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Energetic Charged-Particle Interactions with Atmospheres and Surfaces

With 84 Figures



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This book is dedicated to
Ted and Elsie Johnson

Preface

On attending a conference on the Jovian satellites at UCLA, I heard Lou Lanzerotti vigorously present the exciting data on the sputtering of water ice by MeV protons taken with W.L. Brown at AT&T Bell Labs. In his inimitable way he made clear that this new electronic sputtering process was very poorly understood and was very important for surface properties of satellites. I was immediately hooked, and have been working ever since with Lanzerotti, Brown, my colleague at Virginia, John Boring, and Bo Sundqvist at Uppsala on understanding the ejection of material from surfaces and applying laboratory results to interesting planetary problems. In the course of writing this book I also had the benefit of spending a semester with the Planetary Geosciences group in Hawaii, thanks to Tom McCord, a period of time with Doug Nash at JPL, and a period of time with the group at Catania.

The book was started with the encouragement of Lou Lanzerotti. The writing has gone slowly as the field has been changing rapidly. Even now I feel it is incomplete, as the interesting Halley dust data have just recently been interpreted in detail, Voyager has recently visited Neptune, and the data on Pluto are rapidly improving. However, most of the principles for plasma ion alteration of surfaces and gases have been established allowing, I hope, a coherent and useful framework for incorporating both new laboratory and planetary data.

I would like to thank a number of colleagues for reading large sections of the manuscript: Don Hunten, Nick Schneider, and Don Shemansky at Arizona, Doug Nash at JPL, Darrell Strobel at Johns Hopkins, Bob Smith at Iowa, and Giovanni Strazzulla at Catania, who read the whole manuscript. I was also fortunate in having a number of excellent graduate students during the period of writing the book, who worked on obtaining the laboratory data and on calculating some of the descriptions of the interactions of charged particles with surfaces and gases in the solar system: Lynn Barton, Doug Chrisey, Bob Evatt, Jeff Garrett, Melissa McGrath, Curt Reimann, Ed Sieveka, and Dennis O'Shaughnessy. My most recent colleagues at Virginia, Maria Pospieszalska, who performed a number of the calculations used as figures in the text, Raúl Baragiola, and Bert Donn were also helpful, as were a number of our present graduate students, Sree Banerjee, Jeff Beaudny, Bill Bullen, and Norbert Sack. Most important, however, has been the preparation of the manuscript initially started by Phyllis Harmon but mostly carried out by Pam Lockley, who has been incredibly patient about the numerous drafts and changes.

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