Atmospheric Electrostatics

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Editorial Foreword

Atmospheric Electrostatics is a welcome addition to the Electrostatics Series of monographs.

The author has skillfully combined fundamental theories of atmospheric electrostatic phenomena with his own unique explanation of thundercloud charging. The arguments put forward are very convincing and are supported by appealingly simple experiments. Mathematical treatment of the subject is kept to a minimum, which enables the non-expert to follow the reasoning with ease. At the same time, the introduction of the electrochemical model for charge exchange makes this compulsory reading for atmospheric scientists who are more familiar with the traditional theories of thundercloud charging.

The subject is presented in a very logical manner, beginning with early 19th Century experiments and leading finally to extraterrestrial lightning phenomena. Congratulations to the author for presenting this complex subject in such a way that even a novice to the field will have no difficulty in following the text. All levels of readers are guaranteed a fascinating conducted tour through this most fundamental of electrical phenomena.

Dr. J.F.Hughes,PhD, MIEE, CEng, FInstP.

Southampton. April 1986

Preface

Static electricity became a fashionable science in the early 1700 century and several investigators drew a parallel between the sparks produced in the laboratories to that of lightning and thunder produced during foul weather. It is surprising, however, that even today with our highly advanced technology in electronics and space science we still do not know what causes thunderclouds to charge. The purpose of this book is to give a general overview on atmospheric electricity and to discuss several proposed charging mechanisms including resent important discoveries in atmospheric electrochemistry. The aspects of atmospheric electrochemistry becomes important when we realize that the atmosphere, due to the constant bombardment of cosmic rays, is ionized and behaves very much like an electrolyte. Electrochemical potentials are produced on material surfaces that are exposed to our ionized atmosphere and are as common as contact potentials generated when dissimilar conducting materials touch each other.

This book is not a review of the most current publications on atmospheric electricity but serves as overview of the basic problems still at large and the purpose is to try to inspire new fresh blood into the oldest field of electricity. Two excellent textbooks are recommended for those interest in a detailed picture of the electrical structure of our atmosphere: H. Israel, Atmospheric Electricity Vol. 1, (1970), and Vol.2 1973. J.A. Chalmers, Atmospheric Electricity, (1957).

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Thanks is also due to Dr. John Hughes for initiating this work and for editing and facilitating the publishing of this book.

Boulder, January 1985. Lars Wåhlin

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