Preface

Because its characteristics resemble those of global oceans, the East Sea (Japan Sea) has long been studied and explored. Marine expeditions in the East Sea date back to the mid-1800s, and investigations of some important aspects of its oceanographic characteristics, especially water masses and surface circulation, were begun in the early 1900s. With the advent of computer resources as a powerful tool for numerical model simulations, together with modern methods of investigation such as satellite altimetry, Argos drifters, ARGO floats, and moored current measurements, the study of the East Sea has accelerated during the past two decades. In particular, major scientific achievements have flourished since the late 1990s. Six special issues of major international journals were published from 1999 to 2009 containing results from international programs and workshops dedicated to the East Sea. Two important events contributed to this scientific advancement: CREAMS and PAMS. CREAMS (Circulation Research of the East Asian Marginal Seas) began in 1993 as a comprehensive observational program organized by scientists from Japan, Korea, and Russia, the three countries bordering the East Sea. Many joint international cruises have been carried out over the entire East Sea, thus accelerating our understanding of the Sea. Joint cruises are still ongoing, and CREAMS is now an official program of the North Pacific Marine Science Organization (PICES). The special issues mentioned above were publications of results from CREAMS that were presented in related workshops and symposia. PAMS is an acronym for Pacific-Asian Marginal Seas and refers to a biennial workshop that provides a venue for scientists to present knowledge and share ideas about PAMS, and promote international cooperation in PAMS. The first workshop convened in 1981 with the initial name of JECSS (Japan and East China Seas Study), and its first 10 years PAMS exclusively focused on the physical and chemical oceanography of the East Sea and the East China Sea. The region of interest eventually broadened to include other northwestern Pacific marginal seas, and its name was changed to PAMS/JECSS in 1993 and finally to PAMS in 2009. Regular PAMS workshops have subsequently led to the publication of papers in 11 special issues, including books.

One of the major scientific topics relating to the East Sea oceanography is its own thermohaline circulation, similar to that occurring in the North Atlantic. Sill depths of the straits connecting the East Sea with adjacent seas and the North Pacific are shallower than 200 m, and subsurface waters below about 300 m constitute the Proper Water of the East Sea, first named by the famous Japanese oceanographer, Prof. Michitaka Uda in 1934. The Proper Water and intermediate water masses occupy more than 90 % of the East Sea water volume. They are formed in the northern East Sea, discharged to the south, and modified within the East Sea. Another unique property of the East Sea is its high biological productivity, especially in its southwestern part, the Ulleung Basin, where the nutrient-depleted Kuroshio branch, the Tsushima Warm Current, prevails. The primary productivity in the Ulleung Basin is as high as that of the ocean's major upwelling regions. Coastal upwelling, large- and meso-scale circulation are thought to play a role in maintaining this high productivity. Thus the East Sea is an ideal place to address the calibration of a wide range of proxies for ocean ventilation and productivity based on present oceanic conditions, as well as down-core records of the past. The evidence for rapid changes of physical and biogeochemical properties in the East Sea is compelling. Despite its long history of observations and studies, a comprehensive understanding of the ongoing changes and future projections of the East Sea is yet to be provided.

This book was written as a monograph summarizing current knowledge in the various field of oceanography of the East Sea, with the editors' hope that it will provide a useful compilation of previous important studies on each topic, and thus serve as a reference for anyone interested in the East Sea as well as providing motivation for more in-depth, future studies.

The book consists of 18 chapters, covering physical oceanography in Chaps. 2–5, chemical oceanography in Chaps. 6–9, biological and fisheries oceanography in Chaps. 10–15, and geological oceanography in Chaps. 16–18, together with a general introduction and details of the CREAMS program in Chap. 1. Each chapter serves as a stand-alone article addressing a specific topic in the form of a single scientific paper, including its own list of references. Interdisciplinary discussions of processes, such as physical-biological coupling, are somewhat scattered throughout various chapters. Editors and authors of each chapter have made a special effort to include prior publications exhaustively, though not completely, especially non-English papers. A list of abbreviations and a subject index will help readers to understand terminology specific to the East Sea and to use this book as a reference handbook. Readers are also recommended to refer to Chaps. 1 and 4 for topographic features and names, and basin- and meso-scale upper circulation features of the East Sea, which are often mentioned in other chapters.

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Oceanography of the East Sea (Japan Sea)

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Cover Image: The image shows a distribution of chlorophyll *a* concentration over the East Sea derived from Geostationary Ocean Color Imager (GOCI) observations taken in September, 2011. It reveals various ocean surface features such as fronts, plumes, filaments and eddies. Natural color composite is shown on the land.
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