Radar Remote Sensing of Planetary Surfaces

This introduction to the use of radar for the remote sensing of natural surfaces provides the reader with a thorough grounding in practical applications, focusing particularly on terrestrial studies that may be extended to other planets.

An historical overview of the subject is followed by three chapters that introduce the nomenclature and methodology pertaining to radar data collection, image interpretation, surface roughness analysis, and dielectric constant measurements. The author then presents a summary of theoretical explanations for the backscatter properties of continuous rough surfaces, collections of discrete objects, and layered terrain. The uses and limitations of common scattering models are reviewed, and in many cases empirical relationships between surface properties and radar echoes are presented as a guide to further theoretical studies. These are illustrated with examples from the natural environment such as lava flows, rock-strewn surfaces, and sand dunes. The final two chapters review radar surveys of the Moon, Mercury, Venus and Mars and demonstrate how radar techniques may be used to further our understanding of these remote bodies.

The subject matter is presented at a level appropriate for students across a broad range of scientific disciplines, although particular emphasis is given to practical geological and geophysical studies of the Earth and planets. This book is therefore suitable for advanced undergraduates, graduate students, and professionals in the Earth and planetary sciences, electrical engineering, and remote sensing.

Bruce Campbell received a Ph.D. in 1991 from the University of Hawaii for his radar polarization studies of volcanic and impact-cratered terrains on the Moon, Earth, and Venus. He took a position at the Smithsonian Institution's Center for Earth and Planetary Studies in 1992. His research interests include comparative studies of planetary terrains using imaging-radar data; high-resolution topographic studies of planetary analogue surfaces; and the analysis of scattering, shadowing and emission relationships in radar and visible/infrared remote sensing. Dr Campbell also managed the NASA Planetary Instrument Definition and Development Program, which develops advanced spacecraft instruments and new remote sensing technologies, from 1996 to 1998. He became Department Chairman of the Center for Earth and Planetary Studies in 1998.
To Barbara
RADAR REMOTE SENSING OF PLANETARY SURFACES

BRUCE A. CAMPBELL

Smithsonian Institution

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