

## Book reviews

**Beyond El Niño: Decadal and Interdecadal Climate Variability** edited by Antonio Navarra (Springer, 1999). ISBN 3-540-63662-5. US\$119.

Interest in climatic variability on time-scales of decades to centuries has grown rapidly in the last five years. Some of this interest has been engendered by the need to gain a better understanding of natural climatic variability in order to resolve more clearly the climatic signature of enhanced greenhouse warming. However, this focus on decadal and interdecadal fluctuations in climate has also been driven by a growing realisation that other known climatic features, such as the El Niño Southern Oscillation (ENSO) phenomenon, show distinct signs of being modulated by lower frequency variations in climate. The search is on to resolve distinct climatic signals on decadal to century time scales, to identify the physical mechanisms underlying them, and to incorporate any influences of such climatic signals on ENSO into current seasonal climate forecasting schemes.

The book *Beyond El Niño: Decadal and Interdecadal Climate Variability* provides a useful first step in any assessment of the range of current research and level of scientific understanding concerning decadal to interdecadal climatic fluctuations. It is part of a growing effort aimed at documenting research findings in this area, and their implications for our understanding of the climate system and long range forecasting approaches. Overall, this book addresses the topic in six initial chapters on observational evidence and analyses, followed by the remaining eight chapters devoted to numerical modelling studies and theoretical interpretations.

Being essentially a report of scientific research efforts under the European Commission's Decadal and Interdecadal Climate Variability Experiment (DICE), there is naturally a strong emphasis throughout the book on the northern hemisphere. The bulk of chapters focus on the North Atlantic and North Pacific Ocean basins and in regions such as India and North Africa. However, there are chapters that look to the Tropical Atlantic and Pacific, and one on observational findings from analyses of historical global sea-surface temperature data.

*Beyond El Niño: Decadal and Interdecadal Climate*

*Variability* is a book for the research scientist working in the area, or in related fields, who is interested in following the progress of decadal to interdecadal climatic variability research or wishing to examine its impact on a particular region. This area of research is still evolving, to the extent that there is no overall consensus about nomenclature or a complete picture of the climatic features being resolved. *Beyond El Niño: Decadal and Interdecadal Climate Variability* illustrates something of the scope of the task still required to develop a unified physical understanding of decadal to interdecadal climatic variability.

Several chapters in this book discuss differences between ENSO and decadal to interdecadal signals over various regions of the globe. However, the book stops short of any discussions about the possible modulation of ENSO by lower frequency fluctuations in the climate system. This is to be expected, as such linkages are still being examined and debated, while the scope of this book is specifically to look beyond ENSO. It is an indication that research in this area is still in its infancy, and to gain a full measure of current research findings one needs to examine a number of publications.

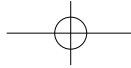
Overall, *Beyond El Niño: Decadal and Interdecadal Climate Variability* provides a useful summary of some of the research effort that is being undertaken around the world to document and understand decadal to interdecadal climatic variability. By the very nature of this research, it is difficult to envisage a current book being published that would cover the full range of the subject matter. This will change over time, much as it has for books dealing with ENSO.

I would recommend *Beyond El Niño: Decadal and Interdecadal Climate Variability* to researchers wishing to add to their understanding of decadal to interdecadal climatic variability. Further publications on this topic in the future will add to the material discussed in this book.

**Rob Allan**

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**Remote Sensing of Tropical Regions**



by Eugene A. Sharkov (John Wiley & Sons, 1998). ISBN 0-4719-7171-5. US\$135.

For readers whose interest in remote sensing is not confined to the oceans and the atmosphere, but who also want to know about ecosystems and land monitoring in the tropics, this book might be a valuable reference. The author makes the point that the tropical region is the driving force in the global hydrological cycle so that the understanding of the tropics is importance to a research community that extends beyond the disciplines of meteorology and oceanography. Most chapters provide a comprehensive summary of work performed in the last three decades. However, there are a couple of chapters dealing with microwave and radar theory that might be tough going for the casual reader.

Chapter 1 sets out the rationale for tropical studies and, quite naturally, explains the motivation behind the Tropical Ocean and Global Atmosphere (TOGA) Programme and its intensive interaction experiment, the TOGA-Coupled Ocean-Atmosphere Response Experiment (COARE). The El Niño – Southern Oscillation (ENSO), one of the prime examples of climatic variability on an interannual scale, is discussed. The chapter closes with a useful statement on the requirements of accuracy for measurable parameters that are essential for process and remote sensing studies.

The structure and development stages of tropical cyclones are detailed in Chapter 2, which has the somewhat unfortunately misspelled title of 'Airsapce remote sensing of tropical cyclones'. The subsequent text reveals that the author meant 'air-space' because both *in situ* aircraft and satellite-based remote sensing of cyclones are discussed.

As pointed out in Chapter 3, the key variable in the tropics is precipitation, in particular precipitation falling over the oceans, which is difficult to measure. Discussion on techniques to obtain precipitation from passive microwave, visible/infrared observations and their validation precede an introduction to the requirements for further satellite missions. This includes a discussion on the Tropical Rainfall Measurement Mission (TRMM), which was in final preparation before launch when this book was written.

For those who are interested in ground observations from space, the atmosphere is just a nuisance. So, the development of passive and active microwave tools, including Synthetic Aperture Radar (SAR), has offered the scientific community a powerful opportunity to bypass the unpleasantness of the atmosphere and probe the ocean surface (Chapter 4). Slicks, which damp surface waves, internal waves, the structure of coastlines and in-land hydrological networks

can be probed in great detail, although it appears from the text that many SAR-techniques for ocean probing are still in their infancy.

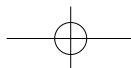
The retrieval of water vapour, thermal structure and clouds is treated in Chapter 5. Their distribution in the tropical atmosphere is important but, as the text points out, the well-known inversion problems associated with thermal and water vapour profiling put constraints on the accuracy of retrievals of the thermodynamic structure. Microwave techniques can be used to obtain liquid water path, but validation using ground-based microwave radiometers appears an almost futile exercise, so information about its accuracy is largely unknown. It was good to see that one section in this chapter was dedicated to the Global Positioning System (GPS). This is a powerful technique that will become important early next century to obtain a detailed global vertical distribution of water vapour.

Chapter 6 gives a comprehensive introduction to the basic principles of passive and active microwave remote sensing. This background material is most useful but is clearly aimed at readers with a more developed interest in the physics of remote sensing. To an undergraduate needing an introduction to remote sensing, some of this material may be too advanced. I also wondered whether this chapter would have been better suited at the beginning of the book rather than in the middle, as descriptions of significant applications of these techniques have already preceded this chapter.

The monitoring of tropical ecosystems is dealt with in Chapter 7, one of the longest treatises in this book. This interesting chapter reveals the way in which remote sensing techniques can be used to probe vegetation parameters, ecological zones, surface temperature, primary productivity, soil moisture, surface roughness, ecosystem boundaries, rainforest, land clearing, fires and crops. Once again, SAR is discussed in the context of monitoring many of these parameters, but now as a well-developed technique.

The final chapter covers the current operational satellites and those planned in the near future, including a long discussion on the Russian satellite programs such as Meteor, Resurs, Electro and Priroda. I suspect that some of these programs may not be very familiar to the Western reader.

Overall, there seemed to be a slight Russian bias in this book, perhaps understandably so. The author makes the point in the last chapter that 'the Western reader has, as a rule, a weak grasp of Russian literature'. This is quite true I am sure, but the reference list contains a number of papers that are quoted to be in Russian. So, these would be inaccessible to the Western reader except with great difficulty.



This book is a good summary of tropical remote sensing. I found it to be well written, with well-balanced and clear figures, including a set of remote-sensing examples in colour.

Despite the editor's comment at the front of the book that it is aimed at a wide readership, I believe that it will be more attractive to the professional than to those seeking an introduction.

**Reinout Boers**

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**Climates of the Southern Continents: Present, Past and Future** edited by J. E. Hobbs, J. A. Lindesay and H. A. Bridgman (John Wiley & Sons, 1998). ISBN 0-471-94926-4. US \$100.

'How many times a year do you travel outside Australia?' My questioner: a Cambridge don in 1975, curious to test the degree of isolation of a newly arrived antipodean colleague. For him, commuting to Paris or even New York was a regular event, less daunting and certainly less costly than an east-west coast trip in Australia.

The northern hemisphere, especially the Europe-North America axis, is almost a different world. In few areas is that difference more accentuated than in the science of global climates in general, and palaeoclimates in particular. Jack Hobbs, Janette Lindesay and Howard Bridgman have set about to redress that imbalance. The publication *Climates of the Southern Continents: Present, Past and Future* brings together a wide dataset from the four major continents in that southern half of the globe where oceans and ice each play distinctive roles in contrast to the dominant land masses of the north.

The first five chapters of the book are each by separate authors and deal systematically with individual continental regions. Janette Lindesay (currently at the Australian National University, Canberra) drawing on her personal research in the land of her origin, explores the physical components and dynamics of climate in South Africa. Jack Hobbs (University of New England, Armidale) expounds on Australia and

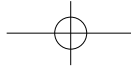
New Zealand, while South America and Antarctica are dealt with by Randall Cerveny (Arizona State University) and Ian Simmonds (University of Melbourne) respectively.

The second part of the book turns back the clock to examine past climatic records. South Africa is again dealt with by Janette Lindesay, emphasising the depth of her experience through both past and present climate patterns of that region. She combines later with Rob Allan (CSIRO, Aspendale) to review past climates of Australia. South American records are summarised by Vera Markgraf (University of Boulder, Colorado). The absence of any treatment of Antarctica's paleoclimatic record reflects the paucity of data from that region. Although not lacking in theories of changes proposed by different workers (changes in sea ice and total ice volume), the history of that great ice mass remains largely shrouded in mystery or unresolved controversy. Debates on its response to time-scales of glacial-interglacial oscillation and also on possible ice collapse about three million years ago associated with the presence of *Nothofagus* forests flora of the Sirius formation raise more questions than answers.

While the treatment of palaeo-events focuses naturally on the more recent Quaternary ice age records, the South Africa summary extends back to that critical period in Tertiary time, the transition from warm, humid environments to cold glacial-interglacial orbitally-driven oscillations. The relevance of these early changes at the mega-scale level are stressed by Janette Lindesay, including their possible influence on the origins of our own genus, *Homo*.

Given the reviews of both present and past climatic records, it comes as no surprise to find the final chapter devoted to climates of the future. Drawing heavily on model predictions, while acknowledging the differences and uncertainty between four comparative models, Howard Bridgman (University of Newcastle) gazes into the crystal ball of future climatic scenarios for the entire southern hemisphere. Each chapter is illustrated by excellent line diagrams and supported by a substantial bibliographic reference list.

While the book will not replace those more systematic accounts devoted to treatment of separate continents, the integration of data from land masses under the influence of related circumpolar systems provides, for the first time, an evaluation of systems between rather than within individual continents. The influence of tropical convective processes, variations in the ITCZ and their interactions with circumpolar westerlies may be traced around the hemisphere. The dynamics of all important rain-bearing systems are evaluated for each major region.



While there is no specific treatment of the global asymmetry between the southern and northern hemispheres, the book provides an excellent basis for understanding such differences. Perhaps this is no more starkly illustrated than in Ian Simmonds' account of Antarctic climates. This demonstrates the exponential accumulation of data now being derived from this great polar ice cap, even if the absence of palaeo-data highlights how little we still know of that region. Its production of globally important cold bottom water, its huge albedo influence and the dynamics of possible ice collapse, particularly of the west Antarctic region, all contribute to its major influence as global climate modulator. No other region more starkly contrasts south with north; no other region emphasises more dramatically the overall importance of the southern oceanic and ice-dominated regions in the global system.

In matters palaeoenvironmental, the southern hemisphere has suffered for far too long under the shadow of data and hypotheses derived from the large number and vocal influence of workers in the northern hemisphere scientific cast. For too long we have been reluctant to put our own individual interpretations on events in our own backyards. Mere mention of the climatic oscillation of the Younger Dryas (about 11,000 years ago) has so often been enough to spark a rash of research applications across Europe and North America. The implication that global temperatures plummeted to near glacial maximum levels in a matter of a hundred years or even less has raised alarm bells in the Greenhouse debate. The possibility of high magnitude, sudden phase shifts in circulation patterns should certainly be cause for concern. The hunt for such records in the southern hemisphere does not necessarily support such extreme changes. Claims for appearance of the Younger Dryas event in South America are not supported either in Australia or Africa thus far. Its global relevance is far from established, despite the enthusiasm that mere mention of its presence creates in the northern hemisphere.

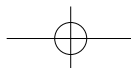
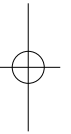
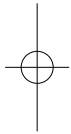
The role of ocean-atmosphere interaction is dealt with indirectly through separate chapters. ENSO dynamics are described both from the Australian and South American perspectives, with an interesting account of such effects in South Africa, far from ENSO's more frequent Pacific association. The influence of SSTs on rainfall variability provides another unifying hemispheric element. Given the special emphasis of oceanic processes in this hemisphere, a separate or synthesis chapter would have added an important dimension to the work. Perhaps another book is required.

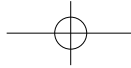
In a special sense, this book breaks new ground. The links between proxy (palaeoclimatic) workers and modern climatologists have been a long time

coming. The pioneering work of Peter Webster and Neil Stretten in 1978 was the first of its kind to attempt a systematic reconstruction of Australia's ice age climates. Today, by comparison, proxy workers need to have detailed understanding of the role of the monsoon system, the westerlies, ENSO effects, and of the magnitude and frequency of change in a way that links them directly to their more analytically quantitative meteorological colleagues.

If it requires a brave person to predict next year's weather, what then of the millennium already upon us? Even the most advanced GCM results for global climate in 2050 provide variable results with limited reliability. Howard Bridgman's predictions of climate in AD 4000 must therefore be taken with the proverbial grain of salt. His extension of greenhouse dynamics so far into the future provides a controversial concluding chapter. Although climatologists in AD 4000 will probably not refer back to this book to verify if Howard's predictions were right or wrong, the challenge of the future is starkly portrayed in the levels of uncertainly involved. Those skeptics who continue to decry modelled greenhouse predictions by pretending 'she'll be right' would do well to contemplate the hazards of the unknown as expounded in this chapter.

The marriage of past proxy datasets with present climate dynamics is almost as difficult as the task of getting proxy workers (pollen analysts, geologists, archaeologists) to talk with climatologists. A growing medium, perhaps the required yeast in that dialogue, is taking shape in the form of mutual interests in and dependence on computer models. Palaeo-data play a critical role in testing the ability of present day models to hindcast past changes established by proxy methods; conversely, proxy workers, more prone to arm-waving generalisations in their climate reconstructions, must look now to their GCM colleagues to provide closer constraints on actual climate parameters that have controlled past major changes. What major changes in the monsoonal patterns controlled the periods of huge water bodies in arid Central Australia, as in Lake Eyre during the last interglacial (isotope stage 5)? What T, P and E values were involved in those periods of extreme aridity that seem to have affected all continents during the last glacial maximum 20,000 years ago? Answers to these questions involve convergence of past evidence with present climate dynamics. More frequent integration of dialogue between proxy and modern climatologists will produce new ways of interpreting our past, a development that will open an exciting period in our understanding of environmental change in general and of the Southern Hemisphere in particular. By providing realistic constraints on the dynamics of past variations, it will also extend baseline reliability for prediction of future climates.





Although Cambridge or New York's Lamont Doherty labs may, at times, have seemed remote from our vantage in the southern hemisphere, the integration of Australia's place with its southern neighbours in the drama of climates past, present and future emphasises those unique qualities that make this hemisphere such a distinctive and exciting half of the globe. The appearance of this volume devoted to just these objectives is a timely and welcome one.

**Jim Bowler**

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