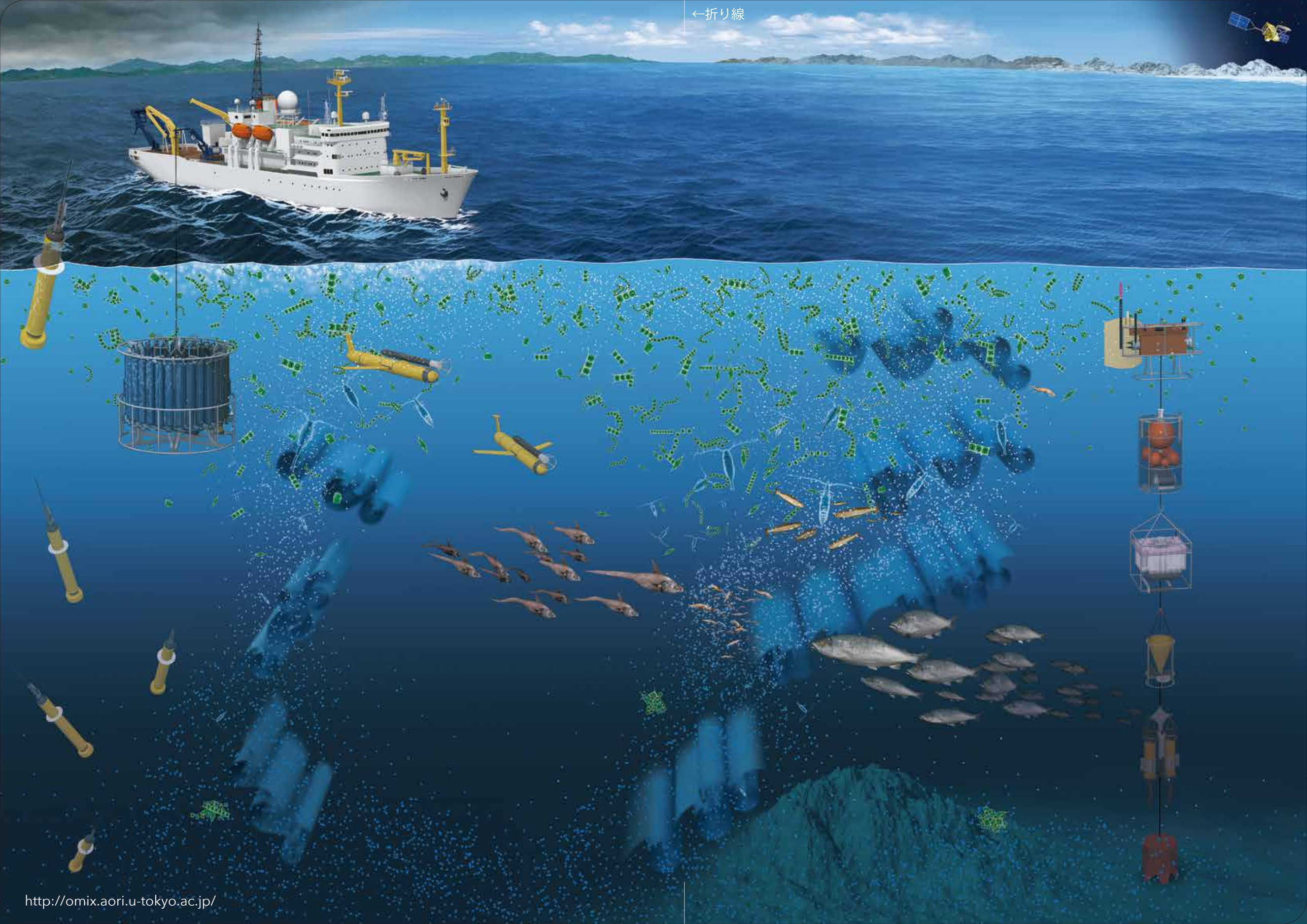

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Planning Research Member & Outline

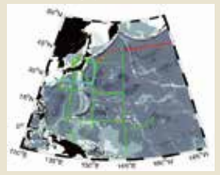
A01-1

Development of methods and systems for vertical mixing and observations


Ichiro Yasuda

This team develops autonomous observation system of multiple underwater gliders and turbulence estimate with fast response thermistors attached to CTD platform to know distrbution of vertical mixing and its generating mechanisms in the western North Pacific and to elucidate its infrluence on ocean circulations.

Principal investigator: Ichioro Yasuda (The University of Tokyo)
Co-investigator: Daigo Yanagimoto (The Univ of Tokyo)
: Ryuichiro Inoue (Japan Agency for Marine-Earth Science and Technology, JAMSTEC)
: Daisuke Hasegawa (Japan Fisheries Research and Education Agency, JFREA)
Collaborator: Masao Ishii (Meteorological Research Institute, MRI)
: Eitaro Oka (The Univ of Tokyo)
: Maki Nagasawa (The Univ of Tokyo)
Joint cooperator: Toshiya Nakano (Japan Meteorological Agency)
: Takahiro Tanaka (The Univ. of Tokyo)
: Yasutaka Goto (The Univ of Tokyo)



Ichiro Yasuda
Recovery of a glyder (left) and observation stations on JMA CTD network (right)

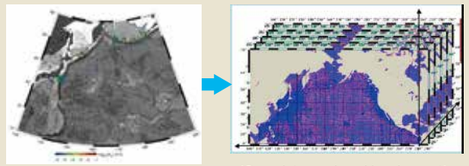
A01-2

Pacific Ocean state estimation and clarification of mechanism of ocean circulation by data synthesis of global observations


Shuhei Masuda

Our aim is to synthesise pre-existing ocean data with newly-acquired turbulence data using state-of-art assimilation technique. The new data set provides improved description of ocean circulation, its heat and salt transports, and oceanic ecosystem at lower trophic level.

Principal investigator: Shuhei Masuda (JAMSTEC)
Co-investigator: Satoshi Osafune (JAMSTEC)
Collaborator: Katsuro Katsumata (JAMSTEC)
: Nozomi Sugiura (JAMSTEC)
: Hiroshi Uchida (JAMSTEC)
: Shinya Koketsu (JAMSTEC)
: Toshimasa Doi (JAMSTEC)


4Dver data produced by observation data and model simulation

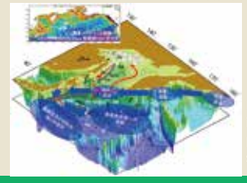
A02-3

Ocean mixing in the sub-polar marginal seas and biogeochemical dynamics in the western North Pacific


Jun Nishioka

The goal of our group is to understand the dynamics of nutrients (including N, P, Si and Fe) and their induced biological production in the western North Pacific. We plan to perform keen international collaborations from ocean observations to the data analyses in the western North Pacific including its marginal seas.

Principal investigator: Jun Nishioka (Hokkaido University)
Co-investigator: Hajime Obata (The Univ of Tokyo)
: Toru Hirawake (Hokkaido Univ)
Collaborator: Koji Suzuki (Hokkaido Univ)
: Hirofumi Tazoe (Hirosaki Univ)
: Fumio Mitsudera (Hokkaido Univ)
: Youhei Yamashita (Hokkaido Univ)
Joint cooperator: Takeshi Yoshimura (Central Research Institute of Electric Power Industry)
: Yutaka Watanabe (Hokkaido Univ)


Biogeochemical cycle observation in Oyashio soruce region and primary production estimated by sattelite observation

A02-4

Mixing Processes, nutrient transport, fundamental structure of ecosystem in the Kuroshio and its origin area


Xinyu Guo

In order to quantitatively evaluate energy dispersion in the ocean lateral boundary that partly contributes to the formation of western boundary currents, the Kuroshio, and to understand the role of Kuroshio in supplying nutrients to primary production in the open ocean, we will carry out physical, chemical and biological researches with a special attention on mixing processes in the Kuroshio and its surrounding areas.

Principal investigator: Xinyu Guo (Ehime Univ)
Co-investigator: Takeshi Matsuno (Kyushu Univ)
: omoharu Senju (Kyushu Univ)
: Kaoru Ichikawa (Kyushu Univ)
: Hirohiko Nakamura (Kagoshima Univ)
: Jing Zhang (Toyama Univ)
Collaborator: Shigenobu Takeda (Nagasaki Univ)
: Joji Ishizaka (Nagoya Univ)


Turbulent mixing in Kuroshio source region, observation and modeling to understand material transportatoin

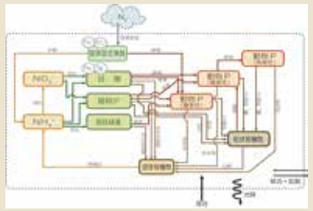
A03-5

Change in lower trophic ecosystem and its complex mechanism in the North Pacific


Naomi Harada

Aims of this study is 1) to understand how primary and secondary producers response on the nutrient supply processes associated with physical mechanisms, atmospheric dynamics, vertical mixing and ocean current; 2) to clarify the controlling factor of specific nutrient supply to give an impact on productivity

Principal Investigator: Naomi Harada (JAMSTEC)
Co-investigator: Tetsuichi Fujiki (JAMSTEC)
: Maki Noguchi (JAMSTEC)
Collaborator: Makio Honda (JAMSTEC)
: Minoru Kitamura (JAMSTEC)
: Osamu Seki (Hokkaido Univ)
: Yoshihisa Mino (Nagoya Univ)
Joint cooperator: Megumi Chikamoto (Univ of Hawaii)
: Takuhei Shiozaki (JAMSTEC)


Scheme of nutrient supply and production

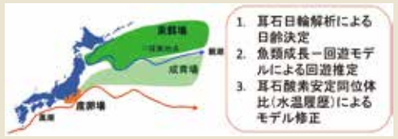
A03-6

Environmental history of living marine resources and fluctuation of fisheries


Shin-ichi Ito

We aim to elucidate direct and indirect influences of the long-term fluctuation of ocean mixing processes caused by 18.6-year nodal tide on fisheries resources by high resolution isotope analysis of fish juvenile otoliths and marine ecosystem-fish coupled models.

Principal Investigator: Shin-ichi Ito (The Univ of Tokyo)
Co-investigator: Kousei Komatsu (The Univ of Tokyo)
: Kotaro Shirai (The Univ of Tokyo)
: Yasuhiro Kamimura (JFREA)
: Motomitsu Takahashi (JFREA)
: Tetsuichiro Funamoto (JFREA)
: Osamu Shida (Hokkaido Research Organization)



A04-7

Dynamical analysis of diapycnal mixing processes in the ocean toward the formulation of their accurate parameterizations


Toshiyuki Hibiya

Our goal is to identify the best performer of the existing turbulent mixing parameterizations for each of layers and whether these parameterizations can be validated and/or improved. Our penultimate goal is to formulate a “seamless” parameterization of diapycnal mixing processes that can be applied throughout the water column, namely, from the ocean surface down to the ocean bottom.

Principal Investigator: Toshiyuki Hibiya (The Univ of Tokyo)
Co-investigator: Toshihiro Niwa (The Univ of Tokyo)
: Hiroshi Yoshikawa (Kyoto Univ)
: Yuuki Tanaka (The Univ of Tokyo)


Observation by multiscale profiler


Simulation by super computer

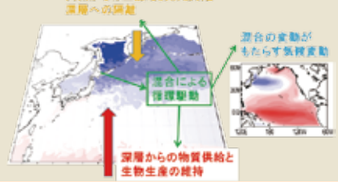
A04-8

Model development and impact assessment for ocean circulation, marine material cycles and climate by incorporating the effect of oceanic vertical mixing


Hiroyasu Hasumi

Our goals are 1) to reveal the three-dimensional structure of the North Pacific circulation induced by ocean mixing and to understand its influence on the climate; 2) to describe the materials cycles in the North Pacific under the influences of physical transport and biogeochemical processes.

Principal Investigator: Hiroyasu Hasumi (The Univ of Tokyo)
Co-investigator: Hiroaki Tatebe (JAMSTEC)
: Yoshiki Komuro (JAMSTEC)
: Yoshimasa Matsumura (Hokkaido Univ)
Collaborator: Takao Kawasaki (National Institute for Polar Research)
: Shogo Urakawa (MRI)



Climate-ocean-bio geochemical cycle model incorporating the effect of vertical mixing

MEXT KAKENHI Grant-in-Aid for Scientific Research in Inovative Areas No. 4702 (2015-2019)

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科研費 KAKENHI

mix

Ocean Mixing Processes ～ Impact on Biogeochemistry, Climate and Ecosystem

Ocean diapycnal mixing is a fundamental physical process that regulates ocean vertical circulations of water, nutrients, carbon and heat; however, its distribution and generation mechanisms have not been known because of the difficulties of observations. This research project will develop efficient observing system of ocean diapycnal mixing and next-generation numerical models, those of which are able to quantify the maintenance mechanism of deep and bio-geochemical circulations and to reproduce observed bi-decadal ocean and climate variability. This new interdisciplinary study on ocean mixing opens the integrated sciences from physical, chemical, biological oceanography to climate and fisheries sciences.

Keywords
Ocean diapycnal mixing
vertical mixing of seawater and dissolved substances due to turbulent eddies. In deep water, these eddies are caused by breaking internal waves generated by currents as tides over rough bottom topography, inducing ocean vertical water, heat and material circulations.