

# 2015 ANNUAL REPORT

## CHINA NATIONAL COMMITTEE FOR IGCP

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Prof. Deng Jun	President, China University of Geosciences (Beijing)
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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. 600	Metallogenesis of Collisional Orogens Prof. Hou Zengqian
No. 630	Permian-Triassic Climatic and Environmental Extremes and Biotic Response

- No. 632 Prof. Chen Zhong-Qiang  
Continental Crises of the Jurassic
- No. 649 Prof. Sha Jingeng  
Diamonds and Recycled Mantle
- Prof. Yang Jingsui

**II. 7 Projects with Project Co-Leader from China:**

- 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
- No. 641 Deformation and fissuring caused by exploitation of subsurface fluids  
Prof. Shujun Ye

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

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

**1) Attending the 43<sup>rd</sup> Session of IGCP Scientific Board:** The China National Committee for IGCP was unable to attend the 43<sup>rd</sup> Session of IGCP Scientific Board in 2015 due to other pre-occupied obligations. The annual report, covering the major activities of the National Committee in the year of 2015, was compiled and sent to the IGCP Secretariat on time.

**2) One IGCP project with Chinese scientists as the Leader being newly approved in 2015:** With the support of the China National Committee for IGCP, one new IGCP projects with Chinese scientists as the Leader got approval of the IGCP Scientific Board, namely:

- ◆ IGCP-649 “Diamonds and Recycled Mantle, led by Prof. Yang Jingsui from the Institute of Geology, Chinese Academy of Geological Sciences

**3) Recommending IGCP proposals to the IGCP Scientific Board:** In 2015, the China National Committee for IGCP recommended 3 IGCP proposals initiated or co-initiated by Chinese scientists, including:

- ◆ IGCP proposal “ Coupling instrumental, historical, archaeological, and

geological records of sea-level change over minutes to millennia” co-initiated by Prof. Yu Fengling from the College of Ocean & Earth Sciences, Xiamen University

- ◆ IGCP proposal “The onset of the Great Ordovician Biodiversification Event” co-initiated by Prof. Zhang Yuandong from the Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences
- ◆ IGCP proposal “Magnetic susceptibility and cyclostratigraphy – improvement of Paleozoic time scales” co-initiated by Dr. Daishuang from Lanzhou University

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

The proposal for the establishment of an International Center on Global-scale Geochemistry in Langfang, China was officially approved at the 37<sup>th</sup> UNESCO General Conference in 2013. The establishment of the Center was officially approved by the State Council of the People’s Republic of China in 2015. Communications and preparations are being made for the signing of the Agreement and the inauguration of the Center.

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 in March 2016 and the Center inaugurated in May 2016. The UNESCO Assistant Director-General for Natural Sciences and officials from the Division of Ecological and Earth Sciences will be invited to attend the inauguration ceremony of the Center to take place at the Institute of Geochemical and Geophysical Exploration, Chinese Academy of Geological Sciences in Langfang of Hebei Province, China in May 2016.

## **3. 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 2015, 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. Relevant domestic formalities are undergoing for the approval of the new Agreement. It is expected that the renewal of the Agreement will be completed in 2016.

#### **4. 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. At the invitation of UNESCO, China sent 7 Chinese experts to conduct field assessment of 2 aspiring global geoparks and revalidation of 5 existing 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; Assisting with Chinese aspiring global geoparks to make applications to UNESCO;
3. The Chinese delegation attended the 4<sup>th</sup> Asia-Pacific Geoparks Network (APGN) Symposium that took place in the San'in Kaigan Geopark, Japan, from 16 to 20 September. Two new Chinese sites – Dunhuang and Zhijin Cave, together with seven other geosites around the world, were added to the UNESCO Global Geoparks Network. With the two newly-designated, the number of Global Geoparks in China now reaches 33, the largest number of Global Geoparks hosted by a country at the current stage.
4. The Chinese delegation attended the 38<sup>th</sup> UNESCO General Conference held at the UNESCO headquarters in Paris on November 3-19, 2015. The Chinese delegation actively supported the new UNESCO Programme "International Geosciences and Geoparks Programme, which was ratified at the General Conference.

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

With the help of the China National Commission for UNESCO, the 2015 contribution of 20,000 USD to IGCP was remitted to UNESCO in due time to support IGCP projects.

#### **Part Five: Meetings and Field Trips Organized and Attended by Chinese Geologists in 2015**

1. **IGCP-589:** Attendance of IGCP-592 Workshop held in conjunction with the

First China-Russia Meeting on the Central Asian Orogenic Belt in Beijing on September 23-25, 2015. Attendance of the fourth international symposium of IGCP Project 589 held on October 26-27, 2015 in the campus of Chulalongkorn University in Bangkok, Thailand.

**2. IGCP-592:** Co-organization of the Annual Workshop in conjunction with the First China-Russia Meeting on the Central Asian Orogenic Belt in Beijing on September 23-25, 2015.

**3. IGCP-600:** Organization of the 5<sup>th</sup> Annual Workshop in Beijing in October, 2015.

**4. IGCP-608:** Organization of the 3<sup>rd</sup> Symposium of the International Geosciences Program IGCP 608” held in Shenyang of Liaoning Province, China on July 15-20, 2015.

**5. IGCP-609:** Organization of the Annual Workshop and Joint Field Trip in Nanjing, China in September 2015.

**6. IGCP-632:** The 2nd symposium was held in the Northeastern University of China, Shenyang, including a two-day presentation (12 to 13 Sept.), and a six-day field excursion in western Liaoning and adjacent Inner Mongolia after the congress (14 to 19 Sept.). “Geologic and biotic events on the continent during the Jurassic/Cretaceous transition” is the theme of this symposium, which contains three major sessions: 1) Integrated paleontology and stratigraphy, 2) Palaeogeography, palaeoclimatology and palaeoecology, and 3) Coevolution of organisms and environments.

**7. IGCP-649:** Organization of the Initial Workshop on IGCP-649 “Diamonds and Recycled Mantle”-“Ophiolite and related high pressure rocks in the Qilian Mountain” in Xining of Qinghai, China on August 5-10, 2015.

## **Part Six: IGCP Meetings to be Attended by Chinese Geologists in 2016**

**1. IGCP-589:** To take part in the Fifth International Symposium of IGCP-589 to be held in Myanmar in 2016 and field excursions.

**2. IGC-608:** To attend the joint session “Cretaceous sea-level changes and Asia-Pacific Cretaceous Ecosystems (IGCP 609, IGCP 608, ICDP Songliao Basin)” , the 35th International Geological Congress, August 27 – Sept. 4, 2016, Cape Town, South Africa. To attend the Fourth International Meeting of IGCP608 at Novosibirsk, Russia on 15-20, August 2016. To attend the “16th Micropaleontology Conference of China” organized by the Micropaleontological Branch of the China paleontological society at Hezhen, Gansu, China on 24-28, June 2016.

The meeting for 2016 is planned to be held in Cape Town, South Africa at the IGC.

**3. IGCP-632:** To organize and attend the Annual Workshop at the 35<sup>th</sup> IGC to be held in Cape Town, South Africa.

**4. IGCP-649:** To organize and attend 2016 IGCP-649 workshop on the opholite and related chromite in Cyprus and field excursion on the Troodosophiolite during 14th-20th May, 2016. To attend the 5th International Geological Congress session “Diamond and Crustal Recycling into Deep Mantle” under The Deep earth symposia in Cape Town, South Africa during 27th Aug-4th Sep, 2016; To attend the 2017 IWTOMA meeting in Wuhan, China.

**Appendix:** Reports of the National Working Group of IGCP-589, 608, 609, 632 and 649

Appendix 1:

**Annual Report (2015) of the Chinese Working Group of IGCP-589**  
**“Development of the Asian Tethyan Realm: Genesis, process and outcomes”**

IGCP-589 is aimed to carry out multi-disciplinary investigations in key areas of the Tethysides to explore the evolution of the Asian Tethyan Realm. The project duration is from 2012 to 2016.

Participants of the Chinese Working Group are mainly from Institute of Geology of CAGS, Nanjing University, China University of Geosciences, Northwest University, Beijing University, Nanjing Institute of Geology and Palaeontology of CAS, and Institute of Geology and Geophysics of CAS.

Listed below are major activities/achievements of the group in 2015.

**1. Editing the second thematic issue “Asian Tethyan Realm” as a special issue of *International Journal of Earth Sciences*.**

IGCP-589 held its Second and Third International Symposia in Philippines (November 2013) and Iran (October 2014), respectively. Colleagues have put forward remarkable results and interesting ideas/models. Some colleagues, however, could not attend the meetings due to various reasons, but their research on the problems related to the development of the Asian Tethyan Realm continued as usual. Selective authors are solicited to contribute to the second thematic issue of the project, which will appear as a special issue of the *International Journal of Earth Sciences*. Editing work of submitted manuscripts have been carried out by the guest editors Xiaochi Jin and Wenjiao Xiao since June.

We have now 17 intended contributions, several more are expected to come. Of the 17 intended contributions, 3 will tackle the problems related to the development of Iranian blocks in the Tethysides by means of geochemical, biostratigraphic and sedimentologic methods; 4 will deal with sedimentary environment of two key basins and granites of the central and south Qiangtang terranes of the Tibetan Plateau; 1 will try to elucidate the timing and mode of the closure of the eastern Palaeo-Asian ocean by means of biostratigraphic methods; 1 is going to make a paleomagnetic appraisal of Gondwana dispersion and Asia Accretion based on data from various blocks in China; 1 is going to explore the Cretaceous reworking on the Late Triassic HP-UHP orogen in east-central China; 3 will focus on the Permian sedimentary history and biogeographic features of the Gondwana-derived blocks in western Yunnan, China and neighboring Myanmar; 3 will tackle stratigraphic and sedimentary problems in Thailand and Laos of mainland Southeast Asia; 1 will study the Triassic carbonates in



the Buruanga Peninsula, Panai Island in Philippines and try to find out constraints on the history of the Palawan Block.

## **2. Attending the Workshop of IGCP-592**

This year's Workshop of IGCP 592 was held in conjunction with the First China-Russia Meeting on the Central Asian Orogenic Belt in Chinese Academy of Geological Sciences, where the leader of IGCP-589 (X. Jin) works. Many active Chinese participants of IGCP-589 took part in the meeting and explored the connections between the development of the Asian Tethyan Realm and the Central Asian Orogenic Belt. X. Jin personally was interested in the overlapping of the so-called Paleo-Asian Ocean and Paleo-Tethys.

## **3. Attending the Fourth International Symposium of IGCP-589 and the post-symposium excursion**

The fourth international symposium of IGCP Project 589 was held on October 26-27, 2015 in the campus of Chulalongkorn University in Bangkok, Thailand. A five-day (Oct. 28- Nov. 1) post-symposium field excursion was conducted in the Lampang–Chiang Mai area in northern Thailand.

More than 40 participants from Australia, Belgium, China, Japan, Malaysia, Myanmar, Philippines, Thailand, Turkey, UK, and Vietnam took parts in the symposium and exchanged their latest understandings of the development of the Tethys. 27 oral and 16 poster presentations were given addressing problems of tectonic configuration, regional geology, biostratigraphy, paleogeographic evolution, geochemistry, petrology, and mineral resources exploration related to the development of the Asian Tethyan Realm. It is encouraging that many students from different countries took parts in the symposium. Also a large number of the students of the Department of Geology, Chulalongkorn attended the meeting. They functioned as hosts, staff members and participants. Four delegates from China took part in the symposium, two joined the post-symposium excursion. X. Jin gave an oral presentation with the title “Is the West Burma block Gondwana- or Cathaysia-derived? - A Permian paleobiogeographic and regional geological reappraisal”; H. Huang talked about the “Mid- Permian fusulinids of the Bawei Section in southern Baoshan Block of western Yunnan, China with a discussion on paleogeographic implications”; X. Qian et al. made a poster presentation of “Geochronological and geochemical constraints on the mafic rocks along the Luang Prabang zone: Carboniferous back-arc setting in northwest Laos”

## **4. Two workshops on the problems related to the development of Tethys**

Chinese colleagues who are interested in the development of Tethys have gathered at two workshops held in Beijing. These workshops were aimed to find out key problems related to the evolution of the Tethyan Realm, and to define the study objectives for the related projects of National Natural Science Foundation of China.

### **5. The website of IGCP-589 has been timely updated and enriched**

The project website <http://igcp589.cags.ac.cn/> is constantly maintained by the project leader X. Jin. It contains various data and materials related to the project, and provides a convenient platform for information-briefing and data-sharing, as well as diffusing geological knowledge to the public.

### **6. Plan for next year**

- 1) Encourage and coordinate the Chinese participants of the project to play a more active role in the study of the Asian Tethysides and conduct timely communication.
- 2) Encourage more Chinese colleagues to take part in the Fifth International Symposium of IGCP-589 to be held in Myanmar in 2016 and field excursions.
- 3) Keep the project website in good condition.

### **7. Publications related to the project**

Specific achievements of various researchers are contained in the following peer-reviewed publications:

- Bao, Z., Wang, C.Y., Zeng, L., Sun, W., Yao, J., 2015. Slab break-off model for the Triassic syn-collisional granites in the Qinling orogenic belt, Central China: Zircon U-Pb age and Hf isotope constraints. *International Geology Review*, 57, 492-507.
- Cai, S., Wang, Q., Liu, X., Feng, Y., Zhang, Y., 2015. Petrography and detrital zircon study of late Carboniferous sequences in the southwestern North China Craton: Implications for the regional tectonic evolution and bauxite genesis. *Journal of Asian Earth Sciences*, 98, 421-435.
- Cai, Y., Lu, J., Ma, D., Huang, H., Zhang, H., Zhang, R., 2015. The Late Triassic Dengfuxian A-type granite, Hunan Province: age, petrogenesis, and implications for understanding the late Indosinian tectonic transition in South China. *International Geology Review*, 57, 428-445.
- Chan, G.H.N., Aitchison, J.C., Crowley, Q.G., Horstwood, M.S.A., Searle, M.P., Parrish, R.R., Chan, J.S.-L., 2015. U-Pb zircon ages for Yarlung Tsangpo suture zone ophiolites, southwestern Tibet and their tectonic implications. *Gondwana Research*, 27, 719-732.

- Chen, C., Zhang, Z., Li, K., Chen, Y., Tang, W., Li, J., 2015. Geochronology, geochemistry, and its geological significance of the Damaoqi Permian volcanic sequences on the northern margin of the North China Block. *Journal of Asian Earth Sciences*, 97, 307-319.
- Chen, J., Tong, J., Song, H., Luo, M., Huang, Y., Xiang, Y., 2015. Recovery pattern of brachiopods after the Permian-Triassic crisis in South China. *Palaeogeography Palaeoclimatology Palaeoecology*, 433, 91-105.
- Chen, Y., Jiang, H., Lai, X., Yan, C., Richoz, S., Liu, X., Wang, L., 2015. Early Triassic conodonts of Jiarong, Nanpanjiang Basin, southern Guizhou Province, South China. *Journal of Asian Earth Sciences*, 105, 104-121.
- Cheng, H., Liu, Y., Vervoort, J.D., Lu, H., 2015. Combined U-Pb, Lu-Hf, Sm-Nd and Ar-Ar multichronometric dating on the Bailang eclogite constrains the closure timing of the Paleo-Tethys Ocean in the Lhasa terrane, Tibet: *Gondwana Research*, v. 28, p. 1482-1499.
- Dong, Y., Santosh, M., 2015. Tectonic architecture and multiple orogeny of the Qinling Orogenic Belt, Central China. *Gondwana Research*, 29, 1-40.
- Du, X., Chen, X., Wang, C., Wei, Y., Li, Y., Jansa, L., 2015. Geochemistry and detrital zircon U-Pb dating of Lower Cretaceous volcanoclastics in the Babazhadong section, Northern Tethyan Himalaya: Implications for the breakup of Eastern Gondwana. *Cretaceous Research*, 52, 27-137.
- Fan, J.-J., Li, C., Liu, Y.-M., Xu, J.-X., 2015. Age and nature of the late Early Cretaceous Zhaga Formation, northern Tibet: constraints on when the Bangong-Nujiang Neo-Tethys Ocean closed. *International Geology Review*, 57, 342-353.
- Fan, J.-J., Li, C., Wang, M., Xie, C.-M., Xu, W., 2015. Features, provenance, and tectonic significance of Carboniferous-Permian glacial marine diamictites in the Southern Qiangtang-Baoshan block, Tibetan Plateau: *Gondwana Research*, 28, 1530-1542.
- Hu, W.-J., Zhong, H., Zhu, W.-G., He, X.-H., 2015. Elemental and Sr-Nd isotopic geochemistry of the basalts and microgabbros in the Shuanggou ophiolite, SW China: implication for the evolution of the Palaeotethys Ocean. *Geological Magazine*, 152, 210-224.
- Huang, H., Jin, X., Shi, Y., 2015. A Verbeekina assemblage (Permian fusulinid) from the Baoshan Block in western Yunnan, China. *Journal of Paleontology*, 89, 269-280.
- Huang, H., Niu, Y., Nowell, G., Zhao, Z., Yu, X., and Mo, X., 2015. The nature and history of the Qilian Block in the context of the development of the Greater Tibetan Plateau. *Gondwana Research*, 28, 209-224.
- Huang, W., van Hinsbergen, D.J.J., Lippert, P.C., Guo, Z., Dupont-Nivet, G., 2015.

- Paleomagnetic tests of tectonic reconstructions of the India-Asia collision zone: *Geophysical Research Letters*, 42, 2642-2649.
- Huang, X., Xu, Z., Li, H., and Cai, Z., 2015. Tectonic amalgamation of the Gaoligong shear zone and Lancangjiang shear zone, southeast of Eastern Himalayan Syntaxis. *Journal of Asian Earth Sciences*, 106, 64-78.
- Li, F., Yan, J., Chen, Z.-Q., Ogg, J.G., Tian, L., Korngreen, D., Liu, K., Ma, Z., Woods, A.D., 2015. Global oolite deposits across the Permian-Triassic boundary: A synthesis and implications for palaeoceanography immediately after the end-Permian biocrisis. *Earth-Science Reviews*, 149, 163-180.
- Li, G.-M., Li, J.-X., Zhao, J.-X., Qin, K.-Z., Cao, M.-J., Evans, N.J., 2015, Petrogenesis and tectonic setting of Triassic granitoids in the Qiangtang terrane, central Tibet: Evidence from U-Pb ages, petrochemistry and Sr-Nd-Hf isotopes. *Journal of Asian Earth Sciences*, 105, 443-455.
- Li, N., Chen, Y.-J., Santosh, M., Pirajno, F., 2015, Compositional polarity of Triassic granitoids in the Qinling Orogen, China: Implication for termination of the northernmost paleo-Tethys. *Gondwana Research*, 27, 244-257.
- Li, R., Pei, X., Li, Z., Pei, L., Liu, C., Chen, Y., Chen, G., Liu, Z., Yang, J., 2015. Geochemistry and zircon U-Pb geochronology of granitic rocks in the Buqingshan tectonic melange belt, northern Tibetan Plateau, China and its implications for Prototethyan evolution: *Journal of Asian Earth Sciences*, v. 105, p. 374-389.
- Li, X., Huang, X., Luo, M., Dong, G., Mo, X., 2015. Petrogenesis and geodynamic implications of the Mid-Triassic lavas from East Kunlun, northern Tibetan Plateau. *Journal of Asian Earth Sciences*, 105, 32-47.
- Li, Y., Wang, C., Dai, J., Xu, G., Hou, Y., Li, X., 2015. Propagation of the deformation and growth of the Tibetan-Himalayan orogen: A review. *Earth-Science Reviews*, 143, 36-61.
- Li, Y., Yang, J., Dilek, Y., Zhang, J., Pei, X., Chen, S., Xu, X., Li, J., 2015. Crustal architecture of the Shangdan suture zone in the early Paleozoic Qinling orogenic belt, China: Record of subduction initiation and backarc basin development. *Gondwana Research*, 27, 733-744.
- Liao, S.-Y., Wang, D.-B., Tang, Y., Yin, F.-G., Cao, S.-N., Wang, L.-Q., Wang, B.-D., Sun, Z.-M., 2015. Late Paleozoic Woniusi basaltic province from Sibumasu terrane: Implications for the breakup of eastern Gondwana's northern margin. *Geological Society of America Bulletin*, 127, 1313-1330.
- Liu, H., Wang, Y., Cawood, P.A., Fan, W., Cai, Y., Xing, X., 2015. Record of Tethyan ocean closure and Indosinian collision along the Ailaoshan suture zone (SW China). *Gondwana Research*, 27, 1292-1306.
- Liu, Z., Jiang, Y.-H., Jia, R.-Y., Zhao, P., Zhou, Q., 2015. Origin of Late Triassic

- high-K calc-alkaline granitoids and their potassic microgranular enclaves from the western Tibet Plateau, northwest China: Implications for Paleo-Tethys evolution. *Gondwana Research*, 27, 326-341.
- Nie, X., Feng, Q., Qian, X., Wang, Y., 2015. Magmatic record of Prototethyan evolution in SW Yunnan, China: Geochemical, zircon U-Pb geochronological and Lu-Hf isotopic evidence from the Huimin metavolcanic rocks in the southern Lancangjiang zone. *Gondwana Research*, 28, 757-768.
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- Qi, X., Zhu, L., Grimmer, J.C., Hu, Z., 2015, Tracing the Transhimalayan magmatic belt and the Lhasa block southward using zircon U-Pb, Lu-Hf isotopic and geochemical data: Cretaceous - Cenozoic granitoids in the Tengchong block, Yunnan, China. *Journal of Asian Earth Sciences*, 110, 170-188.
- Shi, M.-F., Lin, F.-C., Fan, W.-Y., Deng, Q., Cong, F., My-Dung, T., Zhu, H.-P., Wang, H., 2015, Zircon U-Pb ages and geochemistry of granitoids in the Truong Son terrane, Vietnam: Tectonic and metallogenit implications. *Journal of Asian Earth Sciences*, 101, 101-120.
- Yang, L.-Q., Deng, J., Dilek, Y., Qiu, K.-F., Ji, X.-Z., Li, N., Taylor, R.D., Yu, J.-Y., 2015. Structure, geochronology, and petrogenesis of the Late Triassic Puziba granitoid dikes in the Mianlue suture zone, Qinling orogen, China. *Geological Society of America Bulletin*, 127, 1831-1854.
- Yang, T., Ma, Y., Zhang, S., Bian, W., Yang, Z., Wu, H., Li, H., Chen, W., Ding, J., 2015. New insights into the India-Asia collision process from Cretaceous paleomagnetic and geochronologic results in the Lhasa terrane. *Gondwana Research*, 28, 625-641.
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## **2015 report from the Chinese working group, IGCP608**

### **1. General scientific achievements**

The Chinese group of IGCP608 worked in 2015 at the Cretaceous in China mainly in southern Tibet and Tarim and Songliao Basins. The studies in year 2015 mostly cover the marine (Tibet and Tarim) and non-marine (Songliao) Cretaceous succession and paleoclimatic and biodiversity changes, which are basic work for climate change during that time. We temporarily made correlation between marine and nonmarine records. About marine, our field work was mostly based on the Yadong, Gyangze, Tingri, and Gamba areas in Tibet, and in Tarim Basin, Xinjiang. In this year, we have measured 13 new sections and have put much time to process microfossils (radiolaria, foraminifera, ostracods, nannofossil, and charophytes etc.) for Cretaceous-Paleogene stratigraphy and paleontology in southern Tibet. About nonmarine, fieldwork was carried in Zhejiang, Gansu, and western Liaoning.

Records of the Cretaceous OAEs have been searching in eastern Tethys. OAE2 was almost completely documented in Southern Tibet, but OAE1 was not reported. This project focuses on the OAE1 in southern Tibet, and this work recognized the change of carbon isotope excursion.

The major scientific achievements are as follows:

#### **1) Marine Cretaceous**

##### **(1) OAE 1b was recognized in Tethys Himalaya**

Three stages of carbon isotope evolution were distinguished, separated by three boundaries. By the constrain of the stratigraphic sequence and nannofossil biostratigraphic zone CC8, the rapid  $\delta^{13}\text{C}$  change and correlation with western Tethys and Atlantic Ocean together suggest that these three boundaries of the carbon isotope evolution probably correspond to three subevent boundaries of the early Albian OAE 1b, and the subevent levels of upper Kilian, Paquier, and Leenhardt are recorded in eastern Tethys (southern Tibet). The recognition OAE 1b and paleoclimatic inference can improve the understanding of Tethys/global paleoclimate during greenhouse Mid-Cretaceous.

##### **(2) Late Cretaceous marine fossils and inferred seawater incursion events in the Songliao Basin**

The Songliao Basin is the largest non-marine oil-bearing basin in China, the

hypothesis of seawater incursion event into the Songliao Basin remains controversial. Relatively abundant benthic and planktonic foraminifera, nannofossils, marine and brackish-water algae, fish, and bivalves have been discovered in Members 1 and 2 of the Nenjiang Formation; a few foraminifera and brackish-water algae have been found in the lower Qingshankou Formation, and just a few brackish-water bivalves have been found in the uppermost Qingshankou Formation. We suggest that relatively large seawater incursion events occurred during the sedimentation of the lower Nenjiang Fm.; relatively smaller seawater incursions occurred during the deposition of the lower Qingshankou Fm., and possibly a very small seawater incursion occurred during the sedimentation of the uppermost Qingshankou Fm. The seawater incursion events in the Songliao Basin were controlled by regional tectonic activity, evolution of paleo Songliao Lake, and global sea level change.

### **(3) Late Cretaceous biostratigraphy and sea-level change in the southwest Tarim Basin**

The Upper Cretaceous sediments of the southwest Tarim Basin include the remnants of a large epicontinental sea. Based on the analyses of sedimentation, foraminifera, ostracods, bivalves, and other fossils from the Simuhana Section, as well as published biostratigraphy data, we present a field-based biostratigraphy and review of sea-level change for the Upper Cretaceous strata in the southwest Tarim Basin. The relative sea level began to rise during sedimentation of the Lower Kukebai Formation (Cenomanian), and reached a maximum by the time of the middle to upper part of the Upper Kukebai Formation (Turonian to early Coniacian). After a subsequent sea level fall, another transgression began during sedimentation of the Middle Dongba Formation. Above the Upper Dongba Formation, the sea level fell dramatically. The sea level of the southwest Tarim Basin shows a close relationship with the global sea level curve, and with the sea level of south Tibet.

## **2) Marine Paleogene**

### **(1) The youngest marine deposits preserved in southern Tibet and disappearance of the Tethyan Ocean**

Fossil ages as young as Priabonian (38 – 34 Ma) are reported for the last marine sedimentary rocks in southern Tibet. Correlation is based on examination of foraminifers and nannofossil biostratigraphy of youngest preserved sediments in sections at Gamba (Zongpu), Tingri (Qumiba) as well as a previously unreported section at Yadong. Our results demonstrate that a marine seaway remained in existence south of the Yarlung Tsangpo suture zone until at least Priabonian time. Notably this remains a maximum age estimate in this area as all sections are truncated



by erosion or faulting. We compare our results with sections throughout the Himalaya region to demonstrate that shallow marine conditions existed widely during the Eocene period. In fact, it seems likely that the marine conditions in the Tethyan Himalaya did not entirely disappear by the end of Priabonian, especially in the eastern Himalaya. The data presented in this study place direct constraints on the elimination of the Tethyan Ocean and thus have important implications for timing of the India - Eurasia collision.

## **(2) Eocene calcareous algae from Duina, Yadong,, southern Tibet**

Eocene is the demise period of the Tibetan Tethys, during which the youngest marine sediments (the highest marine layer, HML) was formed. The age of the HML stands for the final closing age of the residual basin. The HML is well outcropped in Yadong area, southern Tibet, which was named as the Zhepure Formation. Based on the detailed analysis and study on the calcareous algae fossils from the Ria East section, Duina, Yadong, 27 species of 18 genera have been identified and three assemblages have been recognized from the Zhepure Formation, which are in ascending as followings: ① *Jania denotata* - *Amphiroa iraquensis* assemblage, ② *Ovulites margaritula* - *Fucoporella diplopora* assemblage, ③ *Lithoporella melobesioides* - *Polygonella minima* assemblage. Based on the study of the characteristics of calcium alginate fossil assemblages, it is referred that during Eocene Duina region should be located in shallow shelf environment with a water depth less than 30m.

## **3) Non-marine Cretaceous**

### **(1) Palynological assemblages of Mingshui Formation and K/Pg boundary in Songliao Basin**

In order to determine the inferred position of the K/Pg boundary, the spore and pollen of Mingshui Formation in LD17 Well which is cored in west slope of Songliao Basin are analyzed. Three zonations are identified in ascending order: *Taxodiaceapollenites*-*Wodehouseia-Aquilapollenites*, *Schizaeoisporites-Pinuspollenites*-*Callistopollenites*, and *Pinuspollenites-Ulmipollenites-Tricolpollenites* zones. It is deduced that the age of zone 1 and zone 2 is Maastrichtian, while the zone 3 is of Paleocene. The result indicates a subhumid subtropical paleoclimate, with a vegetation of theropencedrymion and shrub. A cooling and wetting event might happen in the middle part of member 1 namely early Maastrichtian through analysis of characteristic fossils, consistent with the contemporaneous global cooling event during the time.

## **(2) Progress of reactive iron burial in the marine and terrestrial sediments with its implications to the genesis of source rock in Songliao Basin**

Most of the oil and gas of China originated from the terrestrial source rock while with poor constrain on the genesis of these rocks. Recent research on the marine counterpart, however, has shown that the burial of reactive iron is vital for the accumulation of organic carbon. This paper reviewed the iron cycle and its biogeochemical effects in the lake, and suggested that the reactive iron burial in the lake sediments should be affected by the sulfate reduction just like in the marine realm. The enhanced sulfate reduction will cause the large scale release of the nutrients, i.e., mainly the phosphate that will in turn stimulate the eutrophication of the lake favorable for the production and burial of organic carbon. Marine incursion events occurred during the evolution of the Songliao Basin which would have contributed for the formation of the high quality source rock in the Songliao Basin.

## **(3) Two *Pinus* species from the upper Miocene in Zhejiang, China and their palaeobiogeographic significance**

Several three-dimensionally preserved *Pinus* female cones from the upper Miocene Shengxian Formation of Zhejiang Province, eastern China, were identified as two fossils species, *Pinus preyunnanensis* X.H. Xu and B.N.Sun sp. nov. and *Pinus prekesiya* Xing, Liu and Zhou. Morphologically, comparisons of *P. preyunnanensis* sp. nov. With previously published Cenozoic cones and related extant pine cones reveal that the present species differ from all of them. The new species has the closest affinity with the extant *Pinus yunnanensis*. The occurrence of *P. preyunnanensis* sp. nov. and *Pinus prekesiya* from the upper Miocene in Zhejiang, eastern China, indicates that 1) *P. preyunnanensis* and *Pinus kesiya* (or their ancestral taxa) had a wider distribution during the late Miocene compared to the present; 2) *P. Yunnanensis* and *P. Kesiya* (or their ancestral taxa) disappeared from eastern China probably because of the prominent declining cold month mean temperature from the Miocene to the present; and 3) the differentiation of *P. yunnanensis* and *P. Kesiya* can be traced back in eastern China to at least the late Miocene.

## **(4) Atmospheric palaeo-CO<sub>2</sub> estimates based on the carbon isotope and stomatal data of Cheirolepidiaceae from the Lower Cretaceous of the Jiuquan Basin, Gansu Province**

The stable carbon isotope compositions and the stomatal parameters (stomatal density and stomatal index) of four Cheirolepidiaceae species, *Brachyphyllum ningxiaensis*, *Brachyphyllum obtusum*, *Pseudofrenelopsis dalatzensis* and

Pseudofrenelopsis, were analyzed to recover the late Early atmospheric CO<sub>2</sub> levels. The fossil plants were collected from 5 consecutive sedimentary members of the uppermost Zhonggou Formation. Based on the stomatal data, the estimated palaeo-atmospheric CO<sub>2</sub> concentrations in the Jiuquan Basin during the late Early Cretaceous were 1060-882 ppmv based on the carboniferous standardization and were 641-531 ppmv based on the recent standardization; the pCO<sub>2</sub> values present at first a decreasing and then an increasing trend within the sedimentary time of the five members. The  $\delta^{13}C_p$  values based on the 21 Brachyphyllum species showed a large variation, which ranged from -20.98‰ to -25.69‰, with an average of -24.2‰. The values also identified a C3 photosynthetic pathway for the Brachyphyllum specimens. The predicted  $\delta^{13}C_a$  values varies from -2.1‰ to -6.38‰, with an average 0‰ -5.03‰. These two proxies were irregular within the different members; therefore, the correlation with the change in atmospheric CO<sub>2</sub> concentrations was not significant. Moreover, a water-stressed environment was proposed based on the  $\delta_{13}C_a$  values of the present fossil plants, a proposal that was also supported by the previous palaeobotanical, palynological and stratigraphical evidence. In the present study, an inconsistent relationship between the stable carbon isotope and the stomata values was apparent, which most likely indicated that the stomata numbers of the plant were more sensitive to the variation in the concentration of the atmospheric CO<sub>2</sub>, whereas the  $\delta^{13}C$  values were sensitive to the moisture conditions.

(5) Second species of enantiornithine bird from the Lower Cretaceous Changma Basin, northwestern China with implications for the taxonomic diversity of the Changma avifauna.

A new enantiornithine bird, *Dunhuangia cuii*, gen. et sp. nov., was reported from the Lower Cretaceous Xiagou Formation of the Changma Basin, northwestern China. Although the material is incomplete, *Dunhuangia cuii* preserves unique coracoidal and sternal morphologies that distinguish it from other known enantiornithines; this specimen represents only the second enantiornithine reported from the Changma Basin that is diagnostic at the species level. This study enriches our understanding of the enantiornithine component of this ornithuromorph-dominated, Early Cretaceous avifauna.

In general, most works above have been published in international journals like “Palaeogeology, Palaeoclimatology, Palaeoecology”, “Ganwana Reasch” and “Cretaceous Research”, .

## **2. List of international and domestic meetings with approximate attendance**

### **(1) List of international meetings with approximate attendance**

a) Third International Meeting of IGCP608 was successfully and fruitfully finished jointly with jointly with MTE-12 (12th International Symposium on Mesozoic Terrestrial Ecosystems) at Liaoning Mansion Hotel, Shenyang, China (Symposium: 16-18 Aug. and Excursion: 19-20 Aug.). Over 145 registered participants from 16 nations including China presented 81 oral talks and 35 posters during three days symposium. In the post-symposium field excursion, 78 persons including guides and staffs took part and enjoyed the Cretaceous and Jurassic feathered dinosaur localities, excellent museums and their well-preserved specimens.

b) We 3 participants joined the Second Joint Scientific Meeting of GSA and GSC, Nov.1-4, 2015, Baltimore, Maryland, USA.

### **(2) List of domestic meetings with approximate attendance**

a) We 13 participants joined in the “28<sup>th</sup> Paleontology Conference of China” organized by the Paleontological Society of China. During the conference, we organized a special session on “Progress in Stratigraphy and Paleontology in Qinghai-Tibet Plateau”. July 10-14, 2015, Shenyang, Liaoning, China.

b) We 9 participants joined in the “3<sup>rd</sup> Symposium of the International Geosciences Program IGCP 608”. July 15-20, 2015, Shenyang, Liaoning, China.

## **3. Work plan for the coming year**

### **1) Fieldwork**

We will carry out the field investigation related with Cretaceous marine (mainly in Southern Tibet and Tarim) and non-marine (Sichuan, Zhejiang, Gansu, etc.).

### **2) International and domestic meetings**

#### **(1) International domestic meetings**

a. We will attend the joint session “Cretaceous sea-level changes and Asia-Pacific Cretaceous Ecosystems (IGCP 609, IGCP 608, ICDP Songliao Basin)” , the 35th International Geological Congress, August 27 – Sept. 4, 2016, Cape Town, RSA.

b. We will join the Fourth International Meeting of IGCP608 at Novosibirsk, Russia on 15-20, August 2016.

#### **(2) Domestic meetings**

a. We will join in the “16<sup>th</sup> Micropaleontology Conference of China” organized by the Micropaleontological Branch of the China paleontological society at Hezhen, Gansu, China on 24-28, June 2016.

## **4. List of publications**

- Du Baoxia, Sun Bainian, Zhang Mingzhen, Yang Guolin, Xing Lantian, Tang Fenjun, Bai Yanxia. 2015. Atmospheric palaeo-CO<sub>2</sub> estimates based on the carbon isotope and stomatal data of Cheirolepidiaceae from the Lower Cretaceous of the Jiuquan Basin, Gansu Province. *Cretaceous Research* xxx (2015) 1-12 (in English).
- Huang Yongjian, Wang Chengshan. 2015. Progress of reactive iron burial in the marine and terrestrial sediments with its implications to the genesis of source rock in Songliao Basin. *Chinese Journal of Nature*, 2: 79-85 (in Chinese).
- Jiang Tian, Jonathan C. Aitchison, Wan Xiaoqiao. The youngest marine deposits preserved in southern Tibet and disappearance of the Tethyan Ocean. *Gondwana Research*, xxx (2015) (in press)(in English).
- Li Guobiao, Luba Jansa, Wan Xiaoqiao, Li Hongsheng, Xiu Di, Xie Dan. 2015. Reply to the Comment on “Discovery of radiolaria from Upper Cretaceous oceanic red beds in Daba, Kangmar and its paleogeographic implication” by Li et al., 2011 [Palaeogeography, Palaeoclimatology, Palaeoecology 312 (2011) 127-137]]. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 424(2015), 204-205(in English)..
- Li Xianghui, Wei Yushuai, Li Yongxiang, Zhang Chaokai. Carbon isotope records of the early Albian oceanic anoxic event (OAE) 1b from eastern Tethys (southern Tibet, China), *Cretaceous Research*, 2015, in press. <http://dx.doi.org/10.1016/j.cretres.2015.08.015>(in English).
- LI Wei, WAN Xiaoqiao, Atsushi MATSUOKA, et al., 2015. Jurassic-Cretaceous Boundary Strata of the Somanakamura Group in NE Japan and their Correlation with Coeval Terrestrial Deposits in China. *Acta Geologica Sinica-English Edition*, 89(1): 285-299(in English).
- LIU Meiyu, HU Jianfang, WAN Xiaoqiao, 2015. The organic geochemical evidences for the lake water stratification in Lower Nenjiang Formation, Songliao Basin. *Journal of Lake Sciences*, 27(1): 190-194 (in Chinese with English abstract).
- Niu Xiaolu, Li Guobiao, Han Zichen et al., 2015. Eocene calcareous algae from Duina, Yadong,, southern Tibet. *Acta Micropalaentologica Sinica*, 32(4): 361-371 (in Chinese with English abstract).
- QIN Zuohuan, XI Dangpeng, HUANG Qinghua, et al., 2015. Ostracoda biostratigraphy and capapace characteristics in the first member of the Nenjiang Formantion from core D80 of the Songliao Basin, NE China. *Acta Micropalaentologica Sinica*, 32(3): 219-232(in Chinese with English abstract).
- Wang Min, Li Daqing, K. O'Connor Jingmai, Zhou Zhonghe, You Hailu. 2015. Second species of enantiornithine bird from the Lower Cretaceous Changma Basin, northwestern China with implications for the taxonomic diversity of the

- Changma avifauna. *Cretaceous Research*, 55: 56–65(in English).
- Xi Dangpeng., Wan Xiaoqiao, Chen Yi, et al.,2015. Late Cretaceous biostratigraphy and sea-level change in the southwest Tarim Basin, *Palaeogeogr. Palaeoclimatol. Palaeoecol.*, <http://dx.doi.org/10.1016/j.palaeo.2015.09.045>(in English).
- Xi Dangpeng, Cao Wenxin, Huang Qinhua., et al., 2015. Late Cretaceous marine fossils and inferred seawater incursion events in the Songliao Basin, NE China 10.1016/j.cretres.2015.10.025(in English).
- Xu Xiaohui, Wang Zixi, Yang Guolin, Wang Jin, Yang Yi, Ma Fujun, Wang Qiujun, Li Ruiyun, Sun Bainian. 2015. Two *Pinus* species from the upper Miocene in Zhejiang, China and their palaeobiogeographic significance. *Review of Palaeobotany and Palynology*, 215(2015): 68-75(in English).
- Zhang Xiaolin, Zhang Guijie, Sha Jingeng. 2015. Lacustrine sedimentary record of early Aptian carbon cycle perturbation in western Liaoning. *Cretaceous Research*, In Press, Corrected Proof, Available online 23 October 2015(in English).
- Amiot Romain, Wang Xu, Zhou Zhonghe , Wang Xiaolin, Lécuyer Christophe, Buffetaut Eric, Fluteau Frédéric, Ding Zhongli, Kusuhashi Nao, Mo Jinyou, Philippe Marc, Suteethorn Varavudh, Wang Yuanqing, Xu Xing. 2015. Environment and ecology of East Asian dinosaurs during the Early Cretaceous inferred from stable oxygen and carbon isotopes in apatite. *Journal of Asian Earth Sciences*, 98: 358-370(in English).
- IbaYasuhiro, Sano Shin-ichi, Rao Xin, Fuchs Dirk, Chen Tingen, Weis Robert, Sha Jingeng. 2015. Early Jurassic belemnites from the Gondwana margin of the Southern Hemisphere — Sinemurian record from South Tibet. *Gondwana Research*, 28(2): 882-887(in English).

## **5. Abstracts of International Meetings**

- Niu Xiaolu, Li Guobiao, Li Xinfu et al., 2015. The Closing age of Himalayan Tethys: New Evidence from the Planktic Foraminifera. Third International Symposium Of IGCP 608 in Shenyang,China, July 15-20th, 2015(in English)..
- Zhang Wenyuan, Li Guobiao, Li Xinfu et al., 2015. The discovery of Eocene charophytes from Duina, Yadong, southern Tibet and its signification in palaeogeography. Third International Symposium Of IGCP 608 in Shenyang, China, July 15-20th, 2015(in English).

Appendix 3:

## **Annual report of IGCP609 Chinese group**

Leader: Hu Xiumian (Nanjing University)

Leader of Chinese group: Chen Xi (China University of Geosciences, Beijing)

### **1. Progress of IGCP 609**

This year is the third year of IGCP 609. The participants studied Cretaceous short term sea-level changes and rapid paleoclimatic changes based on paleontology, stratigraphy and paleogeography researches.

This year, the active participants of IGCP 609 are mainly from Austria, China, Australia, Bulgaria, Czech Republic, Denmark, Italy, Germany, USA, and some others. IGCP 609 held the 3rd annual workshop during 5th to 11th September in Nanjing. The website of IGCP 609 (<http://www.univie.ac.at/igcp609/>) were visited by a lot of colleagues from the world. More than 10 Chinese geologists and Ph.D students attended this project. In total, 9 papers related to IGCP609 were published in international journals (including 2 in *Geology*) by Chinese participants. Besides, we attended 1 international conference and 4 Chinese scientific conferences. The following lists the annual work by Chinese group.

#### **1.1 Field work**

Chinese participants investigated and measured more than 30 sections/drilling cores and collected more than 5,000 samples this year.

1.1.1 Field trip in Tibet. We did field work to study the Cretaceous-Paleogene in Lhasa and Xigaze area. During this time, we investigated 6 sections and collected 800 samples to study the paleontology and sedimentology. We investigated the melanges and olistostromes of Xiukang, Zongzhuo and Sangxiu Formations in Xigaze area. In order to study the distribution, composition and deformation of exotic blocks, we measured six sections and mapped the blocks in different areas. We investigated Cretaceous marine strata in Tingri and Gamba area to study the paleoceanography of Eastern Tethyan Ocean. The provenance of Cretaceous were studied to analyse the provenance and basin evolution of Xigaze Forearc Basin. We also took field trip in northern Tibet to study the Lower Jurassic to Upper Cretaceous.

1.1.2 Field Trip Xinjiang. In Xinjiang province, we measured 4 sections and

collected 400 samples to investigate the late Mesozoic to Cenozoic lithostratigraphy and structural geology.

## **1.2 Tests and analyses**

1) Identification of microfossils. We identified foraminifers, radiolarians, pores and pollen, and nanofossils from ~900 samples, including the large benthic foraminifers from ~500 thin sections.

2) U-Pb ages of detrital zircon and provenance analysis. We tested the U-Pb ages and Lu-Hf isotopes on about 600 detrital zircons of sandstones from Lower Cretaceous, Triassic Xiukang Fm, and Upper Cretaceous Zongzhuo Fm in southern Tibet. We also dated ~900 detrital zircons from Cretaceous in Cuoqin Basin and Nyma Basin in northern Tibet. In total we obtained 1500 U-Pb ages and 500 Hf isotope data.

3) Elemental and isotope Geochemistry. We tested C- and O isotopes, TOC content, and CaCO<sub>3</sub> contents on ~800 samples for the late Paleocene - early Tertiary, Albian, and Cenomanian marine deposits.

## **1.3 Advances and findings**

### **1) Methane-derived authigenic carbonates of mid-Cretaceous in Southern Tibet**

Methane-derived authigenic carbonates with distinctive structures and morphologies have been documented worldwide, but they are rarely found from ancient strata in the Eastern Tethys Ocean. The methane-derived authigenic carbonates found in southern Tibet are developed in calcareous or silty shales of mid-Cretaceous age in the Xigaze forearc basin and in the Tethyan Himalaya tectonic zone. The morphology, mineralogy, elemental geochemistry and composition of carbon and oxygen isotopes of these carbonates are studied in detail. The carbonates have nodular, tubular, and tabular morphologies (Fig. 1). They are primarily composed of carbonate cement that binds and partly replaces host sediment grains; host siliciclastic sediments are composed mainly of quartz and plagioclase feldspar; a few foraminifers; and framboidal or subhedral to euhedral pyrite. Carbonate cements dominantly are micritic calcite, with minor contribution of dolomite. Nodular concretions are characterized by depleted  $\delta^{13}\text{C}$  values, commonly ranging from -30‰ to -5‰. The  $\delta^{13}\text{C}$  values show a gradual decrease from the periphery to the center, and the CaO, SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub>, Al<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, and TiO<sub>2</sub> contents generally show a gradual change.



These features indicate that the nodular concretions grew from an early-formed center toward the periphery, and that the carbon source of the nodular concretions was derived from a mixture of methane, methanogenic CO<sub>2</sub>, and seawater dissolved inorganic carbon.

The tubular concretions are characterized by  $\delta^{13}\text{C}$  values of -8.85‰ to -3.47‰ in the Shangba Section, and -27.37‰ to -23.85‰ in the upper Gamba Section. Unlike the nodular concretions, the tubular concretions show central conduits, which are possible pathways of methane-rich fluids, suggesting that the cementation of tubular concretions begins at the periphery and proceeds inward. Moreover, the tubular concretions show morphological similarity with the methane-derived carbonate chimneys, pipes and slabs reported in present-day cold seep settings. We suggest that the carbon source of the tubular concretions was derived from a mixture of seawater-dissolved inorganic carbon and oxidized methane formed by released hydrate. The tubular concretions are characterized by  $\delta^{13}\text{C}$  values of -21.87‰ to -6.67‰ in the Xiege Section. These depleted  $\delta^{13}\text{C}$  values suggest that the carbon of the tubular concretions was derived at least in part, from AOM. The tubular concretions are characterized by  $\delta^{13}\text{C}$  values of -28.81‰ to -12.99‰ in the Gamba Section. According to the  $\delta^{13}\text{C}$  values and field observation, we infer that their carbon source was more likely to be a mixture of the oxidized methane formed by released hydrate and seawater-dissolved inorganic carbon.



Fig. 1 Morphologies of methane-derived authigenic carbonates in Southern Tibet (Liang et al., 2016). A- nodular, from Xigaze forearc basin ; B- tubular, from Tethys Himalaya ; C- tabular, from Tethys Himalaya.

## 2 ) Cretaceous Oceanic Anoxic Events (OAEs) in Southern Tibet

This year, based on the studies of lithology, biostratigraphy and isotope

stratigraphy, we identified the OAE1a and OAE1d in Southern Tibet.

### ( 1 ) OAE1a

In the lower Aptian black shale/mudstone succession of Tingri area, we chanced upon a diverse and moderately to well preserved ammonite fauna (> 10 species) at four fossiliferous levels. The presence of two ammonite zones, namely *D. forbesi* and *D. deshayesi* zones, is paleontologically proved. A distinct  $\delta^{13}\text{C}_{\text{org}}$  negative excursion of  $\sim 3\%$  is a few meters below the first occurrence of *Deshayesites cf. gracilis* Casey, 1964, just around the boundary between *D. forbesi* and *D. deshayesi* zones . This event is followed by a  $\sim 1.5\%$  positive excursion. Upward, the  $\delta^{13}\text{C}_{\text{org}}$  values stay stable in a black shale interval. According to the ammonite biozones, we correlate the  $\delta^{13}\text{C}_{\text{org}}$  curve segments respectively to C3, C4 and C5 ones, recorded in the marine successions of other continents (Fig. 2).

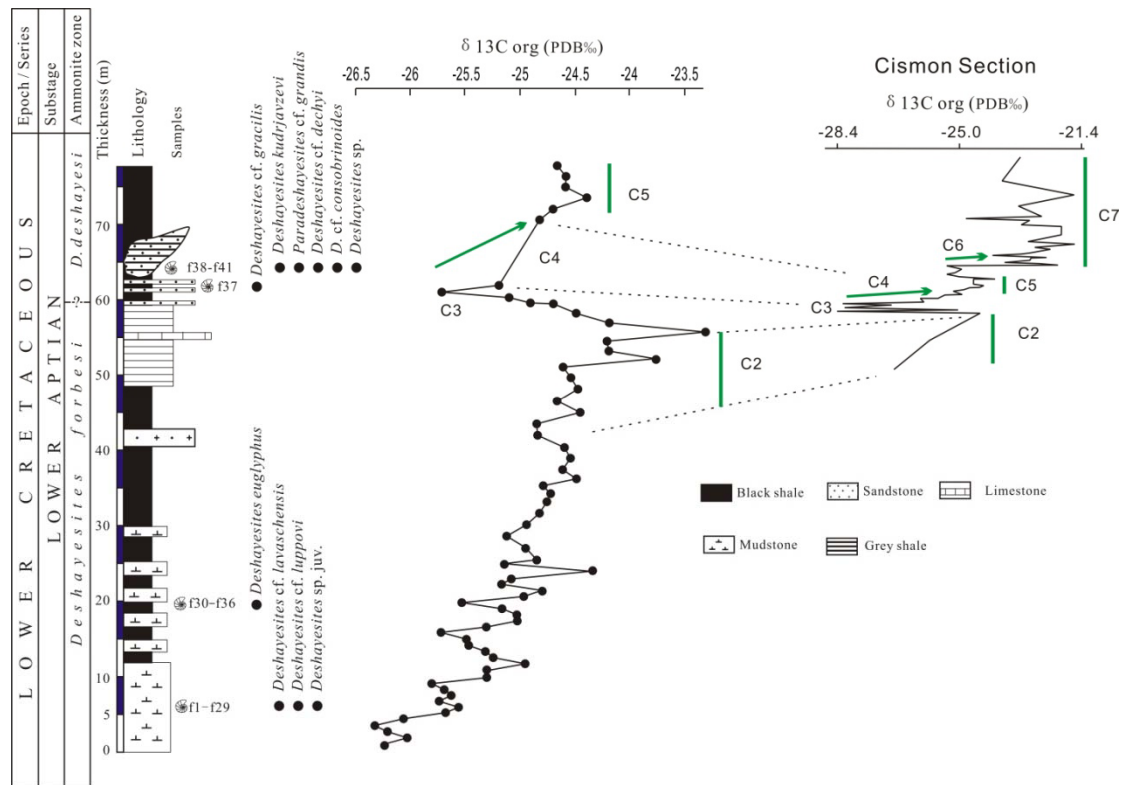


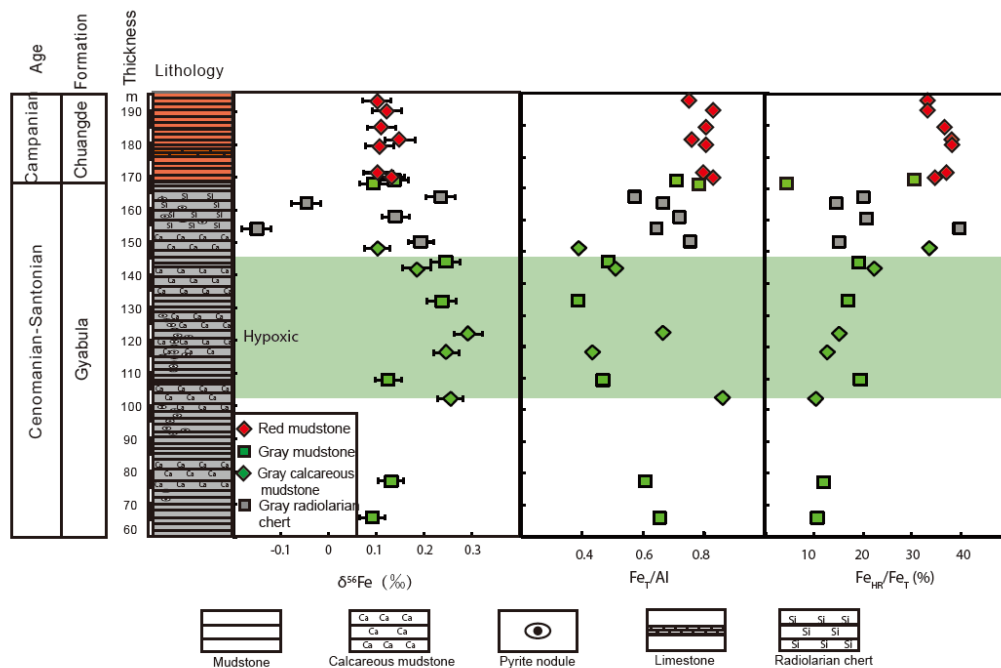
Fig. 2 Biostratigraphy and carbon isotope curve of Early Aptian in Southern Tibet

### ( 2 ) OAE1d



### 3 ) Fe isotope responses to the Black shale and Red Beds transition of Cretaceous

The Upper Cretaceous oceanic sediments record a major change from organic-rich black shales formed during Oceanic anoxic event 2 (OAE2) to Upper Cretaceous oceanic red beds (CORBs). Iron (Fe) isotope compositions of 43 samples from the Chuangde section (CD) (Fig. 4) in southern Tibet and ODP Leg 103 Site 641 A in North Atlantic (NA641) (Fig. 5) have been measured to constrain their deposition environment and to trace Fe geochemical cycling of the Late Cretaceous ocean. The OAE2 grey shales from the CD section have elevated mean  $\delta^{56}\text{Fe}_{\text{IRMM-14}}$  value of  $0.191 \pm 0.073\text{‰}$  (1SD, N = 10) with depleted Fe/Al ratios compared to lithogenic background, recording the loss of isotopically light Fe from the sediments by reduction in an anoxic environment. By contrast, the overlying red shales have uniformly constant  $\delta^{56}\text{Fe}$  values of  $0.101 \pm 0.017\text{‰}$  (1SD, N= 7) with relatively elevated mean Fe/Al ratios of 0.79, showing a  $\delta^{56}\text{Fe}$  versus Fe/Al correlation observed in modern marine sediments deposited in an oxic deep shelf below oxygen minimum zones (OMZ) in open oceans. Hence,  $\delta^{56}\text{Fe}$  versus Fe/Al correlations from the CD section reveal a deposition environment change from an anoxic to oxic shelf below OMZ, and thus might record an OMZ shoaling process during the transition from



OAE2 to CORBs.

Fig. 4 Fe isotope values of Gyabula and Chuangde Formations of Chuangde section in southern Tibet

By contrast, the NA641 section has a different  $\delta^{56}\text{Fe}$  versus Fe/Al correlation. Organic-rich black shales of OAE2 have negative mean  $\delta^{56}\text{Fe}$  of  $-0.190 \pm 0.092\text{‰}$  (1SD, N= 2) with elevated Fe/Al of 0.6. These shales may be deposited in an euxinic environment with net input of isotopically light Fe from anoxic shelf or hydrothermal fluids. The lower interval of the red shales have variably negative  $\delta^{56}\text{Fe}$  from  $-0.400 \pm 0.042\text{‰}$  (2se) to  $-0.008 \pm 0.048\text{‰}$  (2se) with the  $\text{Fe}/\text{Al}_{\text{mean}} = 0.62$ , probably reflect an oxic deposition environment below OMZ in a relatively restricted basin. The upper interval of the red shales has constant  $\delta^{56}\text{Fe}$  values ( $0.039 \pm 0.010\text{‰}$ , 1SD, N= 7) with slight Fe enrichment, indicating an oxic deposition environment below OMZ in an open ocean. Thus,  $\delta^{56}\text{Fe}$  versus Fe/Al correlations of NA641 suggest a deposition environment gradually changing from euxinia during OAE2 to oxic state after OAE2, and may record the evolution of North Atlantic from a restricted basin to an open marine in Late Cretaceous.

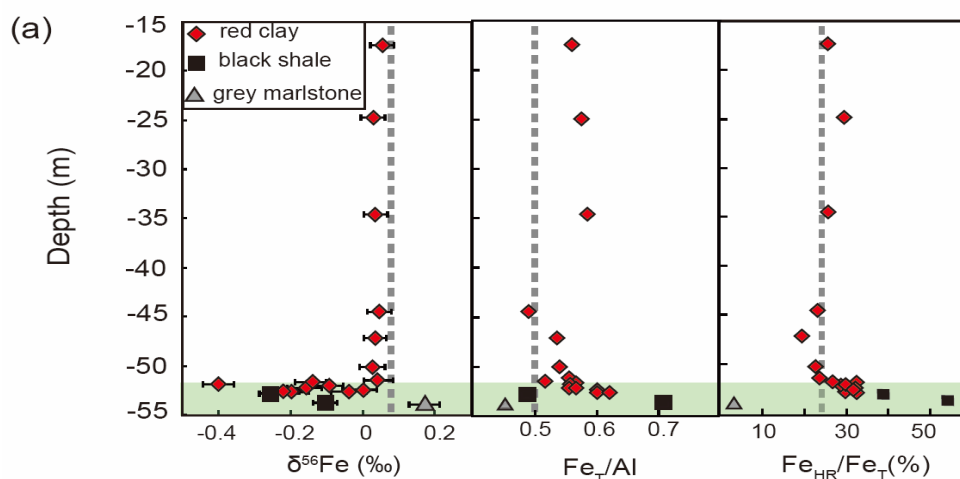


Fig. 5 Fe isotope values of OAE2 and overlying red beds of ODP Leg 103 Site 641 A in North Atlantic (NA641)

## 2. Organizing/Attending Scientific Meetings

### 1、 International workshop

During 5-11 September, 2015, Chinese group organized International Workshop on Climate and Environmental Evolution in Mesozoic Greenhouse World and IGCP609 Third Workshop on Cretaceous Sea-Level Change in Nanjing University. In total 70 specialists attended the workshop. Nine Chinese participants gave oral presentation on the workshop as listed in the table 1.

### 2、 Domestic Workshop

Chinese participants attended domestic conferences more than ten times in 2015. These conferences include "28th annual meeting of Chinese Society of Paleontology", "Annual meeting of China Union of Earth Sciences", "2015 Chinese Conference on Sedimentology", etc.

Table 1 Speakers and the title of oral presentation by Chinese participants on the workshop

Speaker	Title of presentation
Liang Huimin	Methane-derived authigenic carbonates of mid-Cretaceous age in southern Tibet: Types of carbonate concretions, carbon sources, and formation processes
Xi Dangpeng	Late Cretaceous marine fossils and seawater incursion events in the Songliao Basin
Gao Yuan	Mid-latitude terrestrial climate of East Asia linked to global climate in the Late Cretaceous: Evidences from stable isotopes and clay minerals of the scientific core in the Songliao Basin
Li Xianghui	Geochronology of single zircon U-Pb isotope in South China: Insights of the Late Mesozoic terrestrial basin and stratigraphy
Yu Enxiao	Cretaceous two rainy seasons and ENSO signals recorded in Nenjiang Formation in Songliao Basin
Chen Xi	New studies on the Cretaceous Oceanic Anoxic Events in the Tingri Area, Southern Tibet
Zhang Xiaolin	The Cenomanian-Turonian mass extinction and biotic turnover events in south eastern Tethys linked to redox chemistry changes: Evidence from multiple sulfur isotopes
Li Yongxiang	Deciphering the evolution of Oceanic Anoxic Event 2 (OAE2)
Li Juan	Unraveling the Paleocene–Eocene thermal maximum in shallow marine Eastern Tethyan environment: the stratigraphic record in Gamba area (South Tibet)

### 3. Work plan of next year

Field work on the stratigraphy and sedimentology of Cretaceous in Tibet, Songliao Basin, western Liaoning province.

Study on the Cretaceous Paleoclimatology by Cretaceous non-marine sediments in China, especially by cores of continental scientific drilling site #2 in Songliao Basin.

Study the sea-level changes in Tibet and their relationship with paleogeographic and paleoclimatic events.

Organize a session on the "International Geology Congress" held in South Africa, 2016.

#### 4. Publications

Hu, X., Wang, J., BouDagher-Fadel, M., Garzanti, E., An, W. New insights into the timing of the India–Asia collision from the Paleogene Quxia and Jialazi formations of the Xigaze forearc basin, South Tibet. *Gondwana Research*, Available online 18 March 2015.

Hu, X., Garzanti, E., Moore, T., Raffi, I. Direct stratigraphic dating of India-Asia collision onset at the Selandian (middle Paleocene, 59±1 Ma). *Geology*, 2015, 43: 859-862.

Chen X., Wang C., Wu H., Kuhnt W., Jia J., Holbourn A., Zhang L., Ma C. Orbitally forced sea-level changes in the upper Turonian–lower Coniacian of the Tethyan Himalaya, southern Tibet. *Cretaceous Research*, 2015, 56: 691-701

Xiaojing Du, Xi Chen, Chengshan Wang, Yushuai Wei, Yalin Li, Luba Jansa Geochemistry and detrital zircon U–Pb dating of Lower Cretaceous volcanoclastics in the Babazhadong section, Northern Tethyan Himalaya: Implications for the breakup of Eastern Gondwana. *Cretaceous Research*, 2015, 52A:127-137

Liang H., Chen X., Wang C., Zhao D., Weissert H. Methane-derived authigenic carbonates of mid-Cretaceous age in southern Tibet: Types of carbonate concretions, carbon sources, and formation processes. *Journal of Asian Earth Sciences*, 2016, 115:153-169.

Li, J., Hu, X. M., Garzanti, E., An, W., Wang, J.G. Paleogene carbonate microfacies and sandstone provenance (Gamba area, South Tibet): the stratigraphic response to initial India-Asia continental collision *Journal of Asian Earth Science*, 2015, 104: 39-54.

Xi, Dangpeng., Wan Xiaoqiao, Chen Yi. Late Cretaceous biostratigraphy and sea-level change in the southwest Tarim Basin *Palaeogeogr. Palaeoclimatol. Palaeoecol.* 2015, 441: 516-527.

An, W., Hu, X., Garzanti, E. Sandstone provenance and tectonic evolution of the Xiukang Mélange from Neotethyan subduction to India–Asia collision (Yarlung-Zangbo suture, south Tibet) . *Gondwana Research*, Available online 21 September 2015

Gao, Y., Ibarra, D. E., Wang, C. S. et al. Mid-latitude terrestrial climate of East Asia linked to global climate in the Late Cretaceous. *Geology*, 2015, 43: 287-290.

## Annual Report of IGCP-632

### 1. Website address(es) related to the project

<http://www.igcp632.org> official IGCP 632 site

### 2. Summary of major past achievements of the project

- Second symposium of IGCP632 in Shenyang, China, September 12– 13, 2015
- Field excursion in Western Liaoning, China, September 14-19, 2015
- Plans were established for a special session in the 35<sup>th</sup> International Geological Congress, 2016. And the possible field excursions are discussed.
- Proceedings of the symposium in Shenyang will be published as a Special Issue in *Palaeoworld*. Now is the stage for submission contributions.
- Updates of our website [www.igcp632.org](http://www.igcp632.org)
- [Field Guide was printed.](#)
- [Abstract Volume was printed.](#)

### 3. Achievements of the project this year only

#### 3.1. General scientific achievements

*(Meetings are not considered as scientific achievements, they should be listed under heading 3.3.)*

#### I. A field excursion in northeast China is organized.

Altogether 43 participants from 14 countries attend the field excursion. Western Liaoning and adjacent Inner Mongolia is a representative region for studying continental biotic and geologic evolution during the Jurassic-Cretaceous transition. This field trip gives a brief glimpse at the subdivision and correlation of the Jurassic and Cretaceous of Ningcheng Basin and Beipiao Basin in western Liaoning and adjacent Inner Mongolia.

#### II. Updates of the home page of IGCP 632

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.

#### III. Meetings planned for 2016



#### IV. Special Issue is conducting in Palaeoworld

Proceedings of the symposium in Shenyang will be published as a special Issue in palaeoworld. Now is the stage for manuscripts submission.

#### 3.2. *List of IGCP project meetings/symposia and IGCP related meetings/symposia with exact attendance (if possible) and number of countries*

The second symposium of IGCP 632 is around the theme “Geologic and biotic events on the continent during the Jurassic/Cretaceous transition”. Altogether, 152 participants from 18 countries including Australia, Brazil, China (including Hongkong), Egypt, France, Germany, Japan, Lebanon, Morocco, Norway, Pakistan, Russia, Slovakia, Sweden, Tanzanian, Ukraine, United Kingdom, United States of America, and so on.

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

#### 3.3. *Educational, training or capacity building activities related to the IGCP project and IGCP project participants.*

Field trips comprised several levels of training and capacity building both for early career scientists and for senior scientists, and more importantly new networks were formed.

#### 3.4. *List of countries involved in the project (please \*indicate the countries active this year and make the distinction between:*

*Congo, Republic of the Congo  
Democratic Republic of Congo  
Republic of Korea  
Democratic People's Republic of Korea)*

Argentina, Australia\*, Austria, Belgium, Brazil\*, Canada, China\*(including Hongkong), Czech Republic, Denmark, Egypt\*, France\*, Germany\*, India, Iraq, Italy, Japan\*, Korean, Lebanon\*, Lithuania, Mexico, Morocco\*, New Zealand, Norway\*, Pakistan\*, Poland, Romania, Russia\*, Slovakia\*, South Africa, Spain, Sweden\*, Switzerland, Tanzania\*, Thailand, Tunisie, UK\*, Ukraine\*, Uruguay, USA\*, Vietnam. (40 countries)

#### 3.5. *Participation of scientists from developing countries, and in particular young and women scientists: exact number and please describe how this project specifically benefited women scientists, young scientists and/or scientists from developing countries*

	<i>Total number of scientists</i>	<i>Number of male scientists</i>	<i>Number of female scientists</i>
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Number of participating scientists	165	124	41
Number of young scientists/students (<35 years old)	55	30	25
Number of scientists from developing countries	92	66	26

3.6. List of the 5 most important publications (including maps) of this year

a) could not have been published were it not for this project

b) related to this project

- Sha, Jingeng, Olsen, P. E., Pan, Yanhong, Xu, Daoyi, Wang, Yaqiong, Zhang, Xiaolin, Yao, Xiaogang, Vajda, V., 2015. Triassic–Jurassic climate in continental high-latitude Asia was dominated by obliquity-paced variations (Junggar Basin, Ürümqi, China. PNAS **112** (12): 3624–3629. ([www.pnas.org/lookup/suppl/doi:10.1073/pnas.1501137112/-/DCSupplemental](http://www.pnas.org/lookup/suppl/doi:10.1073/pnas.1501137112/-/DCSupplemental)).
- Souto, P.R.F. & Fernandes, M.A., 2015. Fossilized excreta associated to dinosaurs in Brazil. Journal of South American Earth Sciences **57**: 32–38 (<http://creativecommons.org/licenses/by-nc-sa/3.0/>).
- Liu, Zhongjian & Wang, Xin, 2015. A perfect flower from the Jurassic of China. Historical Biology. Online (<http://dx.doi.org/10.1080/08912963.2015.1020423>).
- Fürsich, F.T. & Pan, Y.H., 2015. Diagenesis of bivalves from Jurassic and Lower Cretaceous lacustrine deposits of northeastern China. Geological Magazine. Online (doi:10.1017/S0016756815000242).
- Zhang, Xiaolin, Zhang, Guijie & Sha Jingeng, 2015. Lacustrine sedimentary record of early Aptian carbon cycle perturbation in western Liaoning, China. - Cretaceous Research. Online (<http://dx.doi.org/10.1016/j.cretres.2015.10.001>).

Full bibliography of this year (listed by author in alphabetical order with the most recent work listed first) has to be submitted as an annex. Distinguish between peer review literature and other (no abstracts).

a) could not have been published were it not for this project

b) related to this project

3.7. Activities involving other IGCP projects, UNESCO, IUGS or others

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 609 “International Workshop on Climate and Environmental Evolution in the Mesozoic Greenhouse World”, Nanjing, China, September 05-11, 2015; the symposium of IGCP 608

“International symposium on “Cretaceous ecosystems and their responses to palaeo-environmental changes in Asia and the western Pacific”, Shenyang, China, August 16-20; giving keynotes and oral presentations.

*3.8. Scientific Legacy: Is there a need for storage of publications, field data, and other results of the project? Do you have a clear vision concerning where the data would be stored and who will be the custodian?*

They are stored in the institutions of the project members.

*3.9. What tangible improvements has your project obtained? (Besides publications, we are interested to hear about improvements to research, scientific contacts, policy implications, etc)*

The research connections made by participants during the yearly meetings represent one of the most important tangible benefits of the IGCP projects. Each year, dozens of new research projects are begun by colleagues who have a chance to interface at our meetings and events. We have had limited discussion of public policy thus far, but that will change next year when a geoscience workforce/public policy funding symposium is hosted at the University of Iowa as part of our annual events.

*3.10. What kinds of activities in respect to the benefit of society and science outreach has your project undertaken?*

Many project members have been doing the following contributions: 1) Providing consulting service of designing, construction and exhibition of museums and geoparks for local governments even national government, and palaeontology for the fossil amateurs. 2) Joining the preservation/protection administration work of fossil and Geoheritage, and organization work of Summer Camps for the student who like fossils. 3) Giving popular science lectures.

*3.11. What kind of public information (media reports, etc) has your project generated? And how do you evaluate their impact?*

Our primary public information output has been the project website. Our educational materials yet to be completed and posted will become one of our most important examples of public information.

## **4. Activities planned**

### *4.1. General goals*

1. Special publication in *Palaeoworld* based on the proceedings of the second symposium in Shenyang is carried out successfully.
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.

4.2. *Tentative list of specific meetings and field trips (please list the participating countries)*

1. Special session at the Nordic Winter meeting to be held in Helsinki in January 2016;
2. Berriasian Working Group Meeting: primary business will be a discussion of potential GSSPs in Smolenice Castle on 19-23 April, 2016.
3. 35<sup>th</sup> International Geological Congress will be held in Cape Town, South Africa, 27 August – 4 September, 2016.

**5. Project funding requested**

Project funding \$ 16000-18000 is requested, because many students and scientists from developing countries need full financial support to attend IGCP632 symposium. Since the 3<sup>rd</sup> Symposium will be held in Captown, it means long distances travel and expensive traveling fees. And a plan for 2016 is attached.

**6. Request for extension, on-extended-term-status, or intention to propose successor project**

We request to continue the project with our Year 5 plans.

**7. Financial statement (\$ USD only)**

*The IGCP Scientific Board would like to be informed how the IGCP funds were used.*

100% of IGCP support was used to assist with the attendance of and presentation at meetings (minus bank and wire-transfer fees). Of the allocated resources provided by IGCP (\$6000), 1000 \$ was used for the symposium organization, and the rest of available funding was provided to students, early career researchers, scientists, or colleagues from developing countries. Detail reporting of expenditures is included in the Annual Financial Report Form III.

Furthermore, the organizer supported some participants from undeveloped countries because the founding from IGCP was very limited.

**8. What additional funding besides the IGCP seed funding has your project obtained thanks to the IGCP label? Please estimate the budget received for meetings, research or other and identify the source.**

Additional funding was received from Liaoning Association for Science and Technology, Geological Society of Liaoning, Department of education of Liaoning Province, Northeastern University the State Key Laboratory of Palaeobiology and

Stratigraphy for the project “ Stratigraphy, Palaeogeography and Palaeoecology of Jurassic/Cretaceous transition of Eastern Asia” and from Chinese Academy of Geology for the project “ Jurassic/Cretaceous boundary and mass extinction of northeastern China”, participants involved are JingengSha and young scientists.

## **The 2015 Annual Report of the IGCP-649 Project**

The IGCP 649 webpage is established and perfectly serves as information and communication platform between leadership and participants which has become dynamic during 2015. In the first year we have organized some special sessions and/or joint meetings in order to announce the new project. As a result of this successful promotion regular international exchange led to joint field research in different countries, such as China, Sweden and Czech republic etc.

### **1.1 General scientific achievements**

In terms of our general scientific schedule, we made progress in research of Diamonds in ophiolite, and have confirmed the existence of ophiolite-hosted diamonds on Earth, which occur in mantle peridotites and podiform chromitites of many ophiolites, such as Dangqiongophiolite, Hegenshanophiolite and Sartohaychromitite in china, Bulqizachromitites in Albania, Aladagophiolite in Turkey. These diamonds differ significantly from most kimberlite varieties, particularly in their inclusions. It is worth pointed out that the Ca-silicate perovskite, a typical lower mantle mineral, was identified as mineral inclusions in diamond. We propose that Crystallization of diamond from a C-rich fluid encapsulates the observed inclusions. The diamonds and associated minerals are incorporated into chromite grains during chromite crystallization at depth of mantle transition zone, and are carried to shallower levels by mantle convection.

### **1.2 Education and training of the participants**

- A short-course, from 9th November, 2015 to 13th November, 2015, on secondary ion mass spectrometry was held by IGCP-649 project and Michael Wiedenbeck, head of SIMS Group in Helmholtz Center Potsdam of German Research Centre for Geosciences. Students from different countries, such as China, Pakistan, Poland, Nigeria, Russia, US, and Tunisia, have come to attend this short-course. The five-day SIMS course are designed for people who have background in analytical geochemistry or in related field, but have no or little previous contact with Secondary Ion Mass Spectrometry. The participants are exposed to the basic design of SIMS instrumentation and vacuum system operation. During that course, Robert B. Trumbull from SIMS group gave the students a fantastic course on the Boron isotope study on the tourmaline.

- From August 2<sup>nd</sup> to August 20<sup>th</sup>, three CARMA students, Weiwei Wu, Yanhong Chen and Dongyang Lian, funded by CUGW and CAGS took part in the TRANSCAND-2015 Excursion. TRANSCAND Excursion is for Masters and PhD students, Post-Docs and various staff, including those involved in the ICDP-COSC (International Continental Scientific Drilling Program – Collisional Orogeny in the Scandinavian Caledonides) project, which was first started in the early 1980's. This excursion provides the participants with a fantastic opportunity to see the basic structure of the Scandinavian mountain belt, the thrust-sheets, their internal structure, stratigraphy, metamorphism and intrusions. In the TRANSCAND-2015 Excursion, more than twenty participants from ten countries including China, Germany, Poland, America, England and etc., took part in this excursion. This excursion started from Sweden and ended in Norway. Participants have seen the whole sequence from the lowermost autochthon to the uppermost allochthon of the Scandian Orogeny.

The workshop and conference attendance

## **2.1 Organized workshop**

- In order to review and summarize the achievement of the international communications and researches on ophiolite and related high-pressure rocks around the world and promote the collaborations on the related subjects, the IGCP-649 project has held a workshop on ophiolite and related high-pressure rocks in the Xining city of western China and the field excursion in the Qilian Mountains during 5th-10th, August, 2015. The conference is sponsored by Institute of Geology, Chinese Academy of Geological Sciences and the State Key Laboratory of Continental Tectonics and Dynamics with the assistance of the Science and Technology Department of the Qinghai Province. The professors, young scientists and graduate students from America, Germany, Australia, Russia, Cuba, Mongolia, Iran, Turkey and China in total 106 persons from 9 countries have attended the conference and following field excursion.

The Academician of Chinese Academy of Sciences Prof. XuZhiqin has taken charge of the conference. The chief director Prof. HouZengqian from Institute of Geology, CAGS, the vice-president of the IUGS Prof. Dilek and the chief director Mr. Xie Yuan from the Science and Technology Department of the Qinghai Province have gave the welcome speech. The president of the conference and the leader of the IGCP-649 Project Prof. Yang Jingsui gave a brief introduction of the Project during the opening ceremony.

The expert and professor have gave oral presentations encircle the conference topic on the new findings and theory of ophiolite and related high pressure metamorphic rocks around the world, including ophiolite and chromitite from Cuba, Mongolia, Iran, Ural from Russia and Tibet, Heilongjian from China. The Academician ZhengYongfei and Prof. Dilek's presentation about the metamorphism in the subduction zone and the formation and evolution theory of the ophiolite have drew much attention of the candidates.

Prof. Zhang Jianxin from Institute of Geology, CAGS have lead the field excursion in the Qilian Mountain Orogen. The team of Prof. Zhang have worked in the Qilian Mountain for about two decades. They have got quite a lot of new results of the high pressure metamorphism in this area. The presentations from his group have gave grate impress of the researchers in the field.

The workshop have attractive many geologists from the developing countries and also a lot of female researchers. Prof. Angelica Isabel Llanes Castro from Cuba have traveled half of the world to attend this workshop and gave highly evaluation of it, saying "...I wanted to let you know that I am very proud and honored for having the possibility of so close exchange, during which I could enjoy natural and geological beauty of China and to learn about the Tibetan ophiolites, something indeed very special...". Prof. Buckman from Australia have email us saying "...it was truly a great meeting and I learnt many new things about ophiolites and UHP rocks. It is fantastic to see China welcoming so many foreign researchers in and encouraging scientific collaboration. I look forward to returning to China many times over the coming years and hopefully working with many more of the warm and friendly researchers in China...". Prof. Ochir from Mongolia also emailed us when she come back the University, "...A great start to the IGCP 649: geography, the participation of researchers from developing countries, equal gender, and most importantly an impressive participation of Chinese students...".



## 2.2 Conference attendance

- Geological Society of America. Session No.80, T3. Bridging Two Continents: Diamonds, Zircons and Native Elements in the Mantle: New Discoveries and Models on the Properties and Petrogenesis of Oceanic Mantle Lithosphere (GSA Mineralogy, Geochemistry, Petrology, and Volcanology Division; GSA Structural Geology and Tectonics Division; MSA Mineral Physics; GSA Geophysics Division; Mineralogical Society of American; Geochemical Society), Baltimore, U.S.A.(1-4th November, 2015); approx. Attendance:30; number of countries:9.
- Second International Workshop on Tethyan Orogenesis and Metallogeny in Asia and Silk Road Higher Education Cooperation Forum in Wuhan, China during Oct 16-18, 2015. SESSION II: Tethyan Ophiolites: Genesis, Paleogeographic/Paleotectonic Implications organized by Julian Pearce, Jingsui Yang and Paul T. Robinson (with IGCP-649). Attendance around 40 from ca. 10 countries.

### Next year work plan

The primary scientific theme for Project Year 2 is the research on Ophiolitic type of diamond and the super reduced minerals in the diamonds. This will be the focus of Year 2 meetings. Another two special issue related to the ophiolite and high pressure minerals are also planned on Journal of Asian Earth Sciences and Gondwana Research in 2016.

We anticipate a large turnout of participants for Project Year 2 meetings with events scheduled to take place in Cyprus, China, and South Africa. We expect participation from at least 25 countries: Australia, Austria, Belgium, Canada, China, Czech Republic, Denmark, France, Germany, Iran, Ireland, Italy, Japan, Lithuania, Mongolia, New Zealand, Poland, Portugal, Russia, Spain, Sweden, Turkey, Ukraine, United Kingdom, United States.

2016 IGCP-649 workshop on the ophiolite and related chromite in Cyprus and field excursion on the Troodos ophiolite during 14th-20th May, 2016. Expected participants ca. 70; 35th International Geological Congress session "Diamond and Crustal Recycling into Deep Mantle" under The Deep earth symposia in Cape Town, South Africa during 27th Aug-4th Sep, 2016. Expected participants ca. 50; 2017 IWTOMA meeting in Wuhan, China Expected participants ca. 150.

### Publications

- Special Issue on Journal of Asian Earth Sciences Volume 110, Pages 1-220 (1 October 2015) about EXPLORATION OF THE CRUST AND UPPER MANTLE IN CHINA: PROGRESS FROM SINOPROBE, edited by Jingsui Yang, Shuwen Dong and Paul T. Robinson.

- Special Issue on Gondwana Research Volume 27, Issue 2 about Mantle Heterogeneities and Upper Crustal Variations in the Ophiolite Record, edited by Y. Dilek, J. Yang, H. Furnes, M.F. Zhou.
- Abstract volume on ActaGeologicaSinica (English Edition) volume 89, issue Z2 about the IGCP-649 Qilianshan workshop.
- Appendix 1 The Publication list of the IGCP-649 Project during 2015

1. Butjosa, L., Proenza, J.A., Aiglsperger, T., Rebaza, N.M., Galindos, M., García-Casco, A., Iturralde-Vinent, M., Piñero-Pérez, E., 2015. Layered gabbro-hosted Al-rich chromitites at Loma Iguana area, Camagüey ophiolitic massif, Cuba: originated by crustal recycling?. 13th SGA Biennial Meeting-Nancy-France 2015, Nancy; 08/2015
2. Butjosa, L., García-Casco, A., Proenza, J.A., 2015. Contrasted affinities of peridotites and serpentinites from Villa Clara subduction Melange (Central Cuba). XI International Eclogite Conference 2015, Rio San Juan (Dominican Republic); 01/2015
3. Chen Mei, TianZuolin, Zhang Cong\*, Yang Jingsui, Huang Jie Phase equilibrium modeling for metamorphic evolution of garnet-bearing mica-quartz schist in Sumdo UHP metamorphic belt, Lhasa Block Geology in China.2015, 42(5): 1572-1587.
4. CHEN Yanhong, YANG Jingsui, XIONG Fahui, ZHANG Lan, LAI Shengmin and CHEN Mei Geochronology and geochemistry of the subduction-related rocks with high Sr/Y ratios in the Zedong area: implications for the magmatism in southern Lhasa Terrane during Late Cretaceous. ActaGeologicaSinica (English Edition). 2015, 89(2): 351-368.
5. Chen Yanhong, Yang Jingsui, Zhang Lan, XiongFahui, Lai Shengmin Mineralogical study of the hornblende gabbro in Zetang ophiolite, southern Tibet, and its genetic implications. Geology in China. 2015, 42(5):1521-1442.
6. Feng Guangying, Liu Shen, Feng Caixia, Yang Yuhong, Yang Chaogui, Tang Liang, Yang Jingsui U–Pb zircon geochronology, geochemistry and geodynamic significance of basaltic trachyandesites and trachyandesites from the Jianchang area, western Liaoning Province, China. Journal of Asian Earth Science. 2015, 110, 141-150.
7. Feng Guangying, Yang Jingsui, Xiong Fahui, Liu Fei, Niu Xiaolu, Lian Dongyang, Wang Yunpeng, Zhao Yijue Petrology, geochemistry and genesis of the Cuobuzha peridotite in the western Yarlung Zangbo suture zone Geology in China. 2015, 42(5):1337-1353.

8. Feng Huibin, MengFancong, Li Shengrong, JiaLihui Characteristics and tectonic significance of chromites from Qingshuiquanserpentinite of East Kunlun, Northwest China. *Acta Petrologica Sinica*. 2015, 31 (8) : 2129-2144.
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