Rakov, V.A., M. A. Uman: Lightning: Physics and Effects. – Cambridge University Press, Cambridge, UK, 2003. 687 pp. EUR [D] 176.50, US Dollar 200.00. ISBN 0-521-58327-6, www.amazon.de

Lightning is not only a fascinating atmospheric phenomenon that enlightens clouds and sky in the evenings of warm summer days, but an important ingredient of the geophysical system. Lightning impacts our daily life through the devastating results of a strike to technical installations, buildings, or even humans. However, less obvious effects of lightning on the earths electrical field or climate are as important, and are areas of active research.

Lightning Physics and Effects by Vladimir A. RAKOV and Martin A. UMAN is perfectly covering all aspect of lightning, addressing a wide audience, including physicists, atmospheric researchers, civil engineers and engineers in the aviation, power, and communication sector, as well as meteorologists, dealing with the direct and indirect effects of lightning. But also policy makers in politics and industry, physicians, geophysicists, and forest management officials that are interested in a more general description of lightning and its effects will find valuable information and references.

The 687 pages of the book include over 300 illustrations, nine color plates, and 70 tables that support the reader in understanding the general concepts and provide additional information. More than 6000 references build the scientific basis of the volume and give the opportunity to learn more on specific issues. An index with relevant key words for direct access and an appendix with books on lightning and related subjects complete the reference section.

The first of the 20 chapters is a general introduction to lightning and the earth electric field, including historical notes. Before the detailed description of the lightning phenomena itself, two chapters are devoted to the incidence of lightning, ranging from storm to global scale, and the electrical structure of thunderstorms, including a brief introduction to the charging mechanism.

This background information is followed by three chapters presenting a very detailed discussion of the downward negative, positive and bipolar lightning discharge to ground, as well as the upward lightning initiated by ground objects, such as towers. These chapters present a wide variety of experimental evidence and theoretical descriptions for the different stages in the lightning development. In the following chapter the authors introduce the reader to the potential of artificially triggered lightning in lightning research. A special chapter is devoted to winter lightning in Japan which differs in many respects from the basic discharge characteristics generally observed.

Fundamental properties of the cloud discharge is presented in the next chapter, followed by a section of lightning and airborne vehicles, including some interesting case studies of accidents. The discussion on thunder is followed by a chapter describing the different approaches to model the individual lightning processes.

The lightning electromagnetic environment at distances greater than a few hundred kilometers are covered with the discussion on atmospherics, the SCHUMANN resonance and whistlers. Since the 1990s, the research on lightning effects in the middle and upper atmosphere, better known as red sprites, blue jets and starters, and elves, is rapidly progressing and a chapter is summarizing the status of this work.

Through the production of nitrogen oxides in its channel, lightning can directly impact the earth atmospheric chemistry and thus the radiative forcing, making lightning a climate factor. Thus one chapter is devoted to lightning effects on the chemistry of the atmosphere.

The next two chapters cover extraterrestrial lightning, as well as the principles and systems used for the lightning location, followed by a chapter covering the deleterious effects of lightning and protective techniques, and a short section on lightning hazards to humans and animals. The book ends with a chapter on ball lightning, bead lightning and other unusual discharges.

Practically all chapters start with an introduction section and end in a summary. This is very helpful for the reader who can either easily identify whether the chapter is of interest for him or who needs an immediate briefing on a specific topic.

The quality of the printing and layout is excellent, the clear typesetting supports easy reading.

In summary, the book is a superb reference for lightning physics and effects. Its quality mirrors the outstanding scientific experience of its authors. I recommend that this book is available in all libraries. However, due the rather high price, which is certainly justified for a book of this quality, it will not be possible to use it as a textbook for students, but researcher should certainly consider to purchase a copy.

T. FEHR, Oberpfaffenhofen