

地球系统科学

——21世纪地球科学前沿与可持续发展战略科学基础

毕思文

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摘要: 首先, 从人类面临全球性的重大问题、地球系统的全球化、地球系统科学与传统地球科学和国内外研究现状4个方面介绍了地球系统科学提出的背景, 阐述了地球系统科学的七大特征和六大趋向。其次, 详细介绍了地球系统科学的概念与研究方法, 主要内容有研究思路、基本概念、地球系统过程和地球系统科学的方法论。第三, 构建了地球系统科学理论基础, 主要内容包括: 地球系统的连续动态系统、离散动态系统、地球系统的随机性、地球系统的自组织和地球系统的简单巨系统与复杂巨系统。第四, 重点介绍了地球系统科学子系统与各圈层相互作用的动力学效应。最后, 概述了地球系统的数字表达——数字地球和地球系统科学是可持续发展战略的科学基础。

关键词: 地球系统科学; 地球科学前沿; 可持续发展; 科学基础

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Earth system science—the frontier of earth science and scientific basis of
the sustainable development strategy in the 21st century

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Abstract: The author firstly introduces the background of proposing earth system science in the contexts of global major problems facing the human beings, globalization of the earth system, earth system science and traditional earth science, elucidates seven features and six trends about earth system science. Second, he introduces in detail the concepts and research methods of earth system science. The main contents include the research thought, basic concepts and methodology of the earth system process and earth system science. Third, a theoretical basis of earth system science is constructed. The main contents are the continuous dynamic system of the earth system, discrete dynamic system, randomness of the earth system, self-organization of the earth system and simple giant system and complex giant system of the earth system. Fourth, the motive power effect of the interaction between the subsystems of the earth system science and various layers of the earth is introduced. Finally, the author proposes that the digital expressions of the earth system—the digital earth and earth system science—are the scientific basis of the sustainable development strategy.

Key words: earth system science; frontier of earth science; sustainable development; scientific basis