how successfully people, individually or in groups, concentrate resources and manipulate productivity (N. Irvine, personal communication). Moreover, both productivity and population densities may have fluctuated wildly in prehistoric times, as they do now. Until we can gain a better understanding of the mechanisms of demographic change in "natural" and human communities within the tropics, through detailed studies of particular interactions, there may be little to be gained from another speculative retreatment of the same data.

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Tropical Storms

The Hurricane and Its Impact. ROBERT H. SIMPSON and HERBERT RIEHL. Louisiana State University Press, Baton Rouge, 1981. xxviii, 398 pp., illus. $20.

The frequency of hurricanes affecting the United States has diminished over the past 20 years, and catastrophic losses of life have not occurred recently in this country. Even so, an up-to-date, general book on hurricanes is more relevant than ever owing to the unprecedented expansion of the population into coastal areas threatened by hurricanes. *The Hurricane and Its Impact*, written by pioneers in tropical meteorology and hurricane prediction, is therefore a welcome addition to the limited number of books on this topic. It should find a wide audience among scientists, engineers, and members of the general public who wish a comprehensive introduction to the scientific aspects and the social, economic, and political consequences of hurricanes.

The first half of the book consists of a survey of the structure and life cycle of hurricanes, from their genesis over warm tropical oceans to their eventual decay over land or colder water. The discussion of the life cycle and structure of hurricanes includes an introduction to hurricane climatology and to physical processes such as evaporation from the ocean and release of the latent heat of condensation. These aspects of hurricanes are dramatized by the description of individual storms such as Hurricane Camille in 1969 and by scenarios involving the reactions of people to hurricanes.

The second half of the book treats the important topic of the effect of hurricanes on human activities near the coast. This half treats such practical aspects as the variation of the mean wind speed with height from the ground, the turbulent component of the wind, and the effect of wind on shoreline structures. Because most of the coastal damage caused by hurricanes is associated with water, considerable attention is also devoted to the effect of hurricanes on the ocean through the generation of storm surges and breaking waves.

A unique and valuable portion of the book assesses the hurricane threat and discusses ways to reduce hurricane risk. For example, return periods in years for hurricane strikes are given for 80-kilometer sections of the Gulf and Atlantic coasts and cumulative probabilities for the occurrence of hurricanes of varying intensity are presented. The prediction of hurricanes and systems for warning of them are covered in a comprehensive, understandable way.

Two aspects of the book could be strengthened. Portions of the discussion of the physical mechanisms of hurricane formation and movement are somewhat vague or insufficiently supported by references. Examples include the discussions of the role of sinking cold air in cyclogenesis and of the mechanism by which conservation of absolute vorticity in the ocean enhances the storm surge, the statement that hurricanes tend to avoid landfall, and the use of the concept of efficiency in various contexts without precise definitions.

The book also gives cursory treatment to two important aspects of tropical cyclones: the interactions between the small-scale cumulus clouds and the large-scale vortex and the rapidly expanding use of numerical simulation and prediction models. The latter neglect is unfortunate in view of the success of such models in simulating hurricanes and quantifying physical processes such as latent heat release, radiation, and boundary layer processes and their potential for isolating the physical mechanisms leading to hurricane formation and for testing hurricane modification hypotheses. A particularly frustrating statement concerns the slow, erratic motion of Hurricane Dora in 1964: "Clearly the atmosphere was indeterminate in this situation, precluding any valid forecasting method other than persistence" (pp. 174–175). In fact, the atmosphere is a deterministic system and therefore primitive equation models are entirely capable of forecasting the stalling of hurricanes when the environmental data, particularly the steering flow, are well resolved.

In spite of the criticisms, the book is an excellent summary of hurricanes for general readers as well as meteorologists. It is technically very well done, with numerous clear figures and supporting photographs from aircraft and satellites to illustrate the cloud structure of hurricanes. It is a worthy successor to Dunn and Miller's *Atlantic Hurricanes*, issued in 1960 by the same publisher.

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Atmospheric Motions

Dynamics of the Upper Atmosphere. SUSUMU KATO. Center for Academic Publications Japan, Tokyo, and Reidel, Boston, 1980 (distributor, Kluwer Boston, Hingham, Mass.). xiv, 234 pp., illus. $29.95. Developments in Earth and Planetary Sciences, 01.

Susumu Kato's *Dynamics of the Upper Atmosphere* is an introduction to the theory of acoustic-gravity and tidal waves and their ionospheric effects, as well as a review of recent developments in these subjects. The upper atmosphere in this context refers to the region above about 90 kilometers, or the E and F regions in ionospheric parlance. Kato presents a nice balance between theoretical developments in upper atmosphere dynamics and the interpretation of ionospheric observations that contain signatures of neutral atmosphere dynamic processes. An instructional virtue of the book is that fundamental analog problems are utilized to illustrate and clarify the basic physics of upper atmospheric dynamical processes and to interpret results from theoretical (numerical) models and radar observations.

Following an introductory chapter on basic atmospheric properties and structure and the fluid dynamical equations governing atmospheric motions, a chapter on acoustic gravity waves adequately introduces the physics of acoustic waves and gravity waves by deriving and discussing the wave dispersion relation for an isothermal atmosphere and then qualitatively addressing the effects of temperature gradients, background winds, and molecular dissipation in modifying the propagation of these waves. In addition, several analytic solutions of wave propagation characteristics for particular excitations (infinite and finite-line harmonic oscillators and uniformly moving point and line sources) are obtained that represent analogs of realistic problems in