

Indian examples of contemporary applications. From India, in the last decade a few books have been published on remote sensing, with emphasis ranging from fundamentals to applications; some highlighting atmospheric sensing/sounding and more on Indian satellite sensors and systems, etc. The present book by Panda is a good addition to this library. The book is intended to address the fundamentals for the students.

From the title of the book, the author intends to cover both fundamental principles and applications. However, it lacks sufficient treatment on applications. In all, there are eleven chapters focusing on the physics of remote sensing, energy interactions, remote sensing platforms, data acquisition, information extraction procedures, complimentary spatial technologies and applications. Panda, being a teacher, has basic aspects at one place with his own presentation skills and articulations. The presentations are simple, brief and address the issues the author wanted to present. Illustrations in the book are compiled from different sources, but go well with the text to support understanding. To provide acronyms and glossary is again a good initiative and will facilitate students. Literature cited is just adequate for a beginner, though not as latest as one would expect in the age of internet.

As introduction to remote sensing, target's signals interaction has dealt with the optical and microwave regions. Conspicuous by its absence is the discussion on signal emission in thermal IR region and the concept of thermal inertia. The chapter on sensors and platforms is brief, only popular sensors are discussed. Data acquisition and dissemination are dealt with routinely. Some of the topics such as Landsat data communication and processing systems are archaic in today's context. Some of the technologies used currently for handling large data rates and volumes, for example for Resourcesat, TES, etc. could have been presented. Also the data dissemination to users has undergone tremendous transformation by way of internet and FTP (file transfer protocol) usage. In chapter 7, on 'the sensing', data handling, processing for image enhancement and analysis for information extraction have been discussed, end to end, in a simple manner.

Sufficient coverage and depth have been given to image statistics, image enhancement by histogram manipulation, spectral and spatial transforms and colour trans-

forms. Besides discussion on Tasseled Cap transform with Landsat 1, 2 and 4 satellite data, more coverage on indices for vegetation, snow, soil moisture, urban, etc. could have been provided. Similarly, value addition could have been provided on remote sensing analysis by briefly touching upon evaluation of classification results with inclusion of post-classification analysis covering error/confusion matrix, etc.

The radar remote sensing is dealt with in detail in the chapter on imaging principles. Radar systems provided are the initial microwave systems. A major thrust to the radar remote sensing and its applications has come with the launch of operational radar satellites, viz. ERS-1 & 2 and JERS-1, SIR-C, Radarsat-1 and Envisat in the last decade with major improvements in the data acquisition modes. The author could have included them for the benefit of the reader. Similarly, discussion on image distortions, speckle and its filtering, and radar data processing could have been touched upon.

In the third category of topics covered, principles of GPS and error sources are discussed with basic exposure. However, it was overlooked by the author to mention that the practice of bringing down the accuracy in C/A code by arbitrarily introducing error was given up by the GPS operator. Principles of GIS have been covered with discussion on spatial data representation, GIS functions, linkage between remote sensing and GIS. The present-day GIS is much advanced and should address interoperability, open GIS consortium concepts, data communication/dissemination, visualization and decision support systems.

Though the book title includes applications, the author could only provide generic description of the application potential of satellite remote sensing, specially on themes like agriculture, water resources, landuse/land-cover image, geologic hazard-zone mapping and monitoring, etc. The chapter is just enough to provide a bird's-view of applications.

Panda has devoted about three decades in agricultural physics. I wish he could have covered extensively his areas of application. The students would have greatly benefitted with his research experience. As I scanned the book, I found that some grammatical and conceptual improvements were needed (For example, Preface lines 1, 2, 12, 14, p. 87 last two sentences, p. XXIV description of plate 13). Also, there

are some mistakes (e.g. p. 34, lines 7, 9, 11-K to be replaced by L). Nevertheless, the book has the potential to serve as a textbook for graduate level students, within reasonable cost. As the author mentioned, this book would add to the collection of textbooks on remote sensing and provides a good introduction to the subject chosen.

B. L. DEEKSHATULU

10-3-123/3/1 Upstairs,
East Maredpally,
Secunderabad 500 026, India
e-mail: deekshatulu@hotmail.com

Global Change in the Holocene. Anson Mackay *et al.* (eds) Hodder Arnold, London. 2005. 528 pp. Price: US\$ 55.00.

This book is an outcome of the European Union Advanced Study Course conducted at the University College, London. The book is intended to cater to the needs of students who have recently been initiated into Holocene studies and also of postdoctoral scholars. The Holocene period covers the past 11,500 years of earth's history. This period saw the development and collapse of complex societies and civilizations, and also saw the emergence of agriculture. The Holocene was largely thought to be mundane in terms of climatic variability, as the earlier views were based on data from Greenland ice-core records. Gradually, as more palaeoclimatic records from around the globe were reconstructed, it became clear that this was indeed not the case. The excitement for Holocene research comes from the need to understand climate variability over longer time-scales, beyond the instrumental record. Palaeoclimatic records from the Holocene provide a test for models aiming to predict futuristic scenarios under elevated greenhouse gas concentrations. A book addressing Holocene research would thus be expected to cover the following themes: Processes controlling climate variability; Chronological techniques; Methods of reconstructing past climate change using physical, chemical and biological indicators; Climate change simulations and future predictions; and Material/deposits suitable for reconstruction of past climate change.

And, this is precisely what the book does. In the preface, the editors define the struc-

BOOK REVIEWS

ture of the book, which is divided into six sections. The first section deals with the structure of the Holocene, forcing factors, models and the link between climate change and human civilizations. Subsequent sections address chronological issues, particularly concentrating on radiocarbon dating, varves, dendrochronology, transfer functions using biological proxies and stable isotopes. The fourth section provides an introduction to instrumental and documentary records for reconstructing climates for the past 1000 years. Only a few exceptions exist in the world, where documentary evidence extends beyond the last millennium. Among these, the most well known are the Nile water-level data. A range of depositional environments and record types are introduced in later chapters, including tropical corals, marine sediments, peats, lake deposits, speleothems, glaciers and ice cores. In the Indian context, such an introduction is particularly useful, as all the above-mentioned archives exist in both the peninsular and Himalayan region. Several studies have already been carried out in India using speleothems, corals, marine sediments, peats, lake deposits and tree rings.

The fifth section provides a valuable primer on the use of various microfossil groups for climate-change studies. Introductions are provided for diatoms, ostracods, chironomids, pollen and biomarkers (organic geochemistry). The last section provides case studies from tropical forests, arid regions of the middle latitudes, along with examples of Holocene climate simula-

tions and the relationship between climate and sea levels. All this material is packed into 528 pages that are appropriately illustrated. The book also contains 10 plates all packed into the centre of the book. The authors are dominantly from UK and USA and there are 29 chapters in all. There is a great deal of emphasis on biological proxies, which is useful. Indian palaeoclimatic studies have mainly relied on geochemical and geophysical parameters and the only widely used biological parameter has been pollen. However, here too, rigorous quantitative analyses have not been carried out routinely. In this context, the chapter by John Birks on quantitative environmental reconstruction using biological data is an eye opener. Quaternary palaeontologists would find this chapter useful.

Now that I have highlighted all the good things about this volume, let me get down to material that is not included in this edition and which would be a welcome addition in future editions. First, there is no treatment in the methodology section on environmental magnetism, which logically should be extended with a chapter in the environmental section on loess/aeolian deposits and a chapter on luminescence dating in the chronology section. Although some may opine that for the Holocene, these topics are not suitable based on various issues, I believe that this book would be complete by their inclusion. Sandy loess deposits occur on the margins of all major deserts; these deposits are better dated using luminescence techniques and proxy records from such archives are usually

derived using environmental magnetism. With these additions, a proper synoptic view of the entire spectrum of Holocene research would indeed be obtained. Also, geochemistry has been widely used for palaeoclimatic reconstruction and includes both elemental and stable isotope geochemistry. While stable isotopes of carbon and oxygen are treated in the volume, there is no chapter dealing with elemental geochemistry as a proxy for past climate change or for analysing the impact of humans on environmental change.

For the Indian student, it would have been particularly useful to have some examples related to the Indian monsoon system, with case studies from the Indian region. This perhaps can only be achieved if palaeoclimatologists and Quaternary geologists from India make a concerted effort to bring out an edited volume reviewing each archive type available in India, which would complement this book and provide sufficient material and impetus for Holocene research in India. The book thus provides a balanced outlook to Holocene research and acts as an excellent introduction to this exciting arena of palaeoclimatology. The book is a must have for every aspiring Holocene scholar.

ANIRUDHA S. KHADKIKAR

*Agharkar Research Institute,
G.G. Agarkar Road,
Pune 411 004, India
e-mail: aniruddha.khadkikar@gmail.com*