BOOK REVIEWS

Lightning Physics and Effects

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Cambridge University Press, Cambridge, U.K.; 687 pp.; ISBN 0-521-58327-6; 2003; $200.

Lightning Physics and Effects is not a lightning book; it is a lightning encyclopedia. Rarely in the history of science has one contribution covered a subject with such depth and thoroughness as to set the enduring standard for years, perhaps even decades, to come. This contribution covers all aspects of lightning, including lightning physics, lightning protection, and the interaction of lightning with a variety of objects and systems as well as the environment. The style of writing is well within the ability of the technical non-expert and anyone interested in lightning and its effects.

Potential readers will include physicists; engineers working in the power industry, communications, computer, and aviation industries; atmospheric scientists; geophysicists; meteorologists; atmospheric chemists; foresters; ecologists; physicians working in the area of electrical trauma; and, lastly, architects. This comprehensive reference volume contains over 300 illustrations, 70 tables with quantitative information, and over 6000 reference and bibliography entries.

The 20 chapters begin, characteristically, with general lightning properties, followed by discussions of the incidence of lightning and the electrical structure of lightning-producing clouds. This provides the background for discussion of the lightning flash itself, beginning with a chapter on the downward negative discharge to ground, first lowering negative charge to ground. Subsequent chapters discuss lowering positive charge to ground and upward discharges initiated naturally by ground-based objects such as towers and tall buildings. Artificially initiated lightning or lightning triggered by ground-based activity is discussed through a series of experiments carried out in the United States, France, Japan, and Brazil. Winter lightning, which occurs in many countries, has been most extensively studied in Japan and this is also covered.

Later chapters discuss cloud discharges, lightning and airborne vehicles, and thunder, respectively. Modeling of lightning processes are discussed thoroughly, as this is one of the areas in which the authors have made many of their most important contributions. The distant lightning electromagnetic environment—that is, more than a few hundred kilometers from the lightning—and its associated atmospherics, Schumann resonances, and whistlers, warrant their own discussion, and these are covered as well.

In the last 15 years, much research has focused on the lightning effects in the middle and upper atmosphere following the discovery of "sprites" in 1989 and the identification of blue starters and blue jets, red sprites, and elves. The recent discovery that lightning significantly affects the chemistry of our atmosphere is discussed in detail through consideration of the production of NO by lightning, and the associated uncertainty in the estimates.

Extra-terrestrial lightning is followed by lightning locating systems, deleterious effects of lightning and protective techniques, lightning hazards to humans and animals, and ball lightning, bead lightning, and other unusual discharges.

I particularly appreciated the introduction and summary associated with each chapter, which provides a quick overview of the salient points in the chapter. You might try reading the introduction and summary first to determine if the chapter is of interest. The overall quality of the printing is superb; the figures are excellent, and the Plate Section presents six classic pages of photographs and figures.

In closing, I recommend that you purchase two copies, one for the office and one for the home, to avoid having to carry this 5-lb. tome back and forth.

—RICHARD E. ORVILLE, Texas A&M University, College Station