

Preface

The preparation of the second edition of *An Introduction to Atmospheric Radiation* began when I moved to UCLA in September 1997. I was to teach a number of courses associated with atmospheric radiation and remote sensing, and I needed updated teaching material. Moreover, in the 20 years since the publication of the first edition, global climate research had yielded a wealth of information in the atmospheric radiation field, principally in conjunction with the global warming resulting from greenhouse gases, the effects of aerosols and clouds on climate and climate change, and the need for global observational data to support and perfect weather and climate modeling by means of remote sensing. It was also with a sense of duty and commitment to the atmospheric radiation field that I resolved to complete a volume that reflected the current state of the field, including the latest advances.

The second edition has been extensively revised to address the fundamental study, physical understanding, and quantitative analysis of the interactions of solar and terrestrial radiation with molecules, aerosols, and cloud particles in planetary atmospheres through the theory of radiative transfer and radiometric observations made from the ground, the air, and space.

The second edition contains about 70% new material. However, to the greatest extent possible, I have followed the structure of the chapters developed for the first edition, based on which substantial revisions and additions were made. New subjects include, but are not limited to, the correlated k -distribution method for infrared radiative transfer, light scattering by ice crystals and nonspherical aerosols, and a number of advanced topics in radiative transfer not covered by the plane-parallel assumption, presented in Chapters 4, 5, and 6, respectively.

The subject of remote sensing is a major discipline in itself and also relates to many other fields. However, in Chapter 7, I have confined the discussion of the application of fundamental radiative transfer principles to the development of remote sensing methodologies for the inference of atmospheric and surface parameters.

An understanding of the earth's climate and climate change must begin with a comprehensive understanding of the radiative processes in the earth-atmosphere system. In Chapter 8, I have based presentation of the role of radiation in climate on heat balance considerations, and present it in the context of simplified one-dimensional and global climate models.

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