

Preface

This volume contains results obtained through the priority area research program entitled "Ocean Fluxes—Their Role in the Geosphere and Biosphere" which was funded by the Ministry of Education, Science and Culture, Japan for a 3-year period from 1991 to 1993 fiscal year. The major objectives of the program were to increase our knowledge on the global biogeochemical cycling of biophile elements such as carbon, nitrogen and phosphorous, and their associated elements within the ocean, and on its temporal changes through interactions across the major oceanic boundaries with land, atmosphere and seafloor. These can be regarded as a part of Japanese contribution to the international Joint Global Ocean Flux Study (JGOFS).

The field program started in April, 1991 and ended in March 1994 with great success, particularly in the Western Pacific (see Fig. 1). The coordination office was located at the Ocean Research Institute (ORI), University of Tokyo, and the following personnel served as members of the Steering Board;

Hitoshi Sakai (chairman)	Yamagata University
Yoshiyuki Nozaki	ORI, University of Tokyo
Shin-ichiro Noriki	Hokkaido University
Masayuki Takahashi	Botany, University of Tokyo
Isao Koike	ORI, University of Tokyo
Nobuhiko Handa	Nagoya University
Keisuke Taira	ORI, University of Tokyo

More than one hundred scientists almost exclusively from the universities were involved in the program. They were grouped and worked together under the following four core fields.

A01. Flux of Terrestrial Materials to the Ocean

Terrestrial materials transported by monsoonal winds and rivers to the surface ocean play a significant role in the geochemical cycling of materials in the ocean. The nature and flux of Asian dust and photochemical reactions, biological and abiological transformation occurring in the sea were investigated by measuring organic and inorganic substances and radioactive tracers. The relative importance of lateral transport of lithogenic particles from continental slopes to the ocean interior and the primary vertical flux from the surface ocean has also been studied by using a series of sediment traps.

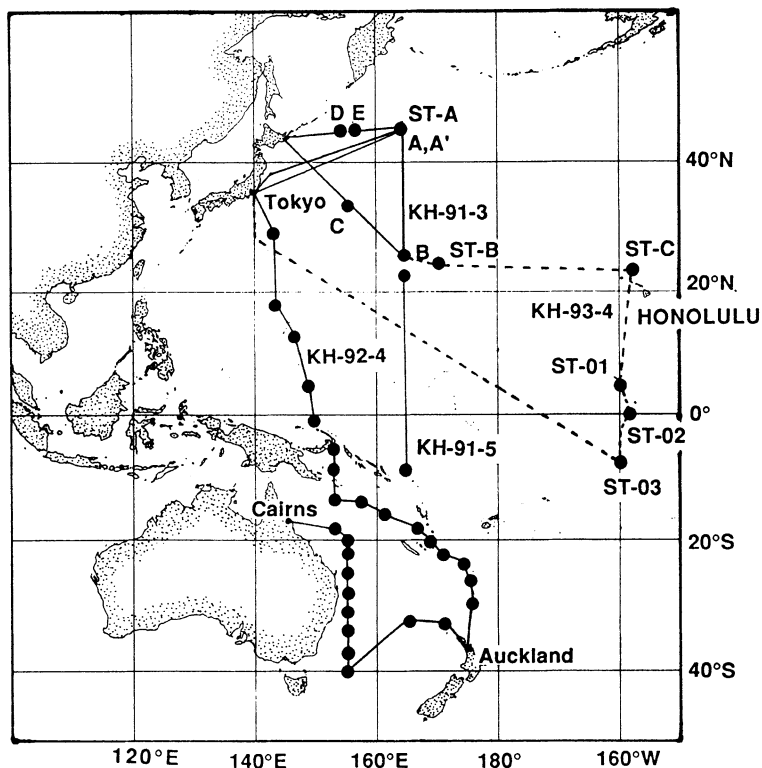


Fig. 1. The cruise tracks of R/V Hakuho-Maru during 1991-93 fiscal years in the Western Pacific.

A02. Biological Production and Export Flux of Particles

Primary production, food webs, and sinking of biogenic debris are important processes that transfer carbon from the surface ocean to the deep sea. This transfer of carbon by “biological pump” shows strong seasonality and local nutritional variability. The international field studies were carried out at the eutrophic and oligotrophic sites of the western North Pacific for understanding the physical and biogeochemical processes that affect the ocean productivity and the vertical flux of particulate matter. A new floating buoy system was developed for the time-series observation of physical and biogeochemical parameters in the surface ocean.

A03. Flux of Materials at the Tectonically Active Ocean Bottom

The island arc-trench-back arc basin system is a unique feature of the western Pacific where many spots of hydrothermal vent field and cold seepage exist (see Fig. 2). Fluxes of chemical constituents in hydrothermal fluids and seep waters appear to be important in the global balance of materials in the ocean. Investigations on the

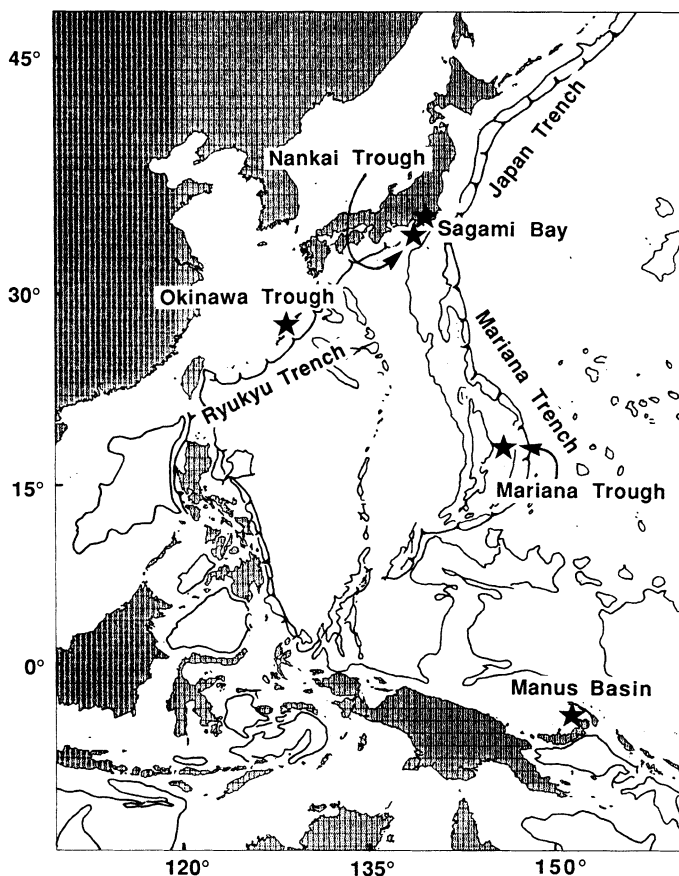


Fig. 2. The sites of submarine hydrothermal system and cold seepage in the Western Pacific.

fluids and deposits were undertaken in the tectonically active areas by using JAMSTEC submersible, “Shinkai 2000” and ROV “DESMOS” from R. V. Hakuho-Maru. An *in situ* monitoring system has also been developed to obtain continuous records of chemical parameters in such deep-sea environments.

A04. Ocean Circulation and its Effect on Ocean Flux of Materials

Physical processes that govern the state of oceans are undoubtedly very important in the biogeochemical cycling. In particular, nutrient supply to the surface mixed layer from underneath the thermocline through diffusion and winter convection is a primary control in biological productivity. A section study of CTD-hydrographic survey along 165°E and a series of moored current meter measurements were carried out to characterize the dynamic aspects that affect ocean flux in the western North Pacific.

The papers submitted to this volume were reviewed, and revised according to the reviewer's comments. Although this book contains 40 papers in somewhat broad interests and different styles, it represents only a part of this research program. Besides this, some results have already appeared in journals and others will be published in the near future. It is hoped that these contributions, altogether, will facilitate future research regarding the role of the ocean on the global climate change.

Thanks are expressed to all the scientists who participated in this program, the contributors to this volume and the reviewers. Financial support for this publication was provided by the Ministry of Education, Science and Culture, Japan to Y. Nozaki at the University of Tokyo. Secretarial and administrative assistance provided by Ms. K. Hasegawa is also gratefully acknowledged.

July 7, 1995

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