

# 2014 ANNUAL REPORT

## CHINA NATIONAL COMMITTEE FOR IGCP

### Part One: Chairperson and Vice Chairpersons/Secretariat of the National Committee:

Chairman: Prof. Liu Dunyi  
Institute of Geology  
Chinese Academy of Geological Sciences (CAGS)  
26 Baiwanzhuang Road  
Beijing 100037, China  
Tel: +86-(10)-6831-1545  
Fax: +86-(10)-6831-1545  
E-mail: [liudunyi@bjshrimp.cn](mailto:liudunyi@bjshrimp.cn)

Vice Chairpersons: Ms. Wang Rongfang  
Division Chief  
International Organizations and Conferences  
Department of International Cooperation  
Ministry of Science and Technology, P. R. China  
15B Fuxing Road, Beijing 100862, China  
Tel: +86-(10)-5888-1320  
Fax: +86-(10)-5888-1324  
E-mail: [wangrf@most.cn](mailto:wangrf@most.cn)

Prof. Chai Yucheng  
Earth Sciences Department  
National Natural Science Foundation of China  
No. 83 Shuangqing Road  
Beijing 100085, China  
Tel: +86-(10)-6232-7159  
Fax: +86-(10)-6232-6900  
E-mail: [chaiyc@nsfc.gov.cn](mailto:chaiyc@nsfc.gov.cn)

Mr. Sun Baoliang  
Chengdu Bureau of State Land Supervision  
E-mail: [blsun@mail.mlr.gov.cn](mailto:blsun@mail.mlr.gov.cn)

Secretary-General: Prof. Dong Shuwen  
Chinese Academy of Geological Sciences  
26 Baiwanzhuang Road  
Beijing 100037, China

Tel: +86-(10)-6899-9606  
Fax: +86-(10)-6831-0894  
E-mail: [swdong@cags.ac.cn](mailto:swdong@cags.ac.cn)

Secretariat: Secretariat  
China National Committee for IGCP  
Division of International Cooperation  
Chinese Academy of Geological Sciences  
26 Baiwanzhuang Road  
Beijing 100037, China  
Tel: +86-(10)-6831-0893 or +86-(10)-6899-9619  
Fax: +86-(10)-6831-0894  
E-mail: [dic@cags.ac.cn](mailto:dic@cags.ac.cn)  
Http: [www.cags.ac.cn/igcp-china](http://www.cags.ac.cn/igcp-china)

## **Part Two: Membership of the Committee:**

Prof. Deng Jun	President, China University of Geosciences (Beijing)
Prof. Jin Zhijun	Head of Exploration and Production Research Institute, SINOPEC
Prof. Lian Changyun	Deputy Director of Department of Science and Technology & International Cooperation, China Geological Survey
Prof. Liu Shuwen	Professor, School of Earth and Space Sciences, Peking University
Prof. Wang Er-chie	Institute of Geology and Geophysics, Chinese Academy of Sciences
Prof. Wang Jingbin	Deputy Director-General, Geological Survey Center of Mineral Resource of Non-ferrous Metals of China
Prof. Xu Qiang	Chief Engineer, Research Center of China National Offshore Oil Corporation
Prof. Xu Shuishi	Director-General, China National Administration of Coal Geology
Prof. Zhao Wenzhi	Deputy Director, Research Institute of Petroleum Exploration and Development, China National Petroleum Corporation
Prof. Zhang Zhibo	Division Chief, Department of Personnel, Education, Science and Technology of China Seismological Bureau

## **Part Three: On-Going Participated IGCP Projects:**

### **I. 5 Projects with Project Leader from China:**

No. 589	Development of the Asian Tethyan Realm Prof. Jin Xiaochi
No. 598	Environmental Change and Sustainability in Karst Systems Prof. Zhang Chen
No. 600	Metallogenesis of Collisional Orogens Prof. Hou Zengqian

- No. 630 Permian-Triassic Climatic and Environmental Extremes and Biotic Response  
Prof. Chen Zhong-Qiang
- No. 632 Continental Crises of the Jurassic  
Prof. Sha Jingeng

**II. 8 Projects with Project Co-Leader from China:**

- No. 580 Application of Magnetic Susceptibility on Paleozoic Sedimentary Rocks  
Prof. Chen Daizhao
- No. 588 Preparing for Coastal Change  
Prof. Zong Yongqiang
- No. 591 The Early to Middle Palaeozoic Revolution  
Prof. Zhan Renbin
- No. 592 Continental Construction in Central Asia  
Prof. Sun Min
- No. 599 The Changing Early Earth  
Prof. Yang Jinhui
- No. 608 Asia-Pacific Cretaceous Ecosystems  
Prof. Wan Xiaoqiao
- No. 609 Cretaceous Sea-Level Changes  
Prof. Hu Xiumian
- No. 618 Paleoclimate information obtained from past-recharged groundwater  
Prof. Chen Jianyao

**III. Projects with an Active Working Group:**

In 2014, the Chinese geoscientists have participated in the following 16 IGCP projects: Nos., 580, 588, 589, 591, 592, 598, 599, 600, 608, 609, 618, 619, 624, 628, 630 and 632.

**Part Four: Activities of the National Committee**

**1. Actively participating in the activities of the IGCP Secretariat and IGCP Scientific Board**

**1) Attending the 42<sup>nd</sup> Session of IGCP Scientific Board:** Entrusted by the China National Committee for IGCP, Prof. Wu Zhenhan, Vice President of the Chinese Academy of Geological Sciences, attended the open meeting of the 42<sup>nd</sup> Session of IGCP Scientific Board held at the UNESCO headquarters on Feb. 19, 2014. On behalf of the China National Committee for IGCP, Prof. Wu Zhenhan reported the major activities of the China National Committee for IGCP in 2013 and the major academic activities of the on-going IGCP projects with Chinese scientists as Leaders and Co-Leaders.

**2) Two IGCP projects with Chinese scientists as Leaders being newly**

**approved in 2014:** With the support of the China National Committee for IGCP, 2 new IGCP projects with Chinese scientists as Leaders got approval of the IGCP Scientific Board, namely:

- ◆ IGCP-630 “Permian-Triassic Climatic and Environmental Extremes and Biotic Response” led by Prof. Chen Zhongqiang from the China University of Geosciences (Wuhan);
- ◆ IGCP-632 “Continental Crises of the Jurassic” led by Prof. Sha Jingeng from the Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences.

**3) Recommending IGCP proposals to the IGCP Scientific Board:** In 2014, the China National Committee for IGCP recommended 4 IGCP proposals initiated or co-initiated by Chinese scientists, including:

- ◆ IGCP proposal “Diamonds and Crustal Minerals in Ophiolitic Peridotites: Global Models for Mantle Dynamics” initiated by Prof. Yang Jingsui from the Institute of Geology, Chinese Academy of Geological Sciences;
- ◆ IGCP proposal “Mechanisms, Monitoring and Modeling Earth Fissure generation and Fault activation due to subsurface Fluid exploitation (M3EF3)” co-initiated by Prof. Ye Shujun from School of Earth Sciences and Engineering, Nanjing University;
- ◆ IGCP proposal “Coupling instrumental, historical, archaeological, and geological records of sea-level change over minutes to millennia” co-initiated by Associate Professor Yu Fengling from College of Ocean and Earth Sciences, Xiamen University;
- ◆ IGCP proposal “Impact of climate change and human activity on eco-hydrological responses in ecohydrology demosites in Asia” initiated by Prof. Zhang Jing from College of Resource Environment and Tourism, Capital Normal University.

## **2. Enhancing interactions and contact with the officials of UNESCO**

The China National Committee for IGCP attaches great importance to remaining interactions and contact with UNESCO. In 2014, the China National Committee for IGCP visited the UNESCO headquarters and a number of UNESCO officials were invited to visit China.

1) While attending the 42<sup>nd</sup> session of IGCP Scientific Board in Paris in February, Prof. Wu Zhenhan visited the Division of Ecological and Earth Sciences and the two sides held discussions on cooperation between China and UNESCO in the field of geosciences, including IGCP, Geoparks, UNESCO Category 2 Centers, assistance to African countries in geosciences etc.

2) On Sep. 1<sup>st</sup>, 2014, Mr. Han Qunli, Director of the Division of Ecological and Earth Sciences, UNESCO and Mr. Hans Dencker Thulstrup, Programme Specialist for Natural Sciences at UNESCO Beijing Office visited the Chinese Academy of Geological Sciences and the China National Committee for IGCP and held in-depth discussions on China's participation in the UNESCO geoscience activities. The proposal for the establishment of the new International Geosciences and Geoparks Programme (IGGP) was also discussed during the meeting.

### **3. Pushing forward the preparations for the establishment of an International Center on Global-scale Geochemistry in Langfang, China**

**1) Assisting in the preparations for the establishment of the Center:** The proposal for the establishment of an International Center on Global-scale Geochemistry in Lang China was officially approved at the 37<sup>th</sup> UNESCO General Conference. In 2014, preparations for the agreement signing and the inauguration of the Center have been in process. The China National Committee for IGCP actively assisted in going through relevant domestic formalities for the preparation work. It is expected that the agreement on the establishment of the Center will be signed and the Center inaugurated in 2015.

**2) Facilitating the signing of the Agreement of Cooperation on Global Geochemical Mapping between China Geological Survey and International Union of Geological Sciences (IUGS):** On Oct. 22<sup>nd</sup>, 2014, Dr. Zhong Ziran, Vice Minister for Geological Survey, Ministry of Land and Resources of China and Director-General, China Geological Survey, met with Prof. Roland Oberhänsli, IUGS President, Prof. Jose-Pedro Calvo-Sorando, IUGS Secretary-General, Prof. Dong Shuwen, IUGS Treasurer and key members of IUGS New Activities Strategic Implementation Committee (NASIC).

At the end of the meeting, Dr. Zhong Ziran and Prof. Roland Oberhänsli signed *Agreement of Cooperation on Global Geochemical Mapping between China Geological Survey, Ministry of Land And Resources of The People's Republic of China and International Union of Geological Sciences*. The purpose of this agreement is to enhance cooperation on global geochemical mapping by supporting the operation of the International Research Centre on Global-scale Geochemistry under the auspices of the UNESCO and the IUGS/IACG Working Group on Global Geochemical Baselines, and by conducting joint research and training projects.

The signing of the Agreement has facilitated the expansion of the Center's international cooperation network and laid a sound foundation for the Center to conduct global-scale geochemical mapping in the future.

#### **4. Assisting in the renewal of the Agreement for the International Research Center on Karst (IRCK)**

In November 2013, the International Research Center on Karst successfully passed the first 6-year evaluation undertaken by UNESCO expert group. In line with *the Integrated Comprehensive Strategy for Category 2 Institutes and Centres under the Auspices of UNESCO* and *the Model Agreement between UNESCO and a Member State or Group of Member States Concerned Regarding an Institute or Centre under the Auspices of UNESCO (Category 2)*, the Agreement for IRCK shall be revised accordingly and get approval both from UNESCO and the Chinese government.

In 2014, the China National Committee for IGCP assisted IRCK in contacting the Division of Ecological and Earth Sciences at UNESCO on the revision and approval of the Agreement. It is expected that the renewal of the Agreement will be completed in 2015.

#### **5. Supporting China's participation in the activities of Global Geoparks Network (GGN)**

The China National Committee for IGCP assisted China National Geoparks Network in accomplishing the following major work:

1. From May to August, 2014, the Committee assisted the Secretariat of UNESCO Global Geoparks and Global Geoparks Network Bureau in the revalidation of 10 global geoparks and application of 2 aspiring global geoparks.
2. The Chinese side assisted with the work of the Secretariat of UNESCO Global Geoparks to enlarge China's influence in global geoparks network: (1) At the invitation of UNESCO, China sent 8 Chinese experts to conduct revalidation of global geoparks overseas; (2) Providing China's Permanent Delegation to UNESCO with advice and suggestions for UNESCO Geoparks Working Meeting; Providing the Secretariat of UNESCO Global Geoparks with suggestions on geoparks proposals and documents; (3) Assisting with Chinese aspiring global geoparks to make applications to UNESCO.
3. The Chinese delegation attended the 6<sup>th</sup> UNESCO Global Geoparks Conference held in Canada on September 17-24, 2014 and organized an exhibition of the development of geoparks in the past 10 years to publicize China's achievements in the protection of geoheritage, thriving development of geoparks and general public's active involvement in the protection of geoheritage and the ecosystem.

#### **6. Continuous Financial Support from the Chinese government to the IGCP**

With the help of the China National Commission for UNESCO, the 2014 contribution of 20,000 USD to IGCP was remitted to UNESCO in due time to support IGCP projects.

## **7. Convening of the 2014 Annual Meeting of the China National Committee for IGCP**

The 2014 Annual Meeting of the National Committee was held in Beijing on December 25-26, 2014 and was attended by more than 30 delegates, including members of the Committee, leaders of China National Working Group (NWG) of on-going IGCP projects and invited guests from relevant government departments. At the plenary session which was open to all the delegates, Secretary-General Dong Shuwen gave the 2014 annual report on the Committee's accomplishments made in the year and the major tasks for the year 2015, leaders or representatives of NWG of IGCP-589, 591, 598, 600, 608, 609 and 632 made a presentation on the annual progress. Prof. Cao Jianhua, Executive Deputy Director of the International Research Center on Karst Geology (IRCK), delivered a presentation on behalf of Prof. Jiang Yuchi, Director of IRCK about the Center's major achievements of 2014 and the working plan for the next year. Prof. Wang Xueqiu, on behalf of the International Center on Global-scale Geochemistry, delivered a presentation on the preparations for the signing of the agreement between the Chinese government and UNESCO as well as the inauguration of the Center.

At the business meeting which was attended only by the Committee's members and invited delegates, the submitted annual progress reports of the NWG were reviewed, and the major tasks for 2015 were proposed and discussed as the following:

1. To re-elect a new term of members of the China National Committee for IGCP;
2. To assist with the preparations for the signing of the agreement and the inauguration of the International Center on Global-scale Geochemistry under the leadership of the Ministry of Land and Resources of China and China National Commission for UNESCO;
3. To further help promote the construction and development of the International Research Center on Karst;
4. To continue to support the work of the China National Geoparks Network;
5. To follow closely and provide necessary support for the establishment of the new International Geosciences and Geoparks Programme at UNESCO.

### **Part Five: Meetings and Field Trips Organized and Attended by Chinese Geologists in 2014**

1. **IGCP-589:** (1) Organization of the Workshop of Regional Geology of Southeast Asia and East Tethys at the Institute of Geology, Chinese Academy of Geological Sciences in Beijing on Oct. 13-17, 2014; (2) Attendance in the 3<sup>rd</sup> International Workshop and Joint Field Trips of IGCP-589 held in Tehran, Iran on Oct. 19-20, 2014.

2. **IGCP-591:** (1) Attendance in IGCP-591 Annual Meeting and Joint Field Trips held in Tartu, Estonia on June 8-19, 2014; (2) Organization of IGCP 591 Field Workshop in conjunction with ISSS, ISOS and ISCS in Kunming, China on August 12-21, 2014.

3. **IGCP-600:** (1) Attendance in the 4<sup>th</sup> workshop of IGCP/SIDA-600 in Tehran, Iran on June 29, 2014; (2) Organization of the Symposia “Metallogenesis in the Eastern Tethysian Orogenic System” on August 23-25, 2014 in Kunming, Yunnan during “the 14<sup>th</sup> Quadrennial International Association on The Genesis of Ore Deposits Symposium”.

4. **IGCP-632:** Attendance in the 1<sup>st</sup> International Workshop and Joint Field Trip of IGCP-632 in Mendoza, Argentina on Sep. 26-Oct. 3, 2014.

#### **Part Six: IGCP Meetings to be Held in China in 2015**

1. **IGCP-600:** To organize the 5<sup>th</sup> Annual Workshop in Beijing in October, 2015.

2. **IGCP-608:** To organize the Annual Workshop and Joint Field Trip at Shenyang Normal University in China on August 15-20, 2015.

3. **IGCP-609:** To organize the Annual Workshop and Joint Field Trip in Nanjing, China in September 2015.

4. **IGCP-632:** To organize the Annual Workshop and Joint Field Trip in Shenyang, China on Sep. 12-13, 2015.

**Appendix:** Reports of the National Working Group of IGCP-591, 598, 632



Appendix-1:

## **Annual Report of IGCP 591 China Group: 2014**

This is the fourth year of IGCP591. All members of its China Group have conducted a series of field excursions and indoor investigations on the major biotic and geologic events of Early-Middle Paleozoic, particularly on the Great Ordovician Biodiversification Event (GOBE) and the end-Ordovician mass extinction and the survival, recovery and re-radiation aftermath, mainly in South China. Tens of relevant research achievements have been finished and published (see Appendix for details). In summary, more than 150 person-times joined the nearly 20 field excursions covering an area of main part of China, such as Zhejiang, Anhui, Guangxi, Guizhou, Hunan, Hubei, Chongqing, Sichuan, Yunnan, Henan, Shaanxi, Gansu, and Xinjiang provinces. Besides, members Zhang Yuandong and Fan Junxuan have made a series drill holes in Zhejiang and Hubei provinces for fresh rock and fossil samples of the Ordovician and Silurian systems.

Academic exchanges are the most important activities practiced by members of the China Group during 2014. We organize one international and domestic academic meeting respectively this year. Besides, 18 person-times of the Group went abroad to take part in international academic meetings giving 3 invited plenary talks, 2 keynote talks, and 10 other talks. In June 2014, Zhan Renbin and 6 other members of the Group went to Tartu Estonia to join the annual meeting of IGCP 591 this year. They gave a plenary talk and 5 other talks, and chaired one academic session for a half day during the meeting. Three Ph.D students got special financial supports from the organizer of Estonian meeting. In October 2014, Zhang Yuandong and three other members of the Group went to Mendoza Argentina to take part in the 4<sup>th</sup> International Palaeontological Congress, during which Zhang Yuandong chaired one academic session and gave an invited keynote talk. The others gave 2 academic talks. In the meantime, Fan Junxuan and three other members went to Vancouver Canada to attend the Annual Meeting of Geologic Society of America. They chaired one academic session, and gave 1 keynote talk and 3 other talks. According to the request from the organizer, they also had a training course including 3 series presentations on the quantitative stratigraphy.

The IGCP 591 Field Workshop in conjunction with the International Subcommission on Silurian Stratigraphy (ISSS), the International Subcommission on Ordovician Stratigraphy (ISOS) and the International Subcommission on Cambrian Stratigraphy (ISCS) was organized by the China Group in Kunming China during August 12 and 21. The meeting had attracted 128 delegates amongst which 43 were from 16 countries outside China. Eight academic sessions were arranged during the two-day indoor meeting including 42 talks and 3 invited plenary talks given by Prof. Mike Melchin (chair of ISSS), Prof. David Harper (chair of ISOS) and Prof. Loren Babcock (chair of ISCS) respectively. There are nearly 30 delegates from outside China sent us emails or letters giving positive assessment on the successful Kunming

meeting after they were back to their hometowns. Three chairmen of three subcommissions all posted us official letters expressing their sincere thanks to our wonderful organization of the meeting and its attached post-conference field excursion.

According to our incomplete statistics, the members of China Group have published 67 papers and monographs during 2014, amongst which 56 are senior authored by the members, 27 in SCI journals and 22 in CSCD journals. Besides, some members (Fan Junxuan, Hou Xudong, etc.) have got a patent for designing a computer software for quantitative stratigraphy (G&T Visual, V1.0).

In the year 2015, the China Group will continue their effort in pursuing the major biotic events during the Early and Middle Paleozoic and their dynamics. We will also go outside China to attend the Annual Meeting of IGCP591 to be held in Quebec City, Canada in late July 2015, and the Field Meeting in Prague region, Czech Republic in middle August 2015.

#### **Appendix: List of publications by members of IGCP 591 China Group in 2014** (group members highlighted in bold)

##### **Monographs:**

**Zhang Yuandong, Wang Yi, Zhan Renbin, Fan Junxuan**, Zhou Zhiqiang and **Fang Xiang**. 2014. *Ordovician and Silurian stratigraphy and palaeontology of Yunnan, southwest China*. Beijing, Science Press. 138 pp.

**Wang Chengyuan**. 2013. *Silurian Conodonts of China*. Hefei, China University of Science and Technology Press. 386 pp (in Chinese). (This book was actually published in early 2014.)

##### **Monograph edited:**

**Zhan Renbin** and **Huang Bing** (eds). 2014. *IGCP 591 Field Workshop 2014, Kunming China, 12-21 August 2014, Extended Summary*. Nanjing, Nanjing University Press. 246 pp.

##### **Peer-reviewed papers:**

Babcock, L. E., **Peng Shanchi**, Brett, C. E., Zhu Maoyan, Ahlberg, P. and Bevis, M. 2014. Evidence of global climatic and sea level cycles in the Cambrian, 9–11. *In: Zhan Renbin and Huang Bing* (eds), *IGCP Project 591 Field Workshop 2014, Extended Summary*. Nanjing, Nanjing University Press, 246 pp.

Babcock, L.E., **Peng Shanchi**, Zhu Maoyan, Xiao Shuhai and Ahlberg, P. 2014. Proposed reassessment of the Cambrian GSSP. *Journal of African Earth Sciences*, 98(2014), 3–10. (SCI)

Cai Xiyao, Zhang Zhili, **Li Yue**, Zhao Lina, Yang Yufang and Zhu Zhendao. 2014. Cretaceous lacustrine strata in the Caohu Sag, Tarim Basin, NW China. *Journal of Stratigraphy*, 38(2), 220–226. (CSCD)

**Chen Qing, Fan Junxuan**, Michael J. Melchin and **Zhang Linna**. 2014. Temporal and spatial distribution of the Wufeng Formation black shales (Upper Ordovician) in South China. *GFF*, 136(1), 55-59. DOI: 10.1080/11035897.2013.876660. (SCI)

Dai Tao, Zhang Xingliang and **Peng Shanchi**. 2014. Morphology and ontogeny of

- Hunanocephalus ovalis* (trilobite) from the Cambrian of South China. *Gondwana Research* 25, 991–998. (SCI)
- Fan Junxuan, Hou Xudong, Chen Qing**, Melchin, M.J., Goldman, D., **Zhang Linna** and **Chen Zhongyang**. 2014. Geobiodiversity Database (GBDB) in stratigraphic, palaeontological and palaeogeographic research: graptolites as an example. *GFF*, 136(1), 70–74. DOI:10.1080/11035897.2014.880070 (SCI)
- Hou Xudong** and **Fan Junxuan**. 2014. CONOP—A Quantitative Stratigraphic Software and an Approach to its Parallelization. 61–63. *In*: Zhan Renbin and Huang Bing (eds), IGCP 591 Field Workshop 2014, Kunming China, 12–21 August 2014, *Extended Summary*. Nanjing, Nanjing University Press. 246 pp.
- Hou Xudong, Fan Junxuan, Chen Qing** and Zhang Qing. 2014. Design and implementation of panoramic display of stratigraphic sections in Geobiodiversity Database (GBDB). *Journal of Stratigraphy*, 38(2), 129–136. (CSCD)
- Huang Bing** and **Zhan Renbin**. 2014. Species-abundance models for brachiopods across the Ordovician–Silurian boundary of South China. *Estonian Journal of Earth Sciences*, 63(4), doi: 10.3176/earth.2014. (SCI)
- Huang Bing**, Harper, D.A.T. and **Zhan Renbin**. 2014. Test of sampling sufficiency in palaeontology. *GFF*, 36(1), 105–109. (SCI)
- Huang Bing, Rong Jiayu** and **Zhan Renbin**. 2014. Essence of Lazarus taxa across mass extinction. *Acta Palaeontologica Sinica*, 53(2), 135–145. (CSCD)
- Huang Bing, Zhan Renbin** and **Wang Guangxu**. 2014. Brachiopod associations from late Rhuddanian in South China and their bathymetric significance. 57–60. *In*: Zhan Renbin and Huang Bing (eds), IGCP 591 Field Workshop 2014, Kunming China, 12–21 August 2014, *Extended Summary*. Nanjing, Nanjing University Press. 246 pp.
- Jiang Liping**, Wang Jianpo, **Li Yue** and **Ni Chao**. 2014. Stromatolite of the Lower Ordovician Lunshan Formation in Shitai, South Anhui Province, East China. *Acta Micropalaeontologica Sinica*, 31(1), 37–46. (CSCD)
- Lei Qianping and **Peng Shanchi**. 2014. *Duyungaspis* Zhang and Qian in Zhou *et al.*, 1997 (Trilobita) from the Balang Formation (Cambrian, Qiandongian) in northwestern Hunan Province and its intraspecific variations. *Acta Palaeontologica Sinica*, 53(3), 352–362. (CSCD)
- Li Jun**, Servais, T. and **Yan Kui**. 2014. The Ordovician acritarch genus *Rhopaliophora*: Biostratigraphy, palaeobiogeography and palaeoecology. *Review of Palaeobotany and Palynology*, 208, 1–24.
- Li Lixia**, Feng Hongzhen, Wang Wenhui and Chen Wenjian. 2014. A new graptolite genus *Norvegiograptus* from the Ningkuo Formation (Lower Ordovician) of Hunan Province, China. *Acta Palaeontologica Sinica*, 53(2), 172–179. (CSCD)
- Li Qiqian, **Li Yue** and Kiessling, W. 2014. Early Ordovician sponge-receptaculitid — microbial buildups in Southeastern Guizhou, South China: an example of metazoan-dominant reefs on platform margin. *GFF*, 136(1), 157–161. doi.org/10.1080/11035897.2013.862852. (SCI)
- Liang Yan, Tang Peng** and **Zhan Renbin**. 2014. Preliminary report on the chitinozoans from the Lower Ordovician Tungtzu and Hunghuayuan formations of Tongzi, northern Guizhou, southwest China. 75–79. *In*: Zhan Renbin and Huang Bing (eds), IGCP 591 Field Workshop

- 2014, Kunming China, 12-21 August 2014, *Extended Summary*. Nanjing, Nanjing University Press. 246 pp.
- Liang Yan, Tang Peng, Zhan Renbin and Wu Rongchang.** 2014. New data of early Late Ordovician chitinozoans from the Miaopo Formation at Jieling, Yichang, Central China. *GFF*, 136(1), 162–166. (SCI)
- Liang Yan, Zhan Renbin** and Jin Jisuo. 2014. The oldest known occurrence of the *Foliomena* fauna in the uppermost Darriwilian (Middle Ordovician) of South China. *Lethaia*, 47, 432–436. (SCI)
- Luan Xiacong, Liu Jianbo and Zhan Renbin.** 2014. Microfacies of the Lower to Middle Ordovician Zitai Formation of southern Anhui and its implications. 80–84. In: Zhan Renbin and Huang Bing (eds), IGCP 591 Field Workshop 2014, Kunming China, 12-21 August 2014, *Extended Summary*. Nanjing, Nanjing University Press. 246 pp.
- Luo Huilin, **Zhou Zhiyi**, Hu Shixue, Zhan Dongqin and Lu Yuxi. 2014. Stratigraphical record of Ordovician trilobites in southeastern Yunnan. *Acta Palaeontologica Sinica*, 53(1), 33–51. (CSCD)
- Luo Huilin, **Zhou Zhiyi**, Hu Shixue, Zhan Dongqin and Lu Yuxi. 2014. Faunal succession of Ordovician trilobites in eastern Yunnan. *Acta Palaeontologica Sinica*, 53(2), 146–171. (CSCD)
- Ma Lu**, Wang Jianpo, **Zhang Yuanyuan, Wang Guan and Li Yue.** 2014. Boundstones from the Upper Ordovician Lianglitag Formation in the central Tarim, NW China. *Acta Micropalaeontologica Sinica*, 31(2), 154–163. (CSCD)
- Ma Lu**, Wang Jianpo, **Zhang Yuanyuan, Wang Guan and Li Yue.** 2014. Sedimentary facies of the Late Ordovician Lianglitag Formation in the well block Tazhong 16, central Tarim, NW China. *Acta Micropalaeontologica Sinica*, 31(1), 15–26. (CSCD)
- Peng Shanchi**, Babcock, L.E., **Zhu Xuejian**, Zuo Jianxun and Dai Tao. 2014: A potential GSSP for the base of the uppermost Cambrian stage, coinciding with the first appearance of *Lotagnostus americanus* at Wa’ergang, Hunan, China. *GFF*, 136, 208–213. (SCI)
- Peng Shanchi.** 2014. Global Standard Stratotype-section and Point (GSSP, “Golden Spike”) and the GSSP research in China. *Earth Science Frontiers*, 21, 8–26. (CSCD)
- Peng Shanchi.** 2014. Invalid Cambrian chronostratigraphic units: the Changqingian and Jinanian stages proposed recently by Yuan and others (2012). *Journal of Stratigraphy*, 38(3), 324–327. (CSCD)
- Rong Jiayu** and Cocks, L.R.M. 2014. Global diversity and endemism in Early Silurian (Aeronian) brachiopods. *Lethaia*, 47, 77–106. (SCI)
- Rong Jiayu and Huang Bing.** 2014. Study of Mass Extinction over the past thirty years: A synopsis. *Science China-Earth Sciences*, 44, 1–28. (CSCD)
- Rong Jiayu, Zhan Renbin and Huang Bing.** 2014. The pre-Hirnantian Late Ordovician shallow water brachiopod biogeography of Tarim, Qaidam, North and South China: A preliminary report. 120–125. In: Zhan Renbin and Huang Bing (eds), IGCP 591 Field Workshop 2014, Kunming China, 12-21 August 2014, *Extended Summary*. Nanjing, Nanjing University Press. 246 pp.
- Rong Jiayu.** 2014. Exploring the real causes of the end-Permian mass extinction. *National Science Review*, 1(3), 326–327. (SCI?)
- Sproat, C., Jin Jisuo, **Zhan Renbin** and Rudkin, D. 2014. Morphological variability in the Late

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Appendix-2:

## **2014 Annual Report of the IGCP/SIDA 598**

### **“Environmental Change and Sustainability in Karst Systems”**

Zhang Cheng

(Institute of Karst Geology, CAGS/International Research Center on Karst Under the Auspices of UNESCO, Guilin 541004)

#### 1. Major results of Project

The major scientific achievements made by IGCP/SIDA 598 members of China working group in the year 2014 could be summarized in accordance with the main objectives of IGCP/SIDA598.

##### **1) Diel variation and influence factors of dissolved inorganic carbon in a surface creek fed by a karst subterranean stream in subtropical area, SW China**

Guancun surface creek is located in Guancun Village, Daliang Town, Rong'an County, Guangxi Zhuang Autonomous Region, SW China, which is fed by Guancun karst subterranean stream. Guancun karst subterranean stream is about 60km away from Liuzhou City. Its outlet situated in 24°52'5.34" N and 109°20'3.41" E with an altitude of about 160m above sea level. Its drainage area is about 30.5 km<sup>2</sup> which is dominated by typical karst peak-cluster in geomorphy. The geological stratum is main limestone that develops in Rongxian Formation(D3r) of upper Devonian. The annual mean temperature and rainfall in the study area are about 20°C and 1750mm, respectively. Rain season is from March to August and dry season is from September to February in study area. The Guancun surface creek which flow length is about 1.35 km with low gradient ( $<2\text{m/km}$ ) and slow flow velocity (0.2m/s) is directly recharged from the Guancun subterranean stream. Flourishing submerged plants grow in the creek channel. The sampling site is located at the surface creek mouth. High resolution data logger and high-frequency autosampler was employed to collect water samples at sampling site during July 8-14<sup>th</sup>, 2013. The high-resolution data of pH, dissolved oxygen (DO), water temperature (T) and specific conductivity (SpC) were measured at 15min interval. Water samples for analyzing hydrochemical character and  $\delta^{13}\text{C}_{\text{DIC}}$  were collected at 2 hr interval. Solar radiation and climate data were collected by a field weather station. Partial pressure of carbon dioxide(pCO<sub>2</sub>) and calcite saturation index(Sic)were calculated by a thermodynamic model(WATSPEC software). The result indicated that obviously diurnal cycle variations were observed in T, pH, DO, SpC, DIC, Ca<sup>2+</sup>,  $\delta^{13}\text{C}_{\text{DIC}}$ , Sic and pCO<sub>2</sub> in the creek. SpC, DIC, Ca<sup>2+</sup> and pCO<sub>2</sub> decreased during the daylight and increased at night. Conversely, T, pH, DO,  $\delta^{13}\text{C}_{\text{DIC}}$  and Sic increased during the daylight and decreased at night. The variation of Sic(range from 0.70 to 0.89) indicated that carbonate precipitation may occur in the creek. By calculating the thermodynamic parameters, the ratio of influence of water temperature on the pCO<sub>2</sub> variations in water was 27.48%~54.88 % in study area. DO reflecting the metabolism processes(photosynthesis and



respiration) of subaquatic plant in the creek and  $\delta^{13}\text{C}_{\text{DIC}}$  increased both in daylight and decreased at night, moreover,  $\delta^{13}\text{C}_{\text{DIC}}$  also showed a negative correlation with DIC ( $R^2=0.71$ ). The variation characteristics of  $\delta^{13}\text{C}_{\text{DIC}}$  and DO indicated that the creek was obviously influenced by subaquatic plant metabolism. Subaquatic plants consumed DIC and released  $\text{O}_2$  in daylight due to photosynthesis. Hence, DIC decreased and DO increased in water body in daylight. Creek was mainly influenced by respiration at night, which caused the increase of DIC and decrease of DO content. The ratio of influence of subaquatic plants metabolism on the  $\text{pCO}_2$  variations in water was 45.12%~72.52% in study area. The results show that DIC variation of the karst surface creek is interactively influenced by physical factors (solar radiation, T), biogenic process (subaquatic plants photosynthesis and respiration). The results will contribute to clearer exposition of DIC fate which is discharged from karst aquifer and to answer the query about the stability of karst carbon sink at some extent.

## **2) Diel Aqueous Chemical Cycling in a Typical Karst Spring-fed Stream: Controls of Biogeochemical Processes**

The study of diel variations can help to reveal biogeochemical processes that occur relatively rapidly in natural waters and also the main and important controlling factors that influence the changes of aqueous chemistry. Three-day monitoring with high resolution data logger and high frequency sampling with 1-hour interval were conducted in a typical karst spring-fed stream with abundant aquatic vegetation. Daily cycling of hydrochemistry and its changes along the stream flow were discussed and the influence of biogeochemical processes on hydrochemistry was analyzed. The results show that the changes in aqueous chemistry are closely associated with biogeochemical processes and featured as diel cycling. Concentrations of  $\text{Ca}^{2+}$  and DIC decrease during the daytime with an amplitude of 22.4%, which reflects the controls of photosynthesis of aquatic plants and suggests that the stream loses  $\text{Ca}^{2+}$ , DIC and nutrients with downstream distance, but changes of various components along the stream flow are quite different.  $\text{NO}_3^-$  concentration also tends to decrease along the stream flow, which is consistent with plant assimilation and exhibits a slightly daytime increasing and nighttime decreasing cycling in a 24-hour time scale. The latter may be caused by nitrification in such a nutrient-rich stream. Data of DOC and TOC collected at hourly interval change quickly but still have a daytime increase and nighttime decrease cycling, with daily increases of as high as 100%. These diel DOC and TOC cycles are likely caused by metabolic processes. The study of diel hydrochemical cycling and biogeochemical processes in karst spring-fed streams will improve understanding of carbon conversion rate between DIC and DOC in karst aquatic environments and thus lead to better estimation of karst carbon sink.

## **3) Preliminary Research on the Feature of Dissolved Inorganic Carbon in Wulixia Reservoir in Summer, Guangxi, China**

To gain more knowledge on the transformation process of dissolved inorganic carbon in a karst reservoir, in situ monitoring, sampling and lab experiments of water columns were carried out at various sampling sites along the flow line in Wulixia

Reservoir, Guangxi, China during early July, 2013. Results showed that: ① The hydrochemical characteristics of study areas were controlled by the carbonate equilibrium system and the hydrochemical type of all water samples was  $\text{HCO}_3\text{-Ca}+\text{Mg}$ . ② The DIC concentration decreased gradually ( DIC( Average) : from 1.03 to 0.78 mmol/L) and the  $\delta^{13}\text{C}_{\text{DIC}}$  increased gradually ( $\delta^{13}\text{C}_{\text{DIC}}$ (Average): from -10.21‰ to -6.62‰) from the reservoir end area to dam area. Meanwhile, with the depth increase in water column , the DIC concentration increased gradually ( DIC( Average) : from 0.86 to 1.05 mmol/L) and the  $\delta^{13}\text{C}_{\text{DIC}}$  decreased gradually ( $\delta^{13}\text{C}_{\text{DIC}}$  (Average): from -7.88‰ to -13.39‰) from the surface to the bottom of the reservoir. Possible reasons for these research results were found as follows: ① Dissolution-precipitation process of carbonate substance could be inhibited by other processes such as biogeochemical processes, which played little role in  $\delta^{13}\text{C}_{\text{DIC}}$  variations. ② Thermal stratification existed in the study areas which could influence the distribution of DIC and  $\delta^{13}\text{C}_{\text{DIC}}$  by affecting the distribution of plankton and its orientation and strength of metabolism process, and the extent of organic matter decomposition, and so on.

#### **4) Karst development characteristics in western Thailand and their correlation to southwest China karst region**

Thailand is situated in the central part of Indo-China Peninsular. Geographically, both the Peninsular and southwest China karst region are in the same zone of global karst environment. Study on karst in Thailand is mainly focused on southern Shan states plateau in the north and Phang Nga Bay of Karbi Province in the south. Karst area in Thailand is about 50,000 km<sup>2</sup>, one fourth of the total area of Indo-China Peninsular. Typical landscapes of karst are well developed, including plateau pojie, peak cluster, peak valley and offshore peak forest. All those landscapes are important in the research field of global karst correlation.

From year of 2012, supported by China Geological Survey, an international project, titled “Correlation study of karst geology between China and Indo-China Peninsular” was carried out by the Institute of Karst Geology, cooperating with the Department of Groundwater Resources of Thailand. Survey data indicated that karst in Thailand is mainly distributed in the west part in north-south direction, crossing 11 degree (N19.3° to N8.5°) of terrestrial latitude. Various karst landscapes with different hydrogeochemistry were developed in different latitude zone.

At present, the first station for karst hydrogeological and carbon cycle monitoring was installed at Phu Toej spring, Kanchanaburi, Thailand, and one-year long high-resolution data with 15-minute time interval were acquired, including water temperature, pH value, specific conductivity and dissolved oxygen. Compared with typical underground streams or springs in southwest China karst region, hydrochemistry of Phu Toej spring is featured as higher values of  $[\text{Ca}^{2+}]$  (100-120 mg/L),  $[\text{HCO}_3^-]$  (8.6-9.3 mmol/L) and specific conductivity(700-777  $\mu\text{s}/\text{cm}$ ). It indicated that the intensity of karst processes in this catchment is much greater than that in southwest China karst region, thus potentially forming higher karst carbon sink intensity in such a tropical monsoon climate zone.

## 5) The Carbon Sink during Karst Water Cycle in the Epikarst Dynamical System of Nongla, Guangxi

Based on years' automatic monitoring of dynamic hydrological state of an epikarst spring in Nongla, Guangxi, the authors found that, under the good vegetation coverage, the discharge mode is different in different seasons. It is mainly the runoff discharge by spring in the wet season and consumption of ecological water requirement in the dry season. In 2012, the precipitation from April to August accounted for 66.24% of the whole year. At the same time, the discharge of spring accounted for 90.89% and the karst carbon sink accounted for 90.46% of the whole year. It is evident that the karst carbon sink occurs mainly in the wet season because of the higher runoff coefficient. In the study area, carbon sink is controlled by rainwater dilution, CO<sub>2</sub> effect and water-rock interaction (WRI). At the beginning of precipitation, the concentration of HCO<sub>3</sub><sup>-</sup> is continuously reduced, controlled by rain dilution. However, it is also obviously affected by CO<sub>2</sub> effect and WRI. HCO<sub>3</sub><sup>-</sup> concentration fluctuation with time. At the later stage of spring discharge, WRI is dominant again and HCO<sub>3</sub><sup>-</sup> concentration tends to be somewhat stable. From the monitoring data obtained in the past decade, the concentrations of Ca<sup>2+</sup>, Mg<sup>2+</sup> and HCO<sub>3</sub><sup>-</sup> in the karst dynamic system were significantly increased with the recovery of the secondary forest vegetation. With the concentration of HCO<sub>3</sub><sup>-</sup> as an example, the average value was 356.55 mg/L during the period of 2003-2005, whereas it was 432.97 mg/L in 2012, the difference being 76.42 mg/L, and the value was increased by 21.4% during the ten years.

## 2. Scientific activities

### (1) Symposia.

*Workshop on Sharing Information in Karst Water Resources in the Middle East* in Ankara, Turkey May 27-29, 2014.

From May 27-29, 2014, the *Workshop on Sharing Experiences in Karst Water Resources in the Middle East* was held in Ankara, Turkey at Hacettepe University as joint project of IGCP598 and the IHP MEDFRIEND program. The workshop was very much a contribution in line with the goals of SIDA for IGCP598, as the project has a mandate to enhance capacity building in Africa, the Arab Countries, and Iran. 35 participants in the workshop represented 11 countries, including Iran, Lebanon, Jordan, Morocco, Palestine, Algeria, Turkey, US, Switzerland, France and Spain. Professor Michel Bakalowicz, head of the MEDFRIEND karst program who has extensive experience working in water resources issues in the Mediterranean region, was instrumental in identifying and communicating with participants. The event was excellently hosted by the Hacettepe University's International Research and Application Center for Karst Water Resources, led by renowned Turkish karst scientist Professor Mehmet Ekmekçi. Appreciation is very much expressed to Professors Bakalowicz and Ekmekçi who were key to the success of the event.

While some challenges are similar in karst regions around the world, some discussed here were specific to the region. After hearing Jordanian hydrogeologist Mohammad Al Hyari describe a karst spring in Jordan contaminated with waste from

olive oil production discussion revealed that in fact this turns out to be pretty common problem around the Mediterranean countries.

Participants were also astounded to learn that in some dry countries high water demand produce such as oranges and tomatoes are grown with costly irrigation and then shipped to water-rich countries in Europe, essentially equivalent to exporting “virtual water” from parched desert regions. In water-starved Morocco, water tables in the country are dropping by more than five feet per year when this happens. Swiss scientist Myriam Saadé-Sbeih also talked about how her team’s hydrologic fieldwork in Syria has become too dangerous to complete because of the war there.

This was an excellent opportunity for synergy and for participants to get to know one another, many of whom had never met before and who have had relatively little interaction with colleagues in the other nations that were represented.

## **(2) Business Meetings.**

Co-leader Professor Bartolomé Andreo and colleagues hosted also the V International Symposium on Karst in Malaga Spain October 14-16, including the training course Hidrokarst. More than one hundred contributions have been received from around 30 countries of the five continents. The best papers will be selected for inclusion in a special issue of Environmental Earth Sciences. Although funding will not go towards that meeting, the logo is included in the conference materials and there was an IGCP598 business meeting, the principal one of the year.

## **3. Work plan of year 2015**

This is the last year of the project. Understanding and development of karst water resources continues to grow as a societal challenge impacting millions of people, and so the ideas of the karst IGCP projects continue to increase in relevance. Discussion is underway to consider an application for a successor project in 2014.

## **4. List of important publications**

- 1) Alam MJ, Yuan D, Jiang YJ, Sun Y, Li Y, Xu X. 2014. Sources and transports of polycyclic aromatic hydrocarbons in the Nanshan Underground River, China. *Environmental Earth Sciences* 71: 1967-1976.
- 2) Pu J, Yuan D, Zhao H, Shen L. 2014. Hydrochemical and PCO<sub>2</sub> variations of a cave stream in a subtropical karst area, Chongqing, SW China: piston effects, dilution effects, soil CO<sub>2</sub> and buffer effects. *Environmental Earth Sciences*, 71: 4039-4049.
- 3) Mo Xue, Pu Junbing, Yuan Daoxian, Zhang Cheng, He Shiyi et al. 2014. Diel variation and influence factors of dissolved inorganic carbon in a surface creek fed by a karst subterranean stream. *Quaternary Sciences*. 34(4): 873-880(In Chinese with English Abstract)
- 4) Marín AI, Ravbar N, Kovačič G, Andreo B, Petrič M. 2014. Application of Methods for Resource and Source Vulnerability Mapping in the Orehek Karst Aquifer, SW Slovenia. In *H2Karst Research in Limestone Hydrogeology* (pp. 139-150). Springer International Publishing.

- 5) Zhang Tao, Pu Junbing, Yuan Daoxian, Zhang Cheng, He Shiyi et al. 2014. Diel variations of hydrochemistry and influencing factors in a surface stream in subtropical karst area, SW China. *Environmental Science*. 35(8): 2944-2951(In Chinese with English Abstract)
- 6) Zhang Cheng, Jiang ZHongcheng, Mahippong Worakul, Pu Junbing, Lv Yong. 2014. Karst topography and hydro-geochemical characteristics in western Thailand and their correlation to that in southwestern China. *Carsologica Sinica*. 33(1): 1-8(In Chinese with English Abstract)
- 7) Liu Wen, Pu Junbing, Yu Shi, Zhang Cheng, Au Yikyu et al. 2014. Preliminary research on the feature of dissolved inorganic carbon in Wulixia reservoir in summer, Guangxi, China. *Environmental Science*. 35(8): 2959-2966(In Chinese with English Abstract)
- 8) Mudarra M, Andreo B, Barberá JA, Mudry, J. 2014. Hydrochemical dynamics of TOC and NO<sub>3</sub><sup>-</sup> contents as natural tracers of infiltration in karst aquifers. *Environmental Earth Sciences* 71: 507-523.
- 9) Junbin Pu, Min Cao, Yuanzhu Zhang, Daoxian Yuan, Heping Zhao. 2014. Hydrochemical indications of human impact on karst groundwater in a subtropic karst area, Chongqing, China. *Environ Earth Sci*. 72: 1683-1695
- 10) Zhang Cheng, Mahippong Worakul, Wang Jinliang, Pu Junbing, Lv Yong et al. 2014. Hydrogeochemical features of karst in the western Thailand. *Journal of Groundwater Science and Engineering*. 2(2): 18-26

## 2014 Annual Report of IGCP-632

### 1. Summary

It is the report of the first year of project activity since its launch in May 2014. And major achievements of 2014 are listed as follows:

1. Initiation of project, information dissemination and call for participation  
At the acceptance of the project the information was launched to the entire network and globally distributed. Circulars were sent out with information about the project and information on the joint meeting planned for end-September was distributed.
2. Design and launch of the new website [www.igcp632.org](http://www.igcp632.org)  
The project website ([www.igcp632.org](http://www.igcp632.org)) has been a highly-visible and widely utilized hub for the continental Jurassic research community. It has been regularly updated and includes important and useful downloadable content such as conference volumes, social activities.
3. First symposium of IGCP632 in Mendoza, Argentina, 26 September – 3 October, 2014
4. During the meeting in Mendoza, a preliminary plan for the coming four years was outlined and several working groups were formed. Further, national representatives were appointed (See attached material).
5. Plans were established for one major meeting and, several continental and national workshops in 2015
6. Special Issue planned in *Palaeo* 3 and proposal submitted to journals editor  
Argentina\*, Australia, Austria, Belgium, Brazil\*, Canada, China\*, Czech Republic, Denmark, Egypt, France, German\*, India, Iraq, Italy, Japan\*, Korean, Lithuania, Mexico\*, Morocco\*, New Zealand\*, Norway\*, Pakistan\*, Poland\*, Romania, Russia\*, Slovak, South Africa, Spain, Sweden\*, Switzerland, Tanzania\*, Thailand, Tunisie, UK\*, Ukraine\*, Uruguay, USA\*, Vietnam. (39 countries)

### 2. Symposia with exact attendance (if possible) and number of countries

The first IGCP632 conference was a great success, and in spite of the short time available for preparation, a well visited session was held, preceded by a business meeting and followed by several fieldtrips, e.g., “A continental Triassic Voyage” and “A Triassic History of the Cuyana Basin: Geology, Fossils, Fuels and Wine”. 40+ participants from 15 countries attended.

Following in depth scientific discussions, new collaborations were initiated and the core group provided a clear strategy for the coming year.

We built up links with IGCP 608 and 609, and the members are being actively encouraged to get involved in IGCP632 by participating meetings and contributing material.

Participants are also active in the symposium of IGCP 608 “Cretaceous

Ecosystem of Asia and Pacific”, Tokyo, Japan, September 04-06, 2014; the 6<sup>th</sup> Symposium of UNESCO conference on Global Geoparks, Saint John, Canada, September 9-22, 2014.

### **3. Activities planned**

- (1) Special publication in PPP based on the presentation at the first session in Mendoza, second special issue following the meeting in China 2015 is already scheduled as well.
- (2) Further development of the website.
- (3) Carry through meetings at all continents, with the different co-leaders as organizers for each meeting. The meeting for 2016 is planned to be held in Cape Town, South Africa at the IGC.
- (4) Discussion on producing a video with information about the Jurassic period, and with shots from the different field trips. This would give a global coverage of interesting sites and with speakers voice providing information. This would be aimed for general public with the goal to disseminate knowledge to the society.
- (5) Special session at the Nordic Winter meeting to be held in Helsinki in January 2016; The working group specialised on the Jurassic-Cretaceous boundary will convene in Ukraine during spring 2015; PALASS meeting (British Paleontological Association) in Leeds, December 15-18, 2014.

### **4. Publications**

As this is the first year of the project and we got the positive reply during the spring this year, we have yet few published papers but several in the pipe line.

One important outcome is the abstract volume of the 1 symposium of IGCP632 in Mendoza, Argentina (see attached material), and a special issue on the presentations of the meeting is scheduled.

### **5. Papers**

1. JingengSha, Xin Rao, Huawei Cai, Yanhong Pan, Yaqiong Wang, 2014. Pan-tropical distribution of the Jurassic ostreid bivalves. *Palaeoworld*, 23: 155-161.