Part I  An Overview of Development in the Geographical Sciences

1  General Trends in the Geographical Sciences .................................................. 3
   1.1 Global Hot Issues Propose New Entry-Points for Research ......................... 3
   1.2 RS and GIS Provide Essential Methods and Tools for Area Studies ........... 7
   1.3 Simulation and Prediction Become Crucial Aspects of Geographical Science Research ................................................................. 8
   1.4 Field Observation and Experimentation Become Important Methods in Physical Geography ............................................................ 9
   1.5 Higher Education Adapts to the Development of the Geographical Sciences ................................................................. 10
       1.5.1 Organisational Structure and Subject/Major Setting ...................... 10
       1.5.2 Curriculum and Specialisation .................................................. 11
       1.5.3 Background of Professors ....................................................... 13
       1.5.4 Basic Understanding .................................................................. 14
   1.6 Summary ......................................................................................... 15

2  International Cooperation in the Geographical Sciences ....................................... 17
   2.1 Global Cooperation Network .................................................................. 17
   2.2 International Cooperation and Independent Research .................................. 19
   2.3 Major Research Fields Involving International Cooperation of China .......... 21
   2.4 Summary ......................................................................................... 27

3  The Background of the Development of the Geographical Sciences in China ............ 29
   3.1 Funds for the Geographical Sciences from the NSFC ................................ 30
   3.2 Geographical Sciences Education ........................................................... 36
   3.3 Universities Involved in Research on Geographical Sciences .................... 39
   3.4 The Geographical Society of China ......................................................... 42
       3.4.1 The Development of Society Membership .................................. 42
       3.4.2 Establishment of Secondary Organisations .................................. 42
       3.4.3 Academic Activities .................................................................. 43
       3.4.4 Science and Technology Award .................................................. 44
   3.5 Summary ......................................................................................... 45

Part II  Trends in the Development of the Four Branches of the Geographical Sciences

4  Physical Geography ..................................................................................... 49
   4.1 General Characteristics of the Research Topics Over the Past 30 Years .... 51
   4.2 Change of Research Topics in Various Periods ........................................ 55
       4.2.1 Period of 1986–1995 .................................................................. 55
4.2.2 Period of 1996–2000 .................................................. 58
4.2.3 Period of 2001–2005 .................................................. 61
4.2.4 Period of 2006–2010 .................................................. 65
4.2.5 Period of 2011–2015 .................................................. 68
4.2.6 Analysis of Driving Factors for Disciplinary Development over the Past 30 Years ........................................... 71
4.3 Disciplinary Development and Research Teams in China ........... 73
4.3.1 Numbers and Proportions of NSFC Applications and Funded Projects for Physical Geography ......................... 73
4.3.2 Objects of Studies in NSFC-Funded Projects ................... 74
4.3.3 Research Teams .......................................................... 78
4.4 Summary ................................................................. 87

5 Human Geography ......................................................... 89
5.1 General Characteristics of the Research Topics Over the Past 30 Years .... 91
5.2 Change of Research Topics in Various Periods .......................... 93
5.2.1 Period of 1986−1995 .................................................... 93
5.2.2 Period of 1996−2000 .................................................... 95
5.2.3 Period of 2001−2005 .................................................... 99
5.2.4 Period of 2006−2010 ................................................... 103
5.2.5 Period of 2011−2015 ................................................... 104
5.2.6 Analysis of Driving Factors for Disciplinary Development over the Past 30 Years ........................................... 110
5.3 Disciplinary Development and Research Teams in China ........... 111
5.3.1 Numbers and Proportions of NSFC Applications and Funded Projects for Human Geography ......................... 112
5.3.2 Objects of Studies in NSFC-Funded Projects ................... 112
5.3.3 Research Teams .......................................................... 114
5.4 Summary ................................................................. 123

6 Geographical Information Science ........................................ 127
6.1 General Characteristics of the Research Topics Over the Past 30 Years .... 130
6.2 Change of Research Topics in Various Periods .......................... 134
6.2.1 Period of 1986−1995 .................................................... 134
6.2.2 Period of 1996−2000 .................................................... 136
6.2.3 Period of 2001−2005 .................................................... 139
6.2.4 Period of 2006−2010 ................................................... 144
6.2.5 Period of 2011−2015 ................................................... 148
6.2.6 Analysis of Driving Factors for Disciplinary Development over the Past 30 Years ........................................... 152
6.3 Disciplinary Development and Research Teams in China ........... 152
6.3.1 Numbers and Proportions of NSFC Applications and Funded Projects for Geographical Information Science ............ 153
6.3.2 Objects of Studies in NSFC-Funded Projects ................... 154
6.3.3 Research Teams .......................................................... 155
6.4 Summary ................................................................. 164
References ................................................................. 165

7 Environmental Geography .................................................. 167
7.1 General Characteristics of the Research Topics Over the Past 30 Years .... 169
7.2 Change of Research Topics in Various Periods .......................... 172
7.2.1 Period of 1986−1995 .................................................... 172
7.2.2 Period of 1996−2000 .................................................... 175
7.2.3 Period of 2001−2005 .................................................... 179
7.2.4 Period of 2006−2010 ................................................... 182
Chapter 7.2.5 Period of 2011–2015
7.2.6 Analysis of Driving Factors for Disciplinary Development over the Past 30 Years
7.3 Disciplinary Development and Research Teams in China
7.3.1 Numbers and Proportions of NSFC Applications and Funded Projects for Environmental Geography
7.3.2 Object of Studies in NSFC-Funded Projects
7.3.3 Research Teams
7.4 Summary

Part III Strategic Research Issues on the Geographical Sciences

Chapter 8 Global Change and Terrestrial Ecosystems
8.1 Overview
8.1.1 Development of Research Questions
8.1.2 Contributions by Scholars from Different Countries
8.1.3 Key Research Topics
8.1.4 The Role of NSFC in Supporting the Research on Global Change and Terrestrial Ecosystems
8.2 Questions and Research Progress
8.2.1 How does Global Change Impact the Patterns and Processes of Terrestrial Ecosystems?
8.2.2 How can the Impacts of Global Change on Terrestrial Ecosystems at Different Spatiotemporal Scales be Effectively Observed and Simulated?
8.2.3 How may Terrestrial Ecosystems be Sustainably Managed in the Context of Global Change?
8.3 Roadmap for Further Research
8.4 Summary

Chapter 9 Terrestrial Water Cycle and Water Resources
9.1 Overview
9.1.1 Development of Research Questions
9.1.2 Contributions by Scholars from Different Countries
9.1.3 Key Research Topics
9.1.4 The Role of NSFC in Supporting the Research on Terrestrial Water Cycle and Water Resources
9.2 Questions and Research Progress
9.2.1 What Has Changed in the Water Cycle and What Changes Could Possibly Occur?
9.2.2 How to Improve Simulation and Prediction Capacities in Hydrology and Water Resources?
9.2.3 How to Achieve Water Security in a Changing Environment?
9.3 Roadmap for Further Research
9.4 Summary

Chapter 10 Land Change
10.1 Overview
10.1.1 Development of Research Questions
10.1.2 Contributions by Scholars from Different Countries
10.1.3 Key Research Topics
10.1.4 The Role of NSFC in Supporting the Research on Land Change
10.2 Questions and Research Progress ........................................ 252
  10.2.1 What Changes in Land Use and Land Cover Have Occurred at Different Scales? ........................................ 252
  10.2.2 What Kind of Natural and Human Factors Can Lead to Land Change? ........................................ 255
  10.2.3 What are the Negative Environmental Impacts of Land Change? ........................................ 256
10.3 Roadmap for Further Research ........................................ 258
10.4 Summary ........................................ 258
References ........................................ 259

11 Global Cryosphere Evolution and Land Surface Processes on the Tibetan Plateau ........................................ 263
11.1 Overview ........................................ 263
  11.1.1 Development of Research Questions ........................................ 263
  11.1.2 Contributions by Scholars from Different Countries ........................................ 265
  11.1.3 Key Research Topics ........................................ 265
  11.1.4 The Role of NSFC in Supporting the Research on Global Cryosphere Evolution and Land Surface Processes on the Tibetan Plateau ........................................ 266
11.2 Questions and Research Progress ........................................ 270
  11.2.1 How Has the Climate Changed in the Past on the Tibetan Plateau, and How is the Spatial Pattern Reconstructed from High-Precision Records? ........................................ 270
  11.2.2 How Has the Cryosphere Changed on the Tibetan Plateau in Recent Years and How Have Such Changes Impacted the Ecosystem and Hydrologic Processes? ........................................ 272
  11.2.3 How Has the Polar Cryosphere Changed and How do These Changes Influence the Planet? ........................................ 274
11.3 Roadmap for Further Research ........................................ 276
11.4 Summary ........................................ 277
References ........................................ 277

12 Economic Globalization and Local Responses ........................................ 281
12.1 Overview ........................................ 281
  12.1.1 Development of Research Questions ........................................ 281
  12.1.2 Contributions by Scholars from Different Countries ........................................ 282
  12.1.3 Key Research Topics ........................................ 282
  12.1.4 The Role of NSFC in Supporting the Research on Economic Globalization and Local Responses ........................................ 283
12.2 Questions and Research Progress ........................................ 284
  12.2.1 How do TNCs Organize Cross-border, Value-adding Networks? ........................................ 284
  12.2.2 How do Capital, Products, Knowledge and Labor Flow across Space? ........................................ 288
  12.2.3 How is the Global Restructuring the Local? ........................................ 290
  12.2.4 How is the LocalResponding to the Global? ........................................ 292
12.3 Roadmap for Further Research ........................................ 294
12.4 Summary ........................................ 295
References ........................................ 296

13 Regional Sustainable Development ........................................ 301
13.1 Overview ........................................ 301
  13.1.1 Contributions by Scholars from Different Countries ........................................ 301
  13.1.2 Key Research Topics ........................................ 302
13.1.3 The Role of NSFC in Supporting the Research on Regional Sustainable Development .......................... 302
13.1.4 The Role of the Geographical Sciences in Regional Sustainable Development ............................ 305
13.2 Questions and Research Progress .............................................. 307
13.2.1 How to Understand the Coupling Relationship Between Man and Nature? .................................. 307
13.2.2 How to Delineate the Carrying Capacity of the Resource-Environment System for Human Activities? . 310
13.2.3 How to Evaluate the Status of Regional Sustainable Development ............................................ 312
13.2.4 How to Utilize Natural Resources in a Sustainable Way? ......................................................... 313
13.2.5 How to Achieve Sustainable Development Through Regional Governance? ............................ 315
13.3 Roadmap for Further Research .................................................. 317
13.4 Summary .............................................................................. 318
References .............................................................................. 318

14 Remote Sensing Modelling and Parameter Inversion ...................... 323
14.1 Overview .............................................................................. 323
14.1.1 Development of Research Questions ................................. 323
14.1.2 Contributions by Scholars from Different Countries .......... 324
14.1.3 Key Research Topics .......................................................... 324
14.1.4 The Role of NSFC in Supporting the Research on Remote Sensing Modelling and Parameter Inversion 326
14.2 Questions and Research Progress ............................................. 328
14.2.1 How Can the Remote Sensing Model Describe the Surface Parameters More Accurately? .............. 328
14.2.2 How to Improve the Retrieval Accuracy of Surface Parameters? .................................................. 330
14.3 Roadmap for Further Research ................................................ 333
14.4 Summary .............................................................................. 334
References .............................................................................. 334

15 Spatial Analysis and Simulation .................................................. 339
15.1 Overview .............................................................................. 339
15.1.1 Development of Research Questions ................................. 339
15.1.2 Contributions by Scholars from Different Countries .......... 340
15.1.3 Key Research Topics .......................................................... 340
15.1.4 The Role of NSFC in Supporting the Research on Spatial Analysis and Simulation .......................... 341
15.2 Questions and Research Progress ............................................. 344
15.2.1 What is the Essence of Geo-objects and Their Relationships? ....................................................... 344
15.2.2 How to Express and Analyze the Spatial Relationship Between Geographic Features? ................. 347
15.2.3 How to Make a More Accurate Spatial Estimation? ................................................................. 351
15.2.4 How to Simulate Evolutionary Geographical Systems? ............................................................... 354
15.2.5 How to Display Spatial Information and Realize Human-Computer Interaction? ......................... 356
15.3 Roadmap for Further Research ................................................ 359
15.4 Summary .............................................................................. 360
References .............................................................................. 360
16 Tempo-Spatial Processes and Modelling of Environmental Pollutants ... 367
16.1 Overview ................................................. 367
  16.1.1 Development of Research Questions ................. 367
  16.1.2 Contributions by Scholars from Different Countries. 368
  16.1.3 Key Research Topics .................................. 369
  16.1.4 The Role of NSFC in Supporting the Research on Tempo-spatial Processes and Modelling of Environmental Pollutants .................. 371
16.2 Questions and Research Progress .......................... 374
  16.2.1 How to Identify and Apportion Sources of Environmental Pollutants. 374
  16.2.2 How to Determine the Behaviors of Environmental Pollutants. .............. 378
  16.2.3 How to Simulate the Spatial Processes of Environmental Pollutants at the Regional Scale ..................... 384
16.3 Roadmap for Further Research ............................ 386
16.4 Summary ................................................... 387
References ...................................................... 387

Part IV A Review and Outlook of Research Fields on the Geographical Sciences Regarding NSFC

17 Geomorphology ........................................... 393
17.1 Overview .................................................. 393
  17.1.1 Development of Research Questions .................... 393
  17.1.2 Contributions by Scholars from Different Countries. 394
  17.1.3 Key Research Topics .................................... 395
  17.1.4 The Role of NSFC in Supporting the Research on Geomorphology ............. 397
17.2 Research Advances and Problems .......................... 399
  17.2.1 Bibliometric Analysis of Contemporary Research .............. 399
  17.2.2 Contemporary Research .................................. 400
  17.2.3 Bibliometric Analysis of Contemporary Research in China ............... 401
  17.2.4 Contemporary Research in China ........................ 401
  17.2.5 Contributions by Chinese Scholars and Subsequent Problems .......... 403
17.3 Roadmap for Further Research ............................ 403
17.4 Summary ................................................... 404
References ...................................................... 404

18 Ecohydrology ............................................. 407
18.1 Overview .................................................. 407
  18.1.1 Development of Research Questions .................... 407
  18.1.2 Contributions by Scholars from Different Countries. 408
  18.1.3 Key Research Topics .................................... 409
  18.1.4 The Role of NSFC in Supporting the Research on Ecohydrology ............. 411
18.2 Research Advances and Problems .......................... 412
  18.2.1 Bibliometric Analysis of Contemporary Research .............. 412
  18.2.2 Contemporary Research .................................. 413
  18.2.3 Bibliometric Analysis of Contemporary Research in China ............... 413
  18.2.4 Contemporary Research in China ........................ 414
  18.2.5 Contributions by Chinese Scholars and Subsequent Problems .......... 414
18.3 Roadmap for Further Research ............................ 415
18.4 Summary ................................................... 416
References ...................................................... 416
25.2.2 Contemporary Research ........................................... 517
25.2.3 Bibliometric Analysis of Contemporary Research in China . 518
25.2.4 Contemporary Research in China .............................. 518
25.2.5 Contributions by Chinese Scholars and Subsequent
Problems ................................................................. 519
25.3 Roadmap for Further Research ................................. 520
25.4 Summary ............................................................ 520
References ................................................................. 521

Appendix A: List of 307 Mainstream SCI/SSCI Journals in Geographical Sciences ........................................... 523
Appendix B: Abbreviations of the Funding Agencies in Fig. 1.4 ................................................................. 531
Appendix C: List of 29 CSCD and Chinese Core Journals ................................................................. 533
Appendix D: List of Institutions in the Collaborative Networks of Chinese Authors in the SCI/SSCI and CSCD (& Chinese Core Journals) Indexed Articles ................................................................. 535
Appendix E: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 8 “Global Change
and Terrestrial Ecosystems” ................................................................. 539
Appendix F: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 9 “Terrestrial Water Cycle
and Water Resources” ................................................................. 541
Appendix G: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 10 “Land Change” ................................................................. 543
Appendix H: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 11 “Global Cryosphere Evolution
and Land Surface Processes on the Tibetan Plateau” ................................................................. 551
Appendix I: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 12 “Economic Globalization
and Local Responses” ................................................................. 555
Appendix J: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 13 “Regional Sustainable Development” ................................................................. 557
Appendix K: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 14 “Remote Sensing Modelling
and Parameter Inversion” ................................................................. 559
Appendix L: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 15 “Spatial Analysis
and Simulation” ................................................................. 561
Appendix M: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 16 “Tempo-Spatial Processes
and Modelling of Environmental Pollutants” ................................................................. 563
Appendix N: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 17 “Geomorphology” ................................................................. 569
Appendix O: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 18 “Ecohydrology” ................................................................. 571
Appendix P: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 19 “Ecosystem Services” ................................. 573

Appendix Q: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 20 “The Urbanization Process and Mechanism” ......................................... 577

Appendix R: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 21 “Medical and Health Geography” ....................... 579

Appendix S: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 22 “International Rivers and Transboundary Environment and Resources” ......................... 585

Appendix T: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 23 “Records of Environmental Changes in Physical Geography” ............................... 587

Appendix U: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 24 “Detection and Attribution of Changes in Land Surface Sensitive Components” ........................... 591

Appendix V: Journals Retrieved with No Less than 15 SCI/SSCI-Indexed Articles in Chap. 25 “Uncertainty of Spatial Information and Spatial Analysis” .............................................. 595
The Geographical Sciences During 1986—2015
From the Classics To the Frontiers
Leng, S.; Gao, X.; Pei, T.; Zhang, G.; Chen, L.; Chen, X.;
2017, L11, 596 p. 211 illus., 209 illus. in color., Hardcover
ISBN: 978-981-10-1883-1