Foreword

The papers published in this volume were presented at the Joint Assembly of the International Association of Geomagnetism and Aeronomy/International Association of Meteorology and Atmospheric Physics held in Seattle, Washington, August–September, 1977, in the symposium “Electric Currents and Atmospheric Motions in the Lower Thermosphere”, convened by Professor Susumu Kato and myself.

To attempt to do justice to a review of a symposium in which nearly 50 papers were presented is obviously beyond the scope of a foreword. The scales of the phenomena discussed extended from interplanetary (the influence of the sun on $E$ region currents) to minuscule (dissipation of dynamic energy at the small scale end of the atmospheric turbulence spectrum). The importance of the presence of electric fields in the interpretation of current/atmospheric motion interactions was emphasized again and again. The work being done on theoretical modeling is encouraging, although experimenters would like to have more definitive statements from theoreticians on the kind of measurements which would be most valuable as input in furthering the modeling process.

As commented on by at least one of the ionospheric physicists present (are ionospheric physicists an endangered species?—the title is not often used these days) it is gratifying to see a resurgence of interest in the $Sq$ current system. For this, I believe we must thank the magnetospheric types who, although they have not been successful in demonstrating their original hypothesis that the magnetosphere is responsible for all currents and fields present in the lower thermosphere, have at least been able to show that significant modulation of these systems by magnetospheric processes is possible, and does, in fact, occur. Some consternation was apparent (among the aforementioned ionospheric physicists) when some satellite results were presented which showed the presence of a well-established equatorial electrojet, but the complete absence of any $Sq$ current system. This result does need further investigation—ground-based experimenters are emphatic in their contention that the $Sq$ current system never “goes away!”

One thing which was quite obvious to anyone attending these sessions was the multiplicity of techniques being used to investigate and describe the electrodynamics of the lower thermosphere. Even a young fellow like myself can remember the days when the only tools available were the measurement of surface magnetism, and a reliance on radio propagation, with some highly speculative (but often ingenious) interpretation. Now, with the continuing use of such tools, plus more sophisticated ground-based experiments, coupled with satellite observations, an almost unbelievable
amount of data which can be applied to a description of the lower thermosphere, and its interactions with the atmosphere both below and above, is becoming available. However, the most efficient use of such data, and the furtherance of the models which need such data to establish boundary conditions and confirm model validity, is going to require considerable coordination. It is hoped that this symposium has, in a relatively small way, forged some links which can be expanded, through such programs as the IMS and MAP, into a description of the real world of the lower thermosphere.

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