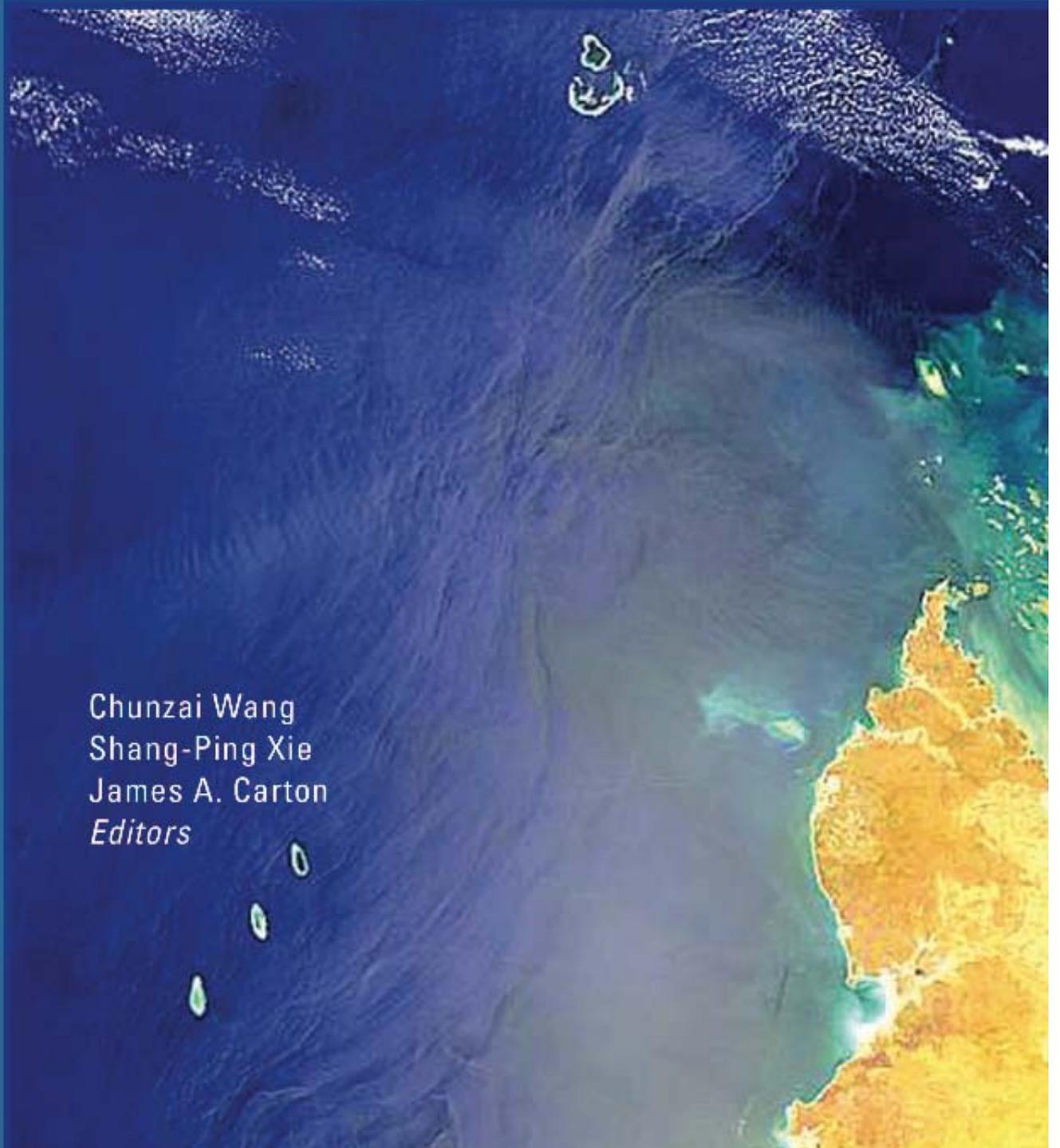


Earth's Climate

The Ocean-Atmosphere Interaction

Chunzai Wang
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Editors



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PREFACE

It is more than 30 years since the publication of Jacob Bjerknes' groundbreaking ideas made clear the importance of ocean-atmosphere interaction in the tropics. It is now more than 20 years since the arrival of a massive El Niño in the fall of 1982 set off a cascade of observational and theoretical studies. During the following decades, the climate research community has made exceptional progress in refining our capacity to observe earth's climate and theorize about it, including: new satellite-based and *in situ* monitoring systems and coupled ocean-atmosphere predictive numerical models. Of equal importance is the expanding scope of research, which now reaches far beyond the Pacific El Niño and includes climate phenomena in other ocean basins.

In order to cover the now global context of ocean-atmosphere interaction we have organized this monograph around five principal themes, each introduced by one or more broad overview papers. Theme I covers interaction and climate variability in the Pacific sector, with extensive discussion of El Niño-Southern Oscillation, and with the possible causes and consequences of variability on both shorter and longer timescales. Theme II is devoted to interaction in the Atlantic sector. This basin exhibits complex behavior, reflecting its geographic location between two major zones of convection as well as neighboring the tropical Pacific. Theme III reviews the recent, exciting progress in our understanding of climate variability in the Indian sector. Theme IV addresses the interaction between the tropics and the extratropics, which are linked through the presence of shallow meridional overturning cells in the ocean. Finally, Theme V discusses overarching issues of cross-basin interaction.

Indeed, this monograph represents the climate community's first effort to summarize the modern science of ocean-atmosphere interaction and the roles that the interaction plays in climate variability on the basin and global scales. We believe that the material covered here will be of interest to the climate research community as well as members of the broader scientific community who want to learn about the current state of climate research, to students studying climate and related topics, and to those members of the public who find themselves increasingly fascinated by the patterns of climate and climate change now revealed by climate monitoring tools.

This monograph derives from a special session at the American Geophysical Union (AGU) Fall Meeting in December 2002 entitled, "Ocean-Atmosphere Interaction and Climate Variability", which attracted a large audience. The session was remarkable for having brought together

many of the scientific leaders in the field, and for providing the first clear overview of this rapidly evolving discipline spanning all three ocean basins — Pacific, Atlantic, and Indian, as well as the interactions among these basins. However, this monograph is not simply a collection of conference papers. Indeed, less than half of the papers contained here were drawn from that conference and many were invited.

We are indebted to a number of people who played a critical role in constructing this monograph. Most importantly, we would like to thank the referees for their time and effort. They are M. Alexander, S.-I. An, M. Barreiro, M. Cai, E. Chang, G. Chepurin, C. Clark, S. Cravatte, H. Dijkstra, A. Fedorov, C. Frankignoul, A. Giannini, B. Giese, B. Goswami, S. Hastenrath, M. Jochum, J. Kinter, B. Kirtman, R. Kleeman, B. Klinger, A. Kumar, N. Larkin, T. Lee, B. Lintner, Z. Liu, C. Meinen, A. Mestas-Nunez, M. Nonaka, Y. Okumura, W. Robinson, R. Saravanan, T. Shinoda, D. Snowden, A. Sobel, H. Su, Y. Tanimoto, A. Timmermann, D. Vimont, R. Wajsowicz, X. Wang, A. Wittenberg, L. Wu, T. Yamagata, and C. Zhang. David B. Enfield served as a guest editor overseeing the review of the opening overview paper authored by us. Yuko Okumura served as editorial assistant for S.-P. Xie, and carefully proofread the camera-ready text for some papers in the volume. We are also grateful to nine anonymous referees of the original book proposal for useful comments. Finally, we would like to acknowledge Kenneth Minschwaner, the oversight editor for this project and member of AGU's Books Board, and Allan Graubard, our acquisitions editor, along with Maxine Aldred and Pamela Ingate of AGU Books.

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The science of ocean-atmospheric interaction now extends from basin- to global scales. Satellite-based and *in situ* monitoring systems as well as coupled ocean-atmosphere numerical models have greatly increased our understanding of climate variations in the Pacific, Atlantic, and Indian sectors as well as interactions cross-basin and between the tropics and extratropics.

Earth's Climate: The Ocean-Atmosphere Interaction is the first monograph to summarize these new advances and how they have enhanced our understanding of climate variability worldwide.

Scientists, researchers and students of climate, oceanography, and atmospheric sciences will find this book a significant resource, now and in the future.

CONTENTS INCLUDE:

- Observational and theoretical aspects of the ocean-atmosphere interaction that helps shape Earth's climate and its variations
- Summaries of current research on ocean-atmosphere interaction and global climate variability
- Beyond the Pacific El Niño, studies on climate variability in the Atlantic and Indian sectors
- Climate variations due to interactions and exchanges between the Pacific, Atlantic, and Indian sectors, and between the tropics and extratropics

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