
Contents

1	Prologue: From Sputnik to the International Space Station	1
1.1	The Beginning of the History	1
1.2	Early Artificial Satellites	3
1.3	Human Spaceflight	5
1.4	Living in Space: The Salyut Space Stations	11
1.5	The Skylab Space Station.	17
1.6	The Space Shuttle, the Reusable Spaceship	18
1.7	The Mir Space Station.	21
1.8	The International Space Station: A Permanent Base in Earth Orbit	21
2	Satellite Geodesy.	27
2.1	The Shape and the Size of the Earth	28
2.2	<i>Vanguard 1</i> Discovers the “Pear Shape” of the Earth	30
2.3	The ANNA Program	34
2.4	Tracking of the “Echo” Balloons.	35
2.5	Laser Satellite Ranging: Beacon Explorer and GEOS	37
2.6	French Geodetic Satellites	40
2.7	PAGEOS: Return to Balloons.	44
2.8	Secret Geodesy: Military Geodetic Satellites.	44
2.9	Satellite Altimetry	46
2.10	Geodynamic Satellites	48
2.11	Gravity Sensors and Accelerometers	53
3	Researches on the Atmosphere	59
3.1	Nomenclature of Atmospheric Structure.	59
3.2	First Observations of the Atmosphere from Space.	60
3.3	The Chemical Composition of the Atmosphere.	63
3.4	The Atmospheric Satellites of Explorer Program.	65
3.5	Atmospheric Researches with Military Satellite.	69
3.6	The Orbiting Geophysical Observatory Program	72
3.7	European Researches: San Marco, Ariel 3, and Aeros Satellites.	73

3.8	The Soviet Researches with Cosmos Satellites	78
3.9	The Second Generation of “Atmosphere Explorer” Satellites	83
3.10	Faint Phenomena in the Upper Atmosphere	86
	3.10.1 The Geocorona.	86
	3.10.2 The Airglow	88
	3.10.3 Noctilucent Clouds	91
3.11	Earth Radiation Budget	94
3.12	Observing the Atmosphere from Space Stations	96
3.13	The Spacelab Missions	102
3.14	Atmospheric Research from Mir and ISS	103
3.15	The Project <i>A-Train</i> , a Train for the Atmosphere	106
3.16	Megha-Tropiques	106
3.17	Observations of Atmospheric Ozone	109
4	Ionospheric Research with Satellites	123
4.1	A Glance at Ionosphere	123
4.2	First Observations from Space	125
4.3	Alouette, the First Topside Sounder.	129
4.4	Explorer 20	131
4.5	ISIS (International Satellites for Ionospheric Studies).	132
4.6	The Soviet Ionospheric Satellites.	133
4.7	The Intercosmos Program.	136
4.8	Other National Programs	139
4.9	The Aurora	139
4.10	Physics of the Aurora	140
4.11	The Observation of Aurora from Space	142
5	Exploration of the Earth’s Magnetosphere.	153
5.1	The Earth’s Magnetic Field	153
5.2	Satellite Studies of Geomagnetism.	155
5.3	The Van Allen Radiation Belts	158
5.4	The Third Radiation Belt	162
5.5	The Solar Wind and the Magnetosphere.	163
5.6	The Exploration of the Magnetosphere.	164
5.7	Exploration of the Radiation Belts—the Soviet Programs <i>Electron</i>	174
5.8	The Ring Current	178
5.9	First European Programs: HEOS and GEOS.	179
5.10	The International Sun-Earth Explorer (ISEE)	181
5.11	Active Experiments in Space: The AMPTE Project	184
5.12	The Intercosmos Programs for the Study of the Magnetosphere	189
5.13	The Interbol Missions: New Models of Magnetosphere	196
5.14	Soviet–French Cooperation: The ARAKS and Arcade Experiments	198

5.15	SOHO: The New Face of the Sun	200
5.16	Cluster: A Study of Small-Scale Plasma Structures and Processes	200
5.17	The Double Star and Equator-S Missions	202
6	Meteorological Satellites	207
6.1	First Orbital Experiments and the First Weather Satellites	207
6.2	The TIROS Program	211
6.3	The Nimbus Satellites	214
6.4	The New TIROS Generations	222
6.5	The ITOS/NOAA Satellites	226
6.6	The Instruments of Meteorological Satellites	228
6.7	The Defense Meteorological Satellite Program (DMSP)	231
6.8	The Third Generation of TIROS	233
6.9	Geostationary Satellites	234
6.10	Soviet Meteorological Satellites	242
6.11	A French Original Solution: The EOLE Project	245
6.12	The Meteosat program	249
6.13	Weather Satellites of Japan	254
6.14	Indian Weather Satellites	255
6.15	Weather Satellites of China	262
7	Study of Micrometeorites and Cosmic Dust	265
7.1	Direct Measurement in Space	265
7.2	The Micrometeorite Explorers	268
7.3	Early Soviet Researches	268
7.4	The Pegasus Project	274
7.5	The Gemini Experiment	277
7.6	The European Experience: Ariel 2, Prospero, and HEOS 2	280
7.7	The Experiments Conducted from the Space Stations	284
7.8	The <i>Comet</i> Experiment on Salyut 7	287
7.9	Collection of Micrometeorites on the Mir Station	288
8	Earth Remote Sensing	293
8.1	Introduction to Remote Sensing	293
8.2	Photography of the Earth from Space	294
8.3	Cosmonauts and Astronauts Observe the Earth from Orbit	294
8.4	The Gemini and Apollo Programs	297
8.5	The Skylab Space Station	300
8.6	The Landsat Program	304
8.7	SPOT, the French Satellite for Earth Observation	308
8.8	The Pléiades Constellation	316
8.9	The Satellites Terra, CBERS, SAC and JERS	317

8.10	Soviet and Russian Remote Sensing Satellites.	320
8.11	The Resurs F Satellites	322
8.12	Earth Remote Sensing from Soviet Manned Spacecrafts.	326
8.13	Earth Remote Sensing from Salyut	330
8.14	The Orbital Stations Salyut 6 and Salyut 7.	336
8.15	The Intercosmos Flights to Salyut	341
8.16	The Indian Remote Sensing Programs	343
8.17	The MKF-6M Multispectral Camera	345
8.18	The Mir Space Station.	348
8.19	Remote Sensing Observations from Shuttle-Mir Program.	355
8.20	Small Satellites for Earth Observation	357
9	Cartography and Mapping	361
9.1	Landsat and SPOT	361
9.2	The Salyut–Almaz Space Stations	361
9.3	The Second-Generation Salyut Space Stations.	364
9.4	Mapping from the Space Shuttle.	368
9.5	The Space Shuttle Radar Missions.	370
9.6	Other Spaceborne Radar Systems	375
10	Oceanography from Space	383
10.1	Observing the Oceans from Space.	383
10.2	Sea Surface Temperature	384
10.3	Early Satellite Measurements of Sea Surface Temperature	384
10.4	Oceanic Currents and Fronts.	387
10.5	The Color of Oceans	388
10.6	Japan’s Marine Observation Satellites	392
10.7	The Skylab Oceanographic Researches	392
10.8	Ocean Surface Winds	394
10.9	Seasat, the First Oceanographic Satellite	395
10.10	The European ERS and Envisat Satellites.	396
10.11	Advanced Earth Observing Satellite (ADEOS)	399
10.12	The Surface Topography of the Oceans	400
10.13	El Niño, a Global Change Event.	402
10.14	The Soviet Space Oceanography	404
10.15	The French–Indian SARAL Satellite	408
	Bibliography	413
	Websites	417
	Index	419

Stamping the Earth from Space

Dicati, R.

2017, XXIV, 429 p. 407 illus. in color., Hardcover

ISBN: 978-3-319-20755-1