

世界遗产遥感图集 中国篇

Atlas of Remote Sensing for World Heritage: China



联合国教科文组织国际自然与文化遗产空间技术中心

中国科学院对地观测与数字地球科学中心

郭华东 ● 主编

Guo Huadong / Chief Editor



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内 容 简 介

世界遗产作为全人类的共同财富,记录着地球演化的历史和人类文明发展的足迹。本图集特色在于空间技术的应用,选择多波段、多分辨率、多时相航天与航空遥感数据,采用典型遥感图像和三维模型表达,从文化遗产、文化景观、混合遗产和自然遗产四个方面,宏观、直观、真实地刻画了中国的40个世界遗产地本体与景观环境特征。

本图集可为各遗产地动态监测、保护与管理、旅游规划与设计等各级管理人员和专业人士提供参考,同时可为研究中国世界遗产地的科研人员提供空间观测信息。

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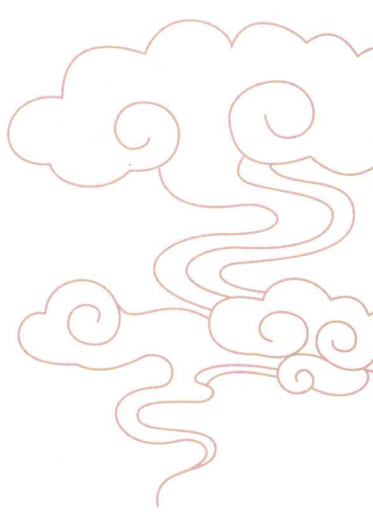
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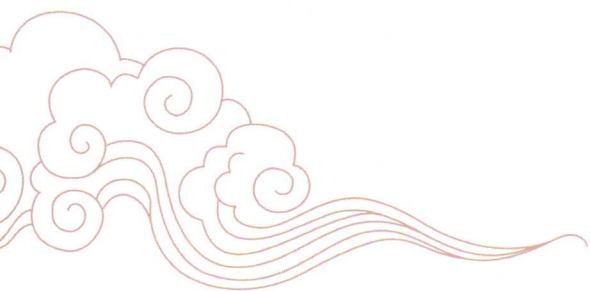
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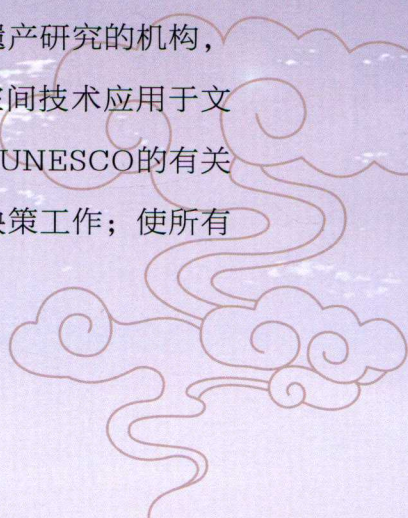
Foreword

世界遗产是全人类公认的具有突出意义和普遍价值的文物古迹及自然景观。它们是人类罕见的、无法替代的财富，也是了解地球的演化历史、认识人类自身进化发展、理解不同民族习俗文化的“物证”。它们具有知识教育、文明传承、精神激励等意义和作用，并可以为世界和平与安全做出独特的贡献。

联合国教育、科学及文化组织（UNESCO）注意到世界各国文化遗产和自然遗产由于自然过程以及人类活动因素的影响，正不断地遭受各种破坏的威胁。1972年11月，UNESCO在法国巴黎通过了《保护世界文化和自然遗产公约》（简称《公约》）。该《公约》提出，整个国际社会有责任通过提供集体性援助来参与保护具有突出的普遍价值的文化和自然遗产。发展科学和技术研究，采取适当的科学、技术和其他措施，达到有效地保护、保存和展示文化和自然遗产的目的。

空间对地观测技术的发展为人类提供了一个从空间认识世界遗产的平台，世界遗产的监测与保护需要空间信息技术。2009年10月，第35届UNESCO全会批准了中国科学院的建议，在中国领土上建立一个国际空间技术中心，利用这种技术开展自然和文化遗产、生物圈保护地、气候变化和自然灾害等领域的工作，并支持可持续发展教育。2011年6月，UNESCO与中国政府签署了建立“国际自然与文化遗产空间技术中心”（WHIST）的协议。WHIST依托中国科学院对地观测与数字地球科学中心(CEODE)建设，而CEODE是中国和国际先进的空间对地观测研究机构之一。因此，我既对WHIST能成为UNESCO大家庭的一员感到高兴，又对WHIST将之于UNESCO的贡献充满信心。

WHIST是UNESCO在全球设立的第一个利用空间技术开展世界自然和文化遗产研究的机构，也是中国科学院第一个UNESCO中心。该中心的目标是帮助UNESCO会员国将空间技术应用于文化和自然遗产研究保护，从而加强其对世界遗产的管理、保护、介绍和宣传及参与UNESCO的有关活动；加强会员国利用对地观测技术获取数据的能力，以支持可持续发展方面的决策工作；使所有





研究成果都能成为新的教育材料，从而支持联合国可持续发展教育活动。我衷心期望这个目标在 UNESCO 的帮助下并通过 WHIST 的努力圆满实现。

每一处世界遗产都应该是人们相聚、发现、分享和热爱的地方。任何自然或文化遗产的衰落与消亡，都会造成不可挽回的损失。我们非常高兴地看到，这项事业正逐步得到越来越多的国家和地区的认可与重视，得到了全世界的积极响应。WHIST 利用多平台、多波段、多模式对地观测信息进行《世界遗产遥感图集·中国篇》的编制，旨在利用空间技术从宏观的、整体的角度展示世界遗产的魅力，展现空间技术在世界遗产保护和监测中的作用，并从一种全新的视角宣传世界遗产，这是世界遗产研究的创新性工作。该图集对世界自然、文化以及混合遗产从空间角度进行展示，达到了宏观与微观相结合、平面与立体相结合、静态与动态相结合、文化与科技相结合，让人们从空间更好地了解不同的文化和民族精神以及大自然的神奇和伟大，这对传播人类知识财富、增进不同民族的交流、促使人类珍爱共有的地球家园大有裨益。

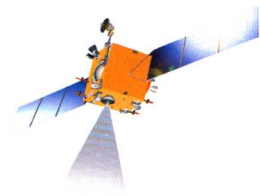
我相信《世界遗产遥感图集·中国篇》在宣传利用空间信息技术对世界遗产进行保护的工作中会发挥重要作用。同时，我希望国际自然与文化遗产空间技术中心能不断为我国和全球的世界遗产保护工作做出创新性研究与贡献。衷心祝愿珍贵的世界遗产将能永续传递，世界各国（地区）、各民族因此而更加享受和平、文明与美好。



白善禮

2011年7月

Foreword

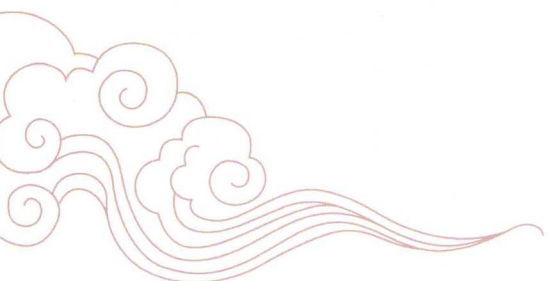


UNESCO World Heritage sites are locations recognized by humankind as cultural relics, historic sites, or natural landscapes of outstanding significance and universal value that are rare and cannot be replaced. Serving as evidence to aid our understanding of the evolutionary history of the Earth, the evolution of human beings, and the cultural diversity of nationalities, World Heritage sites are both educational and inspirational and can make unique contributions to world peace and security.

Being aware of the increasing threat of natural processes and human activities to cultural and natural heritage, the United Nations Educational, Scientific and Cultural Organization (UNESCO) adopted the Convention Concerning the Protection of World Cultural and Natural Heritage in Paris, France, in November 1972. According to the Convention, the entire international community shall shoulder the responsibility of protecting, conserving and promoting cultural and natural heritage of outstanding and universal value through collective efforts and by developing scientific and technological research in order to reach this goal.

The technological development of Earth observation from space has provided us with a platform to recognize the world like never before. The monitoring and conservation of World Heritage sites requires spatial information technology. In 2009, at its 35th General Conference, UNESCO approved China's proposal to establish in its territory the International Centre on Space Technologies for Cultural and Natural Heritage under the Auspices of UNESCO (WHIST), which is meant to utilize space technologies to understand natural and cultural heritage, biosphere reserves, climate change, and natural disasters, and to promote sustainable development education. In June 2011, UNESCO and the Chinese government signed an agreement to establish WHIST. This center is to be sponsored jointly by UNESCO and the Chinese Academy of Sciences (CAS) within the Center for Earth Observation and Digital Earth (CEODE), which is a base for national and international advanced Earth observation research. I am very glad that WHIST has become a member of UNESCO and am confident in its contribution to UNESCO in the future.

As the first center in the world set up by UNESCO using space technologies to study and monitor UNESCO World Natural and Cultural Heritage sites, WHIST's goal is to provide UNESCO and its member states with technical assistance in this regard, namely to enhance the management, protection, presentation, promotion and sustainable development of the sites. WHIST will also help the member states strengthen their capacity for using data



acquired through Earth observation technology in their decision-making. All the research results will become new educational materials to support UNESCO's activities related to sustainable development education. I greatly appreciate WHIST's goal and hope that it will be successfully achieved and further developed with the help of UNESCO and through their own efforts.

Each and every World Heritage site should be a place where people would like to gather, discover, share and enjoy. Any decline or disappearance of natural or cultural heritage would be an irreparable loss. I am very pleased to see that this initiative has been increasingly recognized and valued by more and more countries and regions, and that it has received positive responses from all over the world. By using multi-platform, multi-band, and multi-mode Earth observation technologies, WHIST has started compilation of the *Atlas of Remote Sensing for World Heritage: China* (hereinafter referred to as Atlas). The purpose of the atlas is to give a macroscopic and holistic view of World Heritage sites based on space technology, to show the role of space technology in the protection and monitoring of the sites, and to publicize them from a brand new angle. This is an innovative research approach to world heritage. The atlas is a wonderful and creative presentation of the world's natural, cultural and mixed heritage sites from many perspectives: macro and micro, two- and three-dimensional, static and dynamic, cultural and scientific. It will help people to better understand the cultures of different countries, the spirit of different nations, and the miracles and splendor of nature. This is of great benefit for disseminating the wealth of human knowledge, for promoting communication among different nations, and for encouraging people to cherish their common homestead—Earth.

I believe that the *Atlas of Remote Sensing for World Heritage: China* will play an important role in the protection of world heritage by using space-based information technology to help monitor, protect and promote this valuable resource, and I hope WHIST will continue to contribute its creativeness to this cause so that the precious world heritage we leave to future generations will be passed on from one generation to the next. I hope that all regions and nations will thus better enjoy these treasures and the satisfaction and tranquility that come from visiting them in person or through their visual representations provided by remotely sensed satellite and aircraft imagery.



President, Chinese Academy of Sciences

July, 2011



前言

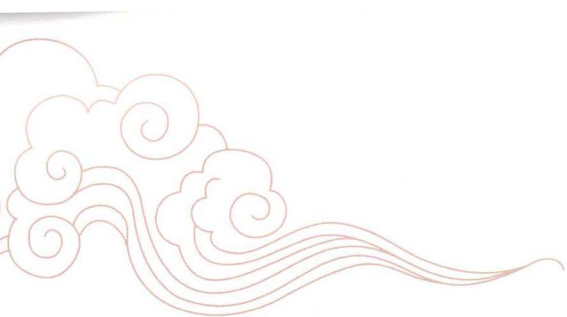
Preface

历经半个世纪的发展，空间对地观测技术已在不同领域得到广泛而成功的应用。作为记录人类文明发展历程和地球典型现象的世界文化遗产和自然遗产具有独特的物化特征，因此利用可揭示地物几何特性、波谱特性的多平台、多波段、多模式遥感技术识别遗产特征具有明确的物理基础，表明遥感技术在世界遗产探测与保护中具有重要作用和极大的发展潜力。

理念指导行动。基于以上认识，2000年以来我们持续开展了世界遗产空间研究工作，十年迈出十大步。2001年，成立了中国科学院、国家文物局、教育部遥感考古联合实验室（JLRSA），并相继建立下属10个省区遥感考古工作站；2002年，JLRSA组织召开了“第一届全国遥感考古会议”；2003年，主持召开了以“人类文化遗产信息的空间认知”为主题的第216次香山会议；2004年，发起并组织召开第一届国际遥感考古会议；2005年，JLRSA与联合国教育、科学及文化组织（UNESCO）签约加入“利用空间信息技术监测世界自然与文化遗产地开放计划”；2006年，第二届国际遥感考古会议在意大利罗马召开；2007年，中国科学院向UNESCO提出在中国建立“国际自然与文化遗产空间技术研究中心”的建议；2008年，UNESCO第179届执行局会议审议通过了建立该中心的可行性报告；2009年，UNESCO第35届全会审议并批准成立“国际自然与文化遗产空间技术中心”（WHIST）；2010年，WHIST筹备工作全面展开；2011年，UNESCO与中国政府正式签署建立WHIST的协议，WHIST在北京正式成立。

WHIST是隶属于UNESCO的一个利用空间技术进行世界遗产研究的国际学术机构，将自然科学与社会科学紧密结合开展研究是其重要宗旨。WHIST建立伊始，即立意于搭起空间技术与世界遗产的桥梁，并在全球范围内逐步实施。于是，我们提出编制世界遗产系列遥感图集的思路。《世界遗产遥感图集·中国篇》（以下简称《图集》）是其第一册。《图集》注重运用空间技术展示遗产与周边环境的关系，揭示世界自然遗产的成因及其动态变化，展示世界文化遗产的历史传承和文化区域，期望对世界遗产保护和监测起到积极推动作用。

《图集》在理念上从宏观动态变化及其与环境要素的关系入手，围绕《保护世界文化和自然遗产公约》对文化遗产和自然遗产的定义，依据每一项遗产被列入世界遗产的基准而展开，挖掘



世界遗产内涵的科学性，展现遗产的整体性，凸显其与环境的关系，力求可读性、艺术性、科学性和收藏性。在编制中，首先努力做到科学性和艺术性的统一。对于自然遗产重在形成的自然原因和自然要素特点方面的介绍；对于文化遗产，重在历史文化遗产、文化区域特色的介绍；利用多源遥感数据融合技术，动态体现世界遗产区域的变化。《图集》选择适当比例尺展示整体性，利用三维显示遗产与自然环境的关系，并通过遥感图像呈现的整体性与摄影照片展现的局部特点相互匹配，将空间技术展示的宏观美、动态美与摄影艺术体现的局部美、静态美融合在一起，全面地展示了中国世界遗产的风貌。

至2010年8月，中国共有世界遗产40处，其中文化遗产26处，文化景观2处，混合遗产4处，自然遗产8处。《图集》中遗产地目录编排按照遗产地划分的类型，即文化遗产、文化景观、混合遗产和自然遗产四大类顺序排列。根据《保护世界文化和自然遗产公约》对文化遗产的定义，将中国的26处世界文化遗产分为建筑群、文物和遗址三类，并参照其所满足的入选标准及世界遗产委员会的相关评价，将每一类世界文化遗产再细分为亚类。每一亚类的目录编排采用首都北京遗产地优先，其余遗产地按入选时间先后顺序排列的原则。文化景观、混合遗产和自然遗产均按入选年代顺序编排。《图集》中遗产地的英文名称、地理坐标、遴选标准均来自UNESCO官方网站（<http://whc.unesco.org/en/list/>）；遗产地的中文名称参照英文名称，并咨询了中国联合国教科文组织全国委员会及相关遗产管理单位。

在《图集》编制过程中，得到了联合国教育、科学和文化组织，中国科学院，中国联合国教科文组织全国委员会，住房和城乡建设部，国家文物局和国家航天局等机构和部门的指导与支持；得到了全国40个世界遗产单位、相关研究机构 and 高等院校专家的热情参与和鼎力协助，一些单位及个人提供了世界遗产地的遥感影像和实景照片；编制组和数据处理组付出了艰辛的劳动，在此一并致以衷心的感谢！

由于世界遗产内涵巨丰，且因时间及篇幅所限，本图集未能对遗产地充分展开叙述，不妥乃至错误之处，敬请读者批评指正。

2011年6月

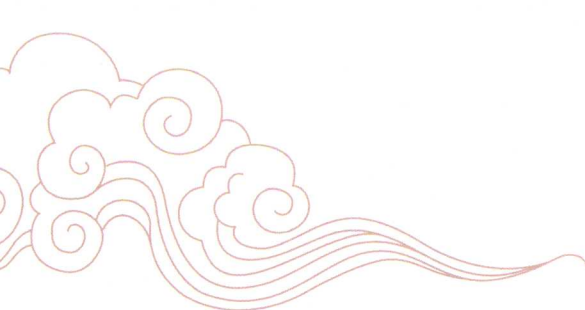
Preface



Having developed for over half a century, space-borne earth observation technology has been widely and successfully applied in different areas. As a record of the development of human civilization and typical earth phenomenon, world cultural and natural heritage sites have their own unique physical characteristics. Thus, through the use of multi-platform, multi-spectral, multi-temporal and multi-scale remote sensing technology, geometric and spectral characteristics of ground objects are revealed, helping to identify and better understand these heritage locations. The utilization of remote sensing technology also plays an important role and has great potential in the continued detection, delineation and protection of world heritage sites.

One's thinking directs one's actions. Based on this understanding, the Center for Earth Observation and Digital Earth (CEODE) and affiliates have been conducting space-based research on world heritage sites since 2000, which has led to great advances during that time. In 2001, the Joint Laboratory for Remote Sensing Archaeology (JLRSA) was established by the Chinese Academy of Sciences, the National Heritage Board, and the Ministry of Education. This was followed by the successful creation of 10 subordinate provincial and regional remote sensing archaeological stations. Since 2001, the JLRSA has taken a leading role in remote sensing archaeology through different forms of discourse. In 2002, JLRSA organized and convened the First National Conference of Remote Sensing Archaeology, which was followed in 2003 by hosting the 216th Xiangshan Science Conference with the theme of "Spatial Cognition of Human Cultural Heritage Information." In 2004, JLRSA initiated and organized the First International Conference of Remote Sensing Archaeology, and in 2005, JLRSA and UNESCO signed "the Open Plan of Utilizing Space Information and Technology to Monitor World Natural and Cultural Heritage." Scientists from JLRSA attended the Second International Conference on Remote Sensing Archaeology held in Rome, Italy in 2006. The Chinese Academy of Sciences proposed to UNESCO the establishment in China of the "International Space Technology Research Center of Natural and Cultural Heritage" in 2007. Subsequently in 2008, the 179th UNESCO Executive Board meeting deliberated and adopted the feasibility report on the establishment of the "Center." In 2009, the 35th UNESCO General Conference examined and approved the establishment of the "International Center on Space Technologies for Natural and Cultural Heritage under the Auspices of UNESCO" (WHIST). In 2011, UNESCO and the Chinese Government signed an agreement to establish WHIST in Beijing.

WHIST is an international academic institution of UNESCO that uses space-based technology



for the study of heritage sites and includes a close combination of natural and social science as its main research tools. At its debut, WHIST aimed at building a bridge between space technology and world heritage and gradually promoting this combination around the world. Therefore, the idea of compiling the Atlas of Remote Sensing for World Heritage came into being. The *Atlas of Remote Sensing for World Heritage: China* (hereinafter referred to as Atlas) is the first part. This Atlas focuses on the use of space technology to show the relationship between heritage sites and their surrounding environments, thus revealing the formation of world natural heritage and its dynamic change. In addition, the Atlas depicts historical growth and cultural/physical areas of world cultural heritage sites. Therefore, this Atlas is expected to play an active and important role in promoting the protection and monitoring of world heritage sites. The Atlas begins with the relationship between the macroscopic dynamic changes and environmental factors, centering on the definition of cultural and natural heritage in accordance with the Convention Concerning the Protection of World Cultural and Natural Heritage, and it presents the benchmarks of all the locations listed as world heritage sites. The focus is on exploring the scientific law of world heritage sites, emphasizing their integrity, and highlighting their relationship with the natural environment. The Atlas is not only artistic and visually pleasing to the reader but also contains and supports valuable scientific research. In the compilation process, priority was given to the unity of science and art. For natural heritage sites, the Atlas mainly introduces the natural causes of formation and the characteristics of the natural elements contained within. For cultural heritage, the focus is on the introduction of the historical and cultural heritage and the characteristics of cultural areas. The technology of multi-source remote sensing data fusion was used to dynamically reflect the changes in these world heritage areas. This Atlas utilized optimum scale data sets to best display site features, and pseudo three-dimensional technology was used to show the relationship between the heritage areas and the natural environment. The whole view displayed by remote sensing technology and the local view presented by photography are combined so that the macroscopic and dynamic beauty displayed by space technology and the local and static beauty presented by photographic art work together to present a comprehensive picture of China's world heritage sites.

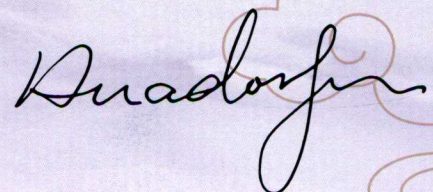
By August 2010, China boasted a total of 40 World Heritage Sites, of which 26 are cultural heritage, two are cultural landscapes, four are mixed heritage and eight are natural heritage. The World Heritage Site list contained within the Atlas is organized according to the four



categories "cultural heritage, cultural landscapes, mixed heritage and natural heritage." In accordance with the definition of cultural heritage in the Convention Concerning the Protection of the World Cultural and Natural Heritage, China's 26 cultural world heritage sites can be divided into three categories: buildings, artifacts, and historic sites. Every world cultural heritage site is further divided into sub-categories with reference to the admission criteria and the relevant evaluation made by the World Heritage Committee. In the cataloguing protocol of every sub-category, the sites located in the capital city of Beijing are listed first, with the remainder listed according to the chronological order of admission. Cultural landscapes, mixed heritage sites, and natural heritage sites are all arranged in accordance with the chronological order of admission. The Atlas also contains the English names of the heritage sites, their geographical coordinates and selection criteria from UNESCO's official website (<http://whc.unesco.org/en/list1>). The Chinese names of the heritage sites were chosen in accordance with their English names and in consultation with the UNESCO China Committee and other relevant heritage management institutes.

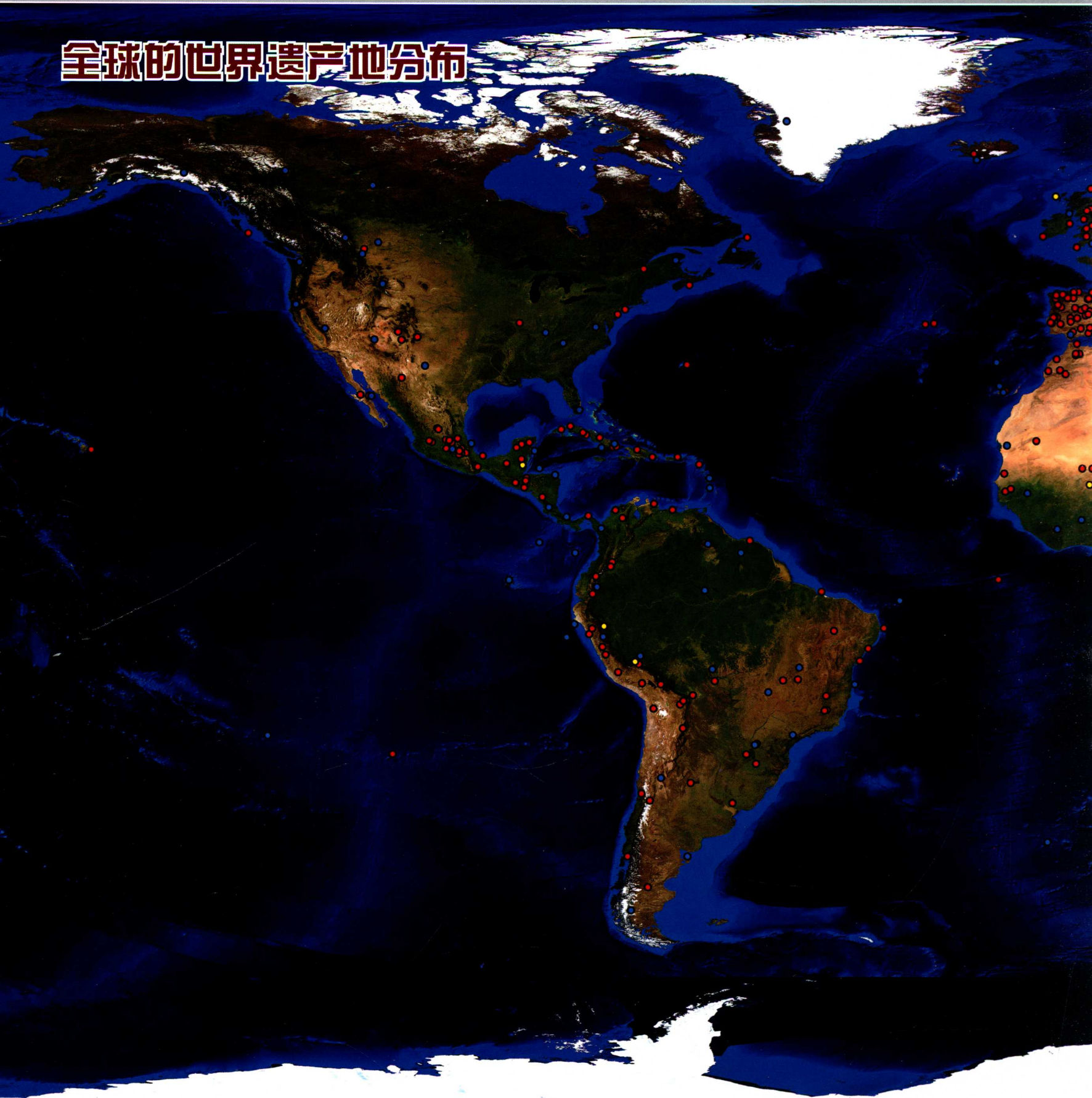
The compilation of this Atlas was guided and supported by UNESCO, the Chinese Academy of Sciences, UNESCO China Committee, China's Ministry of Housing and Urban Affairs, the State Administration of Cultural Heritage, the National Space Agency, and other governmental departments. Experts from over 40 world heritage institutes, research institutions and universities in China devoted their enthusiastic assistance, while selected institutes and individuals provided the remote sensing images and photos of the world heritage sites. The compiling panel and the data processing team exerted tremendous effort. To all those who have made a contribution to the Atlas, we express our heartfelt thanks!

Due to the rich connotation of world heritage sites and the limited time of compilation, this Atlas only succeeded in scratching the surface of the utility of remote sensing technology to explore, study and describe these heritage sites. Therefore, comments and corrections provided by the readers to help improve on the Atlas, our first of hopefully many similar documents for other countries and regions around the world, will be greatly appreciated.



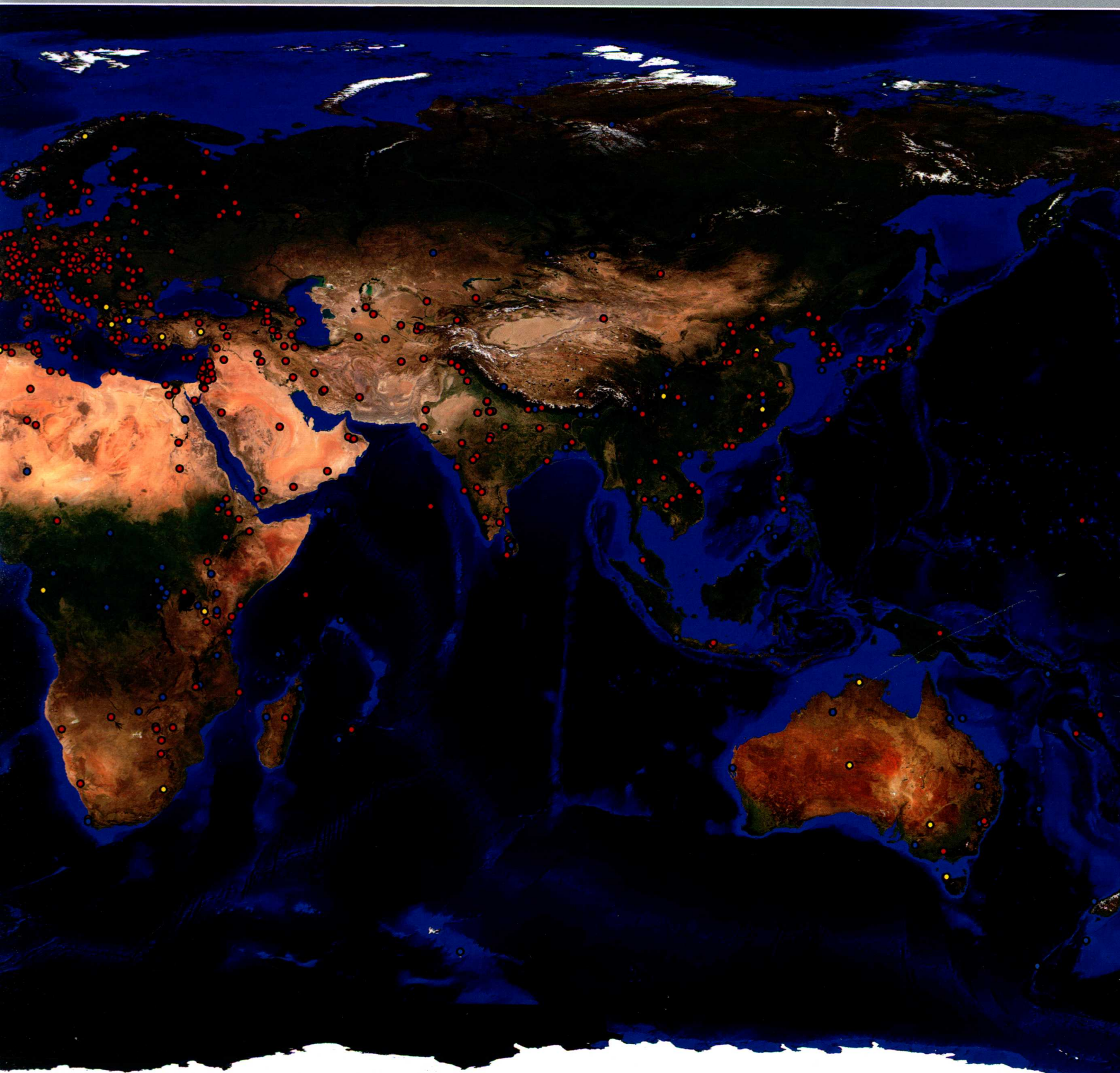
June, 2011

全球的世界遗产地分布



● 文化遗产 ● 混合遗产 ● 自然遗产

0 2000 4000 8000 km



遥感数据: MODIS
成像时间: 2002年
组合波段: R(2)G(3)B(1)
地图投影: UTM投影

注: 截至2010年8月, 全球共有911处世界遗产, 部分遗产由多处“捆绑”构成, 在实际标注时, 按“捆绑”时排在最前面的一处所在位置标注。

中国的世界遗产地分布

