

Book reviews

Climate of Papua New Guinea by J. R. McAlpine and Gael Keig with R. Falls (Australian National University Press 1983) \$A12.95.

McAlpine and Keig, the two principal authors, deserve praise for the preparation of a text which, although not large, is probably the most comprehensive single volume available to date on the climate of Papua New Guinea. They have qualified themselves well for the task, having spent ten years or more gathering and tabulating data on the area. Work on this book followed an earlier involvement in the preparation of a set of climatic tables for Papua New Guinea. A survey of the climate of an area, while very much about the statistics of observed weather elements, is not complete without an interpretation of those statistics. This book redresses the limitations of the earlier publication. A further prerequisite to an understanding of a regional climate is an appreciation of the larger-scale controls operating on the area. There have been considerable advances in our understanding of the synoptic climatology of the tropics and in a broader context, the role of the tropics in the general circulation of the atmosphere. The principal authors sought the assistance of someone more expert in this field, viz. Mr Rex Falls, Regional Director of the Australian Bureau of Meteorology's office in Darwin, Northern Territory (at the time of publication). The outcome of this collaboration is a chapter titled 'Meteorological Controls on Climate and Weather' which includes a summary of the major components of the broadscale atmospheric circulation of equatorial and low latitudes, a discussion of the dominant wind systems of the Papua New Guinea region and a description of the principal weather disturbances observed. The following chapter, also contributed by Falls, treats in some detail the local wind systems, a highly important topic given the magnitude of the role played by the mountainous terrain in shaping the climate of the country. Subsequent chapters deal in sequence with rainfall, temperature, humidity and evaporation and daylength, cloudiness, sunshine and radiation. A chapter on the application of water balance techniques to the data from a selection of stations reflects a particular interest by the two principal authors in such studies.

The ninth and final chapter on 'Climatic Classification' presents breakdowns of the Papua New Guinea climate in terms of several traditional schemes. It should come as no surprise that the authors declare that none of these schemes does the

job properly and hence find it necessary to devise one of their own. The result is a scheme structured primarily on altitude and secondarily on humidity (rainfall) which would appear to be a justifiable and logical approach. This last chapter concludes with short sections on land use and resource assessment. The text is complemented by four tables and 115 maps and graphical presentations. An appendix of climatic tables, a list of references and an index completes the book at around 200 pages.

Overall the authors have done a commendable job. The text is generally well written and pitched, with intent, at a professional level but not specifically at the specialist climatologist; the diagrams are clear and easy to read. The data base available to the authors was more extensive than one might have expected although the records at most stations were either short or badly affected by gaps. The period of the Second World War saw a virtual cessation of the collection of climatic data throughout Papua New Guinea. Consequently, the authors have restricted themselves to a description of the climate for the fifteen-year period 1956-70. This restriction, it is argued, does not limit the usefulness of the results since the sample required for reliability in the principal statistics of the climate in low latitudes is, for the most part, relatively short. It is acknowledged that the 52 station sample chosen for most of the subsequent analyses, although reasonably representing each of the major geographical differences, cannot possibly resolve the steeper climatic gradients; there are some areas for which little or no data were available at all.

One annoying shortcoming is the rather basic 'Contents' section. The text of each chapter has been structured with primary and secondary headings, but unless one flicks ahead one has no idea of the contents or lay-out of the chapter apart from the rather general information implicit in the title. Inclusion of at least the primary headings in the Contents would have better shown the comprehensiveness of the book as a whole in addition to the structure of each chapter. A listing of the selected climatic tables in the 25 page Appendix would also have been a useful inclusion. Nevertheless, these are not serious deficiencies and the book should serve as a good basic reference for anyone with a need for an appreciation of the climate of this mountainous island territory to our north.

M. J. Coughlan

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Turbulence in the Ocean by A. S. Monin and R. V. Ozmidov (D. Reidel Publishing Co. 1985) xv + 247 pp. US\$44.50.

The science of turbulence in the ocean is at once very young and quite controversial. This book is a notable contribution to a field in which any new book is assured of filling a gap. The authors are to be congratulated on the breadth of the book, ranging as it does from strange attractors to the theory of two-dimensional turbulence. Perhaps the most valuable aspect of the book is the very detailed discussion of the turbulence sensors that have been used in Russia in the past 15 years. This information is rarely found in the condensed research reports that are translated regularly from Russian into English.

The book begins by defining the word 'turbulence'; a courageous task indeed. The reader is left with a good feel for what turbulence is as well as what it is not. For the first time in a book on turbulence in the ocean, we are given a good overview of the new mathematical field of strange attractors and their relationship to the initiation of turbulence.

The many distinct physical processes that lead to turbulence in the ocean are dealt with but far too briefly and superficially, in chapters 3 and 4. Also the reader must be made aware that, whereas in the West the word 'microstructure' refers to the very smallest scales of motion in the ocean, down to the Kolmogorov scale and beyond, in this book microstructure describes the higher wavenumber end of the internal wave wavenumber band, that is, vertical scales from 1 m to 10 m.

The traditional concentration of the Russian literature on spectral slopes is reflected in the space given to this topic in chapters 5 and 6. In contrast, Western scientists place more emphasis on identifying individual physical events that have previously been studied in the laboratory. To date, neither approach has given answers to such basic questions as, 'how much small-scale mixing is going on in the ocean and how intense are the property fluxes that are occurring?'

Turbulence tools that have been used by Russian researchers in the past 15 years are the subject of chapter 8; this material will be valued by the English-speaking community.

Chapters 9, 10 and 11 summarise many cruises and hundreds of man years of work involved in collecting, analysing and making sense of turbulence data. The authors rely heavily on spectral shapes, on estimating the dissipation rate of kinetic energy and of temperature variance, and the data are presented in a great variety of tables, graphs and maps. However, as with such small-scale turbulence research in the western hemisphere, there are frustratingly few results that can be used by numerical modellers, or by climatologists. For example, it is not yet possible to estimate (with confidence limits) the vertical flux of heat in the ocean caused by small-scale turbulence. It is not difficult to show that such vertical fluxes are very important in determining the spatial distributions of properties in the ocean, but quantifying the fluxes is as yet beyond the reach of today's observations and our present ability to interpret these observations.

The last section of the book (chapters 12, 13, and 14) concerns the large-scale, quasi-horizontal turbulence in the ocean. It is becoming increasingly apparent to researchers in this field that the large-scale (100 km), two-dimensional turbulence field and the small-scale turbulence field are deeply intertwined (especially when the nonlinearities in the equation of state are considered) and so it is gratifying to see a turbulence monograph with this unusually wide range of topics.

In summary, this book contains much material that will be useful to researchers in the field of ocean turbulence. The large section on instrumentation is especially important. This monograph is not, however, suitable as a text for graduate courses. It is realistically priced and deserves to find a place in oceanographic libraries around the world.

T. J. McDougall

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Award of the 1985 Priestley Medal

The Committee of the Australian Branch of the Royal Meteorological Society has awarded the 1985 Priestley Medal to Dr R. H. Clarke.

The medal was named in recognition of the contribution of Professor C. H. B. Priestley to the science of meteorology. It is awarded every two years for the best paper published in the *Australian Meteorological Magazine* during the past biennium. Papers are judged by the awards sub-committee on criteria of originality, substance, significance, skill and style. If there are no papers of sufficient standard no award is made.

Under the chairmanship of the convenor, Dr Tom Beer, the awards sub-committee unanimously voted the best paper to be:

'Colliding sea-breezes and the creation of internal atmospheric bore waves: two-dimensional numerical studies'

by R. H. Clarke, published in the December 1984 issue of the *Australian Meteorological Magazine* (Vol. 32, pages 207-26).

The paper was particularly highly regarded because of its examination of a number of puzzling features of the uniquely Australian phenomenon 'the morning glory' of North Queensland. It described by means of a numerical model the sequence of events when two sea-breeze circulations, emanating from the two sides of Cape York Peninsula, interact.

Thus, in addition to the paper being an original, substantial and significant contribution in its own right, the sub-committee also noted Dr Clarke's role in organising and collecting the field data and his earlier significant contributions on the topic in the September 1983 issue of the *Australian Meteorological Magazine*. The elucidation of the physical mechanisms behind these data, which has been an ongoing process between Dr Clarke and his colleagues, has been considerably enhanced by the publication of this paper on colliding sea-breezes.

Dr Clarke joined the RAAF meteorological service in 1939 and after the war continued with the Bureau of Meteorology. In 1957 he moved to CSIRO Division of Meteorological (later Atmospheric) Physics and began his career in research. He was instrumental in the development of early numerical weather prediction research in Australia, and became Officer in Charge of the Australian Numerical Meteorology Research Centre in 1974.

Dr Clarke retired in 1978 but has continued his association with meteorological research since then and has continued to produce outstanding work. Earlier, he had led a number of notable atmospheric research expeditions in Australia, and since his retirement has led a further expedition that collected data on the morning glory cloud phenomenon in the Gulf of Carpentaria, leading to an explanation of this famous meteorological feature.

