

Aeronomy of the Earth's Atmosphere and Ionosphere

Editors

Mangalathayil Ali Abdu

National Institute for Space Research,
Sao Jose dos Campos, SP, Brazil

Dora Pancheva

Bulgarian Academy of Sciences, Sofia, Bulgaria

Co-editor

Archana Bhattacharyya

Indian Institute of Geomagnetism,
Navi Mumbai, India

Contents

Part I	Mesosphere-Lower Thermosphere Dynamics and Chemistry	1
1	Chemical-Dynamical Coupling in the Mesosphere and Lower Thermosphere	3
	Daniel R. Marsh	
2	Atmospheric Tides and Planetary Waves: Recent Progress Based on SABER/TIMED Temperature Measurements (2002–2007)	19
	Dora Pancheva and Plamen Mukhtarov	
3	Dynamical Coupling Between Different Regions of Equatorial Atmosphere	57
	Geetha Ramkumar	
4	Microphysical Properties of Mesospheric Aerosols: An Overview of In Situ-Results from the ECOMA Project	67
	Markus Rapp, Irina Strelnikova, Boris Strelnikov, Martin Friedrich, Jörg Gumbel, Ulf-Peter Hoppe, Tom Blix, Ove Havnes, Phillip Bracikowski, K.A. Lynch, and Scott Knappmiller	
5	SABER Observations of Daytime Atomic Oxygen and Ozone Variability in the Mesosphere	75
	Anne K. Smith, Daniel R. Marsh, Martin G. Mlynczak, James M. Russell III, and Jeffrey C. Mast	
6	In Situ Measurements of Small-Scale Structures in Neutrals and Charged Aerosols	83
	Boris Strelnikov and Markus Rapp	
7	High-Latitude Gravity Wave Measurements in Noctilucent Clouds and Polar Mesospheric Clouds	93
	Michael J. Taylor, P.-D. Pautet, Y. Zhao, C.E. Randall, J. Lumpe, S.M. Bailey, J. Carstens, K. Nielsen, James M. Russell III, and J. Stegman	
Part II	Vertical Coupling by Upward Propagating Waves	107
8	Gravity Wave Influences in the Thermosphere and Ionosphere: Observations and Recent Modeling	109
	David C. Fritts and Thomas S. Lund	

9 Neutral Winds and Densities at the Bottomside of the F Layer from Primary and Secondary Gravity Waves from Deep Convection	131
Sharon L. Vadas and Han-Li Liu	
10 The Acoustic Gravity Wave Induced Disturbances in the Equatorial Ionosphere	141
E. Alam Kherani, Mangalathayil Ali Abdu, Dave C. Fritts, and Eurico R. de Paula	
11 Mesosphere–Ionosphere Coupling Processes Observed in the F Layer Bottom-Side Oscillation	163
Hisao Takahashi, Sharon L. Vadas, C.M. Wrasse, Michael J. Taylor, P.-D. Pautet, A.F. Medeiros, R.A. Buriti, Eurico R. de Paula, Mangalathayil Ali Abdu, Inez S. Batista, I. Paulino, P.A. Stamus, and David C. Fritts	
12 A Case Study of Tidal and Planetary Wave Coupling in the Equatorial Atmosphere–Ionosphere System Over India: Preliminary Results	177
S. Gurubaran, R. Dhanya, S. Sathiskumar, and P.T. Patil	
Part III Ionospheric Electrodynamics and Structuring	189
13 Electrodynamics of Ionosphere–Thermosphere Coupling	191
Arthur D. Richmond	
14 Daytime Vertical $E \times B$ Drift Velocities Inferred from Ground-Based Equatorial Magnetometer Observations	203
David Anderson	
15 Three-Dimensional Modeling of Equatorial Spread F	211
J. D. Huba, G. Joyce, and J. Krall	
16 Coupling Processes in the Equatorial Spread F/Plasma Bubble Irregularity Development	219
Mangalathayil Ali Abdu and E. Alam Kherani	
17 Influences on the Development of Equatorial Plasma Bubbles: Insights from a Long-Term Optical Dataset	239
Jonathan J. Makela and Ethan S. Miller	
18 A Review of the Recent Advances in the Investigation of Equatorial Spread F and Space Weather Effects over Indian Sector Using Optical and Other Techniques	251
R. Sekar and D. Chakrabarty	
19 Radar and Optical Observations of Irregular Midlatitude Sporadic E Layers Beneath MSTIDs	269
David L. Hysell, Tatsuhiro Yokoyama, Elnana Nossa, Russell B. Hedden, Miguel F. Larsen, John Munro, Steven Smith, Michael P. Sulzer, and Sixto A. González	

20	Instabilities in the Midlatitude Ionosphere in Terms of <i>E-F</i> Coupling	283
	Tatsuhiro Yokoyama	
21	Statistical Study of Medium-Scale Traveling Ionospheric Disturbances Observed with a GPS Receiver Network in Japan	291
	Y. Otsuka, N. Kotake, K. Shiokawa, T. Ogawa, T. Tsugawa, and A. Saito	
	Part IV Thermosphere–Ionosphere Coupling, Dynamics and Trends	301
22	New Aspects of the Coupling Between Thermosphere and Ionosphere, with Special regards to CHAMP Mission Results	303
	Hermann Lühr, Huixin Liu, Jeahueng Park, and Sevim Müller	
23	Equatorial Ionization Anomaly: The Role of Thermospheric Winds and the Effects of the Geomagnetic Field Secular Variation	317
	Inez S. Batista, Erica M. Diogo, Jonas R. Souza, Mangalathayil Ali Abdu, and Graham J. Bailey	
24	Characteristics of Temperature and Density Structures in the Equatorial Thermosphere Simulated by a Whole Atmosphere GCM	329
	Hitoshi Fujiwara, Yasunobu Miyoshi, Hidekatsu Jin, Hiroyuki Shinagawa, and Kaori Terada	
25	Longitudinal Variations of the Thermospheric Zonal Wind Induced by Nonmigrating Tides as Observed by CHAMP	339
	Kathrin Häusler and Hermann Lühr	
26	Causal Link of Longitudinal Plasma Density Structure to Vertical Plasma Drift and Atmospheric Tides – A Review	349
	Hyosub Kil and Larry J. Paxton	
27	Longitudinal Structure of the Mid- and Low-Latitude Ionosphere Observed by Space-borne GPS Receivers	363
	C.H. Lin, C.H. Chen, H.F. Tsai, C.H. Liu, J.Y. Liu, and Y. Kakinami	
28	Ionosphere–Thermosphere Coupling in the Low-Latitude Region	375
	Shigeto Watanabe and Tsutomu Kondo	
29	A Tutorial Review on Sporadic <i>E</i> Layers	381
	Christos Haldoupis	
30	Long-Term Trends in the Upper Atmosphere – Recent Progress	395
	Jan Laštovička	

31 Parameters of the Ionospheric F2 Layer as a Source of Information on Trends in Thermospheric Dynamics	407
Alexey D. Danilov	
Part V Ionosphere-Thermosphere Disturbances and Modelling	417
32 Storm-Time Response of the Thermosphere-Ionosphere System	419
Timothy J. Fuller-Rowell	
33 Ionosphere Data Assimilation: Problems Associated with Missing Physics	437
R.W. Schunk, L. Scherliess, and D.C. Thompson	
34 Penetration of Magnetospheric Electric Fields to the Low Latitude Ionosphere During Storm/Substorms	443
Takashi Kikuchi, Kumiko K. Hashimoto, Atsuki Shinburi, Yuji Tsuji, and Shin-Ichi Watari	
35 Modeling the Storm Time Electrodynamics	455
Naomi Maruyama, Timothy J. Fuller-Rowell, Mihail V. Codrescu, David Anderson, Arthur D. Richmond, Astrid Maute, Stanislav Sazykin, Frank R. Toffoletto, Robert W. Spiro, Richard A. Wolf, and George H. Millward	
36 A Physical Mechanism of Positive Ionospheric Storms	465
Nanan Balan and Graham J. Bailey	
Index	477