

CONTENTS

PREFACE	ix
EARLY HISTORY	
KRISTIAN BIRKELAND: THE MAN AND THE SCIENTIST Alv Egeland	1
SYDNEY CHAPMAN AND HIS EARLY STUDIES OF MAGNETIC DISTURBANCES Masahisa Sugiura	17
THE EVOLUTION OF ARGUMENTS REGARDING THE EXISTENCE OF FIELD-ALIGNED CURRENTS A. J. Dessler	22
INTRODUCTION TO MAGNETOSPHERIC CURRENTS	
THE MAGNETOSPHERIC CURRENTS: AN INTRODUCTION S.-I. Akasofu	29
INTRODUCTION TO THE TOPOLOGY OF MAGNETOSPHERIC CURRENT SYSTEMS W. P. Olson	49
FUNDAMENTALS OF CURRENT DESCRIPTION Vytenis M. Vasyliunas	63
SURFACE OBSERVATIONS	
ESTIMATION OF ELECTRIC FIELDS AND CURRENTS FROM GROUND-BASED MAGNETOMETER DATA Y. Kamide and A. D. Richmond	67
ELECTRIC FIELDS AND CURRENTS ASSOCIATED WITH ACTIVE AURORA W. Baumjohann and H. J. Opgenoorth	77
POLAR CAP CURRENT SYSTEMS E. Friis-Christensen	86
NEAR-SPACE OBSERVATIONS	
RELATIONSHIPS BETWEEN FIELD-ALIGNED CURRENTS, ELECTRIC FIELDS, AND PARTICLE PRECIPITATION AS OBSERVED BY DYNAMICS EXPLORER-2 M. Sugiura, T. Iyemori, R. A. Hoffman, N. C. Maynard, J. L. Burch, and J. D. Winningham	96
A STUDY OF HIGH LATITUDE CURRENT SYSTEMS DURING QUIET GEOMAGNETIC CONDITIONS USING MAGSAT DATA J. R. Burrows, T. J. Hughes, and Margaret D. Wilson	104
FIELD-ALIGNED CURRENTS DURING NORTHWARD IMF Takesi Iijima	115

THREE-DIMENSIONAL BIRKELAND-IONOSPHERIC CURRENT SYSTEM, DETERMINED FROM MAGSAT L. J. Zanetti, W. Baumjohann, T. A. Potemra, and P. F. Bythrow	123
VARIATION OF THE AURORAL BIRKELAND CURRENT PATTERN ASSOCIATED WITH THE NORTH-SOUTH COMPONENT OF THE IMF P. F. Bythrow, T. A. Potemra, and L. J. Zanetti	131
DISTRIBUTION OF AURORA AND IONOSPHERIC CURRENTS OBSERVED SIMULTANEOUSLY ON A GLOBAL SCALE J. D. Craven, Y. Kamide, L. A. Frank, S.-I. Akasofu, and M. Sugiura	137
DISTANT SPACE OBSERVATIONS	
CURRENTS IN THE EARTH'S MAGNETOTAIL L. A. Frank, C. Y. Huang, and T. E. Eastman	147
CHARACTERISTICS OF THE CROSS-TAIL CURRENT IN THE EARTH'S MAGNETOTAIL A. T. Y. Lui	158
FIELD-ALIGNED CURRENTS NEAR THE MAGNETOSPHERE BOUNDARY Edward W. Hones, Jr.	171
IONOSPHERIC EFFECTS	
MODELS OF AURORAL-ZONE CONDUCTANCES Patricia H. Reiff	180
COORDINATED GROUND AND SATELLITE OBSERVATIONS OF CONDUCTIVITIES, ELECTRIC FIELDS, AND FIELD-ALIGNED CURRENTS R. M. Robinson	192
THEORY AND MODELS	
MAGNETOSPHERIC DYNAMO PROCESSES David P. Stern	200
MAGNETOSPHERIC TOPOLOGY OF FIELDS AND CURRENTS Walter J. Heikkila	208
A NEW THEORY OF SOURCES OF BIRKELAND CURRENTS K. D. Cole	223
DIELECTRIC AND PERMEABILITY EFFECTS IN COLLISIONLESS PLASMAS K. D. Cole	234
FIELD-ALIGNED CURRENT SHEETS AS TANGENTIAL AND ROTATIONAL DISCONTINUITIES G. Atkinson	241
ELECTRODYNAMICS OF CONVECTION IN THE INNER MAGNETOSPHERE R. W. Spiro and R. A. Wolf	247
COUPLING OF BIRKELAND CURRENT RINGS G. L. Siscoe and N. U. Crooker	260
REGION ONE BIRKELAND CURRENTS CONNECTING TO SUNWARD CONVECTING FLUX TUBES J. L. Karty, R. A. Wolf, and R. W. Spiro	269

CORRECTED GEOMAGNETIC COORDINATES FOR EPOCH 1980 Georg Gustafsson	276
HIGH-LATITUDE FIELD-ALIGNED CURRENTS PATTERNS IN CONNECTION WITH MAGNETOSPHERIC STRUCTURE Y. I. Feldstein, R. G. Afonina, B. A. Belov, A. E. Levitin, D. S. Faermark, and V. Y. Gaidukov	284
PLASMA INSTABILITIES	
ELECTRIC FIELDS AND CURRENTS OBSERVED BY S3-2 IN THE VICINITY OF DISCRETE ARCS William J. Burke	294
ASSOCIATION OF FIELD-ALIGNED CURRENTS WITH SMALL-SCALE AURORAL PHENOMENA Cynthia Cattell	304
THREE-DIMENSIONAL POTENTIAL STRUCTURE ASSOCIATED WITH BIRKELAND CURRENTS Lars Block	315
THE ROLE OF CURRENTS IN PLASMA REDISTRIBUTION G. Atkinson	325
THE ROLE OF FIELD-ALIGNED CURRENT FILAMENTS IN GENERATING MORNING SECTOR PI 1 PULSATIONS AT SUB-AURORAL LATITUDES M. J. Engebretson, S. J. Solberg, L. J. Cahill, Jr., and R. L. Arnoldy	331
CURRENT SYSTEMS IN OTHER MAGNETOSPHERES	
ROTATIONALLY-INDUCED BIRKELAND CURRENT SYSTEMS T. W. Hill	340
DYNAMICS OF FIELD-ALIGNED CURRENT SOURCES AT EARTH AND JUPITER D. D. Barbosa	350