

Contents

Chapter 1: Multiscale Features in Complexity Dynamics

Complexity in Space Plasmas T. Chang, S.W.Y. Tam, and C.-C. Wu	3
Intermittency in Space Plasma Turbulence R. Bruno, V. Carbone, L. Sorriso-Valvo, E. Pietropaolo, and B. Bavassano	9
Scale-dependent Anisotropy of Magnetic Fluctuations in the Earth's Plasma Sheet Z. Vörös, W. Baumjohann, R. Nakamura, A. Runov, M. Volwerk, A. Balogh, and H. Rème	29
How Does the Solar Wind Power the Magnetosphere During Geo-effective High Speed Streams? M. Kessel and X. Shao	39
On the Identification of SOC Dynamics in the Sun-Earth System R. Woodard, D.E. Newman, R. Sánchez, and B.A. Carreras	55

Chapter 2: Space Storms

Long-Standing Unsolved Problems in Solar Physics and Magnetospheric Physics S.-I. Akasofu	71
Space Weather Effects on SOHO and its Leading Role as a Space Weather Watchdog P. Brekke, B. Fleck, S.V. Haugan, T. van Overbeek, and H. Schweitzer, and B. Simonin	83
Statistical Precursors to Space Storm Onset J.A. Wanliss	99
Solar Wind Drivers for Steady Magnetospheric Convection R.L. McPherron, T.P. O'Brien, and S. Thompson	113
Geoeffectiveness of Shocks in Populating the Radiation Belts J.B. Blake, P.L. Slocum, J.E. Mazur, M.D. Looper, R.S. Selesnick, and K. Shiokawa	125
Coupling of Relativistic Electrons in the Inner Magnetosphere to Space Weather Phenomena T. Obara, T. Goka, and H. Matsumoto	135
The Lowest Possible Latitude of the Westward Electrojet During Severely Disturbed Periods B.-H. Ahn, G.X. Chen, W. Sun, J.W. Gjerloev, Y. Kamide, J.B. Sigwarth, and L.A. Frank	145
Global Dayside Ionospheric Response to Interplanetary Electric Fields: Plasma Uplift and Increases in Total Electron Content A.J. Mannucci, B.T. Tsurutani, B.A. Iijima, W.D. Gonzalez, F.L. Guarneri, and K. Yumoto	157

Chapter 3: Magnetospheric Substorms

What Determines the Intensity of Magnetospheric Substorms? Y. Kamide	175
---	-----

Roles of Chaos, Self-Organized Criticality and Phase Transitions in Magnetospheric Physics M.I. Sitnov, A.Y. Ukhorskiy, A.S. Sharma, and R.S. Weigel	195
Substorm Onset Caused by the Two State Transition of the Magnetosphere T. Tanaka	217
Explosive Instabilities and Substorm Intensifications in the Earth's Magnetotail J.C. Samson and P. Dobias	235
Substorm Auroral Morphology During Geomagnetic Storms on 19-20 April 2002 X.-Y. Zhou and S.B. Mende	253
Periodic Substorms: A New Periodicity of 2-3 Hours in the Magnetosphere C.-S. Huang and G.D. Reeves	265

Chapter 4: Magnetic Reconnection and Turbulence

Magnetic Field Fluctuations in the Plasma Sheet Region: A Statistical Approach G. Consolini and M. Kretzschmar	283
Numerical Simulations of Solar Wind Turbulence M.L. Goldstein, D.A. Roberts, and A.V. Usmanov	301
Intermittent Turbulence in 2D MHD Simulation C.C. Wu and T. Chang	321
Intermittency and Self-Similarity in 'Natural Parameters' in Solar Wind Turbulence S.C. Chapman, B. Hnat, and G. Rowlands	329
Acceleration of Particles by Lower-Hybrid Waves in Space Plasmas R. Bingham, V.D. Shapiro, P.K. Shukla	343

Chapter 5: Modeling and Coupling of Space Phenomena

Substorm Disturbance Propagation From a Two-Dimensional Cellular Automaton Model A.T.Y. Lui and G. Consolini	357
A Perspective $E + \mathbf{v} \times \mathbf{B} = 0$ From the Special Theory of Relativity G.K. Parks	365
Energization of Ions by Bimodal Intermittent Fluctuations S.W.Y. Tam and T. Chang	375
A Physics-Based Software Framework for Sun-Earth Connection Modeling G. Toth, O. Volberg, A.J. Ridley, T.I. Gombosi, D. De Zeeuw, K.C. Hansen, D.R. Chesney, Q.F. Stout, K.G. Powell, K.J. Kane, and R.C. Oehmke	383
A Comparative Study of Probability Distribution Functions and Burst Lifetime Distributions of B_z and AE at Solar Maximum and Minimum R. D'Amicis, R. Bruno, and U. Villante	399
The Daytime Cusp Aurora in the $O(^1D)$ Emission Observed by WINDII on UARS S.P. Zhang and G.G. Shepherd	411
The Wavelength of Slow MHD Waves Observed in the Night-side Plasma Sheet A. Nakamizo	421

Chapter 6: Techniques for Multiscale Space Plasma Problems

WINDMI: A Family of Physics Network Models for Storms and Substorms W. Horton, M.J. Mithaiwala, E.A. Spencer, and I. Doxas	431
---	-----

A Three-Fluid Model of Solar Wind-Magnetosphere-Ionosphere-Thermosphere Coupling P. Song, V.M. Vasyliūnas, and L. Ma	447
---	-----

Chapter 7: Present and Future Multiscale Space Missions

3D Plasma Structures Observed by the Four Cluster Spacecraft C.P. Escoubet, H. Laakso, and M. Goldstein	459
The Central Role of Reconnection in Space Plasma Phenomena Targeted by the Magnetospheric Multiscale Mission S.A. Curtis, P.E. Clark, and C.Y. Cheung	473
Multiscale Geospace Physics in Canada W. Liu, J. Burchill, L. Cogger, E. Donovan, G. James, D. Kendall, D. Knudsen, J. Lu, I. Mann, R. Michaud, S. Murphree, R. Rankin, J. Samson, E. Spanswick, G. Sofko, T. Trondsen, and A. Yau	487
A Chinese-European Multiscale Mission: The Double Star Program Z.X. Liu, P. Escoubet, and J.B. Cao	509

Author Index	515
---------------------	-----