East Asian Monsoon

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East Asian Monsoon

edited by

C.-P. Chang

*Naval Postgraduate School,
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PREFACE

The term “Asian summer monsoon” most frequently refers to the heavy summer rainfall season in South Asia, particularly around India. To some in the western world, “East Asian summer monsoon” is a less familiar term. This is partly because seasonal mean maps have a large area of high rainfall in South Asia during boreal summer, while rainfall over a comparably sized area in East Asia is significantly lower. In fact, the East Asian summer monsoon has complex space and time structures that are distinct from the South Asian summer monsoon. It covers both subtropics and midlatitudes and its rainfall tends to be concentrated in elongated rain belts that stretch for many thousands of kilometers and affect China, Japan, Korea, and the surrounding seas. The narrow meridional scale and the tendency of alternating stationary and northward progression stages make the seasonal averaged rainfall in East Asia less concentrated than in South Asia. However, the impacts of floods and droughts on human lives and economics during the East Asian summer monsoon are just as great because the finer intraseasonal space-time structure, coupled with the narrow rivers, is more sensitive to interannual variations. For example, a flood event can result from heavier-than-normal rainfall during the normal subseasonal rain period or from sustained rainfall outside of the normal period or both.

The East Asian summer monsoon is also closely linked with the West Pacific summer monsoon. Both are part of the global climate system and are affected by El Niño – Southern Oscillation (ENSO) and surface temperature variations in the western Pacific and surrounding oceans, the tropospheric biennial oscillation, and the South Asian summer monsoon. In addition, typhoons in the western North Pacific are most active during the East Asian summer monsoon. They may be considered a component of the East Asian summer monsoon as they contribute substantial amounts of rainfall and have major impacts on the region.

The East Asian winter monsoon, or “Asian winter monsoon”, may be a more familiar weather system to the western world. Its circulation encompasses a very large meridional domain. Cold air outbreaks emanate from the Siberian high and penetrate deeply into the equatorial region, where the center of maximum rainfall is found in the Maritime Continent region. This center has long been recognized as a major planetary scale heat source that provides a significant amount of the energy that drives the global circulation during boreal winter. The East Asian winter monsoon is directly connected with the Australian summer monsoon by vigorous circulations extending across the equator, and both are affected by ENSO and other oscillations in the Pacific and Indian Ocean. In addition, a number of global teleconnections associated with the East Asian winter monsoon have recently been found. These include a correlation of temperature and precipitation anomalies over North America with fluctuations in the East Asian jet stream, and an association of winter storm development as far away as Europe with precursor convection over the Maritime Continent.

Because of its impacts on nearly one third of the world population and on the global climate system including effects on climate change, the study of East Asian monsoon has received increased attention in both East Asian countries and in the United States. This book presents reviews of the recent research on the subject. The book is organized into five parts with three chapters each: East Asian summer and winter monsoon, interannual variations, general circulation modeling, synoptic and mesoscale processes, and interactions with other circulations.

The idea of this book originated when the World Meteorological Organization/Commission on Atmospheric Science Working Group on Tropical Meteorology Research, under the past chair, Dr. Greg Holland, and the present chair, Prof. Lianshou Chen, organized the *International Panel for East Asian Monsoon* under the leadership of Prof. Shiyan Tao. The book would not have been possible without the efforts of the many reviewers. Besides the members of the Editorial Board of the World Scientific Series on Meteorology of East Asia who served as reviewers, the book benefited tremendously from the following individuals who provided critical reviews of individual chapters: Drs. Hanna Annamalai, Johnny Chan, Russ Elsberry, Bill Frank, Bob Haney, Harry Hendon, Brian Hoskins, Dick Johnson, T. N. Krishnamurti, Bill Kuo, Bill Kyle, Mark Lander, Peggy LeMone, Jerry Meehl, Takio Murakami, Julia Slingo, Wei-Kuo Tao, Mingfang Ting, Chuck Wash, and Song Yang. The technical editing was performed by Ms. Hway-Jen Chen. This work was supported in part by the National Science Foundation under Grant ATM-0101135, the National Oceanic and Atmospheric Administration under Grant NA01AANRG0011, and the Office of Naval Research Marine Meteorology Program.

Chih-Pei Chang
Naval Postgraduate School
Monterey, California

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