中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

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岩溶地质研究所前身为中国地质科学院岩溶地质调查大队，于1976年11月在广西桂林成立，1979年正式更名为岩溶地质研究所，现隶属于国土资源部中国地质调查局。2004年确定为国家非营利性科研机构，目前在职职工211人。1983年建立中国岩溶地质馆，是目前国内外最大的普及岩溶科学技术知识的专业博物馆，国土资源科普基地和广西青少年科普教育基地。由岩溶所主办的《中国岩溶》是我国唯一公开发行的岩溶学科中文核心期刊。

The Institute of Karst Geology (IKG) was formerly founded as the Karst Geological Survey Team of Chinese Academy of Geological Sciences in 1976, in Guilin of Guangxi. It was named as the Institute of Karst Geology formally in 1979. Now it is administrated by China Geological Survey, the Ministry of Land and Resources. It was approved as a non-profit scientific organization in 2004. There are 211 staff members in IKG. The China Karst Geological Museum, built up in 1983 , set in IKG. It is the largest professional museum for scientific popularization on karst. It is also the Scientific Popularization Base for Land And Resources and Education Base for Teenagers in Guangxi Zhuang Autonomous Region. The journal - Carsologica Sinca, sponsored by IKG, is the only Chinese core periodical journal on karst in China.

六大支柱业务
Six major research fields

岩溶碳循环与应对全球气候变化
Karst carbon cycle and addressing global climate change

岩溶水资源开发与利用
Exploitation and utilization of karst water resources

岩溶生态与石漠化治理
Karst ecosystem and rocky desertification control

岩溶塌陷监测与预警
Karst collapse monitoring and early warning

岩溶景观与洞穴研究
Karst landscape and cave research

碳酸盐岩油气资源
Carbonate rocks oil and gas resources

四大国际一流
Four outstanding outcomes

岩溶动力学理论
Karst dynamics

地质记录重建古气候变化
Geological records for the reconstruction of paleo-climate change

固碳增汇技术
Carbon sequestration technology

岩溶地下水探测技术
Karst groundwater exploration technologies

四大支撑平台
Four supporting platforms

联合国教科文组织国际岩溶研究中心
International Research Center on Karst, UNESCO

岩溶动力系统与全球变化国际联合研究中心
National Center for International Research on Karst Dynamic System and Global Climate Change

国际大科学计划
International Big Scientific Plan

岩溶动力学国家重点实验室
Karst Dynamics State Key Laboratory

四大国际服务
Four aspects for international cooperation

牵头承担5项国际地质对比计划
Led and implemented 5 IGCP projects

建立了全球39个岩溶碳循环监测站
Established 39 karst carbon cycle monitoring stations globally

积极推进与东南亚国家合作交流
Promoted the cooperation and communication with Southeast Asian countries actively

培训40多个国家600多名学员
Trainings with more than 600 trainees from over 40 countries involved

八大野外基地
Seven field research bases

岩溶石漠化—广西果化野外基地
Guohua Rocky Desertification Control Base

岩溶地下河系统—广西海洋-寨底试验基地
Haiyang-Zhaidi Underground River System Research Base

岩溶水文地质—广西桂林丫吉试验场
Yaji Karst Experimental Site

岩溶生态与水生态—广西会仙野外基地
Huixian Karst Ecosystem and Wetland Base

弄拉岩溶生态修复示范基地
Nongla Demonstration Base for Karst Ecosystem Rehabilitation

广州岩溶塌陷地质灾害研究基地
Guangzhou Karst Collapse and Geological Hazards Research Base

重庆武隆岩溶研究基地
Wulong Karst Research Base

毛村岩溶碳循环及碳汇效应野外研究基地
Maocun Karst Carbon Cycle and Carbon Sink Research Base

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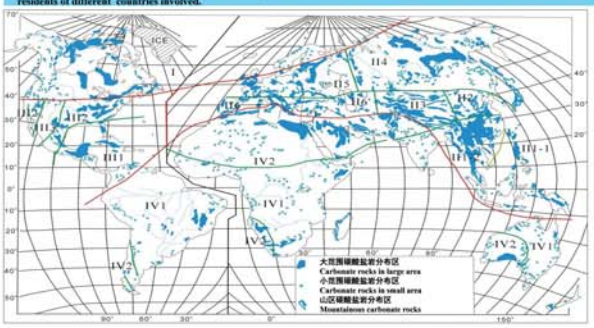
全球岩溶概况
Global Karst Settings

全球岩溶面积2200万平方千米，占全球陆地面积的1/6。全球共有88个岩溶大国：岩溶面积超过5万平方千米，或覆盖国土面积20%以上。岩溶地区景观奇特，资源丰富，环境脆弱，岩溶资源和环境问题引起了各国政府和居民的高度关注。

Carbonate rocks distribute widely around the world, with an area of 22,000, 000 km², which occupies around 1/6 of the land of earth. Across the world, there are 88 karst countries with the territory covered by karst over 50,000km², or over 20%. The karst landscape is distinctive, with abundant resources but vulnerable environment. High attention was paid to karst resources and environment by governments and residents of different countries involved.



世界岩溶分布图
Global Karst Distribution

I冰川岩溶区；II欧亚板块岩溶区：II1热带亚热带岩溶区，II 1-1新生代孔隙性碳酸盐岩溶区，II 1-2古生代坚硬碳酸盐岩溶区；II 2半干旱区岩溶区；II 3青藏高原岩溶区；II 4温带湿润半湿润区岩溶区；II 5欧洲地台岩溶区；II 6地中海气候特提斯构造岩溶区；III北美板块岩溶区：III1热带亚热带新生代孔隙碳酸盐岩岩溶区，III2湿润半湿润区温带岩溶区，III3北美西部干旱区岩溶区；IV冈瓦纳大陆岩溶区：IV1湿润半湿润区岩溶区，IV2干旱区岩溶区。

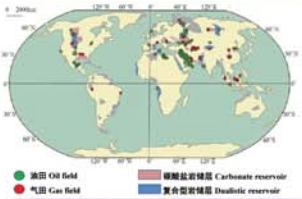
I Glacial karst II Eurasian plate karst: II1 Tropical and subtropical karst II1-1 Cenozoic porous carbonate rocks II1-2 Paleozoic hard carbonate rocks II2 Semi-arid karst II3 Qinghai-Tibet Plateau karst II4 Temperate humid and semi-humid karst II5 European platform karst II6 Tethys structure karst under Mediterranean climate III North American plate karst III1 Tropical-subtropical Cenozoic porous carbonate rocks III2 Humid and semi-humid subtropical karst III3 Western arid karst IV Gondwanaland karst IV1 Humid and semi-humid karst IV2 Arid karst.

丰富的水资源、油气资源以及景观资源
Abundant water resources, oil and gas resources, and landscape resources

根据国际水文地质计划统计，世界地下水资源开发利用量约6000~7000×10⁹m³/a，约占总用水量的50%；其中岩溶地区地下水开发利用量约3500×10⁹m³/a，为世界约25%人口提供饮用水源；目前世界上共发现了1021 个大型油气田，其中碳酸盐岩油气田 321 个。碳酸盐岩储层油气资源量占油气资源总量的50%；流水沿可溶性碳酸盐岩表面进行溶蚀作用，形成独特的丰富多彩的岩溶地质地貌景观，包括岩石嶙峋、奇峰林立的地上景观，及溶洞、地下河等地下景观。

According to the data from IHP, the global groundwater resources consumption is around 6,000-7,000×10⁹m³/a, accounting for about 50% of the total water consumption; the groundwater resources exploited in karst area is around 3,500×10⁹m³/a, providing the drinking water for about 25% of world population. 1,021 giant oil and gas fields have been found so far, 321 of them distribute in carbonate rocks. More than 50% of the total reserve distributes in carbonate reservoirs. Flowing water eroded carbonate rocks along the surface, formed beautiful karst landscapes, including peculiar rocks and peaks on the ground, and caves, underground rivers under the ground.

岩溶水资源是全球约1/4人口的水源
25% population lives on karst water



碳酸盐岩地区分布有大量油气资源
Abundant oil and gas resources distribute in carbonate reservoirs

中国西南地区岩溶景观
Amazing karst landscape in Southwest China

岩溶地区易发生多种环境问题
A variety of environmental problems in karst areas

岩溶地区具有同沙漠边缘一样的脆弱环境，全球岩溶地区环境问题尤为突出，石漠化、水污染、岩溶塌陷、干旱、洼地内涝等地质灾害越来越频繁，而且形成演变过程复杂，具有隐蔽性，难以防治和预测等特征。

karst environment was claimed as a vulnerable environment like the margin of desert. Karst area is suffering serious environmental problems, like rocky desertification, water pollution, karst collapse, drought and waterlogging of depression. These problems are complicated and disguised, which makes the prevention and prediction difficult.

岩溶塌陷
Karst collapse

干旱
Drought

洼地内涝
Waterlogging in depression

全球岩溶研究需求分析
Significance of global karst research

针对全球岩溶资源环境效应特点，亟待实施系统有效的国际岩溶大科学计划研究，一是推动地球系统科学创新发展的需要；二是岩溶资源有效开发和可持续利用的重大需求；三是防治岩溶地质灾害、保护生态环境的迫切需要；四是利用岩溶地域优势科学应对全球气候变化的需要；五是实现国家之间合作发展战略的需要；六是促进国际合作和实现全球岩溶信息共享的需要。

Considering the features of global karst resources and environmental effects, there is an urgent demand for a systematic and effective international big scientific plan on karst. The objectives are:1) to promote innovation of earth system science; 2) to develop and utilize karst resources effectively and sustainably; 3) to prevent karst geohazards and protect ecological environment; 4) to address global climate change by taking the advantages of karst science; 5) to realize collaborative development among countries,; and 6) to promote international cooperation and global karst information sharing.

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六大支柱业务之一：
Six Major Research Fields

应用岩溶动力学，开辟应对全球气候变化研究新途径
Applied karst dynamics to find a new approach for addressing global climate change

袁道先 院士，岩溶地质学学科带头人，国际知名岩溶水文地质学专家，岩溶动力学理论创始人，中心第一、二届学术委员会主任和理事会成员

Prof. Yuan Daoxian: Academician of Chinese Academy of Sciences, group leader of karst geological research in China, world famous karst hydrogeologist, initiator of karst dynamics theory, also the 1st, 2nd AC Director of IRCK and 1st, 2nd GB Member of IRCK (AC-Academic Committee of IRCK; GB-Governing Board of IRCK)

创建岩溶动力学。20世纪80年代以来，以袁道先院士为首的科学团队创立了岩溶动力学理论，建立了国际上第一个岩溶动力学重点实验室，率先开展了岩溶动力系统与全球变化研究，发现了岩溶地质过程中短时间尺度的碳汇效应，开辟了人工增汇新途径，为全球应对气候变化做出突出贡献。

Create Karst Dynamics: In 1980's, led by Academician Yuan Daoxian, a research group created karst dynamics theory. A key laboratory of karst dynamics was established in 1997. They are the pioneers to research the karst dynamic system and global climate change. They found the carbon sink effect in short-time scale involving in global carbon cycle. They found a new approach to increase carbon sink by human activities. A great contribution was hence made to address global climate change.

岩溶动力系统对气候环境响应的敏感性，水和CO_2是岩溶动力系统的驱动力，即以碳酸盐(岩)溶解、沉积为基本过程的岩溶作用，对气候、环境变化响应敏感；岩溶碳汇产生速率快，发生过程短，中国岩溶碳汇占全国地质碳汇的80%，处主导地位。

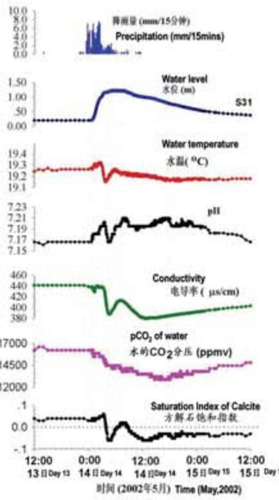
Karst Dynamical System is sensitive to climate and environment: Water and CO_2 are two major factors to drive karst dynamical system. It means that karst process dominated by the dissolution and deposition of carbonate (rocks) responds sensitively to climate and environmental changes. Karst carbon sink happens quickly in short time. Karst carbon sink in China accounts for 80% of total geological carbon sink of China, no doubt dominating.

短时间尺度岩溶地质碳汇过程与效应，中国是岩溶大国，调查数据显示，中国岩溶作用每年净回收大气CO_2的量可达0.42亿tC/a，占我国森林碳汇量的56%；且植被和土壤覆盖好的地区岩溶碳汇比石漠化地区高10倍；近10年来，西南岩溶区石漠化综合治理工程增加的岩溶碳汇达2500万吨，相当于该地区植树造林碳汇量的25%。

Karst carbon cycle and carbon sink in short-time scale involving in global carbon cycle: The data show that karst carbon flux can reach 42M tC/a, it is roughly equal to 56% of net carbon flux of forest; besides, the area with good cover of vegetation and soil has 10 times carbon flux higher than that of rocky desertification area; for recent 10 years, the increased karst carbon flux has reached to 2.5M t C due to integrated control of rocky desertification in SW China, equal to 25% of that of afforestation.

岩溶地质碳汇创新成果，得到国际学术界认可，IPCC第五次报告中其作为碳汇途径之一。2011年国际著名学术期刊《Science》对相关研究成果进行了科学报道，称中国桂林团队是率先开展和定量岩溶作用对全球碳循环贡献的团队；联合国政府间气候变化委员会2013年发布的第五期全球气候变化报告中，充分吸纳了以上研究成果：提出了通过加速碳酸盐岩溶解风化移除大气CO_2、增加碳汇的思路；岩溶碳循环的时间周期比硅酸盐岩的提高2个数量级。

Karst geological carbon sink was an innovative research, whose results were acknowledged by the world and incited by IPCC Fifth Assessment Report: *Science* published a news report on carbon sink in 2011, in which, the Guilin team was claimed as a pioneer to understand and quantify the role of karst processes as a global carbon sink. IPCC Fifth Assessment Report incited the results: atmospheric CO_2 could be removed by accelerating carbonate rocks' dissolution and weathering to increase carbon sink; karst carbon cycle period is prolonged by two orders of magnitude than that of silicate rocks.



曹建华 研究员 Prof. Cao Jianhua | 章程 研究员 Prof. Zhang Cheng | 何师意 研究员 Prof. He Shiyi | 覃小群 研究员 Prof. Qin Xiaoqun | 李强 研究员 Prof. Liqiang | 姜光辉 研究员 Prof. Jiang Guanghui | 郭芳 研究员 Prof. Guo Fang | 蒲俊兵 研究员 Prof. Pu Junbin | 杨慧 副研究员 Prof. Yang Hui

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六大支柱业务之二：
Six Major Research Fields

创新岩溶生态理论与技术支撑石漠化治理
Innovation on Karst Ecosystem Theory and Technology to Support Rocky Desertification Control

蒋忠诚 研究员
岩溶生态与石漠化治理研究团队带头人，国土资源部岩溶生态系统与石漠化治理重点实验室主任，开拓了岩溶生态学研究。
Prof. Jiang Zhongcheng: Group leader for karst ecosystem and rocky desertification control


中国 21 世纪议程管理中心文件

1.贯彻落实精准扶贫战略思想，研究创建典型岩溶石漠化综合治理模式
Alleviate targeted poverty, create effective mode for integrated karst rocky desertification control

研究创建4种可复制可推广石漠化综合治理模式，辐射带动1000多万人脱贫致富：一是岩溶峰丛洼地区土地整理与生态产业协调模式，解决石漠化区无地可用；二是岩溶高原区地表水地下水联合调度模式，解决石漠化区无水可用；三是岩溶地质景观区土地流转与生态旅游模式，力促石漠化区生态经济化；四是岩溶断陷盆地区流域尺度综合治理模式，力促县域生态产业可持续化。
Research and create four modes for integrated rocky desertification control which will be popularized to other counties. The research helped more than 10 million people to improve their life: a) land consolidation with ecological landscape industry used in peak cluster-depression to alleviate soil shortage in rocky desertification area; b) jointly utilization of surface water and GW water on karst plateau to alleviate water shortage; c) land transaction in karst geological landscape area with ecological tourism to promote ecological economization; and d) integrated control mode of catchments in karst garben basin to promote sustainable ecological industrialization of counties.

2. 切实推进“三深一土”国土资源科技创新战略，实施岩溶地区土地整理和土壤改良
Key technologies in land consolidation and soil amelioration to realize innovation strategy on“ 3 Deeps (High) and 1 Soil” (Deep earth detection, deep ocean detection and earth observation in high altitude with soil innovation)

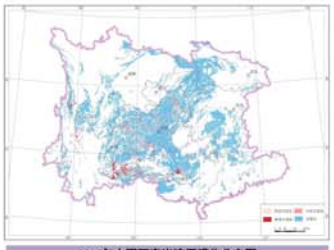
开展生态型土地整理试验与示范，将岩溶水资源调蓄利用、耕地整理、土壤改良作为重点，研发不同水土漏失环境下的景观生态型土地整理模式和技术体系，使示范区土地利用率提高60%；研发一套完整、廉价、易操作、易推广的岩溶土壤改良技术方法，显著改善岩溶土壤理化性状、蓄水保肥能力，示范区粮食单产增加30%-80%，取得较大的生态经济社会效益。
Soil consolidation experiment and demonstration focused on reasonable utilization of karst water resources, farmland cultivation, and soil improvement. Found out a suitable mode and technology for land consolidation with ecological landscape , which may enhance the utilization ratio by 60%; created a set of technology for improving karst soil which is complete and effective, so as to improve the soil conditions obviously. The unit production of crops in demonstration area was raised by 30%-80%.


岩溶峰丛洼地区土地整理与生态产业协调模式图
Land consolidation and ecological industry coordinating mode for karst peak-cluster depression

岩溶地质景观区土地流转与生态旅游模式图
Land transaction and eco-tourism in karst landscape area

3.成果转化与应用推广 Transformation and Application

创立岩溶生态系统理论，有效指导300多个县石漠化综合治理工程；实施了典型石漠化区综合治理和示范推广，在广西平果县、马山县，贵州普定县、平塘县和云南泸西县等建立了 10 处石漠化综合治理示范区，已在 60 多个县成功推广应用，年经济效益约 600 亿元。
Karst ecosystem theory was founded, more than 300 counties were under the effective guidance; promoted the typical rocky desertification control and popularization. Established 10 demonstration sites in Guangxi, Guizhou, and Yunnan. More than 60 counties used the research achievements with the annual economic benefit as about 60 billion yuan .


2015年中国西南岩溶石漠化分布图
Distribution map of Karst Rocky Desertification of Southwest China in 2015


石漠化分区治理图
Rocky desertification zoning map


石漠化治理模式已经推广县和可推广县
Rocky desertification control mode has been promoted to the counties and or plan to be promoted


岩溶生态与石漠化团队研究成员
Research group for karst ecology and rocky desertification

国土资源部杰出青年科技人才
Excellent Young Scientists Awarded by MLR


李强 研究员
Prof. Li Qiang


杨奇勇 副研究员
A.P. Yang Qiyong

研究团队以中、青年科研人员为主，固定成员30人，其中35岁以下11人占总人数37%，36-50岁10人占总人数33%，51岁以上9人占总人数30%。高级职称19人，中级及以下11人，高级职称比例高达63%。硕士17人占57%，博士9人占30%（其中博士后2人）。其中李强研究员和杨奇勇副研究员入选国土资源部杰出青年科技人才培养计划。实验室研究队伍知识、年龄结构合理，团结合作，学术气氛浓厚。是一支集多学科结合、以高水平人才为主、勇于创新的稳定的国家级科研团队。
The research team consists of 30 fixed members and dominated by young researchers. There are 11 people younger than 35 years old, 10 between 36-50 years old, 9 elder than 51 years old. 19 senior scientists and 11 people with mid-level title or junior title. 17 masters and 9 doctors (2 of them are postdoctoral degree) This is a stable national research team, which is characterized by multidisciplinary, high-quality scientists and innovation.

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

六大支柱业务之三：
Six Major Research Fields

率先系统开展岩溶地下水资源调查评价，有力保障干旱缺水地区饮水安全
Pioneering Work of Systematical Karst GW Resources Investigation and Evaluation to Guarantee Water Safety in Urgent Areas

夏日元 研究员
Prof. Xia Riyuan

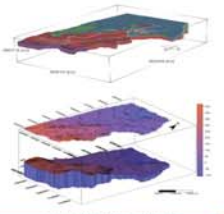
完成西南8省（区、市）岩溶水文地质调查完成78万平方千米，调查3000多条地下河，掌握了岩溶水资源开发潜力；勘探成井8000多眼，解决了1500万人饮水困难。建立了国土资源部广西海洋-寨底地下河系统野外科学观测研究基地和国土资源部广西桂林丫吉试验场野外科学观测研究基地，创立了“五水”（大气水、地表水、土壤水、表层岩溶水、地下河水）模型，有力支撑岩溶水资源合理开发利用。形成了一支以夏日元研究员为学科带头人、专门从事岩溶水文地质调查评价的科研队伍，团队主要科学家包括唐建生研究员、梁永平研究员、裴建国研究员、覃小群研究员、梁彬研究员、邹胜章研究员、易连兴研究员等。

The karst hydrogeological survey in 780,000km² of 8 provinces (cities, regions) in SW China have been completed, with more than 3,000 underground rivers investigated. Its potential for development has been calculated; and besides, over 8,000 wells were drilled to provide drinking water for 15 million people. Field monitoring and research base of Haiyang-Zhaidi Underground River and Yuji Experimental Site were established to research the “5 waters (i.e., meteoric water, surface water, soil water, epikarst water and underground rivers) circulation model”. The members of research teams includes Prof. Xia Riyuan, Prof. Tang Jiansheng, Prof. Liang Yongping, Prof. Pei Jianguo, Prof. Qin Xiaoqun, Prof. Liang Bin, Prof. Zou Shengzhang, and Prof. Yi Lianxing.

中国北方岩溶区以岩溶大泉为特征，岩溶水是重要的集中供水水源。完成了8个大型泉域水文地质环境地质调查，建立了北方岩溶大型泉域含水层结构模型，指导深层岩溶水资源开发；并通过实施钻探建立了一批岩溶应急水源地。

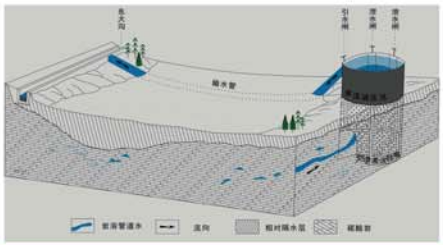
Karst water in Northern China is dominated by large karst springs, and also the significant water source for North China. By carrying out hydrogeological and geo-environmental survey of 8 catchments of large karst springs , the aquifers structures models have been established. Some emergency water source sites have been developed by drilling.

北方岩溶泉水及岩溶水系统分布图
Distribution of karst springs and karst groundwater in North China

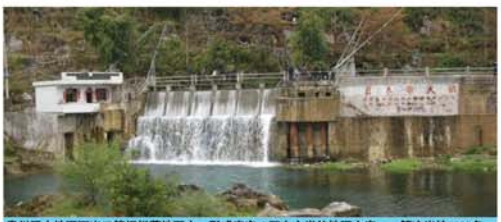


山东淄博岩溶含水层三维模型
Three - dimensional model of karst aquifer in Zibo, Shandong Province

2011年北方应急抗旱打成的岩溶井
Karst borehole drilled in the drought emergency in 2011, Shandong province



云南省泸西盆地岩溶大泉束流调压塘水开发示范工程
Storing karst spring with water-restriction and pressure-regulation in Pijia Village, Luxi Basin, Yunnan, China



贵州巨木地下河出口筑坝拦蓄地下水，形成库容63万立方米的地下水库，，解决当地5000多人和10000多头大牲畜的饮用水以及6000亩农田灌溉用水问题。

A dam was built up at the outlet of Jumu Underground River, Guizhou, China, which has generated a reservoir with the capacity of 630,000 m³. The water level was enhanced by 20m, and a hydropower station was established. More than 5,000 local people and over 10,000 large livestock lived on this reservoir, as well as 6,000 mu farmlands were irrigated by this reservoir. (1 mu= 0.067 ha)

岩溶水资源调查、评价与开发利用研究团队
Research team for karst water resources investigation, evaluation and utilization

岩溶地下水监测井
Monitoring well for karst water

自动水位观测和矩形堰观测
Auto-monitoring and rectangular weir

利用高位表层岩溶带泉采取蓄—引技术开发利用，兴建地间水柜，建立了峰丛岩溶区立体生态农业模式

Using storage-with-diversion to develop high-level epikarst spring with water tank constructed to establish a comprehensive eco-agricultural mode for peak-cluster area.

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六大支柱业务之四：
Six Major Research Fields

引领岩溶景观与洞穴世界遗产保护和地质公园建设
World Heritage Protection and Geopark Construction on Karst Landscape and Caves

中国岩溶景观与洞穴类型丰富多彩，形成众多稀有的旅游资源。近年来，调查了3000多个岩溶洞穴和天坑的开发利用条件，指导建设52处岩溶国家地质公园、7处世界岩溶地质公园、11处世界岩溶自然遗产以及500多处旅游洞穴开发，旅游开发年经济效益达200亿元，有力促进地方社会经济可持续发展和生态文明建设。建立了岩溶天坑理论和发展了岩溶景观与洞穴调查评价理论方法体系，培养了一支成员达20人的科研团队。

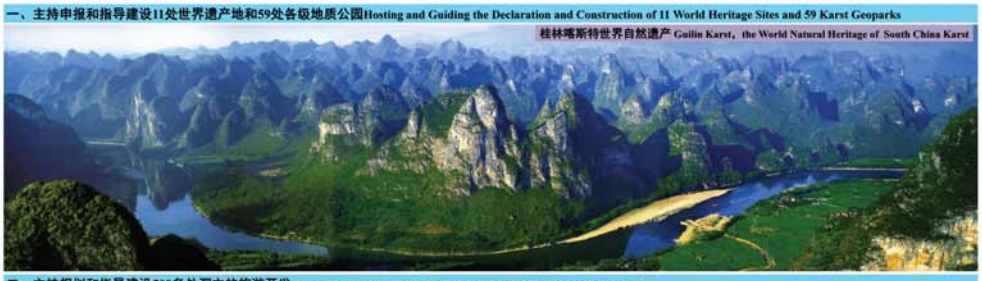
The diversity of karst landform in China makes lots of karst landscapes and caves become rare tourism attractions. In recent years, by conducting various projects of investigation, evaluation and planning of karst landscape and cave,including over 3000 caves and other karst geosites,we guided the declaration and construction of 52 national karst geoparks,7 global karst geoparks,11 world natural heritage sites and over 500 show caves, which help the tourism companies obtain direct income of ¥20 billion/year and promote the locale socio-economical development and eco-civilization construction.Furthermore, these works help us establish and perfect the evolution theory system of karst landform and cave， and cultivate a 20-members academy team.

陈伟海 研究员
岩溶景观与洞穴研究团队带头人，发展了岩溶景观与洞穴调查评价理论方法体系。
Prof. Chen Weihai: Group leader of karst landscape and caves research. He developed the theoretical system for investigation and evaluation of karst landscape and caves.

岩溶景观与洞穴研究团队部分成员与外国专家在阿尔卑斯山山顶考察冰川岩溶
Some members of the group investigated glacial karst on the top of Alpes with Slovenian and Spanish experts

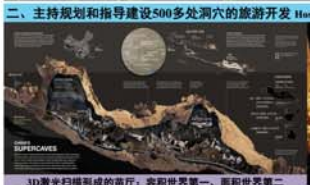
中国大型洞穴分布图
Distribution of Large Caves in China

一、主持申报和指导建设11处世界遗产地和59处各级地质公园Hosting and Guiding the Declaration and Construction of 11 World Heritage Sites and 59 Karst Geoparks



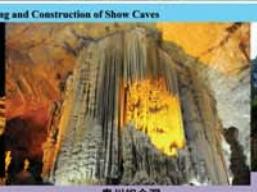
桂林喀斯特世界自然遗产 Guilin Karst，the World Natural Heritage of South China Karst

二、主持规划和指导建设500多处洞穴的旅游开发 Hosting and Guiding the Tourism Planning and Construction of Show Caves

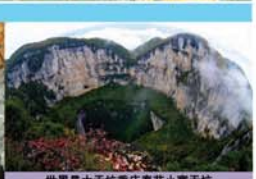


3D激光扫描形成的苗厅：容积世界第一、面积世界第二
Miao Room Ranking 1st in Volumn，2nd in Floor Area in the World by 3-D Laser Scanning

重庆武隆芙蓉洞
Furong Cave in Wulong，Chongqing

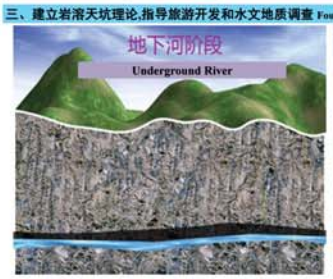


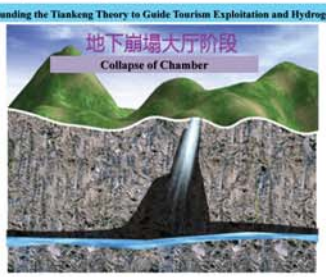
贵州织金洞
Zhijin Cave

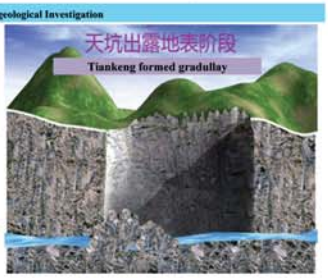


世界最大天坑重庆奉节小寨天坑
Xiaozhai Tiankeng in Chongqing，the Largest Tiankeng in the world

三、建立岩溶天坑理论,指导旅游开发和水文地质调查 Founding the Tiankeng Theory to Guide Tourism Exploitation and Hydrogeological Investigation







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六大支柱业务之五：
Six Major Research Fields

率先系统地开展岩溶塌陷调查与研究，保障岩溶区城市地下空间开发和重大工程建设
Systematical Investigation and Research on Karst Collapse Provide Significant Reference for Underground Space Development and Major Infrastructure Construction

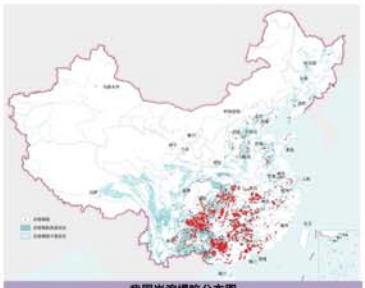
雷明堂 研究员
岩溶塌陷防治研究团队带头人，制定了岩溶塌陷调查评价技术规范
Prof. Lei Mingtang: Leader of the research group on karst collapsee prevention. The author for Specification of Karst Collapse Investigation and Evaluation.

瞄准岩溶塌陷监测预警这一重大科学问题，完成重点地区3万平方千米岩溶塌陷地质调查，建立湖南宁乡、广州、山东泰安、湖北武汉、广西来宾6个不同类型岩溶塌陷监测试验站，研发了基于岩溶地下水动力监测、分布式光纤传感监测和地质雷达探测的岩溶塌陷监测预警技术方法体系。

Monitoring and early warning of karst collapse are of scientific significance. For this field, we completed the karst collpase investigation across 30 000 km² in key areas. There are 6 monitoring experimental sites established in Ningxiang of Hunan, Guangzhou, Tai'an of Shandong, Wuhan of Hubei, and Laibin of Guangxi respectively. Hence, a systematical technology for karst monitoring and early warning was formed consisting of groundwater hydrodynamic monitoring, distributed optical fiber sensing and geo-radar.

岩溶塌陷监测预警技术方法体系，实现对岩溶塌陷隐患的风险评估和早期识别定位，在武广高铁、贵广高铁、哈大高铁、沪昆高速公路、中缅油气管道、西气东输二线天然气管道等重大工程岩溶病害处置中发挥重要作用。

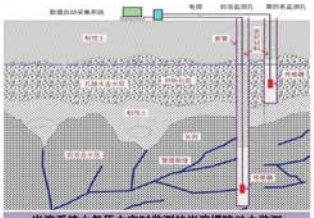
Karst monitoring and early warning system helped to assess the risk and early localization for karst collapse, which is used widely for high-speed railways construction, high-speed roads construction, setting pipelines for oil and gas, and other major infrastructure projects.



我国岩溶塌陷分布图
The map of sinkhole distributed in China

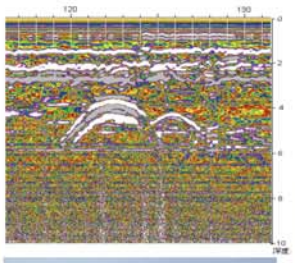
岩溶塌陷对高速铁路的影响
The harm of karst collapse to high-speed railways

岩溶塌陷对油气管道工程的影响
The harm of karst collapse to oil and gas pipelines



岩溶系统水气压力实时监测的岩溶塌陷动力监测
Karst collapse dynamical monitoring based on real-time monitoring of karst water hydraulic and barometric pressures

岩溶塌陷动力监测（武广高铁）
Groundwater hydrodynamic monitoring of karst collapse along Wuhan-Guangzhou high-speed railway



岩溶塌陷防治研究团队核心人员
The research group of karst collapse prevention

岩溶塌陷隐患探测（桂林-阳朔高速公路）
Detection of potential karst sinkholes along highway by GPR

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
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六大支柱业务之六：
Six Major Research Fields

揭示碳酸盐岩储层古岩溶演变规律，支撑和服务油气勘探
Study on the Paleokarst of Oil and Gas Fields to Support the Exploration

梁彬 研究员 岩溶油气资源研究团队带头人

Prof. Liang Bin: group leader of research on karst oil & gas resources.

掌握了岩溶型油气储层发育与分布规律，建立了塔里木盆地、鄂尔多斯盆地和黄骅坳陷奥陶系古岩溶发育演化模式。特别是塔里木盆地古碳酸盐岩油气储层研究，以埋深5000-6000m的奥陶系古岩溶地貌研究成果为指导，圈定油气总储量达9.17亿吨的岩溶储层，指导部署10多口油气高产井，为塔河油田二次开采增产450万吨提供了技术支撑。

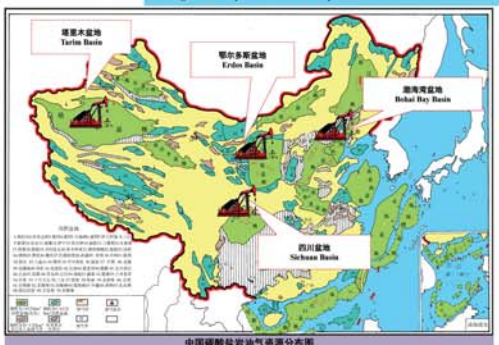
Through our research, we understood the rules for distribution and development of oil and gas reservoir in karst area. Development and evolution models for Ordovician paleokarst development in Tarim Basin, Erdos Basin and Huanghua Depression were created. Especially, the research on oil and gas reservoir of paleo-carbonate rocks in Tarim Basin has achieved a lot. Based on the research results of Ordovician paleokarst geomorphology of Tarim Basin buried 5,000-6,000 m deep, it has delineated the karst reservoir with the total reserves up to 917 million tons, and guided to deploy more than 10 oil and gas wells with high yield. It has provided technological support for the re-exploitation of Tahe Oilfield to increase 4.5 million tons of oil.

以碳酸盐岩中的古岩溶为研究对象，建立了一套适合碳酸盐岩油气藏岩溶储层研究方法：古岩溶识别；古岩溶地貌恢复与刻画；古岩溶垂向分带与岩溶储层发育关系；岩溶缝洞充填与演化分析；岩溶储层形成地质模型建立等。为岩溶储层研究与油田勘探开发提供了理论依据。

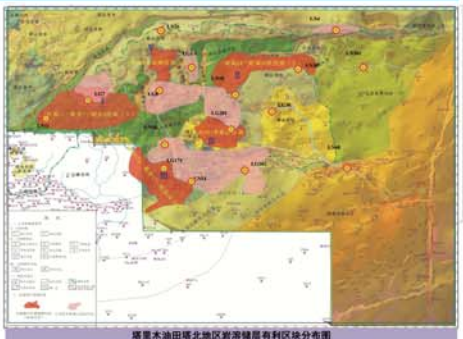
Taking paleokarst in carbonate rocks as research objects, a set of research methods which are suitable to study carbonate karst reservoir have been established. Including identifying the paleokarst type; resuming and depciting the paleogeomorphology; the relationship between the vertical zonation and paleokarst reservoir; filling and evolution of karst fracture-cave system analysis; establishing geological model of karst reservoir and so on. What we have done provides theoretical basis for paleokarst reservoir researching and oil and gas fields exploration and development.

在塔北、塔中油田圈定了9个有利区块，建立了典型区块岩溶储层地质模型，为油田勘探开发提供了地质依据。

We have identified 9 areas of favorable oil-bearing in Tabei and Tazhong Oilfield, at the same time we established geological model of karst reservoir. That provides geological basis for oil and gas fields exploration and development.



中国碳酸盐岩油气资源分布图
Distribution of oil and gas resources in carbonate rocks in China



塔里木油田塔北地区岩溶储层有利区块分布图
Favorable oil-bearing areas of karst reservoir in Tabei Oilfield

建立不同微地貌表层岩溶带岩溶储层形成地质模型，为轮古油田表层岩溶带储层提出了新的油井开采方式，救活老井4口、新井10口井均为高效井，单井减少成本约500万元。

We have established the epikarst geological models of karst reservoir in different geomorphological units. That provides a new method for oil well exploitation in Lungu Oilfield. It has remarkable effects on reproducing of 4 old oil wells. 10 new oil wells are high-yield. Besides, the cost of the individual well has reduced about 5 million yuan.

岩溶缝洞发育结构模式建立，为塔河油田四区勘探部署和油藏二次开采提供了技术支撑，促进增产450万吨。

Development and Evolution Pattern of karst fracture-cave system has been built, which provided technical support for the re-exploitation of fourth area in Tahe Oilfield, increasing production of 4.5 million tons

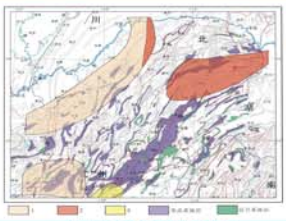
开展了碳酸盐岩高温高压溶蚀模拟试验，揭示了深部岩溶发育机理，为开展深部碳酸盐岩储层研究提供理论依据。

We have carried out the carbonate dissolution experiment of high temperature and high pressure, and revealed the mechanism of deep karst development. It provides the basis for the research of deep carbonate reservoir.

开展西南地区海相碳酸盐岩油气岩溶储层地质调查约$15\times10^4km^2$，初步查明岩溶储层类型与分布特征，圈定了4个碳酸盐岩油气有利远景区块。

We have carried out the geological survey of marine carbonate reservoirs for about $15\times10^4km^2$ in SW China. On this basis, the types and distribution characteristics of the karst reservoir were preliminarily identified, and 4 carbonate oil and gas favorable prospect zones were delineated.

碳酸盐岩油气田岩溶储层研究团队
The team of the research on paleokarst reservoir



西南地区岩溶储层分区预测图
1.灯影组层间岩溶型储层分布区；2.灯影组风化壳型古岩溶储层分布区；3.下奥陶统风化壳型古岩溶储层分布区
Prediction of karst reservoir in SW China
1. Carbonate reservoir in Dengying Formation; 2. Weathering-crust -type paleokarst reservoir in Dengying Formation; 3. Lower Ordovician weathering – crust-type of paleo-karst reservoir

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

四大国际一流成果之一：
Four Outstanding Outcomes

创立岩溶动力学理论，引领全球岩溶地质研究
Founded the Karst Dynamics Theory to Advance the Global Karst Geological Research

袁道先教授：中国科学院院士，岩溶地质学学科带头人，国际知名岩溶水文地质学专家，岩溶动力学理论创始人。

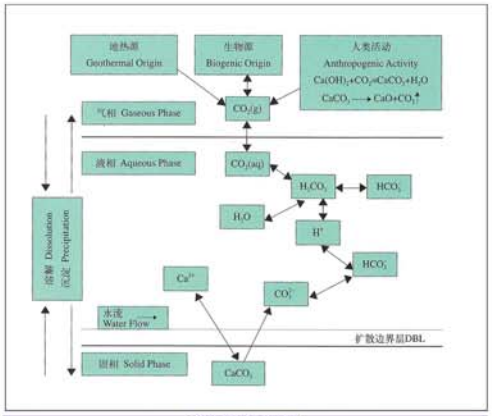
Prof. Yuan Daoxian, Academician of Chinese Academy of Sciences, the leading scientist of karst geology, world famous karst hydrogeologist, initiator of karst dynamics theory.

从实践到理论：在地质调查、国家科技项目和联合国国际地质对比计划（IGCP）持续资助下，袁道先院士带领的科研团队，以地球系统科学为指导，从全球尺度着眼，瞄准解决重大资源环境问题，深入研究和系统总结岩溶区碳、水、钙在地球多圈层中的互馈机制与动态循环演化机理，创立了岩溶动力学理论。为有效解决岩溶区重大资源环境问题提供了理论指导，获得国际社会的广泛认可，领跑国际岩溶理论研究。近年来，该理论还为全球气候变化研究提供了技术指导。

With the funds from China Geological Survey, National S&T Projects and IGCP projects, guided by the Earth System Science, aiming to solving important resources and environment problems globally, Prof. Yuan Daoxian led his team to deeply study and summarize the mutual feedback and dynamic evolution mechanism of carbon, water and calcium cycle in karst area among the four spheres of the Earth, and established Karst Dynamics Theory, which is the theoretical guidance to effectively solve the important resources and environmental problems in karst area. The achievements obtained wide recognition and advanced the international karst theory research. In recent years, the theory has been used address global climate change.

岩溶动力系统定义为：控制岩溶形成演化，并常受制于已有岩溶形态的，在岩石圈、水圈、大气圈、生物圈界面上的，以碳、水、钙循环为主的物质、能量传输、转换系统。岩溶动力学是研究岩溶动力系统的结构、功能、运行规律及其应用的科学。

A karst dynamic system involves the transfer of energy and matter within the carbon, water and calcium(life elements cycle). It occurs at interfaces of the lithosphere, hydrosphere, atmosphere and biosphere and control the formation and evolution of karst, but is moderated by the existing formed karst features. This theory is of the subject to research the structure, function, operation and application of karst dynamic system.



岩溶动力系统结构图
Structure of Karst Dynamic System

岩溶动力系统具有四大功能：
Karst dynamic system has four functions

1.驱动各种岩溶形态的产生，并通过其所造成的地表地下双层岩溶空间结构和碱性地球化学背景导致一系列环境问题，如旱、涝、石漠化、水土贫瘠、地面塌陷、生物多样性受限等；

Drive the production of kinds of karst forms, and lead to a series of environmental problems, such as drought, flooding, desertification, soil impoverishment, collapse, limited of biodiversity and so on due to the surface and underground karst spatial structure, and alkaline geochemical background.

2.通过岩溶作用由大气回收或向大气释放CO_2，调节大气温室气体浓度，缓解环境酸化；

Recycling from or releasing CO_2 into the atmosphere by karst processes, regulating the concentration of greenhouse gases, alleviating environmental acidification.

3.驱动元素迁移、富集、沉淀，形成有用矿产资源，影响生命；

Drive element migration, enrichment and precipitation, form a useful mineral resources, and affect the life.

4.记录全球环境变化过程，由于岩溶动力系统与全球四圈层的密切关系，它可以敏感地反应并忠实地记录各种环境因子，包括降雨量、气温、植被、地下水位与海平面升降、酸碱度等变化，为研究全球变化提供依据。

Record global environmental change by data of precipitation, temperature, vegetation, GW level and sea level change, and pH values.

乌江渡水电站大坝灌浆廊道中发育的鹍管
Secondary sediment developing in Wujiangdu Hydropower Station dam's grouting gallery

从理论再到实践：运用岩溶动力学理论，论证了乌江渡水电站坝区灌浆廊道中发育的次生沉积物更有利于防止坝区渗漏，而不是对坝区有害，并提出了帷幕老化防治措施。

Using the karst dynamics theory to demonstrates that the secondary sediment developing in the dam's grouting gallery of Wujiangdu Hydropower Station is more favorable to prevent water leakage, not harmful to the reservoir and dam themself, and put forward the control measures on preventing the aging of grouting curtain .

部分野外捕捉碳、水、钙循环的便携式仪器
Part of portable instrument to catch carbon, water and calcium in field

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四大国际一流成果之二：
Four Outstanding Outcomes

利用微区取样技术获取石笋中季节尺度的气候变化地质记录
Season-Scale Climate Records from Stalagmite Utilizing Micromill Sampling

目前全球变暖以及极端气候频繁是全世界关注的焦点。借鉴古气候地质记录特别是石笋记录是应对全球气候变化的最佳途径。

At present, the global warming and abrupt climate events frequently is the focus of the world. The best way to address global climate change is to learn from the ancient climate geological records especially the stalagmite records.

洞穴石笋是气候变化地质记录的重要载体，其精确定年的时间标尺为其他气候变化记录的对比研究提供了物质基础。

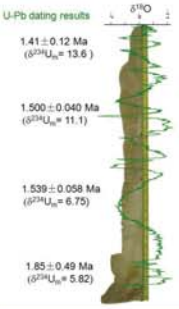
Cave stalagmites have been an important archive on climate changes, whose records provides the precise time-scale for other climate change records to be compared.

气候变化的天然档案—石笋
Natural Archive of Climate Change —Stalagmite

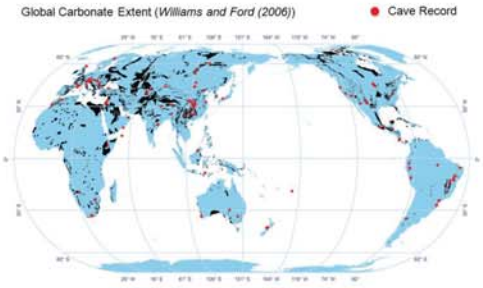
石笋作为一种重要的气候变化档案，具有明显的优势：精准定年，高分辨率，分布广泛等。

Obvious superiority of stalagmite as an important archive on climate change: precise U/Th dating; high-resolution isotopic analysis; widely distribution; and other factors.

洞穴沉积
（Speleothems）

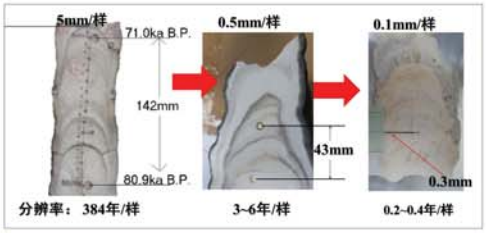


石笋测年至1.85Ma BP
The oldest dating of the stalagmite is 1.85Ma BP



石笋记录全球分布
Stalagmite records in the World

微区取样技术是获取高分辨率石笋记录的重要途径
Micromill sampling is an important way to obtain high resolution stalagmite record

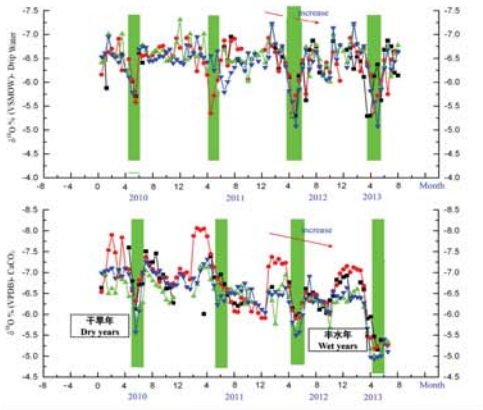


石笋同位素分辨率提高（百年~年~季节）
Improvement on the isotopic resolution of stalagmites (century to year to season)

章程 研究员
Prof.Zhang Cheng.

吴夏 博士
Ph.D.Wu Xia

殷建军 博士
Ph.D.Yin Jianjun



洞穴滴水、$CaCO_3$的$\delta^{18}O$的指标
$\delta^{18}O$ index in dripping water and $CaCO_3$

中国地质调查局岩溶地质研究所
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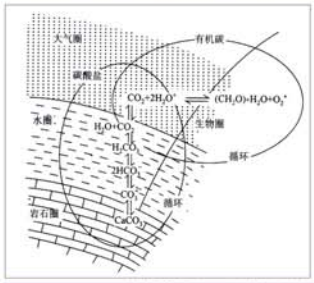
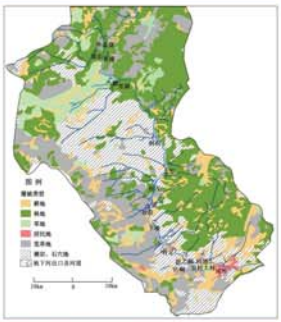
四大国际一流成果之三：
Four Outstanding Outcomes

创新流域尺度岩溶碳汇循环研究和人工干预固碳增汇技术
Innovative Research on Karst Carbon Sink in Catchments and Human-Intervened Carbon Sequestration

岩溶碳循环过程与陆地、水生生态碳循环紧密相连。岩溶碳循环是可溶岩碳酸盐岩在雨水溶解下，将大量大气/土壤CO_2转移到水圈中，水和CO_2是岩溶碳循环发生的驱动力，因此它与陆地、水生生态系统碳循环过程紧密相连，揭示查明不同生态环境背景条件下岩溶碳汇差异。

Karst carbon cycle is closely related to the ecological carbon cycle on land and in water bodies. Carbonate rocks dissolved by rain, which transfer atmospheric/soil CO_2 into hydrosphere. Water and CO2 are major factors to drive karst carbon cycle. We also found karst carbon sink differences under different ecological environments.

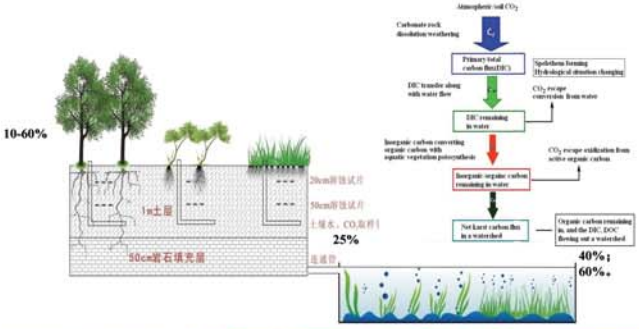




岩溶碳循环以CO_2和水为驱动力，与陆地、生态生态系统碳循环紧密相连
Karst dynamic system close related to ecosystem and droven by CO_2 and water

流域尺度碳循环过程调查研究，提高岩溶碳汇评价精度。流域尺度岩溶碳循环过程主要包括3个部分：一是水和二氧化碳（包括生物作用）对碳酸盐岩溶解、生成水体中的无机碳；二是包含丰富无机碳水流在岩溶含水介质中迁移与转化；三是水生植物的光合作用将水体中无机碳转化为有机碳，部分有机碳在水体底部沉积。从而导致岩溶碳汇从过去的岩石风化碳汇项中分离，碳汇效应评价从过去的无机碳转化为有机碳和无机碳，评价精度提高50%以上。

Carbon cycle investigation and research at catchment scale to enhance evaluation precision. Carbon cycle at catchment scale mainly includes 3 parts: a) water and CO2 (including biological process) dissolved carbonate rocks and generated inorganic carbon in water body; b) inorganic carbon-rich flow transferred and transformed in water-bearing medium of karst; c) photosynthesis will transfer inorganic carbon into organic carbon partially with organic carbon deposited into the bottom. Therefore, karst carbon sink could be apart from weathering carbon sink. Both inorganic carbon and organic carbon will be used to assess carbon flux rather than only inorganic carbon. The precision is enhanced by over 50%.



人工干预固碳增汇技术，创新缓解气候变化新途径。建议在土地空间合理高效利用规划的基础上，综合考虑以下人为干预、增加岩溶碳汇的技术途径：（1）选择和培育适宜岩溶环境、碳固定能力强的C4植物，增加岩溶碳汇发生强度；（2）使用来自硅酸盐岩地区、具有侵蚀力的外源水灌溉，增加岩溶碳汇量；（3）改良土壤，如增加生物碳，在改善土壤质量的同时，提高土下岩溶碳汇发生强度；（4）有针对性的选择和培育沉水植物，如海菜花，提高岩溶碳汇的稳定性。其固碳增汇能力提高了10倍以上。该项技术居于世界一流。

Human-intervened carbon sequestration technology will find new approaches for addressing climate change. It is suggested to consider the following approaches for carbon sequestration by human intervention : a) C4 plants could be selected and cultivated, which is adapted to karst environment and has a good capacity for carbon sequestration; b) use allogenic water from silicate rocks area for irrigation, which may erode karst area faster; c) improve soil (e.g.to increase biological carbon) so as to increase soil karst carbon sink; and d) enhance the stability of karst carbon sink by cultivating submerged plant such as *Ottelia acuminata* , which will enhance the carbon sequestration over 10 times. This is an advanced technology in the world.

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四大国际一流成果之四：

Four Outstanding Outcomes

世界一流水平的高精度大深度岩溶地下水探测技术

Advanced Deep Karst Groundwater Detection Technique With High Resolution

甘伏平　教授级高工
Prof. Gan Fuping
Expert in Geophysics

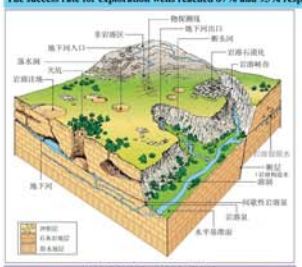
岩溶地下水主要赋存于地下岩溶管道和洞穴中，分布极不均匀，岩溶地下水的精确探测是世界难题，国际上岩溶地下水的探测主要还是采用传统的高密度电法、瞬变电磁法等方法。针对岩溶地下水分布特点，研发了大功率、大电流的电磁法找水技术，以及电磁法与微动地震仪组合的定位、定深、定性等多种新型物探找水方法，有效提高了岩溶地下水探测精度。

Karst groundwater, uneven distributed, mostly occurs in the underground channels and caves. It is a big challenge to detect the karst groundwater accurately in the world. Traditional geophysical methods such as ERT and TEM etc have been mainly adopted for karst groundwater exploration. Based on the characteristics of karst groundwater distribution, the high-power, large current electromagnetic prospecting technique and new multiple integrated geophysical methods such as electromagnetic, microtremor methods with complementary features of position definition, depth determination and water bearing attribute identification have been developed for karst water exploration, which effectively improve karst groundwater detection resolution.

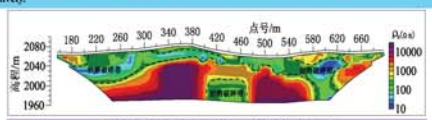
一、岩溶地区抗旱找水综合物探技术　Integrated Geophysical Techniques for Exploring Karst Groundwater

根据不同储水构造的地球物理响应模型，选取合适物探靶区，利用高密度度电法、AMT法和微动法等相应组合，实现储水构造的定位、定深和定性探测，有效提高了岩溶地下储水构造的探测精度。应用新技术新方法，使岩溶区定井的成功率由30%提高到70%以上。指导2010年西南和2011年北方四省抗旱找水打井，成井率分别达到87%和95%。

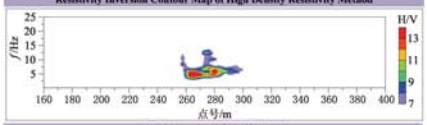
According to the geophysical response models in different karst water bearing structures. A promising site will be selected, the techniques to defining position, determining depth and differentiating attribute for exploring karst water bearing structures will be achieved by using integrated approaches of ERT,AMT and microtremor methods, which can effectively improve the detection resolution and greatly increase success rate for the karst water wells from 30% past to 70% or more and significantly support emergency drought water drilling projects during the years of 2010 in southwest China and 2011 in four northern provinces. The success rate for exploration wells reached 87% and 95% respectively.



岩溶含水层三维地质模型
3D Geological Model of Karst Aquifers



高密度电法探测结果电阻率反演等值线断面图
Resistivity Inversion Contour Map of High Density Resistivity Method

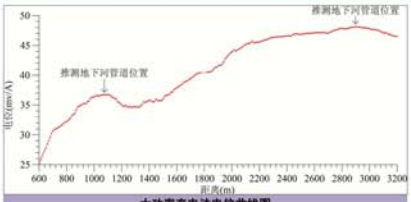


微动法H/V谱等值线频谱图
Microtremor H/V Ratio Spectrum Contours

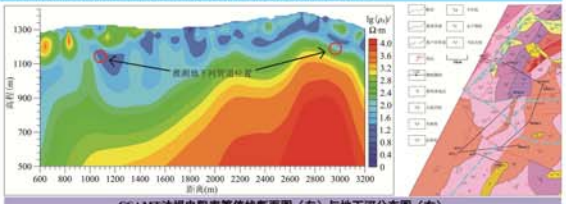
二、岩溶地区地下河管道探测技术　Subterranean Streams Identification Techniques in Karst Area

研发地下河管道大功率充电法、微动法等探测新技术，对地下河管道探测追踪，最长可达7Km、最深大于300m以上，显著提高定位的精度和分辨率。

To develop new geophysical prospecting techniques such as high power mise-a-la-masse and microtremor methods for exploring subterranean streams or channels with the potential of tracking up to 7 km away from the outlet and penetrating depth more than 500m,which significantly improve the positioning accuracy and resolution while comparing to conventional geophysical methods.



大功率充电法电位曲线图
Potential Curve for High Power Mise-A-La-Masse Method



CSAMT法视电阻率等值线断面图（左）与地下河分布图（右）
Apparent Resistivity Contours for CSAMT(Left) and Distribution of Underground River (right)

研究团队在云南指导抗旱打井
The research team conducted geophysical survey prior to drilling

解决西南老少边穷地区饮水难题
Geophysical survey was testified by drilling

充电法及微动测试现场
Field Photos for Mise-A-La-Masse and Microtremor Methods

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
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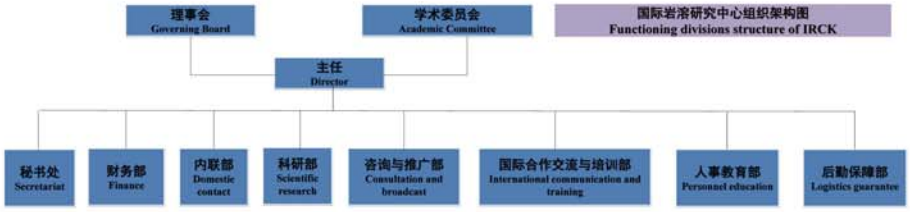
四大支撑平台之一：
Four Supporting Platforms

联合国教科文组织国际岩溶研究中心
International Research Center on Karst under the Auspices of UNESCO

2008年12月15日，联合国教科文组织国际岩溶研究中心（以下简称"中心"）在中国桂林挂牌成立，它是教科文组织设立的第一个地学类二类研究中心。自中心成立以来，举办了11次国际会议，与40多个国家的200多名专家展开了学术交流，与11个国家或国际组织签署了15项国际合作协议。充分体现了中心的国际交流平台作用，为促成项目层面国际合作奠定了坚实的基础。2013年11月，中心以其突出成果获得了教科文组织评估组的一致好评，顺利通过第一个6年运行评估。2016年5月12日，中心二期协定在河北廊坊正式签署，标志着中心正式步入第二个运行周期。

On December 15, 2008, the International Research Center on Karst under the Auspices of UNESCO (hereinafter IRCK) was formally established in Guilin, China. It is also the first category II center concerning geosciences. Since the foundation of IRCK, 11 international symposia have been organized. Over 200 foreign scientists from more than 40 countries have conducted the academic exchange with IRCK. 15 international cooperation agreements have been signed with11 countries or international organizations. IRCK has taken the full advantages of international platform for academic exchange, which has made a firm foundation for international cooperative projects. In November 2013, IRCK successfully passed the first six-year evaluation by the Experts Panel of UNESCO, who agreed that IRCK was an efficient category II center under UNESCO. On May,12 ,2016, the Renewed Agreement of IRCK was signed in Langfang, Hebei Province, indicating the formal operation of phase II of IRCK.

国际岩溶研究中心组织架构图
Functioning divisions structure of IRCK



2016年5月12日，国际岩溶研究中心二期协定在河北廊坊正式签署
On May 12, the Renewed Agreement of IRCK is signed in Langfang, Hebei

教科文组织代表助理总干事弗莱维娅.斯莱格尔女士与中国政府代表国土资源部曹卫星副部长签署中心二期协定
Ms. Flavia Schlegel, ADG of UNESCO and Vice Minister Cao Weixing signed the Renewed Agreement of IRCK

首届教科文组织科学中心会议上，中心被评选为优秀二类中心作代表发言，图为中心人员与教科文助理总干事弗莱维娅.斯莱格尔女士、教科文北京办事处专员汉斯先生合影
For the fist UNESCO Science Centres Coordination Meeting, IRCK was chosen as the excellent representative .Secretariat of IRCK with Ms. Flavia Schlegel (ADG of UNESCO) and Mr. Hans Thalstrup (Specialist of UNESCO Beijing Office)

组织了11次国际会议，充分发挥中心交流平台的作用
Organized 11 international conference for playing a role of exchange platform of IRCK

中心主办了多次国际会议，其中2013年主办的"岩溶资源、环境与全球变化-认识、缓解与应对"（左）国际学术会议共吸引了来自13个国家的138名学者；2014-2015年度连续两年主办了中国-东盟矿业合作论坛地质环境保护分论坛（中），吸引了东盟国家的160余位专家参与；2015年度承办了第二届亚洲跨学科岩溶学术会议（右），吸引了22个国家的180余名中外专家。

IRCK organized several international conferences, including the International Symposium on Karst Water under Global Change Pressure in 2013 (Left), which attracted 138 scientists from 13 countries; Geological Environmental Protection Sub-Forum under China-ASEAN Mining Cooperation Forum (Middle) in successive two years from 2014 to 2015, which attracted over 160 experts from the ASEAN countries; the 2nd Asian Trans-Karst Conference in 2015 (Right), which attracted over 180 experts from 22 countries.

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

四大支撑平台之二：
Four Supporting Platforms

国家级“岩溶动力系统与全球变化国际联合研究中心”
National Center for International Research on Karst Dynamics and Global Change, Ministry of Ministry of Science and Technology, PRC

2013年9月29日，“岩溶动力系统与全球气候变化国际联合研究中心”国家国际科技合作基地获得科技部批复，该中心自成立后，致力于从岩溶角度开展应对全球气候变化的系列国际合作。

On Sep 29, 2013, National Center for International Research on Karst Dynamic System and Global Climate Change was approved by the Ministry of Science and Technology. Since the foundation, it has focused on serial international cooperation on addressing climate change through karst research.

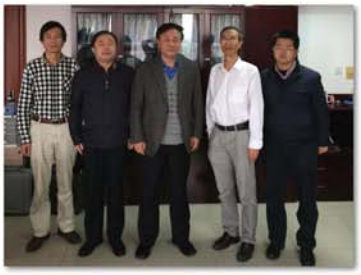
牵头开展了6项国际合作项目
Led six international projects

IGCP/SIDA598“岩溶系统的环境变化及可持续性-气候变化和人类活动的关系”（2011年-2015）（左）
IGCP/SIDA598 “Environmental Change and Sustainability in Karst Systems: Relations to Climate Change and Anthropogenic Activities” (2011-2015).(Left).
中心分别与11个国家或国际组织签署了15份合作协议（右）
The Center signed 15 cooperation agreements with 11 countries and international organizations.(Right)

开展中国-斯洛文尼亚政府间科技合作项目，中国-斯洛伐克政府间科技合作项目围绕碳汇效应开展对比研究。
Conduct inter-governmental cooperative projects, e.g. the projects between China-Slovenia and China-Slovakia .

中心成果受到中国政府及国际地学组织高度认可
The achievements of the Center was highly approved by Chinese government and international organizations on geosciences

姜大明部长、曹卫星副部长、钟自然局长观看我所展板，听取袁道先院士的解说
Minister Jiang Daming, Vice Minister Cao Weixing, with Mr. Zhong Ziran, Director-General of CGS, listened to the introduction by Academician Yuan Daoxian



国际地球科学联合会主席成秋明教授与中心主任等一行合影
Prof. Cheng Qiuming, President of IUGS took photo with delegation from the Center led by Director Liu Tongjiang

应对全球气候变化中心未来主要任务：

对比调查全球岩溶水循环及其资源环境效应，创新水土耦合调控技术；评价岩溶作用的二氧化碳增汇效应，科学应对全球气候变化；建立全球岩溶环境监测网络，创建全球岩溶网络信息平台。

Major missions in future:

Investigate and compare different global karst water cycles and their resources and environmental effects, and innovate the technology for coupling regulating water and soil resources; evaluate the carbon sink, and address global climate change scientifically; build up a global karst environment monitoring network and a global karst information platform.

中国地质调查局岩溶地质研究所
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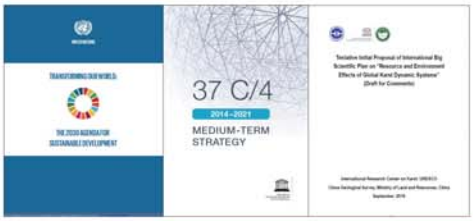
International Research Center on Karst, UNESCO

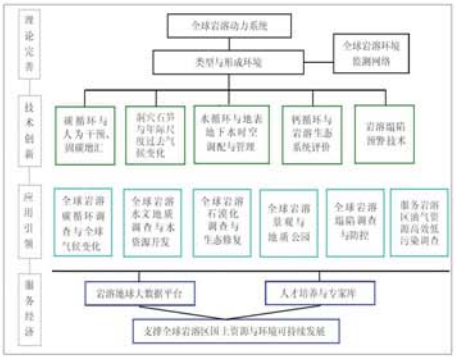
四大支撑平台之三：
Four Supporting Platforms

“全球岩溶动力系统资源环境效应”国际大科学计划
Intentional Big Scientific Plan on “Resources and Environmental Effects of Global Karst Dynamic Systems ”



肩负重任、主动作为，发起国际岩溶大科学计划。科技创新与资源环境可持续已经成为国际经济社会发展主流，联合国制定2030年可持续发展战略、教科文组织在中期发展战略中提出：加强国家、地区科技创新能力，加强合作，共同面对资源环境可持续面临的重点科学问题，在国家“十三五规划”中，提出在优势学科领域起引领作用，发起国际大科学计划，塔建国际创新平台。国土资源部中国地质调查局岩溶地质研究所是我国唯一岩溶专业队伍，拥有国家级国际联合研究中心、教科文国际岩溶研究中心，是国际上具有地域、学术优势，需担当责任、主动作为，牵头全球岩溶动力系统资源环境效应国际大科学计划。

Launch International Big Scientific Plan for Global Karst is our mission and responsibility: Innovation and sustainable development is one of the major focuses of the world. No matter in the 2030 Agenda for Sustainable Development of UN or UNESCO Medium-Term Strategy (2014-2021) , they all mentioned the innovation should be strengthened nationally, regionally, and globally. Collaboration is also required to facing critical scientific problems on resources and environment. In the thirteen five-year plan of China: the big scientific plan is highly required to help international related scientists to have a general guideline and establish an innovative platform. IKG under CGS of MLR is the unique professional team focusing on karst science. It is our mission and responsibility to propose and implement Big Scientific Plan on Resources and Environmental Effects of Global Karst Dynamic Systems (hereinafter as Global Karst).



科技创新、夯实平台，直面岩溶区国土资源问题。国际岩溶大科学计划主要依托国际岩溶研究中心和岩溶动力系统与全球变化国际联合研究中心，突破岩溶重大科学问题：全球岩溶地下水资源与自然环境、全球岩溶环境变化及其二氧化碳增汇效应、全球岩溶地质景观类型与地质公园、岩溶塌陷预警与防控、服务高效低污染油气资源调查开发，建立“岩溶地球”大数据平台，支撑岩溶自然资源与环境可持续发展。

Land and resources problems need to be solved through S&T innovation and firm platforms : IRCK and NCIR will support Global Karst as much as possible. The plan will try to breakthrough the bottleneck of key issues like GW resources and environment of karst area, karst environmental changes and carbon sink effects, landscape types and geoparks, karst collapse prevention and early warning, environment-friendly exploration for oil & gas in carbonate reservoirs, and big data platform of Karst Earth. The major aim is to support sustainable development of karst area.

多方支持、期待成果，引领国际岩溶学科前沿阵地。自国际岩溶研究中心提出全球岩溶动力系统资源环境效应国际大科学计划2个月以来，得到国际同行普遍认可和支持，先后收到美国、德国、俄罗斯、南非、巴西、斯洛文尼亚等12个国家20多位专家、学者的支持函，即相关国际组织的支持：联合国教科文组织、国际地质科学联合会和东亚东南亚地学计划协调委员会。同时对国际岩溶大科学计划提出完善建议和意见。

Act like a pioneer for karst science requires support for all of you: we proposed this plan just for about 2 months, and we have received a lot of support from many countries, like USA, German, Russia, South Africa, Brazil, Slovenia. Meanwhile, we have achieved support from many international organizations, such as IUGS. We promise to improve our plan according to all your suggestions.

首席科学家： 曹建华 研究员
Chief Scientist: Prof. Cao Jianhua

主要带头人：章程研究员
Group Leader:Prof. Zhang Cheng

国际专家：皮特·米兰洛维奇
Prof. Petar T.Milanovic

国际专家：保罗·威廉姆斯
Prof. Paul Williams

国际专家：克里斯·葛立夫
Prof. Chris Groves

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

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四大支撑平台之四：
Four Supporting Platforms

岩溶动力学国家重点实验室建设与申报工作方案
Construction and Application for Karst Dynamics State Key Laboratory

学术委员会主任 袁道先 院士
Academician Yuan Daoxian,
Director of Academic Committee.

实验室主任 蒋忠诚 研究员
Laboratory Chief,
Prof. Jiang Zhongcheng.

学科带头人 王焰新 教授
Group Leader,
Prof. Wang Yangxin from CUG (Wuhan)

学科带头人 陈学军 教授
Group Leader, Prof. Chen Xuejun, From GUT

一、总体定位 Orientation

围绕国家发展战略目标，针对岩溶学科发展前沿和国民经济、社会发展的重大岩溶科技问题，以岩溶动力系统过程和机制及岩溶关键带资源环境效应为主要研究内容，聚集和培养优秀科学家，深入开展岩溶动力学基础研究和应用基础研究，使之成为国家科技创新体系的重要组成部分，国际一流的岩溶研究科研实体，开展高层次国内外岩溶学术交流的重要基地。

Based on national development strategies, scientific frontiers and social development, the Karst Dynamics State Key Laboratory will conduct basic and applied research on karst dynamics, mainly including processes and mechanism of karst dynamical system, resources and environmental effects in karst critical zones. The major objectives of the laboratory are to become a significant part of national S&T innovation, an advanced organization for karst research, and a significant platform for academic exchanges.

二、依托单位 The Sponsor and Co-Sponsors

中国地质科学院岩溶地质研究所 Institute of Karst Geology (IKG)
中国地质大学（武汉） China University of Geosciences(Wuhan) (CUG)
桂林理工大学 Guilin University of Technology (GUT)

三、主要研究方向 Main Fields

研究岩溶动力系统结构、功能和物质能量运行转化规律，岩溶关键带碳水钙循环规律及其资源环境效应。

Study on the structure and functioning of karst dynamical system, and transformation of energy and matter involved, as well as carbon, water and calcium cycle and the resources & environmental effects of critical zones in karst area

(1)岩溶动力系统与全球环境变化研究 Karst dynamic system and global environmental change.
(2)岩溶动力系统的水循环及其岩溶水资源研究 Water cycle and water resources of karst dynamical system,.
(3)岩溶动力系统与岩溶生态系统耦合机制及石漠化综合治理 Mechanism of karst dynamic system coupling with karst ecosystem, and integrated rocky desertification control.
(4)岩溶动力系统塌陷发生的机制及预测 Collapse mechanism and prediction in karst dynamic system.

四、建设思路和总体框架 Preliminary Design

◆总体框架Framework

(1)国家重点实验室实行学术委员会指导下的主任负责制，国家重点实验室主任为蒋忠诚研究员，另设副主任2-3名，由三家单位联合推荐产生。
Laboratory Chief, Prof. Jiang Zhongcheng will be responsible for the operation, and 2-3 deputy chiefs would be recommended by IKG, CUGs and GUT.

(2)国家重点实验室学术委员会：由袁道先院士任主任委员，筛选国际岩溶研究中心、国土资源部/广西岩溶动力学重点实验室学术委员会委员和中国内外知名岩溶专家联合组成。
Academician Yuan Daoxian will be the director of Academic Committee (AC), and international scientists of IRCK and Karst Dynamics Key Lab under MLR and Guangxi will be invited to be members.

(3)国家重点实验室下设4个科研研究团队。
There will be 4 research groups under the laboratory.

◆建设思路 Plan for Construction

(1)在国土资源部和广西区政府的联合支持和培育下建设和发展，成为科学研究世界领先、服务发展一流的国家重点实验室。
The objective is to be the first-class state key laboratory in basic researches and for social development, supported by Ministry of Land Resources (MLR) and Guangxi of PRC.

(2)在国土资源部/广西岩溶动力学重点实验室、部岩溶生态与石漠化治理重点实验室和院岩溶塌陷防治重点实验室的基础上，进一步集岩溶所的全力，并联合中国地质大学（武汉）和桂林理工大学的相关科技力量而组建。
To establish the laboratory with support from IKG, CUG and GUT, including Karst Dynamics Key Laboratory under MLR &Guangxi and Key Laboratory of Karst Ecosystem and Rocky Desertification Control under MLR, as well as Key Laboratory of Karst Collapse Control under CAGS.

(3)充分发挥国际岩溶研究中心和国家级岩溶动力系统与全球变化国际联合研究中心的平台作用，三者联合运行。
To operate the lab combined with IRCK and NCIK together.

(4)与中国地调局地调工程“岩溶地区水文地质环境地质综合调查”的实施进行有机融合。
To acquire possible support from the Project "Comprehensive Hydrogeological and Geo-environmental Investigation in Karst Area" under CGS.

五、科研团队建设 Research Groups

首席科学家和学科带头人4-6人，科研骨干人员25-30人，客座研究员（包括外籍客座研究员）8-10人，技术和辅助人员10余人，岩溶动力学国家重点实验室总人数50人左右。

All the members involved will be around 50. 4-6 chief scientists and group leaders, 25-30 skeleton scientists, 8-10 visiting scientists, and over 10 technicians and assisting staff.

六、科研条件建设 Facilities, Field Bases and Platforms

(1)室内测试分析实验室及大型仪器设备建设
Equipped with experimental laboratories and large-scale instruments.

(2)实验模拟平台建设：建设岩溶动力系统碳-水-钙循环模拟实验室、多重岩溶介质水循环过程模拟实验室、石漠化形成演变模拟实验室、岩溶塌陷过程模拟实验室。
Modeling platforms: including laboratories for carbon-water-calcium cycle modeling, water cycle modeling in complex karst system, rocky desertification formation modeling and karst collapse formation modeling.

(3)野外研究基地建设：在三个单位已有研究基地的基础上，各选择1个野外基地加强基础设施和条件建设。
Field research bases construction: select 3 research based to be upgraded of the three sponsors respectively.

(4)科研信息平台建设：加强岩溶动力学国家重点实验室网站建设。
Information platform : Strengthen website construction .

七、组织机构 Organization

(1)建设领导小组 Leading Group
组长：刘同良、王焰新、解庆林
Leaders: Prof. Liu Tongliang, Prof. Wang Yanxin, and Prof. Xie Qinglin
(2)实验室主任：蒋忠诚
Lab Chief: Prof. Jiang Zhongcheng
(3)学术委员会主任：袁道先
Director of AC: Academician Yuan Daoxian

八、进度安排 Schedule

2016年，与中国地质大学(武汉)、桂林理工大学签署联合申报合作协议，组织编制《岩溶动力学国家重点实验室申报书（初稿）》，确定研究方向、研究内容，学术委员会成员和研究团队成员，启动申报工作；2017年-2020年，开展培育和建设，对研究团队成员开展定向培育和资助，联合申报国家重大科技项目和成果奖励，提高人才队伍、条件平台和成果建设水平，提出申报；2021-2022年，争取申报成功并运行。

Experts team would be organized to compile the first draft of "*Declaration of Karst Dynamics State Key Laboratory*", and consult from other state key laboratories in 2016. National projects and rewards would be applied by IKG, CUG and GUT, and high-level research teams would be formed in 2017 to 2020 Submit the "*Declaration of Karst Dynamics State Key Laboratory*" to Ministry of Science and Technology of PRC in 2021 and 2022.

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

岩溶动力学重点实验室研究方向之：
Research Focus for the Karst Dynamics State Key Laboratory

华北与华中典型岩溶水系统演化与水资源可持续利用
Evolution of Karst Water System and Sustainable Utilization of Water Resources in North and Central China

研究内容 Research Scope

1.研究人类活动对岩溶水系统水质、水量及流动系统发生作用的过程、广度（范围）和深度；以及人类活动和岩溶系统天然过程共同作用下，岩溶水系统演化形式的变异。

Investigating the processes, scope and profundity of human activity on the quantity, quality and flow system of karst water system; and the mechanisms diversity of karst water evolution under the joint effect of anthropogenic and natural geological processes.

2.研究大尺度厚埋深岩溶系统创新监测手段及岩溶水污染及防控技术，常规/非常规同位素-水化学方法在岩溶水系统中的示踪作用和多尺度岩溶系统中污染物迁移行为刻画。

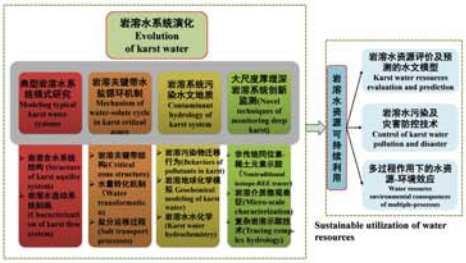
Developing novel monitoring and karst water pollution controlling skills, tracing techniques using traditional/non-traditional isotope-hydrochemistry approaches and characterization of behaviors of pollutants in different scales within karst systems.

3.研究岩溶泉域多过程相互作用下的水资源-环境效应，以及地表水、地下水、污废水等多源头参与下的水资源相互转化行为。

Understanding the impact of multiple geological-environmental processes on water resources and environmental in karst systems, the water resources transformation between karst water, surface water and sewage water and so on.

4.研究岩溶关键带的水循环机制及其水资源转化关系，岩溶水文过程的识别技术及水文模型，以及岩溶山区的水资源评价方法。

Understanding the mechanisms of karst water cycle in critical zones and its relation to karst water resources, developing techniques of discerning hydrological processes and karst models, as well as new methods for karst water resources evaluation in mountainous area.



典型岩溶水系统演化与水资源可持续利用研究结构图
Framework of studying karst water system evolution and sustainable utilization of water resources

研究条件 Research Facilities

中国地质大学和环境学院实验中心构建了良好的科研环境来支撑岩溶水系统演化科研工作。购置了大量的大中型仪器设备，为实验室科学研究、野外岩溶水文调查、岩溶水污染防治提供了良好的科技条件。研究成果也得到了国内外同行的高度认可。培养了一大批有志于岩溶地质工作的优秀青年学子和学者。

The laboratory at China University of Geosciences has a series of well-equipped facilities and established six karst ecological field observation research bases to support the research work and to realize the multi-discipline integration. It provides a good platform for scientific research, field karst hydrogeological investigation and karst water pollution control and has become a training center for Chinese and internationals students and young scholars.

野外观测基地及室内实验设备 （Field Monitoring Facilities and Laboratory Equipment）

研究团队和领军人才
Research Group and Group Leader

“典型岩溶水系统演化与水资源可持续利用”团队目前有固定成员10余人，全部具博士学位，高级职称。团队组成以中、青年科研人员为主，其中40岁以下7人，占总人数70%。其中国家杰青、教育部新世纪人才、湖北省百人计划各1人、湖北省楚天学者（学子）2人。

The research team consists of more than ten faculty, all of them with Ph.D degree and senior research positions. Among them, there are awardee of NSFC Fund for Distinguished Young Scholars, awardees of Education Ministry's New Century Excellent Talents Supporting Plan, Hundred-Talent Program of Hubei Province, and Chutian Scholar (Junior Scholar).

王焰新 教授
研究团队带头人，国家杰青获得者
国家基金委创新研究群体负责人
Prof. Wang Yanxin
Group leader for studying evolution of karst water system and sustainable utilization of water resources. Awardee of NSFC Fund for Distinguished Young Scholars. Leader of NSFC Innovation Research Group.

岩溶领域代表性成果
Major projects and publications in karst research

中国地质大学（武汉）在岩溶系统演化与水资源开发领域具有悠久的历史传承，积累了大量优秀成果。近10年来，圆满完成国家、部委和各类地方大中型科技攻关任务百余项。依托项目发表大量学术论文，其中国际SCI论文30余篇，发表专著多部。

代表性项目（Representative projects）

序号	项目名称	金额（万元）	项目时间	项目类型
1	宜昌长江南岸岩溶流域1:5万水文地质环境地质调查	900	2016-2018	中国地质调查局项目
2	典型岩溶山区城镇化过程中地下水演变机制调查评估与可持续利用对策	300	2014-2017	湖北省公益科技项目
3	山西柳林泉地下水系统补给水质污染分析研究	66	2015-2016	省研发与示范类项目
4	湖北宜昌兴山香溪河岩溶流域1:5万水文地质调查	1680	2013-2015	中国地质调查局项目
5	山西六大盆地地下水资源及其环境调查评价	180	2003-2005	中国地质调查局项目

代表性论文和专著（Peer-reviewed journal papers and books）

序号	发表论文/专著名称	作者	期刊/出版社	时间
1	Evaluation of fluorine release from air deposited coal spoil piles: A case study at Yangquan city, northern China	XB Gao, YD Hu, CC Li, C Dai, J Li, X Ou, YX Wang*	Sci Total Environ	2016
2	Method for calibrating a theoretical model in karst springs: an example for a hydropower station in South China	MM Luo, ZH Chen*, RE Criss, H Zhou, H Jakada, TT Shi	Hydrol Process	2016
3	Dynamics and anthropogenic impacts of multiple karst flow systems in a mountainous area, South China	MM Luo, ZH Chen, RE. Criss, H Zhou*, H Huang, ZF Hua, TT Shi	Hydrogeol J	2016
4	Hydrochemistry and coal mining activity induced karst water quality degradation in the Niangjiguan karst water system, China	XB Zhang, X Li, XB Gao*	Environ Sci Pollut Res	2016
5	Occurrence and source apportionment of PAHs in highly vulnerable karst system	YX Shao, YX Wang*, XQ Xu, X Wu, Z Jiang, SS He, K Qian	Sci Total Environ	2014
6	Strontium isotope characterization and major ion geochemistry of karst water flow, Shentou, northern China	YX Wang*, QH Guo, CL Su, T Ma	J Hydrol	2006
7	地下水污染与防治	王焰新	高等教育出版社	2007
8	Calibration and reliability in groundwater modeling: Managing groundwater and the environment	YX Wang, SM Ge, MC Hill, CM Zheng (eds)	IAHS Publication	2011
9	岩溶水系统演化与全球变化研究	马腾,王焰新,邓安利,郭清海	中国地质大学出版社	2005
10	盆-山地下水系统演化近期水资源.环境效应	郭清海,马腾,王焰新,马腾	科学出版社	2010
11	山西省娘子关泉域岩溶地下水演化研究	梁加建	中国地质大学出版社	2016

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

岩溶动力学重点实验室研究方向之：
Research Focus for the Karst Dynamics State Key Laboratory

岩溶动力系统塌陷发生的机制及预测研究
The Collapse Mechanism and Prediction of Karst Dynamic System

研究内容 Research Scope

1.研究典型红粘土的成分、结构，以及红粘土水土作用效应；

The typical red clay's component , structure and water-soil interaction is studied.

2.通过引入非饱和土力学理论以及土壤土质学理论，从物质成分以及微细观结构方面对红粘土的变形机理进行描述，建立宏观的变形、渗流、化学、温度等多物理过程耦合的物理力学模型；

With the introduction of unsaturated soil mechanics and soil geology theories, the deformation mechanism of red clay is described from material composition, micro and fine structure. The mechanics-physics model is established for multi-physics coupling process of the deformation, seepage, chemistry and temperature.

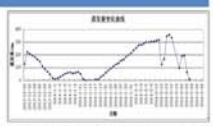
3.通过揭示岩溶塌陷灾害的孕育演化过程及灾变机理，研究岩溶塌陷预测与评价理论、方法与技术；

Through revealing the process of evolution and disaster mechanism on karst collapse, the prediction theory and evaluation methods of karst collapse is studied.

4.研究岩溶地基强度及变形规律、渗透破坏规律和机制。

The strength and deformation laws of karst foundation, seepage failure rule and mechanism is studied.

岩溶区红粘土现场试验
Field test of red clay in karst area



红粘土温度和水分随大气环境的变化
The change features of temperature and moisture with ambient weather

桂林市西城区综合工程地质图
Comprehensive engineering geologic map of western region in Guilin city

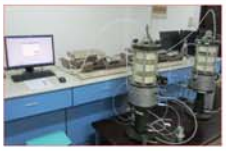
桂林市西城区岩溶塌陷预测分布图
Karst collapse prediction map of western region in Guilin city

研究条件 Research Facilities

依托广西岩土力学与工程重点实验室、广西土木工程检测与实验教学中心、广西岩土工程“八桂学者”创新团队等研究平台，拥有完善的研究岩溶地质灾害科学仪器与设备，具备了良好的科研条件。

Based on multiple research platforms, such as Guangxi key laboratory of geomechanics and geotechnical engineering , Guangxi testing and experimental center of civil engineering ,the Guangxi innovation team of geotechnical engineering “Bagui scholars” and so on,with the complete equipments and good scientific research conditions, the karst geological disaster research can be carried out in laboratory.








实验室及实验设备
Laboratory and laboratory equipment

研究团队和领军人才 Research Group and Group Leader

岩溶工程地质灾害预测及防治研究团队，现有固定人员18人，教授或研究员6名，副教授8人，讲师4人，高级职称占77.7%。具有博士、硕士学位17人（其中博士10人），博士生导师 4人。1人为“百千万人才工程”国家级人选、广西八桂学者；1人为省部级杰出青年人才。

Research team consists of 18 fixed members, among them there are 6 professors or researchers, 8 associate professors, 4 lectures, 77.7% of the them have senior titles. 17 people of them have master degree or Ph.D. degree, 4 doctoral supervisors. one is the person selected for Talents Project and Bagui Scholar, 1 people is the provincial outstanding young talent.

陈学军
广西岩土力学与工程重点实验室学科带头人，建立了桂林岩溶塌陷评价模型与方法。
Prof. Chen Xuejun: Group leader of the Guangxi key laboratory of geomechanics and geotechnical engineering, who establishes the karst collapse evaluation model and method.

韦昌富
“百千万人才工程”国家级人选，建立了红粘土介质多场耦合理论框架及应用。
Prof. Wei Changfu: the person selected for Talents Project, who established the multi-field coupling theoretical framework of red clay and its application .

承担的重要科研项目 Key research projects

序号	项目来源	项目编号	项目名称	项目负责人	项目开始年月	项目结束年月	总经费（万元）
1	国家自然科学基金	41262011	采矿振动扰动下岩溶塌陷的动力学机制	陈学军	201301	201612	56
2	国家自然科学基金	51169005	非饱和红粘土中水-溶质迁移机制及力学效应	吕海波	201201	201512	52
3	国家自然科学基金	11372078	饱和岩土介质的化学-力学耦合问题—理论模型与试验验证	韦昌富	201401	201712	92
4	国家自然科学基金	51169004	特殊环境条件下桂北岩溶区红粘土水土作用研究	刘之葵	201201	201512	52
5	国家自然科学基金	51369010	季节性地下水变化作用红粘土路基沉降机理及时空演化规律	肖桂元	201301	201712	51
6	国家自然科学基金	51309055	水化学环境变异下黏性土的物理力学特性	顾荣涛	201301	201712	26
7	国家自然科学基金	11562007	孔隙中水合物含量及赋存模式对土体力学特性的影响机理	顾荣涛	201601	201912	48
8	国家自然科学基金	41502284	红粘土传热特性及其渗流-传热耦合作用机制研究	曾召田	201601	201812	20
9	国家自然科学基金	51568014	岩溶地区红粘土热湿迁移特性及其对地源热泵效率的影响	曾召田	201601	201912	40
10	国家自然科学基金	51108110	酸雨环境下红粘土路基溶质迁移机理及强度衰减研究	肖桂元	201201	201412	25
11	广西自然科学基金创新团队	2012GXNSFGA060001	极端气候下典型地质灾害的评估、预测与防治	韦昌富	201204	201604	200
12	广西区人民政府	广西八桂学者项目	重大地质灾害与工程安全	韦昌富	201201	201612	500

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Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

四大服务之一：
Four Aspects for International Cooperation

牵头承担5项国际地质对比计划(IGCP)
Led and Implemented Five IGCP Projects

袁道先 院士，IGCP299/379/448负责人
Prof.Yuan Daoxian, Leader of IGCP299, 379,448.

克里斯.格雷夫 教授，美国，IGCP513负责人，中国 "国际合作奖"获得者
Prof.Groves.C. USA. Leader of IGCP513, Honored 2016 International cooperation awarded by PRC.

章程 研究员，IGCP598负责
Prof.Zhang Cheng, Leader of IGCP598

自1990年以来，由我国科学家袁道先院士提出申请，岩溶所为主持单位，连续实施了五个国际岩溶地质对比计划项目（IGCP）。这五个项目分别是：

Since 1990, Academician Yuan Daoxian of China began to apply for the IGCP projects, which listed the Institute of Karst Geology(IKG), MLR as the host. Five IGCP projects were implemented successively, they are:

- IGCP 299 "地质、气候、水文与岩溶形成" Geology, Climate, Hydrology and Karst Formation(1990-1994)
  把岩溶形态组合与岩溶形成环境条件相结合，从全球视野研究岩溶动力系统。
  To study karst dynamic system by compiling the karst forms with its environmental condition of formation from a global view.
- IGCP 379 "岩溶作用与碳循环" Karst Processes and the Global Carbon Cycle(1995-1999)
  将岩溶作用与全球碳循环紧密联系在一起，揭示全球最大的碳库积极参与人类共同关注的碳循环,开拓全球变化研究新领域。
  To combine karst process with global carbon cycle closely, to reveal how the largest carbon reservoir of the world to participate in the carbon cycle actively, which is paid common attention by human beings. A new field for global change research is broadened.
- IGCP 448 "岩溶地质及其相关的生态系统全球对比" World Correlation on Karst Geology and Its Relevant Ecosystem(2000-2004)
  对比由不同地球化学环境、碳酸盐岩岩相和水文地质条件形成的微观岩溶生态系统，尤其是揭示其对物种选择和生物多样性的影响。
  To make comparisons of the micro karst ecosystems under the different geochemical environment, with different carbonate rocks lithofacies or under different hydrogeological conditions. Especially, to reveal their influence on spices selection and biodiversity.
- IGCP513 "岩溶含水层与水资源全球研究" Global Study of Karst Aquifers and Water Resources（2005-2009）
  研究岩溶水文地质和岩溶生态系统功能与健康，探索岩溶水资源的管理途径，进一步完善岩溶动力系统。
  To study karst hydrogeology and karst ecosystem function and fitness to probe approaches for scientific management of karst water resources, and to improve the karst dynamic system.
- IGCP/SIDA 598 "岩溶系统中的环境变化与可持续性" Environmental Change and Sustainability in Karst Systems（2011-2015）
  研究地质生物过程和人类活动对碳酸盐岩溶蚀作用的影响，进行不同岩溶地貌/含水层系统地下水脆弱性评价方法对比研究，有针对性和科学地保护岩溶含水层。
  To study effects on erosion of carbonate rocks by the geological and biological processes and human activities. To make comparison to the evaluation methods of underground water vulnerability for different karst landforms/aquifer systems, and to protect the karst aquifers purposefully and scientifically.

突出贡献：a) 是将我国岩溶地域优势转化为学术优势，提出岩溶动力学理论和一整套岩溶地球化学监测技术方法，极大地推动了现代岩溶学的完善与发展；b) 是形成广泛且稳定的国际岩溶研究团队，约40个国家的200余位科学家与管理人员参与到项目，开展双边与多边合作研究，培养一批年轻的岩溶学科带头人；c) 是扩大了我国岩溶研究的国际影响力，奠定了国际领先地位，对国际岩溶研究中心成功落户桂林起到了关键作用。

Outstanding contributions: a) to promote karst research based on natural advantages of China, put forward the KD theory and develop the modern karstology; b) to form a worldwide stable international research team with about 200 scientists of 40 countries involved to conduct collaborative research and cultivate a group of young karst scientists; and c) to expand the international influence of China on karst research, and plays a key role to the successful foundation of IRCK in Guilin.

5个岩溶IGCP项目成果总结，论文，专著，报道，通讯报道，工作会议
Summary of 5 IGCP projects, papers, monographs, reports, and workshops

IRCK落户中国，中国政府代表在巴黎签字
IRCK settled in China, the Chinese government representatives signed the agreement in Paris

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

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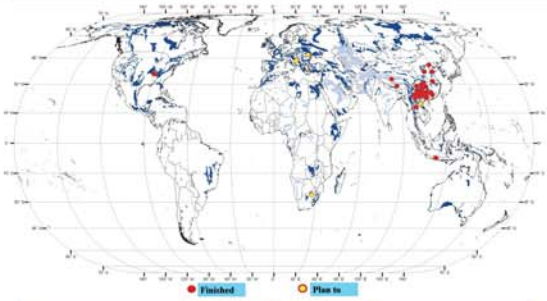
四大服务之二：
Four Aspects for International Cooperation

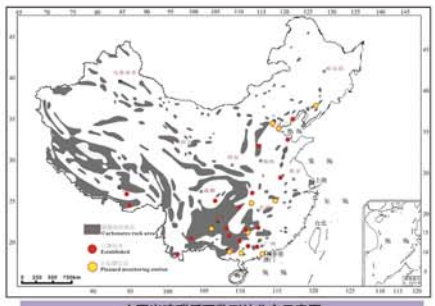
建立全球39个岩溶碳循环监测站
Establish 39 Monitoring Stations for Karst Carbon Cycle around the World

在原有地下水监测站基础上，全球岩溶碳循环监测网络的系统建设工作始于2010年。依托IRCK，目前已在美国、泰国、印度尼西亚先后建立了3个国际岩溶碳循环监测站。已在中国建立了36个监测站。随着越来越多的国家和机构加入中心合作平台，中心计划未来在奥地利、斯洛文尼亚、南非等地逐步建立岩溶碳循环监测站。

Since 2010, IRCK has started systematical construction of global karst carbon cycle monitoring network. So far, IRCK has set up 3 monitoring stations in USA, Thailand and Indonesia successively, and 36 monitoring stations in China. With more and more countries and organizations collaborated with IRCK, it has planned to establish monitoring stations in Austria, Slovenia and South Africa in near future.



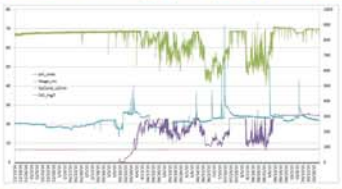
全球岩溶碳循环监测站分布示意图
Distribution of global karst carbon cycle monitoring stations

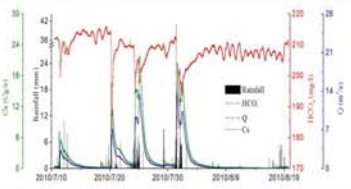


中国岩溶碳循环监测站分布示意图
Distribution of karst carbon cycle monitoring stations in China

代表性监测站列表
Representative monitoring stations

No.	站名称 Name of station	No.	站名称 Name of station
1	山东滨州站，黄河干流控制断面 The controlling section of Yellow River, Binzhou, Shandong	10	云南西双版纳勐腊站 Mengla Station, Xishuangbanna Yunnan
2	安徽池州大通站，长江控制断面 The controlling section of Yangtze River, Chizhou, Anhui	11	贵州茂兰板寨（3个） Banzhai Station,Libo, Guizhou (3)
3	广西梧州站，珠江控制断面 The controlling section of Pearl River, Wuzhou, Guangxi	12	广西马山弄拉站 Nongla Station, Mashan, Guangxi
4	秦皇岛海水碳汇指标监测站 Monitoring station for sea water, Qinhuangdao, Hebei	13	桂林丫吉、毛村、寨底等站（15个） Yaji Station, Maocun Staion, Zhaidi Station etc in Guilin, Guangxi (15)
5	湘西大龙洞站、屋檐洞站（2个） Dalongdong Station and Wuyandong Station in Hunan(2)	14	郴州万华岩站 Wanhuayan Station in Chenzhou, Hunan
6	重庆青木关站、金佛山站（2个） Qingmuguan Station and Jinfoshan Station in Chongqing, China(2)	15	广州北江站、东江站（2个） Beijiang Station & Dongjiang Station, Guangzhou, Guangdong
7	西藏拉萨河站 Lashahe River Station, Tibet	16	Kentucky, USA 美国肯塔基州
8	西藏山南站 Sannan Station, Tibet	17	Kanchanaburi, Thailand 泰国北碧省
9	山西跑马神泉站 Paomashen Spring Station, FenYang, Shanxi	18	Southern Indonesia 印度尼西亚南部





泰国普特泉监测结果：已有监测数据表明，与中国西南岩溶区典型地下河（泉水）相比较，普特地下河水具有高钙（100-120 mg/L）、高重碳酸根离子含量（8.6-9.3 mmol/L）及高电导率（600-880 μs/cm）特征。

The result from Phu Toej Spring in Thailand shows the Ca^{2+} content (100-120mg/L), HCO_3^- content (8.6-9.3mmol/L) and Ec (600-880μs/cm) in Phu Toej Underground River are relatively higher than that of springs in karst area of Southwest China.

中国茂兰地下河观测结果：岩溶碳汇量的主控因素是水循环通量，而非HCO_3^-浓度。HCO_3^-浓度低的雨季对碳汇的贡献更大。因此，流量变幅大时需进行更精确地在线监测。

The result from Maolan underground river in south China shows the main controlling factor to karst carbon sink flux is water. Rainy season with low HCO_3^- contributes to the carbon sink greater. Consequently, more precise online monitoring is required when the flow rate fluctuated greatly.

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

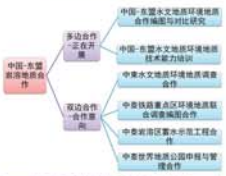
Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

四大服务之三：
Four Aspects for International Cooperation

积极推进与东南亚国家合作与交流
Promote the Cooperation and Communication with Southeast Asian Countries

一、与东盟国家开展合作与交流，搭建了中国-东盟岩溶地质合作平台。
Cooperate and communicate with ASEAN Member States, and have established China-ASEAN cooperation platform for karst geology

与CCOP成员国代表考察红水河水文水资源情况
Investigated the water resource of Hongshui River with the representatives from CCOP member states



中国-东盟岩溶地质项目合作内容
China-ASEAN cooperation contents of karst geological projects

与印尼研究人员进行现场测试
Field work with researchers from Indonesia

与越南研究人员进行泉点调查
Investigation of springs with researchers from Viet Nam

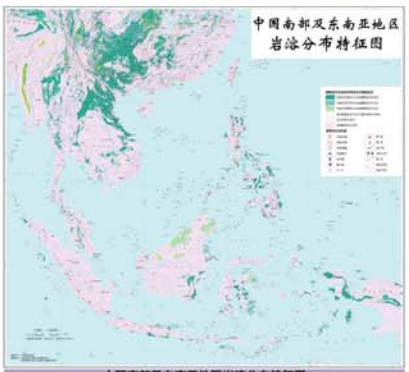
与缅甸研究人员共同开展岩溶地质野外调查
Field research on karst geology with researchers from Myanmar

与泰国专家合作开展中泰铁路沿线环境地质踏勘（右上），合作开展溶蚀试验（右下），中泰联合建设监测站（左下）
Field investigation on environmental geology along China-Thailand railway with the researcher from Thailand (upper right), carry out erosion experiment jointly (lower right), China and Thailand established monitoring station jointly (lower right)

与东盟国家专家签署合作会议纪要（2016，北京）
Sign MOM with experts from ASEAN Member States (2016, Beijing)

二、形成20多名技术人员组成的专家合作团队
Formed a professional cooperation team with over 20 scientists and technicians

三、编制了中国与东南亚地区岩溶地质系列图件
Compiled serial maps on karst geology in China and Southeast Asia



中国南部及东南亚地区岩溶分布特征图
Map of Karst Distribution in Southern China and Southeast Asia

与东盟专家开展岩溶环境地质编图研讨（2015，南宁）
Seminar on Mapping of Karst Geology and Environmental Geology with ASEAN scientists (2015, Nanning)

中国地质调查局岩溶地质研究所
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四大服务之四：
Four Aspects for International Cooperation

国际培训班
International Training Courses

自2008年联合国教科文组织国际岩溶研究中心成立以来，以岩溶与全球气候变化、岩溶水文地质与水资源、岩溶生态系统与石漠化综合治理、岩溶塌陷与预警、岩溶景观与地质公园等为主题，成功举办16次为期15-30天的国际培训班，邀请16个国家63名岩溶专家组成教员团队，6大洲40个国家的600多名学员参加了培训。泰国学员参加培训后，积极推动泰国与中国合作，成功申请两国政府联合资助的岩溶地质调查研究项目，促进了泰国岩溶地质研究。

Since the inception of IRCK from 2008, the international training course for 15 to 30 days have been organized 16 times, with the themes like karst and global climate change, karst hydrogeology and water resources, karst ecosystem and integrated control on rocky desertification, karst collapse and early warning, karst landscape and geoparks. 63 karst scientists invited from 16 countries composed the lecturers team, and there are more than 600 trainees from over 40 countries in 6 continents involved in total. Among them, the trainees from Thailand promoted the cooperation between Thailand and China actively, and successfully applied the geological survey project on karst sponsored by governments from both sides jointly to improve the karst geological research in Thailand.

2009-2015年国际培训班主题信息列表
List of Themes and Other Related Information about the International Training Courses from 2009 to 2015

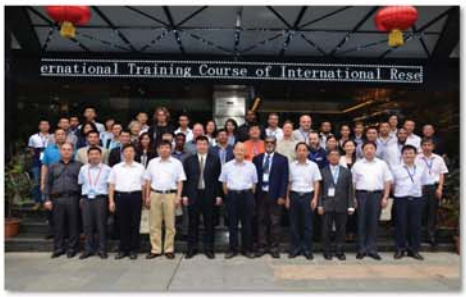
期次 Sequence	主题 Themes	开班时间 Year/Duration	相关主办协办单位 Sponsors/Co-organizers	参与学员(人) Number of Trainees	学员涉及国家（地区） Trainees' Nationalities
第一期 First	岩溶水文地质与生态 Karst Hydrogeology and Karst Ecosystem	2008年/30天 2008 / 30 Days	商务部 Ministry of Commerce, China	17	8
第二期 Second	岩溶水文地质与碳循环 Karst Hydrogeology and Karst Carbon Cycle Monitoring	2010年/12天 2010 / 12 Days	国土资源部 Ministry of Land and Resources, China	17	11
第三期 Third	岩溶水文地质调查技术方法 Karst Hydrogeological Investigation Technology and Methodology	2011年/12天 2011 / 12 Days	国土资源部 Ministry of Land and Resources, China (MLR)	17	9
第四期 Forth	岩溶与水文地球化学 Karst and Hydrogeochemistry	2012年/12天 2012 / 12 Days	国土资源部西南大学 MLR / Southwest University	20	11
第五期 Fifth	流域岩溶水文地质调查、动态监测与应用 Karst Hydrogeological Survey, Dynamic Monitoring and Application in River Basins	2013年/12天 2013 / 12 Days	国土资源部 Ministry of Land and Resources, China	21	18
第六期 Sixth	岩溶生态系统与地质碳汇生物 Karst Ecosystem and Geomicrobiology	2014年/14天 2014 / 14 Days	国土资源部中国地质大学（武汉） MLR / China University of Geosciences (Wuhan)	17	14
第七期 Seventh	岩溶景观、地质公园、自然遗产地、环境地质编图与数据挖掘 Karst Landscape, Geopark, Natural Heritage, Environmental Geology Mapping and Data Mining	2015年/14天 2015 / 14 Days	国土资源部中国-东盟矿业合作论坛 MLR/ China-ASEAN Mining Cooperation Forum	28	20
合计 Summation		198天(Days)		147	33

中心的国际培训班，每年分不同的主题，围绕岩溶水文地质、岩溶生态、岩溶景观等相关课题开展培训。右上为袁道先院士及中心委员为学员室内授课，右中为蒋忠诚副所长为培训班学员野外授课，右下为学员结业领取证书。

The theme of training courses are different every year, including the karst hydrogeology, karst ecosystem, and karst landscape, etc. Prof. Yuan Daoxian was giving a lecture to the trainees (Upper left), Prof. Jiang Zhongcheng was giving a lecture to the trainees in the field (Middle right), trainees were having the certificates (Lower right).

培训班学员涉及国别统计表 (2009-2015)
Statistics of Trainees from Different Countries joining International Training Courses (2009-2015)

序号 No.	大洲 Continents	国家 Nationalities	参与学员 Number of Trainees
1	亚洲	柬埔寨Cambodia	4
2		印度India	6
3		印度尼西亚 Indonesia	9
4		伊朗Iran	2
5		老挝Laos	4
6		马来西亚Malaysia	3
7		蒙古Mongolia	2
8		缅甸Myanmar	2
9		菲律宾Philippines	2
10		泰国Thailand	13
11		越南Vietnam	12
12		中国China	22
13	非洲	埃塞俄比亚Ethiopia	10
14		肯尼亚Kenya	5
15		尼日利亚Nigeria	3
16		南非South Africa	2
17		坦桑尼亚Tanzania	1
18		乌干达Uganda	2
19		津巴布韦Zimbabwe	3
20	欧洲	匈牙利Hungary	4
21		波兰Poland	1
22		罗马尼亚Romania	6
23		塞尔维亚Serbia	2
24		斯洛伐克Slovak	4
25		斯洛文尼亚Slovenia	3
26		西班牙Spain	1
27		俄罗斯Russia	2
28	美洲	巴西Brazil	6
29		墨西哥Mexico	2
30		秘鲁Peru	4
31		美国 USA	2
32	大洋洲	澳大利亚Australia	2
33		巴布亚新几内亚 Papua New Guinea	1



国际岩溶研究中心面向东南亚国家开展区域性的国际培训，在2015年中国-东盟矿业合作论坛期间，召开“岩溶景观、地质公园、自然遗产地、环境地质编图与数据挖掘”国际培训班，为“一带一路”和平共建倡议服务。

IRCK organized the regional training course facing to the Southeast countries. In 2015, the training course on Karst Landscape, Geopark, Natural Heritage, Environmental Geology Mapping and Data Mining was organized , which supported the initiative of *the Belt and Road*.

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八大野外研究基地
Eight field research bases

果化、寨底、丫吉、会仙、弄拉、白云、武隆、毛村基地各具岩溶环境代表性

Guohua, Zhaid, Yaji, Huixian, Nongla, Baiyun, Wulong and Maocun Base

具有大型野外科学观测研究基地8个，其中岩溶石漠化—广西果化野外基地、岩溶地下河系统—广西海洋寨底试验基地、岩溶水文地质—广西桂林丫吉试验场和岩溶生态与水生态—广西会仙野外基地为国土资源部野外科学观测研究基地。

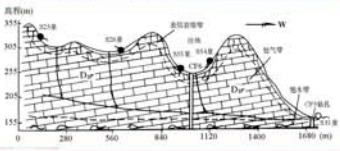
There are 8 big experimental sites, of which, Guohua Rocky Desertification Control Base, Zhaidi Underground River System Research Base, Huixian Karst Ecosystem and Wetland Base, and Yaji Hydrogeological Experimental Site were approved by MLR.

1.国土资源部岩溶石漠化—广西果化野外基地： 通过15年的治理示范与监测，对基地石漠化与水土流失等生态环境问题开展了系统的示范研究，构建了岩溶峰丛洼地复合型立体生态农业模式，研发了一系列可推广可复制的生态重建关键技术和模式：景观生态型土地整理技术、表层岩溶水生态调配利用技术、土壤改良和固碳增汇技术和水土保持与生态产业培植技术等。

Guohua Base for Karst Rocky Desertification Control (MLR):Through 15 years of demonstration and monitoring, it has carried out systematic demonstration study on the eco-environment problems, with integrated agricultural mode for karst peak cluster-depression established. A serial key technologies and modes have been created to popularize in public, i.e., land consolidation to form ecological landscape, reasonable utilization of epikarst water, soil improvement and carbon sequestration, soil and water preserve as well as cultivation technology of ecological industry.

2.国土资源部岩溶地下河系统—广西海洋寨底试验基地： 创建了地下河管道库容评价计算方法、建立了回收强度和水动力场管道结构分析方法；获得了降水入渗系数、径流模数、碳酸盐岩溶蚀速率等基础水文地质参数；获得了裂隙水流与管道水流交换机理、表层岩溶带地下水调蓄机理；发现岩溶管道水头损失新机理。

Haiyang-Zhaidi Experimental Site (MLR): Created the capacity evaluation method of underground river conduit, and found out the methods to analyze conduit structure of hydraulic field and recycling rates; obtained related basic hydrogeological parameters; understood the exchange mechanism between fissure flow and conduit flow, and the epikarst GW storage and regulation mechanism. Discovered the new mechanism of water head loss in karst conduit.



3.国土资源部岩溶水文地质—广西桂林丫吉试验场： 以岩溶含水系统为单元，按照地下水形成(表层岩溶带)、流动(管道网络)、排泄(地下河)的空间次序，研究岩溶形态组合特征与地下水循环流动的关系，岩溶动力系统碳-水-钙循环特征及其与生态环境的关系，开拓了应对全球气候变化的新领域。

Yaji Experimental Site (MLR): Focus on the research of the relationship between karst morphology combination and GW cycle, the relationship between carbon-water-calcium in karst dynamical system and ecological environment. It helps to broaden the new fields for addressing climate change .

4. 国土资源部岩溶生态与水生态—广西会仙野外基地： 提出按照湿地的成因、水文特征、植物群落类型建立分级分类标准，初步建立岩溶湿地的分类体系。

A classification standard, according to the cause, hydrological characteristics and plant community type of wetland, is proposed. The classification system of karst wetland was established preliminarily. The karst wetland is divided into surface karst wetland and underground karst wetland two types, seven level classification of seventeen two grade classification.

5. 弄拉岩溶生态修复示范基地： 通过开展石漠化治理、植被诱导恢复、洼地排涝工程以及土地整治等工作，石漠化山区森林覆盖率达到95%，被评为国家级药材自然保护区和全国造林绿化千佳村等。

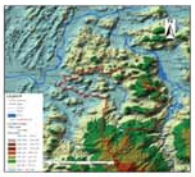
Nongla Demonstration Base:Karst rocky desertification treatment has been conducted in Nongla demonstration base for karst ecosystem recovery, the plant cover rate rise up to 95%.

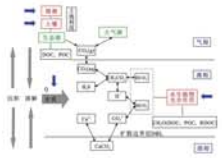
6. 广州岩溶塌陷地质灾害研究基地： 建立了广州市白云区金沙洲岩溶塌陷监测站，部署岩溶塌陷动力监测点15个、钻孔光纤传感监测3个、地质雷达测线2千米，实现对金沙洲岩溶塌陷高易发区的监控。

Karst collpase research base in Guangzhou: with 15 monitoring sites for dynamic, 3 BOTDR monitoring and 2km GDR monitoring line, to realize the monitoring of high-risk area.

7. 重庆武隆岩溶研究基地： 验证了水—土—岩的相互作用对洞穴现代滴水的时效影响，发现Mg/Ca、Sr/Ca比值反相关，响应年际尺度上降水量增加的气候信息。

Wulong Karst Research Base in Chongqing: it verified the impact on modern cave dripping due to interaction of water, soil, and rock with time, and found that the Mg/Ca, Sr/Ca ratio, proportional to the precipitation increase annually.





8.毛村岩溶碳循环及碳汇效应野外研究基地： 用多方面的数据证明岩溶碳循环及碳汇效应的存在，回答了国际对岩溶碳循环不能产生短时间尺度碳汇的争议。

Maocun Experimental Site: It focused on the evidence for karst carbon cycle and carbon sink, responding to the argument on whether carbon cycle could be possible to generate short-time scale carbon sink or not.

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两个辅助部门之一：
Two Assisting Sections

岩溶地质数据处理与应用中心，支撑全球岩溶大科学计划
Karst Geological Data Processing and Application Center Supports the Big Scientific Plan on Global Karst

主任 周立新副研究员
Director, A.P. Zhou Lixin；

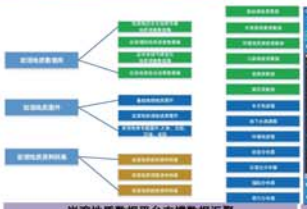
副主任 许琦 助研
Deputy Director, Assistant Prof. Xu Qi

岩溶地质数据处理与应用中心主要任务是制定岩溶水文地质环境地质调查数据库建设的系列标准和规范，建立岩溶地质数据库，开发信息系统软件，编制“一带一路”、中国及东南亚地区、全国和区域的多比例尺岩溶专题图件，提供岩溶地质信息服务产品的在线、离线共享服务。

The primary missions of Karst Geological Data Processing and Application Center are to formulate the standards and rules of the establishment of karst hydrogeological and environmental geological database, to establish karst geological database, to develop information system software, to compile serial maps for “the Belt and Road” Initiative, multi-scale thematic maps of karst in China and Southeast Asia and national and regional multi-scale thematic maps of karst, and to provide karst geological information service online and off-line.

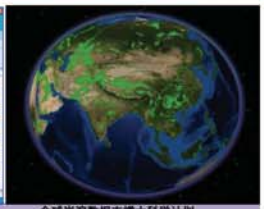
一、建设了岩溶地质信息平台，提供数据支撑和技术支撑，逐步集成全球50余个国家和国内全境岩溶相关数据。

Establish karst geological information platform to provide data and technological support and gradually collected data related to karst in China and over 50 other countries.



岩溶地质数据平台支撑数据汇聚
Karst geological data platform supporting data aggregation

岩溶地质软件平台支撑数据采集与管理
Karst geological software platform supporting data management

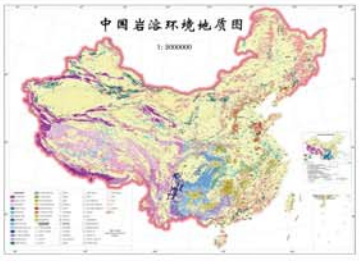


全球岩溶数据支撑大科学计划
Global karst data supporting the big scientific plan

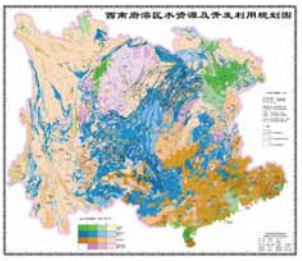
二、编制了岩溶专题图件，支撑科研工作

Compile karst thematic maps supporting scientific researches

“一带一路”岩溶分布图
Map of karst along *the Belt and Road*



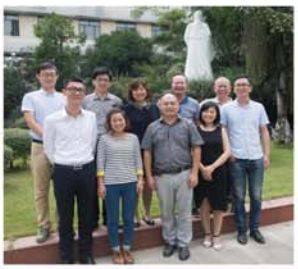
中国岩溶环境地质图
Karst Environmental Geology in China



西南岩溶区水资源及开发利用图
Karst Water Development in Southwest China

三、构建了岩溶地质资料服务平台，为社会化服务提供支撑。

Establish service platform of karst geology information, supporting the socialized services.



岩溶地质信息化建设团队
Karst geological database construction team

岩溶地质信息在线服务
Online service of karst geological information

岩溶地质资料离线服务
Off-line service of karst geological data

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

两个辅助部门之二：
Two Assisting Sections

岩溶分析测试技术与应用
Karst Analysis and Testing Technology and Its Application

邓振平 主任
Section Director, Prof.Deng Zhenping

俞建国 副主任
Deputy Director, A.P. Yu Jianguo

一、简介 Introduction

岩溶地质与资源环境测试中心设有化学分析、同位素和岩石土工三个专业组和管理组。检测中心的主要任务是承担国家、部、局、院下达的有关岩溶地质、岩溶资源、岩溶生态环境等各类项目中的检测任务，开展相关的测试技术方法研究，同时开展西南岩溶地下水示踪试验技术的应用研究。

Karst Geology and Resource and Environment Testing Center is composed of three technical groups and one administrative group. The main task is to undertake the testing tasks related to karst geology, karst resources and karst ecological environment, as well as the karst groundwater tracing test in SW China.

等离子体发射光谱仪
Plasma Emission Spectrometry

MAT253稳定同位素质谱仪
MAT253 Stable Isotope Ratio Mass Spectrometry

气相色谱-质谱联用仪
Gas Chromatography - Mass Spectrometry

二、主要检测业务 Main missions

1.化学分析与应用 Chemical Analysis and Application

化学分析实验室有X射线荧光光谱仪、等离子体质谱仪、气相色谱-质谱联用仪、高效液相色谱仪、多功能碳氮分析仪等仪器设备20多台/套，主要用于水质分析、岩石土壤、水系沉积物、生物样品中常量、微量元素及土壤营养成分的分析和测定；同时开展岩溶地下水等水质样品中挥发性有机物、有机氯农药、多环芳烃等各类有机化合物的分析与测定。

Inorganic chemical analysis laboratory holds XRF, ICP-MS, ICP-AES, GC-MS, GC, HPLC, AAS, IC, EA, TOC/TN and so on, which were mainly used for the constant and trace elements analysis in water, rock soil, sediment, biological samples and soil nutrient composition determination. Meantime, volatile organic compounds, organochlorine pesticides, and other organic compounds are also can be determined.

2.同位素分析与应用 Isotopic Analysis and Application

同位素分析实验室拥有MAT253稳定同位素质谱仪、超低本底液体闪烁能谱仪、α能谱仪。主要用于水、土壤、生物、沉积物，环境样品中的稳定同位素C、H、O、N的测试和放射性同位素年轻年代学的氚、碳十四测年、铀系不平衡地质测年，^{210}Pb地质测年。

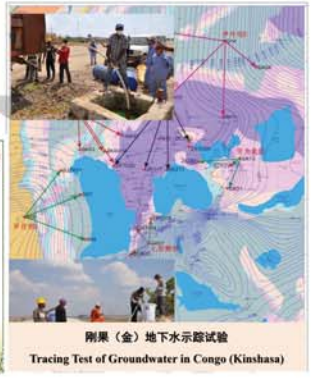
Isotopic analysis laboratory holds MAT253 Stable Isotope Ratio MS, ultra-low-background liquid scintillation counter and α energy dispersive spectrometer. which were mainly used for the stable isotopes of C, H, O, N of water, soil, biological, sediment, environmental samples and radioactive isotope chronology of tritium , ^{14}C dating, U-series dating, ^{210}Pb geological dating.

三、测试技术应用及成果 Application & Achievements

1.地下水示踪技术在岩溶水文地质调查中的应用
Ground water tracing technique in karst hydrogeology

2.野外分析测试平台
Field analysis and testing platform

3.同位素测试技术研究与应用
Research and application of isotopic analysis technology



刚果（金）地下水示踪试验
Tracing Test of Groundwater in Congo (Kinshasa)

中国地质调查局岩溶地质研究所
联合国教科文组织国际岩溶研究中心

Institute of Karst Geology, China Geological Survey
International Research Center on Karst, UNESCO

结语
Epilogue

抚今追昔，四十载辛勤耕耘铸就辉煌丰碑；　继往开来，双百年宏伟蓝图开创世界一流。

Endless efforts, endless findings on karst research

在国土资源部、广西自治区政府、中国地质调查局及广西科技厅、国土厅、桂林市政府等部门的正确领导和大力支持下，岩溶所精心服务国家战略和重大需求，地质调查与科技创新工作蓬勃发展。我所将继续坚决贯彻落实部、局党组关于全面深化科技体制改革和创新驱动发展战略的部署和要求，围绕服务“六大需求”，积极参与实施“三深一土”重大战略，按照“责任、创新、合作、奉献、清廉”新时期地质工作者核心价值观的要求，不忘初心，肩负使命，打造世界一流的新型岩溶地质调查研究机构，为国土资源事业的改革创新和持续发展再立新功。