

Contents

Part I	Introduction	1
1	The Sun, the Solar Wind, and the Heliosphere	3
	Mari Paz Miralles and Jorge Sánchez Almeida	
2	Universal Heliophysical Processes	9
	Nat Gopalswamy	
Part II	The Solar Interior	21
3	Solar Convection Zone Dynamics	23
	Matthias Rempel	
4	Solar Oscillations: Current Trends	31
	Sébastien Couvidat	
5	Theories of the Solar Cycle : A Critical View	39
	Hendrik C. Spruit	
6	The New Solar Composition and the Solar Metallicity	51
	Nicolas Grevesse, Martin Asplund, A. Jacques Sauval, and Pat Scott	
Part III	The Solar Atmosphere	61
7	Magnetic Reconnection in the Solar Atmosphere Observed by Hinode	63
	Shinsuke Imada, Hiroaki Isobe, and Toshifumi Shimizu	
8	Constraining the Initiation and Early Evolution of CMEs with SECCHI on STEREO	73
	Spiros Patsourakos	
9	Funnels and the Origin of the Solar Wind	83
	Ruth Esser and Øystein Lie-Svendsen	
10	MHD Simulations of the Global Solar Corona and the Solar Wind	101
	Roberto Lionello, Jon A. Linker, Zoran Mikić, Pete Riley, and Viacheslav S. Titov	

Part IV The Heliosphere	107
11 Solar Wind Observations from the STEREO Perspective (2007–2009)	109
Antoinette B. Galvin	
12 Shocks in the Heliosphere	121
Toshio Terasawa	
13 Observations of the Termination Shock and Heliosheath	131
John D. Richardson	
Part V Heliophysical Processes	145
14 Three Dimensional Magnetic Reconnection at Null Points and Separators	147
Clare E. Parnell, Andrew L. Haynes, and Rhona C. Maclean	
15 Current Sheets in the Solar Atmosphere	157
Giannina Poletto	
16 Solar Energetic Particles	167
Eino Valtonen	
17 From Micro- to Macro-scales in the Heliosphere and Magnetosphere	177
Dastgeer Shaikh, Igor S. Veselovsky, Quanming M. Lu, and Gary P. Zank	
18 Selected Solar Influences on the Magnetosphere: Information from Cosmic Rays	199
Karel Kudela and Leonid L. Lazutin	
19 Radio Emission Processes as Tracers of Heliospheric Weather: An Ontological Approach	209
Mauro Messerotti	
Part VI Radio Emissions	221
20 Solar and Interplanetary Radio Emissions	223
Bo Li, Dalmiro J. F. Maia, and Milan Maksimovic	
21 Radiation in the Solar System Through Converted Electrostatic Waves	235
Paul J. Kellogg and David M. Malaspina	
22 Contributions of Radioheliograph Observations to the Understanding of Solar Flares, Coronal Mass Ejections, Electron Beams in the Corona and in the Interplanetary Medium	247
Nicole Vilmer	
23 Coherent Radio Emissions Associated with Solar System Shocks	267
Iver H. Cairns	

Part VII Coordinated Science in the Sun-Earth System	339
24 Advances in Coordinated Sun-Earth System Science Through Interdisciplinary Initiatives and International Programs	341
Horst Fichtner and W. William Liu	
25 Solar Orbiter: Linking the Sun and Inner Heliosphere	347
Richard G. Marsden and Daniel Müller	
26 Scientific Objectives of the Canadian CASSIOPE Enhanced Polar Outflow Probe (e-POP) Small Satellite Mission	355
Andrew W. Yau and H. Gordon James	
27 The Sun-Climate Connection Through Measurements and Modeling: The Picard Investigation	365
Gérard Thuillier, Steven Dewitte, Werner Schmutz, and the PICARD team	
28 The International Space Weather Initiative (ISWI)	375
Joseph M. Davila, Nat Gopalswamy, Barbara J. Thompson, Tom Bogdan, and Mike Hapgood	
Index	381