

Climate Change in the Polar Regions

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Book Reviews

CLIMATE CHANGE IN THE POLAR REGIONS. By John Turner and Gareth J. Marshall. Cambridge: Cambridge University Press, 2011. 434 pp. \$115 (hardcover). ISBN 978-0-521-85010-0.

This book fills a gap in the polar climate literature. There are ongoing rapid changes in the climate of both the Arctic and Antarctic, with major impacts on sea ice, glaciers and ice caps, the two major ice sheets, permafrost, and plant and animal life on land and in the ocean. The authors are both members of the British Antarctic Survey with substantial Antarctic experience.

There are eight chapters. Chapter 1 gives a brief introduction to the polar environment, discusses the role of the polar regions in the global climate system, and reviews the possible implications of high-latitude climate change. Chapter 2 addresses observed and proxy polar climate data and models. Chapter 3 examines high-

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latitude climates and mechanisms of change on geological and recent time scales. The energy budget and poleward heat fluxes are discussed fully while the vapor budget is only briefly considered in spite of an extensive literature. The discussion of the 1970s Weddell Sea polynya (p. 78) overlooks other explanations. There is a thorough treatment of causal mechanisms ranging from orbital variations to Heinrich and Dansgaard-Oeschger events, and feedbacks and modes of atmospheric circulation. The chapter also covers polar region climatology. However, the section on arctic sea ice (p. 146) fails to cross-reference the recent changes in minimum annual extent that are noted on pp. 292–293. Chapter 4 examines the climates of the last million years using the Antarctic ice core evidence, but for the Arctic focuses mainly on the last 130,000 years. The chapter concludes by examining the links between climate changes in the two polar regions. The Holocene is the subject of Chapter 5, which first considers the forcings and then the climatic and oceanographic conditions. The temperature of the Holocene interval is treated in three time slices—early, middle, and late. Sea ice conditions and the history of greenhouse gases and aerosols are discussed, followed by a section on the main components of the cryosphere and sea level. The word ‘precipitation’ should be deleted from the subheading of section 5.8 as it is not discussed.

Chapter 6, which represents 21% of the text, reviews the instrumental period in detail. It treats the main meteorological

elements (temperature but not precipitation), atmospheric circulation and weather systems, the ocean, sea ice, snow cover, permafrost, gases (including stratospheric ozone) and aerosols, terrestrial ice and sea level, and the attribution of recent changes. Figure 6.23 of September sea ice extent should have been extended back to 1979 to demonstrate the steady decrease over three decades.

Chapter 7 discusses predictions for the next 100 years beginning with IPCC greenhouse gas emission scenarios. It then follows the sequence of subheadings used in Chapter 6. Chapter 8 provides a brief summary and considers future research needs.

The book has more than 150 line drawings and a few photographs that unfortunately are not well reproduced. There is a comprehensive reference list of some 800 titles and an index. The book can be recommended as a comprehensive account of polar climatic change suitable for beginning graduate students in climatology and as a reference work for polar scientists.

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