it has spawned. The ENSO phenomenon, a sparkling example of coupled atmosphere–ocean interactions, is given very short shrift and the work on the retarded oscillator explanation of ENSO (Schopf and Suarez 1988; Battisti and Hirst 1989) is not mentioned at all.

Although the preface was written in 1993, there are very few results of the 1990s contained in the book (of the 300 references, only eight were from the 1990s and none after 1992). In a field as rapidly moving as atmosphere–ocean interactions, this is a serious drawback. For example, the many attempts and successes over the last few years to make coupled models without flux correction is not reported nor is the large number of intercomparison projects, both of component models and of fully coupled models, mentioned. The huge amount of work, mostly involving coupled models, coming from the Max-Planck-Institute in Hamburg, Germany, is omitted. These deficiencies are probably due to a combination of time delays needed to translate the book and the particular focus of Russian scientists who do not have access to all the late-breaking developments in the West.

The translation is acceptable, but the text could not be mistaken for native English. "Small glacial period" for Little Ice Age, "soil humidity" for soil moisture, and the constant references to the "hydrothermodynamic equations" are quaint and perhaps not so serious. Sentences such as this one in chapter 1 (in reference to satellite measurements), "Each of them is compile with its own frequency of information-gathering," are more serious, occur regularly, and sometimes interfere with the smooth flow of comprehension.

If the reader is a graduate student and knows little of the processes and models used to investigate the mean and variable climate of the earth and its responses, there is much of value in this book. If the reader is a western scientist actively working in the field, he or she would probably know more than what is in this book, although the references to the Russian literature and the admixture of mathematical analysis may prove interesting. I recommend that a library possess this book, flaws and all, since there is no other book on the subject.—*Edward S. Sarachik.*

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Mountain Environments in Changing Climates. Martin Beniston, Ed. 1994. 452 pp. $125.00. Hardbound. Routledge. ISBN 0-415-10224-3.

This book documents the technical contributions to an international conference of the same name held in Davos, Switzerland, on 11–16 October 1992. It includes scientific articles contributed by climatologists, biologists, hydrologists, ecologists, economists, and other experts who attended the conference. The editor states in the introduction that the book is intended as a reference document for those interested in global climate change and its potential impact on mountainous regions. The Intergovernmental Panel on Climate Change is preparing assessment reports on the potential effects of global climate change, and this book will be a key contribution to their assessment report on mountainous regions.

The book is divided into three major sections: section 1, "Climate Change in Mountainous Regions: Fundamental Processes, Historical and Contemporary Observations, and Modeling Techniques"; section 2, "Impacts of Climate Change on Mountain Vegetation: Observations, Modeling, and Networks"; and section 3, "Socio–Economic Aspects of Climate Change in Mountainous Regions."

The three sections are of approximately equal length. The contributions are well balanced, the quality of the articles is generally good, and the editing job, considering the international mix of authors, is superb. In each of the three major sections there is at least one

broad summary paper that sets the stage for the more narrowly focused papers in the same section.

The first section, which may be of most interest to meteorologists, includes contributions on various topics, such as the role of mountains in the climate system; past and potential future changes in mountain environments; the global, regional, and local anthropogenic threats to Alpine ecosystems; use of proxy climate records; climate in Europe during the period 1675–1715; glacier and permafrost changes in the Alps; monitoring of snow cover variation in the Alps; the effects of mesoscale vegetation distributions on local mountain climates; and the need for accurate climate scenarios on the scales required by those who will model climate impacts.

The baseline levels of climate data available for the different mountain regions of the world are quite variable. The long-term climate records from permanent mountain observatories in the Alps and from mountain meteorology networks makes this mountain range one of the best documented in the world. Permanent mountain observatories are nearly unknown in North America, where mountain population densities are comparatively low. The contributions discuss our present very rudimentary understanding and documentation of climate change in mountains, and one is struck by the very significant effort now being applied to this problem in the Alps—an effort that, to my knowledge, is unmatched in North America and will thus be of interest to North American readers.

From the second section, dealing with the effects of climate change on vegetation, one gets an overall view of the surprising complexity of the response of plant communities to climate change. This complexity is illustrated with references to the paleoclimate record, mountain timberlines, forest succession, and heathland ecosystems.

The third section deals with the potential impacts of climate change on mountain communities, including supposed effects on tourism, agriculture, forestry, water resources, and protected mountain areas (national parks, nature reserves, etc.). Statistical jargon in the papers dealing with human perceptions of the climate change problem made them somewhat hard to follow. In these chapters, and in others, the tentative nature of the research results is clearly stated.

A conclusions chapter summarizes the findings from the three main sections to consider whether mountain communities should be concerned about climate change. The conclusion is that the degree of concern will vary considerably depending on a number of interacting factors. Mountain environments exhibit complexities on all scales, the depth of scientific knowledge of the mountain environment varies greatly from region to region, different mountain communities utilize their mountain environments in different ways, and there is much to be learned about the mechanisms, timescale, and magnitude of global climate change. It is clear, however, that climate change may have positive as well as negative impacts.

The book presents a snapshot as of 1992 regarding our knowledge of potential climate change impacts in mountain regions. I recommend the book to anyone with a broad interest in global climate change and its localized effects on mountain regions.—*C. David Whiteman.*

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Air Pollution Modeling and Its Application X. Sven-Erik Gryning and Millán M. Millán. 1994. 704 pp. $165.00. Hardbound. Plenum Publishing Company. ISBN 0-306-44888-2.

This book constitutes the Proceedings of the 20th NATO/CCMS International Technical Meeting on Air Pollution Modeling and Its Application, which was held 29 November–3 December 1993 in Valencia, Spain. This conference was conducted under the auspices of the North Atlantic Treaty Organization (NATO) Committee on the Challenges of Modern Society (CCMS).

The series of technical meetings sponsored by NATO/CCMS have become a "standard" international conference on air pollution modeling. The conference in Valencia drew 172 participants from 31 countries, including several non-NATO countries.

The book (reflecting the conference organization) consists of five main sections: "Integrated Region Modeling," "Global and Long-Range Transport," "New Developments," "Accidental Release," and "Model Assessment and Verification." In addition, two project-oriented workshops, a video session, and a poster session are included, making a total of nine sessions and more than 100 papers. Both the text of each paper and a rapporteur's summary of the succeeding discussion are included.

The session on Integrated Modeling includes 13 papers on mesoscale models that integrate the modeling of dispersion with modeling of meteorology (wind flow or boundary layer structure), photochemistry, and/or deposition. About half the papers in this section involved comparisons between model results and observations.

The session on Global and Long-Range Transport includes 11 papers. These are predominantly model descriptions and analyses, with some comparisons with measurements. This section includes papers on