INSTITUTE OF GEOLOGY CHINESE ACADEMY OF GEOLOGICAL SCIENCES

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Annual Report 2015

Institute of Geology
Chinese Academy of Geological Sciences
(CAGS)

Editorial Committee

Contents

Preface

Preface

The Institute of Geology, Chinese Academy of Geological Sciences (CAGS), is a national public scientific research institution and is mainly engaged in national fundamental, public, strategic and frontier geological survey and geoscientific research. Entering the new century, and in particular during the past 5 years, the Institute has made notable progress in scientific research, personnel training and international cooperation, with increasing cooperation and exchange activities, expanded fields of cooperation, abundant output of new research results, and an increased number of papers published in “Nature”, “Science” and other high-impact international scientific journals. In the light of this new situation and in order to publicize, in a timely manner, annual progress and achievements of the Institute to enhance its international reputation, an English version of the Institute’s Annual Report has been published since 2010.

Similar to previous reports, the Annual Report 2015 includes the following 7 parts: (1) Introduction to the Institute of Geology, CAGS; (2) Ongoing Research Projects; (3) Research Achievements and Important Progress; (4) International Cooperation and Academic Exchange; (5) Important Academic Activities in 2015; (6) Postgraduate Education; (7) Publications. In order to avoid confusion in the meaning of Chinese and foreign names, all family names in this Report are capitalized.

We express our sincere gratitude to colleagues of related research departments and centers of the Institute for their support and efforts in compiling this Report and providing related material – a written record of the hard work of the Institute’s scientific research personnel for the year 2015.

Editorial Board of
The Annual Report (English Version) of the Institute of Geology,
Chinese Academy of Geological Sciences
11 May 2016

1. Brief Introduction to the Institute of Geology

The Institute of Geology, Chinese Academy of Geological Sciences (CAGS), was formally established in April 1956 but can be historically traced back to the former Central Geological Survey as early as the 1910s. As a national public scientific research institution, the Institute of Geology is an integral part of the national scientific and technological innovation system, providing technological support for national geoscientific research and investigation of geology and mineral resources. The Institute is mainly engaged in national, fundamental, public, and strategic geoscientific frontier research and basic geological survey. It is one of the important national research bases in the solid earth sciences, the application of earth science-related technologies, and the education of young geoscientists.

Since its establishment in the 1950s, the Institute has made considerable contributions to national economic growth by providing scientific and technological advice to major issues of social relevance such as resources, environmental protection, and large-scale construction projects. The Institute has also won recognition in theoretical advances in the geosciences by means of basic research in frontier disciplines. In the Institute, 18 geoscientists, such as HUANG Jiqing, XIE Jiarong, SUN Yunzhu, CHENG Yuqi, LI Chunyu, etc., were elected Academicians of the Chinese Academy of Sciences (CAS) and the Chinese Academy of Engineering (CAE). With its competitive research team and remarkable scientific achievements, the Institute strives to enhance its domestic and international status in the geoscientific community.

The Institute currently has 254 staff, including 6 Academicians, 58 Research Fellows, and 58 Associate Research Fellows. 152 researchers earned their doctoral degrees, and 18 earned their master degrees. Amongst the Senior Researchers there are 90advisers of doctoral candidates and 4 advisers of master candidates.

By the end of 2015, the Institute had won 162 science and technology awards at national, provincial and ministerial levels, among which were 24 prizes of the National Science Conference Award, 11 prizes of the National Natural Science Award and the National Science and Technology Progress Award (2 first prizes, 5 second prizes, 3 third prizes and 1 fourth prize), 127 prizes of the Science and Technology Progress Award at the Provincial and Ministerial levels (14 first prizes, 43 second prizes, 56 third prizes and 14 fourth prizes). More than 3250 research papers and 122 monographs were published since 1981. Since 1991, 4 researchers of the Institute have won the Prize for Scientific and Technological Achievement or the Prize for Scientific and Technological Progress of the Ho Leung Ho Lee Foundation, 7 researchers have won the J. S. Lee Honorary Prize for Geosciences, and 5 researchers have won the National Natural Science Foundation of China for Distinguished Young Scholars.

Fig. 1. Main building of the Institute

Organizational framework

The structure of the Institute is as follows:

Administrative Departments

General Office

Science and Technology Department

Service and Security Department

Financial Department

Personnel and Education Department

Research Divisions

Division of Regional Geology and Mapping

Division of Tectonics

Division of Stratigraphy and Paleontology

Division of Metamorphic Rocks and Precambrian Geology

Division of Igneous Rocks

Laboratory of Continental Dynamics

Laboratory of Isotope Geology

Lithosphere Research Center

Beijing SHRIMP Center

Mineral and Energy Resources Center

Three-dimensional Geological Survey and Research Center

Key Laboratories

Key Laboratory of Continental Tectonics and Dynamics, Ministry of Land and Resources

Key Laboratory of Isotope Geology, Ministry of Land and Resources

Key Laboratory of Stratigraphy and Paleontology, Ministry of Land and Resources

Key Laboratory of Earthprobe and Geodynamics, Ministry of Land and Resources

National Research Centres

Beijing SHRIMP Center

Technical Support Organizations

Commission for the Geological Map of China (CGMC)

Center for Stratigraphy and Paleontology, China Geological Survey

Affiliated Academic Organizations

China Commission of International Continental Scientific Drilling

Commission of Regional Geology and Mineralization, Geological Society of China

Commission of Geological Mapping, Geological Society of China

Commission of Stratigraphy and Paleontology, Geological Society of China
Commission of Petrology, Geological Society of China
Commission of Isotope Geology, Geological Society of China
Commission of Metamorphism, Mineralogy and Geochemistry, Geological Society of China

Peer-reviewed Publication

Acta Petrologica et Mineralogica

Research Fields

Regional geology, mapping and related database construction
Regional and global tectonics
Origin and evolution of life, paleontological and stratigraphic correlation
Precambrian geology and early crustal evolution
Cenozoic geology and modern geological and ecological environments
Ultrahigh pressure metamorphism and metamorphic belts
Petrology, mineralogy, and earth materials science
Continental dynamics and mantle dynamics
Geological setting of mineralization and regional mineralization
Deep geophysical probing, lithospheric structure and geodynamics
Isotope geology theory, methods and applications
Quaternary geology and past global changes

2. Ongoing Research Projects

There were 175 ongoing research projects in 2015 as listed below.

2.1 Projects funded by the National Natural Science Foundation of China

Key Projects:

No.	Chief Investigator	Project	Duration	E-mail address
1	ZENG Lingsen	Crustal anatexis and deep orogenic processes	2015-2019	zls1970@gmail.com
2	ZHU Xiangkun	A high-resolution study on the Cryogenian interglacial oceanography: a record from the Yangtze basin	2015-2019	xiangkun@cags.ac.cn
3	LIU Fulai	The spatial extension, multiple metamorphism and magmatism, and tectonic evolution of the Jiao-Liao-Ji orogenic belt, North China Craton	2015-2019	lfl0225@sina.com
4	XU Zhiqin	Hot collisional orogenic dynamics: deformation, metamorphism and partial melting for exhumation process of the Great Himalaya complex (Central Nepal)	2015-2019	3077864156@qq xzq@ccsd.cn
5	GAO Rui	The detailed structure of the lithosphere and deep processes of deformation in the transition from the northeastern Tibetan Plateau to the Alashan, Ordos and Sichuan Craton basins	2015-2019	gaorui@cags.ac.cn
6	WANG Tao	Spatial-temporal distribution of deep, old and juvenile continental crust and constraints on metallogenesis of northern Xinjiang and adjacent areas	2015-2018	taowang@cags.ac.cn
7	XU Zhiqin	Continental dynamics and resource effects of the Qinghai-Tibet Plateau	2013-2015	3077864156@qq xzq@ccsd.cn
8	ZHANG Zeming	Metamorphism and tectonics of the eastern Himalayan orogen	2013-2017	zzm2111@sina.com
9	HOU Zengqian	Comparison of the main metallogenesis of the Himalayan-Zagros collisional orogenic system	2014-2018	houzengqian@126.com
10	LI Haibing	Fault friction over time: coseismic weakening and post-seismic healing within the Wenchuan Fault	2014-2018	lihaibing06@163.com

†deceased April 2016

General Projects:

No.	Chief Investigator	Project	Duration	E-mail Address
1	TANG Feng	The evolution and biostratigraphic significance of typical Ediacaran macroscopic fossil assemblages in southern China	2012-2015	tangfeng@cags.ac.cn
2	LIU Pengjv	Biostratigraphic division of acritarchs from the Ediacaran Doushantuo Formation in the Yangtze Gorges and their international correlation	2012-2015	pengju@cags.ac.cn
3	CHI Zhenqing	Study of criteria for Pleistocene-Pliocene division in the Nihewan Basin, Hebei Province	2012-2015	zqchi@263.net
4	DU Lilin	2.2-2.0 Ga geologic event in the Wutai and Zhanhuang areas, central North China craton, and its tectonic features	2012-2015	dulilin7310@cags.ac.cn
5	WAN Yusheng	Formation and evolution of the Archean granite-greenstone belt in western Shandong: geology, geochemistry and zircon dating	2012-2015	wanyusheng@bjshrimp.cn
6	YAN Zhen	Volcanic-sedimentation and tectonic setting of mineralization of the Caotangou Group in the western section of the North Qinling	2012-2015	yanzhen@mail.iggcas.ac.cn
7	ZHANG Jin	Provenance and deformation of Lower Paleozoic sediments along the southern and eastern margins of the Alax Block and their tectonic implications	2012-2015	zhangjinem@sina.com
8	SHI Yuruo	SHRIMP U-Pb dating of diagenetic xenotime in sedimentary rocks –a case study of the Changzhougou Formation	2012-2015	shiyuruo@bjshrimp.cn
9	LI Qiusheng	A broadband seismic observation profile in northern North China to find traces of the upper mantle structure of the Paleo-Asian Ocean	2012-2015	liqiusheng@cags.ac.cn
10	CHEN Shouming	Research on silicified acritarchs from the Ediacaran Doushantuo Formation at Shimen, Hunan, South China	2013-2015	shoumingchen@gmail.com
11	DONG Xin	Early Mesozoic metamorphism and tectonic significance of the Central and Eastern Lhasa terranes	2013-2015	dongxin5811935@163.com
12	XU Xiangzhen	Detailed FIB and TEM studies of unusual mineral inclusions in chromite and mantle peridotite from Kangjinla of Tibet	2013-2015	xuxiangzhensjl@aliyun.com
13	YU Shengyao	Relationship between high-pressure granulite and adakitic rocks -a case study in the Dulan area, North Qaidam Mountains	2013-2015	yushengyao1211@tom.com
14	MENG En	Petrogenesis of the Changhai khondalite series in southeastern Liaoning Province, China and tectonic implications	2013-2015	mengen0416@126.com
15	LIU Dongliang	Cenozoic paleomagnetic research for the spatio-temporal variations of block rotation between the northeastern margin of Pamir and the southern margin of the southwestern Tianshan	2013-2015	pillar131@163.com

16	CAO Hui	New technique for the study of orogenesis and porphyroblast formation mechanism - Application of electron backscatter diffraction on foliation inflection/intersection axes (FIA)	2013-2015	caohuicags@gmail.com
17	PAN Jiawei	Partitioning of strike-slip and uplift during late Quaternary deformation along the Ashikule Fault, western segment of the Altyn Tagh Fault	2013-2015	43469518@qq.com
18	ZHAO Lei	Ages, characteristics and tectonic implications of ophiolite from the southern Xiemisitai Mountain in West Junggar, Xinjiang	2013-2015	jleiz@163.com
19	DONG Aiguo	Magnesium isotope character and its constraints on the genesis of magnesite deposits in the eastern Liaoning Province, China	2013-2015	aiguo.dong@gmail.com
20	LI Shizhen	Isotopic fractionation of Zn and Cu in plants	2013-2015	shizhenli@cags.ac.cn
21	WANG Yue	Iron isotope fractionation during fluid exsolution of skarn-type deposits: a case study of a polymetallic deposit in the Middle-Lower Yangtze valley	2013-2015	wyivy@aliyun.com
22	SONG Huixia	Petrogenesis of two periods of TTG gneiss in the Zanhuang area, Hebei Province	2013-2015	huixiasong@cags.ac.cn
23	YIN Jiyuan	Geochronological and geochemical study of basic-intermediate dikes in West Junggar, NW China	2013-2015	yinjiyuan1983@163.com
24	XIE Hangqiang	Zirconology of metamorphic oceanic crust, a case study from the Heilongjiang Complex in the Mudanjiang area	2013-2015	rock@bjshrimp.cn
25	QU Chen	Detailed receiver function images of the fine crustal structure in the Tarim basin	2013-2015	quchen760511@163.com
26	KUANG Hongwei	Taphonomy of Cretaceous dinosaurs in the Jiaolai basin and implications for paleoecology and paleogeography	2013-2015	kuanghw@126.com
27	LV Junchang	The study of Cretaceous dinosaurian faunas from Henan Province	2013-2016	lujc2008@126.com
28	JIN Xiaochi	Establishment and correlation of Permian biostratigraphic sequences of the Tengchong Block, western Yunnan	2013-2016	jinxchi@cags.ac.cn
29	MENG Fancong	Genetic mineralogy of eclogite from the East Kunlun Mountains, western China	2013-2016	mengfancong@yeah.net
30	ZHANG Jianxin	Early Precambrian crustal evolution of the western Alxa block and constraints on the North China Craton	2013-2016	zjx66@yeah.net
31	QI Xuexiang	Identification of the Neoproterozoic magmatic belt in the Ailaoshan orogeny and its tectonic implications	2013-2016	qxuex2005@163.com
32	WANG Tao	The characteristics of rock assemblage and formation ages of flysch mélange of the Bailongjiang Group in the Western Qinling	2013-2016	real-wt@sohu.com

33	Chevalier Marie-Luce	Towards final agreement on the total slip-rate and location of the entire Karakorum Fault, western Tibet	2013-2016	mlchevalier@hotmail.com
34	LI Jinyi	Provenance of Silurian-Permian clastic rocks on the northwestern margin of the Tarim basin and its constraints on the closure time of the Paleozoic ocean in the Tianshan Mountains	2013-2016	jyli2003@126.com
35	ZENG Lingsen	Construction of large leucogranite plutons along the Himalayan orogenic belt and thermal effects	2013-2016	zls1970@gmail.com
36	SONG Yucai	Study of the large Chaqupacha Pb-Zn deposit in the Fenghuo Shan-Nangqian fold-thrust belt, Tibet	2013-2016	songyucai@gmail.com
37	YANG Zhiming	Sources of metal and sulfur for post-collisional porphyry Cu deposits: A case study of the Qulong copper deposit, Tibet	2013-2016	zm.yang@hotmail.com
38	ZHU Xiangkun	Genesis of Shilu Iron Ore Deposits, Hainan	2013-2016	xiangkun@cags.ac.cn
39	HE Rizheng	Structure of the front of the Asian mantle southward-subducted beneath North Tibet and effects on continental collision	2013-2016	herizheng@cags.ac.cn
40	LU Zhanwu	Research on the structural attribute of strong seismic reflections in the crust of the southern Qiangtang terrane in the central Tibet	2013-2016	luzhanwu78@163.com
41	WANG Haiyan	Fine lithospheric structures and deep processes of the inland deformation of the Xuefeng mountain tectonic zone	2013-2016	hyanwhy@126.com
42	DONG Jin	Paleosecular variations and environ- mental magnetic study on Holocene lake sediment from the monsoon marginal zone in eastern China	2014-2017	djin@cugb.edu.cn
43	GUO Lei	Spatial distribution, transition mechanism and timing of late Mesozoic crustal contraction and extension on the southeastern China-Mongolia border	2014-2017	guolei_cn@sina.com
44	GUO Xianpu	Study on Middle-Late Ordovician vertebrate fauna in Bachu County, South Xinjiang	2014-2017	guoxianpu@cags.ac.cn
45	JI Shu'an	Early Cretaceous vertebrate fauna from the Ordos Basin (Inner Mongolia) and related stratigraphic correlation	2014-2017	jishu_an@sina.com
46	LI Yibing	Petrological and geochronological studies on varied magmatic evolution during the early stages of the Izu-Bonin-Mariana Island-arc	2014-2017	tansei007@aliyun.com
47	LI Zhaoli	Determination of the Songduo suture zone in the Lasha terrain and Indosinian orogeny of the Qinghai-Tibet Plateau	2014-2017	lizhaoli3@tom.com
48	LIU Chaohui	Tectonic features of the Zhaertai and Bayan Obo Groups at the northern margin of the North China Craton and their relationship with break-up of the Columbia supercontinent	2014-2017	denverliu82@gmail.com

49	LIU Fulai	Multiple metamorphic and partial melting events in the San Jiang complex belt, southeastern Tibetan Plateau	2014-2017	lfl0225@sina.com
50	LIU Yongqing	The Tuchengzi-Zhangjiakou Formations and basin evolution at the transition of the Jurassic-Cretaceous in the Yanshan Mts and implications of the North China rift system	2014-2017	liuyongqing@cags.ac.cn
51	TONG Ying	Petrogenesis of Permian A-type granites in the middle segment of the border between Mongolia and China and tectonic implications	2014-2017	yingtong@cags.ac.cn
52	WANG Yanbin	Crust formation and evolution of the Archaean Block from the Rauer Group, Antarctica: constraints from geochemistry and zircon U-Pb, Hf-O isotopes	2014-2017	fengguangying198@163.com
53	XU Jiren	Analyses of seismic data recorded at different depths of the Donghai 5000 m borehole and study of the non-linear properties of seismic waves in different layers and the seismo-tectonics in and around the Tanlu fault	2014-2017	xujiren1125@aliyun.com
54	YAN Zhen	Sedimentary analysis of the wedge-top basin within the ophiolite mélange belt in the Lajishan Mountains	2014-2017	yanzhen@mail.igcas.ac.cn
55	YANG Tiannan	Dose the Longmu Co-Shuanghu suture connect with the Changning-Menglian suture?	2014-2017	yangtn@cags.ac.cn
56	YIN Chongyu	Study on the lower age of the Chang'an glaciation and the biostratigraphy of the Cryogenian Period in South China	2014-2017	chongyuyin@cags.net.cn
57	YU Changqing	The deep structure and physical properties of the Eastern Tarim basin	2014-2017	geoyucq@hotmail.com
58	ZHENG Hongwei	The crust and upper mantle 3-D seismic velocity structure and dynamics beneath the Tongbai Orogen and adjacent areas	2014-2017	zhenghongwei004@sina.com
59	ZHOU Xiwen	Metamorphic evolution and genesis of the Paleoproterozoic khondalite series in the Liaoning and Jilin regions	2014-2017	xwzhou@cags.ac.cn
60	CAI Zhihui	Study on the relationship between horizontal and vertical shear zones and kinematic implications of Diancang- shan, southeastern Tibet	2014-2016	cai-zhihui@hotmail.com
61	FENG Guangying	Geochronology and geochemistry of Permian-Triassic mafic dikes in the Songnen-Zhangguangcailing Range, Jilin Province	2014-2016	fengguangying198@163.com
62	GUO Xiaoyu	Lithospheric structure of the Liupan Shan thrust-nappe belt, northeastern Tibetan Plateau, and deep deformation	2014-2016	guomichele@gmail.com
63	HAN Liang	The fine structure for fault healing and its impact on the mechanical properties of the fault	2014-2016	hanliangla@163.com

64	LEI Min	Magmatic evolution and eruption dynamic process for the cone-forming stage of the Changbaishan Tianchi volcano: evidence from melt inclusions	2014-2016	leiminlm@126.com
65	LI Jin	Mo isotopes of Mesoproterozoic Fe and Mn sedimentary formations of North China and implications for the paleo-oceanic environment	2014-2016	lijin80119@hotmail.com
66	LI Zhonghai	Subduction-induced mantle flow and seismic anisotropy: numerical modeling	2014-2016	lzhhai@gmail.com
67	LIU Pinghua	Petrology and metamorphic evolution of the Daqingshan-Wulashan high pressure granulites, northwestern North China Craton	2014-2016	lph1213@126.com
68	LIU Shoujie	Zircon characteristics under ultrahigh-temperature conditions: a case study of the ultrahigh-temperature metamorphic rocks from Inner Mongolia	2014-2016	sjliu@bjshrimp.cn
69	LIU Yong	Geochemistry of the Mesozoic basic rocks and interface conversion of the asthenosphere in the Hunan-Jiangxi Province	2014-2016	liuyongfirst@163.com
70	NIU Xiaolu	Petrology and Os-Pb-Nd-Sr isotope geochemistry of Datong Triassic lamprophyres and their geological significance	2014-2016	niuxiaoludx@126.com
71	WANG Fang	The genesis and metamorphic evolution of blueschists in the southern segment of Lancang River, south-western China	2014-2016	wangfang_mr@163.com
72	XIANG Hua	The genesis of early Paleozoic sapphirine-bearing mafic granulites in the Tongbai orogen	2014-2016	xianghua2710@gmail.com
73	YAN Bin	Fe, Mo isotope constraints on Neoproterozoic negative carbon isotope excursions	2014-2016	yanbin703@163.com
74	LI Ming	Graptolite stratigraphic sequence in Nanba, Yiyang of Hunan Province and re-subdivision of the Tremadocian Stage	2015-2017	liming@cags.ac.cn
75	MENG Meicen	Research on lycopsids from the Upper Devonian of the lower reaches of the Yangtze River	2015-2017	mengmeicen@gmail.com
76	WU Zhenjie	Cyclostratigraphic study of the Jiangshanian Stage at Duibian section, Zhejiang	2015-2017	wuzhenjie_cags@163.com
77	KOU Caihua	Petrogenesis of mafic-ultramafic rocks in northern Guangxi and constraints on the tectonic evolution of the western Jiangnan Orogen	2015-2017	caihuakou@163.com
78	HUANG He	Mechanism of Nb-Ta enrichment and mineralization in the Boziguo'er alkali granite pluton in the South Tianshan, Xinjiang Province	2015-2017	huanghecugb@126.com
79	ZHANG Yinghui	Phase equilibria on partial melting of TTG gneisses and petrogenesis of potassic granites in the Hengshan Complex	2015-2017	yhzhang@sina.cn

80	ZHENG Ning	Study of features of early Paleozoic radiolarian siliceous rocks and sedimentary environment in Yongzhou-Pingxiang, Hunan and Jiangxi, South China	2015-2017	zhengninglaio@163.com
81	JIA Jianliang	Research on conductive mechanism of lacustrine immature organic-rich shale, based on accumulation difference of organic matter and its interpretation model	2015-2017	jiajl0228@163.com
82	XIE Shiwen	Temporal and spatial distribution and zircon Hf-O isotopes of Paleoproterozoic magmatic rocks in the Jiaodong terrane	2015-2017	swxie210@163.com
83	LIU Jiang	Occurrence and weakening effect of amorphous carbon in the fault slip zone：A case study of the Wenchuan earthquake fault zone	2015-2017	liujiang689@163.com
84	LI Shan	Source, petrogenesis and tectonic implications of Triassic granitoids in the Linxi area of Inner Mongolia, southern Central Asian Orogenic Belt	2015-2017	lishan428@163.com
85	SUN Jian	Iron isotope investigation of hydrothermal sedimentary iron deposits: a case study of the Motuosala Iron deposit in Xinjiang Province	2015-2017	sunjiantc@163.com
86	CHEN Xijie	Petrogenesis and crust-mantle interaction of early Permian extensional tectono-magmatic assemblages in the Harlik Mt., eastern Tianshan belt	2015-2017	chenxijie@cags.ac.cn
87	LIU Yingchao	F-rich fluid origins of carbonate-hosted Pb-Zn deposits in thrust belt of a collisional orogen: A case study of the Mohailaheng deposit in Qinghai	2015-2017	lychappy@126.com
88	LI Jie	Development of Cenozoic reference material for Ar-Ar dating	2015-2017	huaer3312@sina.com
89	YANG Jing	40Ar/39Ar geochronology of the oxidation zone of sulfide deposits (Liuhuangshan deposit and Kangguer deposit) from the Tu-Ha basin recorded paleoclimatic significance	2015-2017	yangjing822822@gmail.com
90	ZHU Xiaosan	Study of the collisional belt between the Yangtze and Cathaysia blocks in the Precambrian, based on deep reflection seismic data	2015-2017	zhuxiaosan@yahoo.com
91	LI Wenhui	Research on joint inversion of deep seismic sounding and coincident deep seismic reflection data from the Qinling profile	2015-2017	dereklee1984@126.com
92	TIAN Shugang	Late Permian organic reefs and palaeogeographic conditions in the Linxi, area, Inner Mongolia - the Jiutai, Jilin	2015-2018	sgtian@cags.ac.cn
93	YAO Jianxin	High-precision stratigraphic correlation between South China and Tibet during the major turning period of the Permian-Triassic biotic evolution	2015-2018	yaojianxin@cags.ac.cn

94	LIU Jianfeng	Petrogenesis and geological significance of early-middle Triassic mafic volcanic rocks from southeastern Inner Mongolia	2015-2018	wenjv@aliyun.com
95	ZHANG Zeming	Formation and evolution of the Precambrian crystalline basement of southeastern Tibet	2015-2018	zzm2111@sina.com
96	WU Cailai	Magmatic system dynamics in Shujiadian, Tongling	2015-2018	wucailai@126.com
97	Zhang Hongrui	Coupling between deformation and fluid flow in the Baiyangping ore-producing hydrothermal system, Sanjiang area	2015-2018	hongrui_1982@126.com
98	KUANG Hongwei	Formation mechanism and correlation for molar tooth carbonate—the sedimentary record in the Meso-Neoproterozoic	2015-2018	kuanghw@126.com
99	DONG Chunyan	Late Neoarchean to early Paleoprotero- zoic tectono-magmatic-thermal events in the Daqingshan area: Geology, geochemistry and zircon	2015-2018	dongchunyan@sina.com
100	XIE Hangqiang	Tectono-thermal events and tectonic setting during the late Neoarchean in western Shandong	2015-2018	rock@bjshrimp.cn
101	WAN Yusheng	Formation and evolution of the Archean basement in eastern Hebei: Geology, geochemistry and SHRIMP U-Pb zircon dating	2015-2018	wanyusheng@bjshrimp.cn
102	REN Liudong	Distribution of Pan-African orogenic belts in the East Antarctic Craton and geological features of the Prydz belt	2015-2018	ldren@cags.ac.cn
103	LU Haijian	Tectonic coupling between the Kumukuli basin and adjacent orogenic belts: evidence from paleomagnetism and low-temperature thermochronometry	2015-2018	haijianlu2007@126.com
104	CAO Hui	P-T-t-D path based on quantitative data of porhpyroblast growth :a case study of Qilian Tuolemuchang	2015-2018	caohuicugb@hotmail.com
105	TANG Suohan	Precise determination of Ti isotope com-position in rock samples and geological application in mantle processes	2015-2018	tangsuohan@163.com
106	YANG Zhiming	Genesis of comb quartz layers: case studies from porphyry Cu deposits at Qulong, Tibet and Now Chun, Iran	2015-2018	zm.yang@hotmail.com
107	CHEN Wen	Isotope thermochronological research on orogenic and ore-forming processes in the eastern part of the western Tianshan orogenic belt	2015-2018	chenwenf@vip.sina.com
108	HOU Hesheng	Tectonophysics research and its significance for the Suihua-Hulin profile, northeast China	2015-2018	hesheng.hou@126.com

2.2 Projects funded by the Ministry of Science and Technology and/or the Ministry of Finance

No.	Chief Investigator	Project	Duration	E-mail address
1	XU Zhiqin	Tectonic regime and exploration prospecting of the central part of the Main subduction-collision metallogenic belt, southern Tibet	2015-2017	3077864156@qq.com
2	TANG Suohan, LI Jie	Preparation of geochemical reference materials for Sm-Nd isotope measurement of silicate and (U-Th)/He dating of zircon	2015-2017	tangsuohan@163.com
3	ZHU Xiangkun	Mechanisms of Neoproterozoic mineralization of Mn, Fe and P in the Yangtze basin	2014-2016	xiangkun@cags.ac.cn
4	PI Jinyun	Long-term deep borehole geophysical observation and comprehensive data analysis	2014-2016	jinyunpi@163.com
5	WANG Tao	Superposition of the Mongol–Okhotsk plate tectonic regime on the Paleo-Asian oceanic plate and its metallogenic systems	2013-2017	taowang@cags.ac.cn
6	SHI Yuruo	In-situ SHRIMP U-Pb dating of U-bearing accessory minerals (rutile and baddeleyite)	2013-2015	shiyuruo@bjshrimp.cn
7	WANG Yue	Fe isotopic study of the terrestrial facies of volcanic deposit metallogenesis	2013-2015	wyivy@aliyun.com
8	LIU Dunyi	R & D of new models of TOF-SIMS for isotope geology	2011-2016	liudunyi@bjshrimp.cn
9	DING Xiaozhong	Geological records and maps of China and tectonic maps of Eurasia	2011-2016	xiaozhongding@sina.com

2.3 Projects funded by the China Geological Survey

No.	Chief Investigator	Project	E-mail address
1	CHEN Huiming	Comparative study on sporopollen fossils in Mesozoic basins on the southeastern margin of the Yangtze Block, South China	chuiming666@aliyun.com
2	CHEN Wen	Research on isotopic dating techniques of metal deposits	chenwenf@vip.sina.com
3	GUAN Ye	Building a three dimensional lithosphere structural framework in China and developing a three dimensional geological database system of China.	guanye@cags.ac.cn
4	HE Bizhu	Tectonic structure of the Tarim basin of Xinjiang and survey on its oil-gas prospects	hebizhu@vip.sina.com
5	HE Zhenyu	1:50000 special geological mapping of the Shaquanzi sheet in the eastern Tianshan and the Ertuomiao sheet in the Langshan	ahhzy@163.com
6	HOU Zengqian	Orogenic processes and geological background of the middle-eastern Tibetan collisional orogen	houzengqian@126.com
7	JI Shu'an	Dinosaur fanuas, biostratigraphy and classic fossiliferous sections of China	jishu_an@sina.com
8	JI Zhansheng	Pilot paradigm on the mapping of marine strata in the northern Cuoqin Basin	jizhansheng@vip.sina.com

9	LI Haibing	Integrated study of the geological corridor in the Qiangtang terrane and its basin tectonic setting for oil-gas	lihaibing06@163.com
10	LI Tingdong	Comprehensive integration of the divisions of geological structure and regional geological survey of China and development of service products	litdong@163.com
11	LI Zhihong	Development and application of isotope tracers in Precambrian geology	lizh1129@cags.ac.cn
12	LIU Fulai	Important geological events, curstal growth and tectonic evolution of the early Precambrian North China Craton	lfl0225@sina.com
13	LIU Jianfeng	Geological survey on the tectonic framework of some key areas and geological corridors of the Xing'an Mongolian orogenic belt	wenjv@aliyun.com
14	LIU Jianhui	3-D geological-structural model of the iron ore district and deep resource evaluation in eastern Hebei Province, China	liujianhui1999@163.com
15	LIU Pengju	Biostratigraphic succession and chronostratigraphic subdivision of the Ediacaran in China	pengju@cags.ac.cn
16	LIU Pinghua	Genetic mechanism of the Helanshan-Wulashan-Huangtuyao Paleoproterozoic orogenic belt on the northern margin of the North China Craton	lph1213@126.com
17	LIU Yanxue	Regional geological survey and summary of the Jiangnan Orogenic Belt	lyxue@sohu.com
18	LIU Yongqing	Experimental mapping of terrestrial stratigraphy and sedimentary basins	Liuyongqing@cags.ac.cn
19	MENG En	Tectonic nature and evolution of the Jiao-Liao-Ji Paleoproterozoic mobile belt in the eastern North China craton	mengen0416@126.com
20	PENG Nan	Stratigraphic-sedimentary framework and background of sandstone type uranium deposits in the Mesozoic to Cenozoic, Ordos Basin	pengnan19830120@126.com
21	QU Chen	Distribution characteristics of land gas hydrates and evaluation on their resource potential	quchen760511@163.com
22	QU Junfeng	Neotectonic map compilation of China and its relationship with earthquakes	qujf@cags.ac.cn
23	REN Liudong	Some key peoblems in establishing the tectonic architecture of China and adjacent areas	ldren@cags.ac.cn
24	TONG Ying	Pilot paradigm of the 1:50000 scale map and isotopic mapping of the magmatic rocks in important metallogenic belts	yingtong@cags.ac.cn; yingtong@pku.org.cn
25	WAN Yusheng	Formation and evolution of ancient terranes (>2.6 Ga) of the North China Craton	wanyusheng@bjshrimp.cn
26	WANG Fang	Scientific geological mapping (1:50000) and its paradigm implication in the Paleoproterozoic Jiao-Liao-Ji belt, North China Craton	wangfang_mr@163.com
27	WANG Jun	International collaboration on map compilation of Central and East Asia	wj257@126.com
28	WANG Tao	Investigation of metamorphic rocks and copper-gold deposits in western Zhejiang Province and northeast Jiangxi Province, South China	real-wt@sohu.com

29	WANG Yong	Lacustrine records of climate change in eastern China	wangyong@cags.ac.cn
30	XIANG Zhongjin	Study of paleo-tethyan orogenic processes and geological background of ore deposits in the southwestern segment of the Qingzhou-Hangzhou tectonic belt and adjacent regions, southwestern China	qryan@cags.ac.cn
31	XIAO Xuchang	Tectonic evolution of ophiolite belts in China and implications for mineral resources	xxchng@public.bta.net.cn
32	XIAO Xuchang	Compilation of Chinese terms in geology	xxchng@public.bta.net.cn
33	XU Qinqin	Marine and continental tectonics of China and adjacent areas: framework, evolution, and control of resources and environment	qinqin2002dz1@163.com
34	XU Zhiqin	Study of the eological and metallogenic setting of the Lhasa-Gangdse terrane	3077864156@qq.com
35	XUE Huaimin	Time-space evolution, tectonic background and significance for mineralization of volcanic rocks in important mineralized belts	huaiminx@sina.com.cn
36	YAN Zhen	Study on the tectono-magmatic events of the junction between the Qinling-Qilian-Kunlun Orogens and mapping of the subduction complex	yanzhen@mail.iggcas.ac.cn
37	YANG Chonghui	Paleoproterozoic stratigraphic framework, geological events, and setting of mineralization in the central North China Craton	chhyang@cags.ac.cn
38	YANG Jingsui	Investigation of the Zedang Ophiolite Massif and assessment of chromitite resources in the Tibet Plateau	yangjsui@163.com; yangjsui@cags.ac.cn
39	YANG Tiannan	Regional geological survey in typical areas of the southern segment of the Sanjiang orogenic belt, SW China	yangtn@cags.ac.cn
40	YANG Zhiming	Tectonic setting, metallogenesis and prospecting potential of the main mineral deposits in the central Tethyan area	zm.yang@hotmail.com
41	YAO Jianxin	Protection and research of representative standard sections in China	yaojianxin53@163.com
42	YU Changqing	Key problems solving with 2D seismic data processing methods	geoyucq@qq.com
43	ZENG Lingsen	Integrated geological investigation on the structure and tectonics of the Himalayan orogenic belt	lzeng1970@163.com
44	ZHANG Jianxin	Integrated survey on the tectonic setting of the Qilian-Altun-Kunlun composite terrane	zjx66@yeah.net
45	ZHANG Lei	Spatial-temporal evolution, mineralization and tectonic setting of Mesozoic granites of the main metallogenic belts in northern China	leizhang@cags.ac.cn
46	ZHANG Zeming	Investigation of tectonic events and 1: 50,000 geological mapping pilot project in the Qinling-Dabie orogenic belt	zzm2111@sina.com
47	ZHU Xiangkun	Investigation of chromitite in the Xigaze ophiolite	xiangkun@cags.ac.cn
48	ZHU Xiaosan	Geological setting, metallogenesis, and mineral prospecting of improtant ore deposits in the Andes orogen	zhuxiaosan@yahoo.com

3. Research achievements and important progress

3.1 Results of Natural Science Foundation projects completed in 2015

Geochemistry and chronology of ophiolites occurring in the eastern Junggar, Xinjiang, and central-southern Mongolia (chief researcher: JIAN Ping, deceased 10 March 2015)

In order to constrain the genetic types, tectonic environments and formation ages of ophiolites, we conducted a combined geological, geochemical and geochronological investigation in western and southern Mongolia and East Junggar of China. The early Paleozoic Beishan ophiolites were studied by similar means. In western Mongolia the Dariv–Khantaishir ophiolite marks the boundary between the Lake arc in the west and the Dzabkhan–Baydrag microcontinent in the east. Zircons from a microgabbro and four plagiogranites yielded weighted mean $^{206}Pb/^{238}U$ ages of 568±5, 567±4, 560±8 Ma (Dariv), 573±8 and 566±7 Ma (Khantaishir) that we interpret as reflecting the time of ophiolite formation (ca. 573–560 Ma). In southern Mongolia, zircons of a layered gabbro (lower ophiolite crust) and a leucogabbro (mid-upper crust) of the Gobi Altai ophiolite yielded crystallization ages of 523±5 and 518±6 Ma. These age data constrain the formation time of the Gobi Altai ophiolite within ca. 523–518 Ma, slightly older than that of the East Junggar Zhaheba (ca. 490-481 Ma)-Armantai (506±2 Ma)-Beitashan (494±3 Ma) early Paleozoic ophiolites (ca. 506-481 Ma). The ophiolites become younger in age, from western Mongolia via southern Mongolia to East Junggar. The Beishan early Paleozoic ophiolites, however, show a contrasting age trend: the southerly Xichangjing-Yueyashan and Hongliuhe ophiolites have zircon ages of 535±6 and 535±3 Ma, the geographically intermediate Baiyunshan and Yushishan ophiolites are 524±2 and 521±4 Ma, and the northerly Xiaohuangshan and Jijitaizi ophiolite, are 516±8 Ma and 516±4 Ma. Therefore, the western Mongolia – southern Mongolia- East Junggar juvenile crustgrew southwards in the latest Neoproterozoic-early Paleozoic, whereas the Beishan grew northwards during the early Paleozoic. The two display contrasting growth directions and hence are part of different orogenic systems. Our work also documents that in East Junggar, the Kalamaili(MORB-type; ca. 411-396 Ma)and Balikun (MORB-type; ca. 389-385 Ma) ophiolites have similar formation ages, are tectonically continuous and thus mark a plate boundary.

Genesis of the jadeitite from the Polar Urals, Russia (chief researcher: MENG Fancong)

Fluid processes in subduction zones is one of the geoscience frontier topics that attract geologists internationally. Jadeitite occurring in the mantle wedge on the hanging wall of subduction zones is one of the best objects for researchon the mass transfer in subduction environments. Based on friendly cooperation with geologists of the Russian Academy of Sciences, we have carried out jadeitite investigations in the Polar Uralsof Russia. We studied the genesis of jadeite, zircon and phlogopite from the jadeitite. The results indicated that the jadeitite belongs to the precipitation-type, and zircon is hydrothermal in origin and formed at 404±7Ma. The initial Hf isotope compositions of zircons range from +6.5 to +17.4. $\delta^{18}O$ isotope compositions of the zircons range from +5.03 to +6.04‰, averaged at +5.45±0.11‰, similar to those of mantle rocks. The initial Sr isotope compositions of the jadeitite range from 0.70339 to 0.70347 (t=404 Ma), and initial Nd-isotope compositions ($\varepsilon_{Nd}t$) range from +0.97 to +5.62. The data above argue that material for jadeitite formation was derived from the subducted oceanic lithosphere. The age of jadeitite constrains the timing of serpentinization of peridotite in the mantle wedge. A simple model of jadeitite formation from the Polar Urals, Russia, was proposed.

The paleobiogeography of Permian fusulinids in the Baoshan Block, Yunnan, SW China (chief researcher: HUANG Hao)

Detailed fieldwork resulted in the discovery of new fossil material of the Permian fusulinids in the southern Baoshan Block (e.g. Verbeekina assemblage and Neoschwagerina assemblage). The biostratigraphic framework of the Permian fusulinids in the Baoshan Block has been synthesized, following systematic identification. The early Permian fusulinids of this block are characterized by a monotonous Eoparafusulina-Pseudofusulina assemblage with strong peri-Gondwana affinity. Host rocks of this assemblage belong to the temperate-water heterozoan association. These early Permian fusulinids are thus interpreted to have lived in temperate water. Thus, the Baoshan Block at that time very likely occupied a relatively high paleolatitude, even higher than other Gondwana-derived blocks such as central Iran and Central Pamir. In contrast, middle Permian fusulinids of the Baoshan Block are more diversified and yielded typically warm-water Verbeekinids and Neoschwagerinids. The amelioration of the water temperature was also supported by the Mid-Permian warm-water photozoan association of carbonate facies. On the other hand, the relatively low diversity of the Midian Verbeekina assemblage suggests that the water temperature was still not optimal for fusulinid diversification. The paleoposition of the Baoshan has been speculated to have beenlocated between a typically warm region (e.g. South China and eastern Thailand) and a cool-water region (e.g. Peninular Thailand and Malaysia).

Genesis and tectonic implication of eclogites of the Songduo terrane, Lhasa, Tibet (chief researcher: CHEN Songyong)

Field studies combined with petrological, geochemical and isotopic analyses show that the Sumdo eclogites mark a Carboniferous–Permian suture zone, at least 100 km long, containing ophiolite fragments, eclogites and Indosinian post-orogenic granitoids. This suture divides the Lhasa block into a northern and southern segment. Three lithological eclogite types were recognized in the Sumdo suture zone, namely rutile eclogite, quartz eclogite and phengite eclogite. There exist two protoliths of the eclogites. Most eclogites are derived from mid-ocean ridge basalt, whereas the rutile eclogite was formed from oceanic island basalt. LA-ICPMS U-Pb dating of zircon from the Sumdo eclogites indicates a Permian metamorphic age (260-270 Ma) and a Carboniferous protolith age of 303 ±4.8 Ma. The ophiolite fragments in the Sumdo suture zone are composed of ultramafic rocks, MORB-type basalt, and OIB-type basalt, some of which are intruded by post-collisional granites. The Gongbupala ultramafic body, a typical tectonic block in the suture zone, is completely serpentinized. Its geochemical features suggest that it is composed of harzburgite, typical of depleted mantle peridotite. The MORB and OIB-type basalts crop out in the Chasagang Formation. Zircons from the OIB-type basalt with typical magmatic characteristics yielded a mean U-Pb age of 306 Ma, suggesting formation in a Paleo-Tethyan basin in the Carboniferous. U-Pb dating of zircon from basaltic andesite north of the Sumdo eclogite belt yielded concordant ages of 289-348 Ma (Linzhou) and 191Ma (Ranwu), suggesting formation during subduction of oceanic crust or during closure of the ocean. Indosinian granodiorite with an age of 194±4.3 Ma crops out north of the Sumdo suture. These granodiorites are similar to late Indochina granites in the Lhasa Block and most likely formed during continent-arc collision or during closure of the Paleo-Tethyan Ocean.

Petrogenesis of vast volcanic-intrusive complexes in the coastal Zhejiang-Fujian area: insights from case studies (chief researcher: HE Zhenyu)

The genetic relationships between plutonic and volcanic rocks are central to understanding the derivation and evolution of magma, especially for silicic magma systems. The volcanic-intrusive complex in a caldera provides important clues to the integration of plutonic and volcanic records. The present project studies the representative Yunshan and Yandangshan volcanic-intrusive complexes which are distributed in Yongtai County of Fujian Province and Yueqing County of Zhejiang Province respectively. We conducted field observations and petrographic studies, as well as detailed geochemical analyses.These mainly include major and trace element concentrations of complexly zoned plagioclase, zircon Hf-O isotopes and whole-rock major and trace elements. The results indicate that the formation of the two volcanic-intrusive complexes resulted from a large volume of high-percentage partial melt, and different types of rocks in the volcanic-intrusive complex have the same magma source. This is derived from the deep mantle with variable mixing or contamination with crustal material. Different rock types in a caldera are the products of varying extents of magma evolution processes: the final stage of a volcanic rock experienced the highest degree of crystal fractionation; the central intrusive represents the crystal-rich residue remaining after eruption; whereas the early stage of volcanic rock was closest to the composition of the primitive magma. This study offers

new perspectives on the petrogenesis of late Yanshanian volcanic-intrusive complexes in SE China.

Tectonic setting of Permian volcanic rocks from the southern segment of the Great Xing'an Range (chief researcher: LIU Jianfeng)

We carried out petrological, geochronological and geochemical studies on volcanic rocksfrom the Linxi and Xiwuqi areas in the southern segment of the Great Xing'an Range that were previously thought to have formed in the Permian. The Permian tectonic setting of the study area was discussed through the petrogenesis and spatial-temporal distribution of the volcanic rocks. The main results are as follows: (1) Zircon U-Pb dating and biotite $^{39}Ar/^{40}Ar$ dating indicate that the volcanic rocks, previously thought to be Permian, include late Carboniferous (318~300 Ma), early-middle Triassic (252~238 Ma) and early Cretaceous (145.5±0.5 Ma) rocks besides early Permian (287~271 Ma) rocks. The southern borders of the volcanic rocks of different periods migrated southwards with time. (2) The early Permian volcanic rocks constitute a bimodal assemblage and occur in the Xilin Hot-Xiwuqi area with NEE trend. The volcanic assemblage includes a felsic end-member of rhyolite and a mafic end-member of basalt, basaltic andesite and andesite, with the felsic end-member being dominant. Geochemical characteristics of the bimodal volcanic rocks indicate that the mafic rocks originated from the lithospheric mantle that was metasomatised by fluids in a subduction setting; the felsic rocks were the products of the partial melting of juvenile crust. Through comparison with typical bimodal volcanic rocks in the world, it is suggested that the bimodal volcanic rocks in the southern segment of the Great Xing'an Range formed in an extensional active continental margin such as the Basin and Range Province in western North America. (3) The late Carboniferous volcanic rocks are distributed in the Daqing pasture area, south Xiwuqi County. They consist of pillow basalt and foliated basalt, which exhibit geochemical characteristics of mid-ocean ridge basalt (N-MORB) and island arc basalt (IAB), respectively. All volcanic rocks occur as exotic blocks in foliated clastic rocks together with blocks of bioclastic limestone, asbestos and chert. All rocks in the Daqing pasture area constitute a late Carboniferous subduction-accretion complex on the southern margin of the Siberian paleoplate. (4) The early-middle Triassic volcanic rocks are distributed along the Linxi and Balinzuoqi areas, to the north of the Xar Moron River ophiolite belt. The rock types mainly include mafic rocks of basalt, trachybasalt, basaltic andesite and shoshonite, and few felsic rocks of dacite and rhyolite composition and is more complex than that of the early Permian. It is pointed out that further studies on the petrogenesis and tectonic setting of the early-middle Triassic volcanic rocks are required. A total of 45 days for 6 persons each were spent on fieldwork, and 15 geochronological ages have been obtained. Five papers were published and funded by this project, including 3 SCI papers and 2 CSSCI papers.

Genesis of barite in eclogite from the main drillhole of the CCSD and its indication of fluid exsolution in a continental subduction zone (chief researcher: YANG Hong)

This project is focused on barite-bearing eclogite cores of the main-hole of the Chinese Continental Scientific Drilling (CCSD) in the Sulu UHP terrane. Based on a petrological, mineralogical and geochemical study, the occurrence, generation and mineral chemistry of the accessory mineral barite in the 0-3000 m depth range of the main-hole of CCSD were investigated. In-situ Sr isotope tracing of barite was successfully attempted. Some of the barite grains found in the eclogite were analyzed in-situ by LA-ICP-MS $^{87}Sr/^{86}Sr$ specifications, and Sr-isotope ratios of barite related to the metamorphic stages of UHP eclogite facies and HP eclogite facies-amphibolites facies were established. According to the mineralogical study of barite and sulfide, the redox conditions during subduction and exhumation were determined. It was hard to find barite in zircon, so the zircon chronology related to fluid could not be established. Moreover, barite-bearing eclogite and UHP-HP veins around the CCSD were also studied. The results of this study are as follows. Barite-related fluids occurred abundantly during subduction and exhumation, although the volume of barite deposited by the fluid is small in volume and mostly occurs in garnet and in the matrix. The Sr content of barite was highest during the UHP metamorphic stage and gradually decreased during the retrogressive process. Therefore, the Sr content of the fluid is positively related to pressure. The redox conditions of the fluid throughout the metamorphic stages are oxidation-reduction-oxidation. The fluid was mainly a mixed phase derived from mantle and crustal sources during continental subduction. More external crustal fluid was later added during the early phase of exhumation and, finally, external crustal fluids became the dominant source when the Sulu UHP terrane was exhumed to upper crust levels.

Chronology and petrochemistry of the Yushu ophiolite (chief researcher: YONG Yong)

The Yushu ophiolite is a remnant of a late-Paleozoic ocean, and its tectonic environment and evolution history play an important role in research for understanding the tectonic evolution of the Tibetan Plateau and Paleo-Tethys. This summary focuses on the detailed geochronology and petrology of cumulate rocks, gabbro and basalt from the Yushu ophiolite, in order to provide evidence for the tectonic evolution of the Yushu ophiolite. According to our results, the age of the oceanic basin which is represented by the Yushu ophiolite was early Carboniferous to Middle Triassic, but the main period of the ocean basin expansion was the Permian. The oceanic basin was subducted during the Middle to Late Triassic, and collision occurred in the Late Triassic. The ultramafic and mafic rocks of the Yushu ophiolite can be divided into two types: one type belongs to the subalkaline series, and the petrographic and geochemical characteristics show similarities with magmatic arc rocks. The crystallization order for cumulate rocks is olivine-clinopyroxene-plagioclase. Combined with previous research, we hypothesize that the Yushu ophiolite belongs to the SSZ type ophiolite. The second type of ultramafic and mafic rocks originated from an enriched source, and most of these belong to alkaline series with geochemical features of high-Ti and strong enrichment in large ion lithophile elements. Based in their tectonic setting as E-MORB or OIB, these rocks are likely to have been produced during late Paleozoic mantle plume activity that existed in the southwestern region of China. In summary, the Yushu ophiolite most likely extents eastwards to the Garze-Litang ophiolite belt rather than the Jinsha River ophiolite belt. This belt should represent a back-arc or forearc basin in the Paleo-Tethys Ocean.

Genesis of the Shuangyashan Cenozoic basalt in Heilongjiang Province and its mantle origin (chief researcher: ZHANG Lei)

Ar-Ar geochronology, petrology, elemental geochemistry and Sr-Nd-Pb-Hf isotope chemistry studies have been performed on basalts from 4 locations (Shuangyashan, West Anbanghe, Laodaogoushan and Lihong) from Shuangyashan and nearby regions in eastern Heilongjiang Province, China. The major results of this work are as follows: 1) Precise ages for basalts from Shuangyashan and nearby region have been obtained. The West Anbanghe basalts consists of 4 layers erupted at 26±2, 8±5, 7.8±0.2 and 7±4 Ma, from bottom to top. The Laodaogou basalt formed at 15.6±0.3 Ma, and the age of the Lihong basalt is 93±2 Ma. 2) The petrogenesis and origin of the basalts have been studied. The Shuangyashan, West Anbanghe and Laodaogou basalts share similar isotope ($(^{87}Sr/^{86}Sr)_i$= 0.7045-0.7055;$(^{143}Nd/^{144}Nd)_i$ =0.51278-0.51285) and rare earth element compositions (La/Yb=13.0-20.7). The parental magma of these basalts were generated by asthenospheric mantle, subsequently modified by lithospheric EM2 during their upward transport. The Laodaogou basalt with negative Nb and Ta anomalies may be partial melts of mantle peridotite in reaction with water or a water-rich fluid. The Late Cretaceous Lihong basalt exhibitsa more enriched isotope composition($(^{87}Sr/^{86}Sr)_i$ = 0.7055-0.7056; $(^{143}Nd/^{144}Nd)_i$ = 0.51259-0.51261) than the other basalts, and the trace element composition of the Lihong basalt is similar to typical island arc basalt. It is possible that this basalt formed in a subduction setting and was generated in metasomatically enriched mantle. 3) The genesis and origin of Cenozoic basalts in northeastern Asia have been summarized. It has been believed that the LoMu, if present, is not an important end member in terms of Sr-Nd isotope study, and the FOZO is not a common asthenospheric end member in northeast Asia. On the basis of Sr-Nd isotope as well as trace element data from the literature, basalts from northeastern Asia occur in three regions. The basalts in western northeast China originated from a typical EM1 source located in the garnet-phase peridotite mantle. Basalts from eastern China may have formed by reaction of asthenospheric and lithospheric melts. The asthenospheric mantle is composed of DM, and the lithospheric mantle consists not only of DM, but also EM1 and EM2 components. Basalts from the Japanese Islands generally formed in a subduction setting, and recycled continental crust has participated in their generation. The originated in both the garnet-phase and spinel-phase peridotite mantle, and metasomatism of the garnet-phase peridotite mantle is more intense than in the spinel-phase mantle. 6 Ar-Ar ages, 45 suites of whole-rock major and trace elements, 192 spots of electron microprobe analysis, 27 bulk Sr-Nd isotope, 6 Pb isotope and 6 bulk Hf isotope data have been obtained during this work. One graduate and one doctoral student were funded by this project. Four papers (one published, one finished and two in preparation) are also funded by this project.

Xuebaoding leucogranites in northwest Sichuan Province and their W-Sn-Be deposit forming mechanism (chief researcher: LIU Yan)

The Xuebaoding ore deposit is well known for producing large crystals (up to 10 cm in size). The contents of Be, W,

Sn, Li, Cs, Rb, B and F in the Pankou and Pukouling granites are similar to those in granites that host the Nanling W-Sn deposits. Based on calculations of the isotopic compositions of beryl, scheelite and cassiterite (δD = -69.3‰ to -107.2‰ and $\delta^{18}OH_2O$ = 8.2‰ to 15.0‰), the ore-forming fluids were mainly composed of magmatic water with minor meteoric water and CO_2 derived from decarbonation of marble. Primary fluid inclusions are CO_2 - CH_4 + H_2O ± CO_2 (vapor), with or without clathrates and halites. We estimate the fluid trapping conditions at T=220 to 360°C and P>0.9 kbar. Fluid inclusions are rich in H_2O, F- and Cl-. Evidence for fluid-phase immiscibility during mineralization includes variable L/V ratios in the inclusions and inclusions containing different phase proportions. Fluid immiscibility may have been induced by the pressure released by extension joints, thereby facilitating the mineralization found in Part III. It is assumed that the large crystals were formed by 1) the high content of ore elements and volatile elements such as F in ore-forming fluids; 2) occurrence of fluid immiscibility and Ca-bearing minerals after wall rock transition from granite to marble, completing the ore elements deposit; 3) pure host marble as host rock without impure elements such as Fe; 4) sufficient space in ore veins to allow growth, and 5) the absence of fluid or magma activities around the deposit after mineralization.

The unit cell dimensions of the beryl are 9.223–9.232 Å for ao and 9.183–9.244 Å for co. The ratio co/ao = 0.995–1.002. The beryl has a high alkali content, including Li_2O (2.60–3.10 wt. %), Rb (65–120 ppm), Cs_2O (0.70–0.92 wt.%), and Na_2O (1.29–1.66 wt.%),indicating a Na–Li–Cs beryl with a dominance of tetrahedral substitution in the crystal structure. According to a systematic statistical study of the relationship between chemical composition and habit, a high content of alkalis leads to a lower growth rate of c {0001} compared with m {1010 }, thus producing the short prismatic/columnar habit that typifies the Xuebaoding beryl. The difference in the number of pyramidal growth hillocks on s {1121} faces that face in opposing directions strongly suggests the influence of an oriented fluid flow on growth rates. The oriented flow also led to variable growth rates for other crystal faces, including m {1010} and c {0001} and caused the growth of many thick, distorted crystals of scheelite, cassiterite, and tabular apatite. It seems that the m {1010} faces are outgrown by other faces and, consequently, may disappear. Two mechanisms led to the tabular habit: (1) the geochemical compositions, and especially the high amount of alkalis at the Be site and in the channel structures of the crystals; and (2) the directional flow and supply of hydrothermal fluids in narrow fractures during crystal growth.

Internal structure of a reverse fault and its control on the formation of hydrothermal deposits in the shallow crust: A case study from the Domozhazhua Pb-Zn deposit, north-central Tibet (chief researcher: ZHANG Hongrui)

The mechanism of reverse fault control on ore formation in the shallow crust is not clear. The Dongmozhazhua deposit was choose as an example for the study of fault internal structure and its control on fluid flow. We describe the internal structure and composition of an ore- controlling fault, restore the ore vein formation process, and reveal the spatial and time relationship between fault zone and ore body. The main results include: (1) two distinctive igneous evolution trends within the Permian to Late Triassic volcanic rocks of the Yushu area can be recognized, consistent with a two-stage Paleo-Tethyan subduction event; (2) three deformation sequences in the Dongmozhazhua area can be reconstructed: the first phase (D1) is characterized by nearly E-W trend folds and formed during closure of the Paleo-Tethyan ocean in the Late Triassic; the second phase (D2) was associated with NE-directed shortening in the Late Eocene that produced NW trending thrusts and open folds and was caused by continental collision between India and Eurasian; the third phase (D3) is characterized by nearly N-S striking thrusts and was possibly triggered by left-slip faulting in the eastern Indo-Asian collision zone; (3) the ore-controlling fault zones are composed of different fault-related breccias. These include predominantly matrix-supported breccias with angular and rounded clasts in the fault core (fault core I) and clast-supported breccias with angular clasts in the damage zone. A transitional type is developed between the above breccias and consist of lenticular breccias with little fault gouge (fault core II). Mineralization at Dongmozhazhua occurs as veinlets in breccias and disseminated between breccias. The ore veins contain calcite and primary sulfides (sphalerite, galena, pyrite, etc.) and their texture suggests that they are controlled by the fault zone; (4) the geometry of lodes suggests fault zone control on their location and orientation. Cataclasis and pressure solution are important for ore-bearing fluid flow and precipitation in a compressional setting. Our research can help to understand the genetic relationships between deformation and mineralization.

Cenozoic uplift and exhumation history of the North Qinling Range:

Constraints on the temporal and spatial evolution of Cenozoic intracontinental extension in the North Qinling Range-Weihe Graben (chief researcher: LIU Jianhui)

Significant extensions during the Cenozoic along the north Qinling Ranges-Weihe Graben resulted in rapid exhumation and uplift of the North Qinling Range as the footwalls of the North Qinling Margin Fault (NQMF) and Huashan Front Fault (HFF). We conducted apatite fission track (AFT) analysis in the north Qinling Range. AFT ages become progressively older with increasing distance from the active range border, and normal faulting suggest that Cenozoic uplift and southward tilting were a response to range-parallel extension. Correlations between AFT ages and both elevation and track lengths, combined with thermal modeling of representative samples, reveal that the North Qinling Range experienced two major phases of Cenozoic exhumation: relatively slow exhumation in response to a small magnitude of extension was initiated at ~50 Ma; relatively rapid exhumation in response to a large magnitude of accelerated extension was initiated at ~10 Ma. In addition, small changes in cooling at ~35 Ma and 25 Ma may reflect minor changes in fault rate. We interpret the initial extension at ~50 Ma to be a far-field effect of initial India-Asia continental collision. In contrast, accelerated extension after ~10 Ma along the Qinling is likely linked to the upward and outward growth of the Tibetan Plateau.

Research on clay minerals and fluid-rock interaction along the surface rupture zone of the Wenchuan earthquake (chief researcher: SI Jialiang)

Based on fault rocks developed along the seismic fault, different samples were continuously collected, using a u-channel from west to east in the trench cutting across the Anxian-Guanxian fault, then were dried and prepared with 2 cm intervals for synchronic XRD analysis. Significant variations were detected for clay minerals, quartz, feldspar and calcite and were used to determine the mineral change, faulting mechanism and evolution near the slip zone in combination with other data. For the Yingxiu-Beichuan fault, continuous samples were collected around the 589m depth. The results indicate that a clay anomaly zone is located in the FZ590 fault zone. A slight enrichment of smectite occurring in fresh fault gouge implies that there is a fault-related authigenic clay formation. In addition, the location of the slight enrichment of smectite is consistent with the plausible active slip zone determined by previous results, adding confidence to the supposition that the principal slip zone (PSZ) of the 2008 Wenchuan earthquake is located at a depth of 589.2 m and situated at the lithological boundary of the Neoproterozoic Pengguan Complex and Triassic Xujiahe Formation. The tiny clay anomaly signal captured from borehole cores implies that low frictional heat was generated by coseismic slip, which drives only slight authigenesis processes. Thus, other dynamic weakening mechanisms, such as thermal pressurization, may have been involved in the fault zone of the Yingxiu–Beichuan fault during the 2008 Wenchuan earthquake. The mineralogical and geochemical data of the host rocks collected around the Chelungpu Fault suggest that chemical weathering seems to have been the main driving force for the phase changes of clays. The amount of smectite produced by chemical weathering varies with depth and suggests that the previous idea of a weak fault caused by the presence of smectite in the fault zone may be insufficient without considering weathering processes. The observations of clay mineralogy and major element geochemistry in this study indicate that the presence of smectite in the outcrops may not have played a significant role during faulting.

Source and tectonic setting of Silurian volcanism in the northern Daba Mountains, China: evidence from pyroclastic rocks (chief researcher: XIANG Zhongjin)

We presented geochemical and Sr-Nd isotopic data for clinopyroxene and phlogopite and Re-Os isotopic data for alkali-basalt in order to determine the nature and genesis of the mantle source for Taohekou volcanism in the North Daba Mountains. Two phlogopite $^{40}Ar/^{39}Ar$ isotopic ages were obtained at 446±3 and 362±2 Ma, respectively, suggesting that the eruption began at ~446 Ma. All clinopyroxene is diopside or sahlite, and most of shows relatively identical internal composition, whereas a few crystals have compositional zoning. Compositional profile analysis suggest that, from core to rim, SiO_2, MgO, and Cr_2O_3 contents decrease, and TiO_2 and Al_2O_3 increase. The characteristics of compositional variation show a rough symmetry instead of simply decreasing or increasing, the trace elements also have asimilar variation trend, which may be attributed to mantle metasomatism. All clinopyroxenes show identical chondrite-normalized REE patterns, with enriched LREE, indicating a similar origin. The total REEs of Cpx increase from megaporphyric basalt, pillow lava to volcaniclastic rocks, suggesting that they

were crystallization products of different phases within the magmatic evolution. The Cpx in megaporphyric basalt should be an early-phase crystallization because of their highest MgO and total REE. Thus, the composition of their parental magma should approximate the primitive magma. The $^{87}Sr/^{86}Sr$ (0.7045-0.7054) and $^{143}Nd/^{144}Nd$ (0.51257-0.51275) isotopic ratios of clinopyroxene are similar to those of the host alkali-basalts, suggesting an enriched OIB-like magma source that formed by mixture of HIMU, EMI and EMII components. The alkali-basalts of the Taohekou Formation have highly variable $^{187}Re/^{188}Os$ ratios ranging from 7.0 to 75.2, and Os (t= 418 Ma) values ranging from +32~+59. The initial $^{187}Os/^{188}Os$ ratios (0.1639-0.1970) and Os (t) values of alkali-basalts are much higher than those of plume-generated OIBs, precluding their plume-origin. The extremely high Os (t) values could be the result of recycled oceanic crust and sediments in the mantle. This explanation is consistent with the conclusion reached from the study of Pb, Sr and Nd isotopes as well as their trace element abundances and ratios. Phlogopite is characterized by low Mg# (0.78-0.83) and high TiO_2 (4.51-6.39 wt%). In comparison with primitive mantle, it is enriched in LILE (Rb, Sr and Ba) and Ti, and relatively depleted in Th and U. The composition of phlogopite is in accordance with metasomatic genesis from mantle xenoliths in alkali-basalts. The clinopyroxenes have particularly high Ba (>7000), and phlogopite is enriched in Ba, indicating that metasomatism in the mantle was mainly formed by a silicate melt or fluid and probably a minor carbonatite melt or fluid.

The layered anisotropy imaging technique inferred from P wave polarization and its application (chief researcher: ZHANG Hongshuang)

Whether deformation between different layers is coupled or decoupled has become a hot topic. Seismic anisotropy offers important information for studying the deformation of layered crust. Although S-wave splitting measurements have been used to study the coupling relationship between two adjacent layers, this technique can only offer some large-scale characteristics, which are not adequate to study earth models with multiple anisotropic layers. Luckily, the P wave polarization deviation inversion technique, which has a good vertical resolution, is an important supplement to the S wave splitting technique, because P particle motion is only sensitive to the anisotropy structure during the last period of propagation. We developed some techniques for computing P wave polarization deviation, and a model to analyze and inverse multi-layer anisotropy. The corresponding software was also developed. The proposed technique and software were used in the study of the crustal-upper mantle anisotropic structure beneath northeastern Tibet. The northeastern (NE) Tibetan Plateau is the transition zone from Tibet to the Chinese mainland interior. The complex tectonics and lithospheric deformation in the study area provided a natural laboratory for examining lithospheric deformation and deep continental processes. We collected seismic waveforms from the Gansu and Qinghai seismic networks and derived some revealing deep structures of the NE Tibetan Plateau, including the crustal S-wave velocity, the geometry of the lithosphere-asthenosphere-boundary, and the crustal and upper mantle anisotropy. Based on these observations and combined with previous studies, we come to the following conclusions: (1) the upper crust of NE Tibet is decoupled from the lower crust, and NE Tibet is currently dominated by upper-crustal thickening; (2) the lower crust of NE Tibet is deformed and has the same deformation style as the lithosphere below; (3) the Kunlun fault is one of the important transformation zones which control expansion of the plateau; (4) the lithosphere of NE Tibet is still in the early stage of the extensional deformation.

Moho variation and shallow response from the Huayingshan to Xuefengshan tectonic belt in South China (chief researcher: XIONG Xiaosong)

We modified the geological section (1:200,000) from Chongqing to Shaoyang, based on the different scale geological map and our new surveying data, and obtained skeleton structural features of the crust of the Sichuan basin-Xuefeng tectonic belt from deep seismic reflection data. The profile unraveled a subtle Moho variation, and the depth and deformation style of the sedimentary layers. The main result is that in the Sichuan fold belt and Hunan-Guizhou intracontinental complex tectonic zone, several reflectors were recognized in the lower crust, the bottom of which is considered as the Moho reflection, and the Moho depth in the former is 12.5-14 s TWT, whearas in the latter it is 9.5-12.5 s TWT; beneath the Xuefeng core uplift zone the Moho reflection is weak or transparent at a depth of 12-13.5 s TWT (36-40.5 km); beneath the Jinfoshan fault belt there is no Moho offset or variation, wheareas the Moho reflection is weak to transparent beneath the Dayong-Songtao fault zone and Huaihua-Xupu fault zone. With the combination of surface geology, the geological section, and other geophysical data we interpreted the seismic reflection profile to obtain a detailed upper crustal structure, including the geometry and depth of the sedimentary cover: the sedimentary cover hasa depth of 3.5 s TWT (ca. 10 km), and the base of the sedimentary cover acted as the detachment surface to control the deformation of the sediments. In the Hunan-Guizhou intracontinental complex

tectonic zone, the detachment surface is 3.5-4 s TWT and decoupled the upper and lower layers due to different crustal shortening. We also classified the Moho shape and discussed the relationship between the Moho variation and the shallow deformation. Combined with other geophysical and geochemical data, we suggest that the Sichuan basin can be divided into two paleo-continental blocks, with a large difference to the Xuefeng tectonic zone to the east.

Shallow-deep structural relationships between the northern margin of North China Craton and southern margin of Xing'an-Mongolia Orogenic Belt revealed by deep seismic reflection profiles (chief researcher: HOU Hesheng)

Based on the data of two 710km long deep seismic reflection profiles from the northern margin of the North China craton to the southern margin of the Siberian craton, we analyzed the propagation law of seismic waves within these two ancient plates by investigating the recorded frequency and energy from 500 kg shots at different localities. The application of tomographic inversion of first arrival travel times revealed the near-surface velocity structure (0-3000m) and analysis of seismic attributes of poststack seismic profiles revealed shallow to deep structural features. Based on a combination of the above experimental results on the shallow deep tectonic characteristics, we made a preliminary study on the shallow to deep structural relationships between the northern margin of North China Craton and the southern margin of Xing'an-Mongolia Orogenic Belt.

3.2 Results of the IGCP/SIDA 600 Project "Metallogenesis of Collisional Orogens in the Tethyside Domain"

The IGCP/SIDA-600 Project (2011-2015), approved at the 39th Session of the IGCP Scientific Board in February 2011, is jointly funded by UNESCO and the Swedish International Development Cooperation Agency (SIDA). With Prof. HOU Zengqian, Director-General of the Institute of Geology as the principal proposer, this is the second IGCP Project in the field of ore deposits with a Chinese geoscientist as the principal leader.

Summary of major past achievements of the project:

1) Useful links were established amongst researchers on the Tethyan metallogenic belt with a focus on Iran, Pakistan, and China. About 100 scientists from 10 countries, including 5 developed countries (USA, Canada, Australia, Japan, and Spain), and 5 developing countries (P. R. China, I. R. Iran, Pakistan, Georgia, and Turkey) have been involved in the project, with more than 50% of young and women participants.

2) A first workshop was held in Beijing (2011), the second workshop during IGC in Brisbane (2012), the third workshop at a SGA meeting in Sweden (2013), and the fourth workshop in Teheran, Iran (2014).

3) The project organized three joint Chinese-Iranian field investigations in the Zagros Mts. of Iran (2012, 2013, and 2014) with a total of 66 days. These field trips provided excellent chances for the Chinese-Iranian participants to observe the geology and discuss scientific questions on the Himalayan-Zagros orogen system.

4) A database for major deposits in Iran, Pakistan, Turkey, and China was established, which provides a solid basis for further study on the temporal-spatial distribution and tectonic controls of major mineral systems in the Tethyan metallogenic belt. Comparative studies have generated more than 60 publications on the tectonics and ore systems in the Zagros-Himalayan orogeny.

5) The project organized several symposia at international congresses: (1) Symposium 15.5 at the 34th IGC (2012); (2) Symposium 18 at the 11th Congress of Chinese Ore Deposits in Guiyang (2012); (3) Symposium at the 13th SGA meeting in Sweden (2013); (4) Symposium at the 14th IAGOD Conference in China.

6) The project so-sponsored the 6th, 7th, 8th, and 9th annual workshops of ore deposit models held in Beijing (2011), Guangzhou (2012), Hefei (2013), Shanghang (2014), and Xi'an (2015). Leaders of the project, Drs. David Leach, Richard Goldfarb, and Zengqian Hou, gave lectures on MVT Pb-Zn, orogenic Au, and porphyry Cu deposits. More than 600 young researchers and graduate students attended these short courses.

The project published special issues on "Magmatic and Metallogenic Evolution of the Tethyan Orogen" in the journal Ore Geology Review and on "Metallogenesis of Collisional Orogens in the East Tethyside Domain" in Acta Geologica Sinica (in Chinese), which specially contribute to the IGCP 600 Project.

Achievements of the project in 2015 only:

1) ***Tectonic evolution and collisional processes:*** Studies of collisional and post-collisional magmatic rocks in Tibet have further constrained the magmatic source and associated geodynamic setting at this time. The studies suggest that (1) the thermal perturbation and heterogeneous geochemistry of magmas during ~53-50 Ma correspond to Neo-Tethyan slab break-off, which triggered asthenospheric mantle upwelling. Mantle-derived magmas resulted in extensive heating, induced crustal melting, and generated magmas with variable isotopic compositions; (2) Break-off of the northward-subducted Indian plate in the early Miocene caused asthenospheric upwelling beneath the Indian plate through a slab window. This resulted in varying degrees of partial melting in the overlying metasomatized, heterogeneous subcontinental lithospheric mantle to produce primitive magmas of post-collisional potassic and ultrapotassic volcanic rocks and Mg-rich potassic rocksin an extensional setting; (3) The Miocene Rongmucuola pluton and Qulong high-Mg diorite were generated during two phases: partial melting of highly metasomatized lithospheric mantle that generated ultrapotassic mafic melts; underplating of such melts beneath thickened juvenile lower crust, resulting in melting of the lower crust and generation of adakite-like magmas. Mixing of the adakite-likemelt with ultrapotassic magmas elevated the K_2O, MgO, and other LILE (e.g. Rb and Ba) contents of the adakite-like melt.

2) ***Collisional porphyry copper and REE ore systems:*** Comparison of geochemistry between subduction- and collision-related copper-bearing porphyries indicates that subduction-related porphyry Cu mineralization is probably associated with magmas generated by underplated mafic material that underwent a MASH process, whereas collision-related porphyry Cu mineralization is produced by a process in which underplated arc-like basaltic magma beneath the lower crust is gradually cooling and transformed into amphibolites and eclogitic amphibolites, which then undergo partial melting and interaction with underplated potassic and ultrapotassic melts from an enriched mantle. A study found that Oligo-Miocene magmas in the Gangdese belt show sharp longitudinal (~89° E as boundary) contrasts in geochemical and isotopic compositions, which are also correlated with the occurrence of porphyry-type mineralization. This study suggests that, in the absence of underthrust Indian lithosphere to the east in the Oligo-Miocene, slab breakoff triggered asthenospheric upwelling and partial melting of previously subduction-modified Tibetan lithosphere, generating hydrous, oxidizedcalc-alkaline magmas with the potential to generate porphyry Cu-Mo deposits. In contrast, underthrusting of the Indian plate to the west at this time limited the involvement of asthenospheric meltsand the extent of partial melting of subduction-modified lithosphere, with the result that melts±fluids derived from the underthrust lithosphere were infertile. In Tibet, remelting of the lower crustal sulfide-bearing Cu-rich Jurassic cumulates, triggered by Cenozoic crustal thickening and/or subsequent slab break-off, led to the formation of giant Miocene porphyry Cu deposits; the copper ore-forming high Sr/Y dacitic-rhyolitic porphyries are residually H_2O-enriched, high-pressure differentiation products of hydrous mafic partial melts of Tibetan mantle.

The REE deposits are located along the western margin of the Yangtze Craton that experienced Proterozoic lithospheric accretion and was metasomatized by the Li-rich fluids derived from the subducted oceanic crust and marine sediments, and controlled by Cenozoic strike-slip faults related to Indo-Asian continental collision. Studies show that these carbonatites were likely formed by melting of the sub-continental lithospheric mantle (SCLM), which had been previously metasomatized by high-flux REE- and CO_2-rich fluids derived from subducted marine sediments. The fertility of these carbonatites depends on the release of REEs from recycled marine sediments and on the intensity of metasomatic REE refertilization of the SCLM.

3) ***Genesis and model of ore deposits:*** A detailed study characterized the geological characteristics and genesis of the Jurassic No. I porphyry Cu-Au deposit in Tibet. It shows that the deposit formed in an intra-oceanic island arcsetting, and the ore-bearing porphyry originated from partial melting of mantle with limited contribution of subducted sediments. Another study shows that massive Fe-Au orebodies within the Beiya Cu-Au deposit are generally located within the skarn-altered boundary of a~36 Ma porphyritic granite and along faults in the surrounding Triassic carbonates. They consist of hematite and magnetite with disseminated pyrite that hosts native gold. The porphyritic granite contains porphyry-style mineralization in the form of disseminated and veinlet-hosted pyrite and chalcopyrite. Age dating shows that the No. 1 and No. 3 orebodies in the Dalucao REE deposit were formed at 12.69 ± 0.13 and 12.23 ± 0.21 Ma, respectively. Two faults and brecciation events associated with the

Dalucao deposits facilitated the activity of ore-forming fluids and provided space for deposition of the hydrothermal and REE minerals. The newly discovered Chaqupacha Mississippi Valley-type (MVT) Pb-Zn deposit in central Tibet provides a good example of MVT mineralization in a foreland fold-and-thrust belt that post-dates regional thrusting.

3.3 Results of China Geological Survey Projects completed in 2015

Study on deep hydrocarbon prospective areas in the Tarim Basin (Project Leader: YANG Wencai)

A study on deep hydrocarbon prospective areas in the Tarim Basin, a 12th FYP Geological Survey project, was accepted in December 2015 and rated to be of highest quality. Focused on the Tarim Basin, the largest superimposed basin in China by area with the best hydrocarbon potential, the project was headed by Academician YANG Wencai and Researcher YU Changqing. The deep geotectonic survey of the basin relied on geophysical methods and updated 3D crustal physical imaging theory. It extracted and applied geophysical information to disclose the spatial position and size of deep fluids and structures. Outputs of the project include: 1) acquisition of three complete sets of data and maps covering the 3D crustal density, resistivity and seismic velocity of the Tarim Basin through data acquisition, processing and comprehensive study, and generation of prediction maps of the hydrocarbon potential areas in the basin, based upon geological results; 2) delineation of the distribution and extent of the Manjar Depressionon the 6km, 8km and 10km depths, and discovery and delineation of depression structures in the Manzhong high-density and high-resistivity zone and Manbei low-density and low-resistivity zone through fine imaging of the 3D structures and deformation zones in the depression; 3) creation of multi-scale gravity field analysis and inversion theories and methods applied to 3D crustal density and deformation zone imaging, and development of 3D resistivity inversion and many more new approaches; and 4) 25 research papers published in such journals as *Geophysics* and *Science in China*, and so on; a Chinese monograph and an English monograph published; and seven post-graduate students cultivated, of whom two doctoral students have already graduated.

Formation and evolution of Archean TTGs in the North China Craton (Project Leader: WAN Yusheng)

TTG (tonalite-trondjemite-granodiorite) rocks constitute the most important Archean geological record in the North China Craton (NCC) that has had a long geological history back to ca. 3.8 Ga ago. Eoarchean (3.6-4.0 Ga) TTGs have only been identified in the Anben (Anshan-Benxi) area, although abundant 3.6-3.88 Ga detrital zircons were discovered in several types of metasedimentary rocks in eastern Hebei; Paleoarchean (3.2-3.6 Ga) TTGs occur in Anben, eastern Hebei and Xinyang; Mesoarchean (2.8-3.2 Ga) TTGs occur in Anben, eastern Hebei, eastern Shandong and Lushan. Early Neoarchean (2.6-2.8 Ga) TTGs have been discovered in nine areas, whereas late Neoarchean TTGs occur in almost every Archean area. The common features of Archean TTGs in the NCC are summarized as follows.

1) >2.8 Ga TTGs locally occur in the North China Craton but only account for less than 5 % of Archean TTGs in the basement. They do not show an increasing trend in distribution with time, but this may be due to uneven reworking of old rocks during later geological processes. >2.6 Ga TTGs mainly occur within the three ancient terranes identified by Wan et al. (2015). Neoarchean TTGs widely occur all over the NCC, similar to other cratons, in showing that the Neoarchean was the most important period of continental growth.

2) 3.1-3.8 Ga and 2.7-2.9 Ga intrusive rocks are mainly trondhjemite and tonalite in composition, respectively, with some gabbro, diorite and crustally-derived granites. Both trondhjemite and tonalite were also important during the period of 2.5-2.6 Ga, but granodiorites together with K-rich granite (including monzogranite and syenogranite) became widespread as a result of increasing maturity of the continental crust.

3) 3.3 Ga TTG rocks exhibit variable REE contents, resulting in weakly to strongly fractionated REE patterns.

This may be a result of thickening of the continental crust during this period. 2.5-3.4 Ga TTGs show large variations in their REE patterns, although many have strongly differentiated REE patterns, indicating variable conditions of formation. Whole-rock Nd isotopes and Hf-in-zircon isotopes indicate that juvenile additions played important roles in the formation of TTGs. However, crustal recycling also occurred as shown by the compositional features of some TTGs, including 3.8 Ga trondjemitic rocks in the Anben area.

4) Long-term magmatism from 3.8 Ga to 2.9 Ga related to mantle activity and crustal reworking occurred widely in Anben. In eastern Hebei, detrital zircons record almost continuous ages ranging from 3.4 Ga to 3.88 Ga, although only 3.4-3.0 Ga rocks were discovered until now. This suggests that mantle overturn activity may have been the main mechanism of continental growth and reworking in the NCC before the Mesoarchean. In contrast, continental growth was extensive and strong during the Neoarchean period, as suggested by the vast volume of TTGs, and the ~2.5 Ga tectono-thermal event was well developed as recorded by metamorphic and anatectic zircons. These indicate that the continental crust of the NCC became thick enough at that time. It is considered that plate tectonics began to play an important role in the NCC during the late Neoarchean.

Geophysical recognition technology in the Songliao Basin and the upper Paleozoic strata of adjacent areas (Project Leader: GAO Rui)

This is a new project funded by the China Geological Survey in 2014. There is no funding for future work in 2015 due to project adjustment. Therefore, we completed the project evaluation on 16 December, 2015.

Our research group has carried out detection technology experiments of upper Paleozoic electromagnetism in the northeast (Qing Gang area), middle (in the vicinity of well Sishen1) and south (in the vicinity of well Deng 101) of the Songliao Basin in 2014. A geo-electric structural model (0-10km) of these three study areas was obtained. The distribution of Cenozoic sedimentary strata, the basement and Paleozoic strata were determined in a preliminary basis.

The thickness of the upper Paleozoic strata in the vicinity of well Deng 101 is 1-2km, which is the thinnest area for C-P strata in the Songliao basin. Survey area Well Sishen 1 is located in the Zhaodong - Chaoyang anticline. It revealed the thickest upper Paleozoic strata, which are up to 4-5 km. For the Qinggang area, the upper Paleozoic thickness is 3-4km.

The research group conducted several special seismic data processing treatments on the post-stacked profile data, as well as CRP pre-stack 3D gathers in the area of Well Sishen1 with assistance of the Exploration and Development Research Institute of Daqing Oilfield Limited Company. New processing techniques and methods were used to eliminate shortcomings from conventional stack post-processing, such as “the generalized S transform frequency division processing technique” and “post stack random noise attenuation” from other processing methods and techniques. Based on well logging data of Well Du 101 and Well Sishen and seismic reflection data in the vicinity of these two wells, the distribution of the top layer of the upper Paleozoic strata was predicted according to the seismic features and wave group characteristics. Logging calibration of the 2D seismic reflection profile was carried out.

Comparative analysis through seismic calibration processing profiles and electric stack structure was obtained by magnetotelluric measurements. The results show that the Cenozoic magmatic activity had an important influence on the distribution of the upper Paleozoic sediments in the Songliao Basin.

Detailed investigation on the lithospheric structure from the Songliao Basin to the Hailaer Basin across the great Xing’an mountain range and its resources prospect (Project Leader: GAO Rui)

This project (2011-2013) has been rated excellent during project evaluation on 16 December, 2015. After four years of work, we completed a total of 560 km deep seismic reflection profile data acquisition and 1500km seismic

reflection profile data processing experiments. The project team eventually obtained a nearly 1500km long seismic reflection profile and magnetotelluric profiles across the basin-mountain tectonic zone (Hailar Basin - Great Xing'an mountain range - Songliao Basin - Lesser Xing'an mountain range - Hulin basin) in NE China. The results revealed the deep crustal fabric and deformation beneath these basin and mountain ranges and indicated the deep level of convergence and divergence for the early ancient microplate. A favorable area for future resource exploration was proposed, based on the comprehensive analysis of other geophysical data.

1) The tectonics of the basin and mountain ranges in NE China is controlled by the Mongol-Okhotsk tectonic domain and the geodynamics of bi-directional convergence of the Pacific plate. The Songliao Basin is situated in the center of this bidirectional convergence. Thus, this bidirectional convergence may be the reason of the formation of the Songliao Basin, which provides a new perspective for the study of large oil- and gas-bearing basins on the continental shelf.

2) Subduction and collision between the Jiamusi and Songnen Massifs, as well as subduction and collision of the Songnen and Xing'an Massifs were identified in the eastern and western borders of the Songliao basin. Strike-slip faults developed during the late stage and control the boundary of the massifs as well as the distribution and evolution of hydrocarbon resource rocks at depth where oil and gas are prospected for. Oil and gas exploration on the western margin of the basin should be strengthened.

3) There are many arc reflections within the upper crust in the western Great Xing'an mountain range, which may reflect magmatic activity that is indicative of the formation of polymetallic mineralization.

4) Three large suspected late Paleozoic sedimentary strata (TWT, 2-4s) in the Songliao Basin (near the Qing Gang area) were found beneath the Mesozoic uplift, which may provide valuable information for further oil and gas exploration. The Hailar Basin thickens from east to west and thus the deep basal faults have a potential prospect for oil and gas according to their velocity and electric property. It is worthy of further work.

5) The magnetotelluric inversion results revealed the lithospheric thickness of the basin and mountain ranges of NE China. The lithosphere beneath the Hailar Basin and Songliao Basin is thinner than that of the Great and Lesser Anling mountain range.

6) The project team published 13 papers (5 international SCI articles) and 10 international and domestic conference abstracts through financial support of this project.

3D geological investigation of the junction zone between the Central Orogenic belt and the N-S tectonic belt (Project Leader: WANG Haiyan)

After three years of intensive research, we have completed the designed research and the primary results are listed below:

1) The seismic reflection image across the Liupan Shan fold-and-thrust belt indicates a thin-skinned structural deformation pattern. The underlying crust has been detached from the upper crust along a major detachment fault. This scenario shows that crustal shortening was the primary mechanism driving the uplift of the northeastern margin of the Tibetan Plateau. In addition, seismic velocity results show a higher-velocity structure of the western Liupan Shan relative to other regions but change abruptly until to the eastern Liupan Shan where it meets the stable basin. The Moho becomes shallower eastwards.

2) The Qinling deep seismic reflection image indicates northward subduction of the Sichuan basin beneath the Qinling orogenic belt. A major detachment fault separates the upper crust from the lower crust beneath the south Qinling orogen. The tomographic results show that the Weihe Graben shallows toward the north and is separated from the Ordos basin by a high-velocity upwarping zone. Additionally, the North Qinling fault zone appears to be a velocity gradient that separates the North Qinling from the Weihe Graben. The Wuxi-Tiexi fault zone appears as another velocity gradient separating the Daba Shan fold-and-thrust belt from the Sichuan basin.

3) The Minjiang fault zone consists of a series of west-dipping thrust faults. Convex reflectors with high-

amplitude signals are seen in the upper to middle crust. Similarly, the east-dipping offset of the Moho is evident beneath the Min Shan. Under a circumstance of eastward extrusion of the Tibetan Plateau, both scenarios reveal subduction of the Ruo'ergai basin beneath the Min Shan and, simultaneously, upward thrusting of the upper crust along the Minjiang fault zone.

4) A crustal-scale 3D geological model was constructed, based on the integrated analysis of the seismic data and previous geologic studies.

Research on the geological background, metallogeny and propecting potential of important mineral deposits in the giant Andean metallogenic belt (Project Leader: ZHU Xiaosan)

After three years of intensive research, the main achievements of this project are as follows:

1) The geological and structural information of geological bodies (including geological units of different scales, structures and magmatic bodies) has been summarized, based on processing and interpretation of gravity and magnetic data in the Andean metallogenic belt.

2) Considering the metallogenic environment and the relationship between the evolution of structure-magma and the metallogeny, the background of metallogenic geology and regional ore-controlhas been summarized, based on the study of geochemical characteristics of sampled rocks from the Andes and comparison with those of the Gandise.

3) The Andes have been subdivided, from north to south, into 3 second-class metallogenic provinces and 13 third-class metallogenic belts, based on a comprehensive study of the basement, the tectonic evolution, plate subduction and metallogeny of the Andes. Some third-class metallogenic belts have been divided into several sub-belts.

4) The metallogenic conditions have been analyzed, and the metallogenic regularities of some typical ore deposits in the Andes have been summarized.

5) A series of geological maps of the Andes has been compiled, including a geological map, a structure-magma map and a metallogenic map. A corresponding geological database has been established together with its operation instructions.

Macrofossil biotas in the late Ediacaran–Cambrian boundary interval of South China and stratotype correlation (Project Leader: TANG Feng)

The Ediacaran-Cambrian transition is characterized by a major transformation in the geological history of the Earth, reflecting a series of geological and biological changes in environment and life history. New material from an important macrofossil biota of South China indicates that, synchronous with deposition of strata spanning the Precambrian–Cambrian boundary, complex life underwent a dramatic evolutionary change, mainly from soft-bodied metazoans to shelled animals. Research on the phylogenetic and stratigraphic correlation of these major macrofossil groups therefore has important implications. Eastern Yunnan is located along the southwestern margin of the Yangtze region which, during the Precambrian-Cambrian transition, was an open platform to a slope shallow water environment, and also contains a candidate stratotype for the Chinese Sinian and Cambrian boundary. In recent years newly described macrofossil algae, trace fossils and more complex possibly Ediacaran-type fossils ("Jiangchuan Biota"), as well as numerous examples of the ribbon-like macrofossil *Shaanxilithes* have been found in strata underlying the base of the early Cambrian phosphate layer. Relevant boundary sections from the Dengying Formation up to the base of phosphatic strata (Zhongyicun Member) suggest continuous deposition and contain diverse macrofossil assemblages (assemblage zones) that can be useful for defining the Dengyingxian Stage of the upper Ediacaran, followed by the Jinningian Stage and Meishucunian Stage of the lowermost Cambrian. These sections are candidates for a potential Chinese standard stratotype section.

This project will prioritize research of the standard sections and Meishucun stratotype—Jingning in the eastern

Yunnan, South China—and documentation of the occurrence of associated macrofossil assemblages, including the Jiangchuan Biota. These sections will then be compared to other neighboring sections as well as to the typical South China successions of upper Ediacaran and lower Cambrian phosphorite strata containing early animal fossils with phosphaticshelly material. An in-depth study of the biostratigraphy and evolutionary paleobiology of these macrofossils and their assemblages, etc. is essential to more clearly define the chronostratigraphic stage of the late Ediacaran, establish stratotype sections, and identify more useful index macrofossils which can be used to define the Precambrian–Cambrian boundary worldwide.

Hydrozoan-like Ediacaran fossils from South China (Project Leader: TANG Feng)

An abundant and diversified assemblage of benthic fossils from the Ediacaran Doushantuo black shales in the Wenghui section, Guizhou Province, South China, contains two discoidal carbonaceous forms, *Kullingia rotadiscopsis* sp. nov. and *Eoaequorea xingi* gen. & sp. nov. The fossils have well-preserved concentric rings and radiating lines and resemble many circular casts and moulds in Ediacaran clastic and carbonate rocks worldwide, such as *Aspidella*, *Ediacaria*, *Cyclomedusa*, *Eoporpita*, *Ovatoscutum*, *Spriggia* and *Kullingia*. The Doushantuo carbonaceous macrofossils help us to enquire into the current functional identifications of circular disks as the holdfasts of unknown organism or scratch circles. Although there is not sufficient correspondence in morphology to warrant reinterpreting all previously described *Kullingia* and *Aspidella* form-genus-type structures, these carbonaceous compressions are prone to be the ancestor of pelagic jellyfish-like organisms with medusoid hydrozoan affinity.

Achievements in integration and information platform development of the three dimensional geological survey (Project Leader: GUAN Ye)

After three years of comprehensive research, the main achievements of this project are as follows:

1) Tracing the progress of the three dimensional pilot project, summarizing the general progress of the first class project, establishing systemically the overall workflow of the three dimensional geological survey in China. The three dimensional geological survey has been divided into three stages, that is, surface geological mapping, deep exploration and three dimensional geological modeling. The initial methods and techniques of the three dimensional geological survey has been developed in China.

2) Compiling a series of technical guidelines of the three dimensional geological survey for the exploration of the deep crustal structure, metallogenic belts and ore concentration areas, and economic zones and cities.

3) Developing a data management system for the deep geological survey and the three dimensional geological survey. Establishing a systemic overall framework includes data storage, system security, WebGIS, data service, etc. Developing a subsystem of data release includes the management of raw data, queries, browsing and downloading of the results.

4) Developing a multi-source heterogeneous system of the three dimensional geological models which can solve the problems of sharing, visualizing and querying the multi-source three dimensional geological models between different departments.

5) Developing a platform for a digital three dimensional earth system. Geological profiles at different scales and scopes as well as geophysical data (seismic, electrical, magnetic and gravity) can be visualized in the three dimensional geological models.

6) Establishing a prototype system for management and displaying three dimensional geological models based on the study of the three dimensional modeling workflow, data exchange standards, etc.

3.4 Important Scientific Rewards

One project won the first grade award of the Ministry of Land and Resources, China:

Comparative studies on granitoids from important orogenic belts in China and Asia, based on mapping for the International Geological Map of Asia (WANG Tao, TONG Ying, WU Cailai, WANG Xiaoxia, ZHANG Lei, and GUO Lei et al.)

Voluminous granitoids occur in China and elsewhere in Asia, attracting considerable attention by geoscientists worldwide. The research team focused on comparative studies of granitoids from important orogenic belts in China and central, eastern and southern Asia, based on mapping for the International Geological Map of Asia, which is funded by the Chinese Geological Survey, the National Natural Science Foundation and the National Basic Research Program of China (973 Program). We obtained the following results: (1) Compilation of digital maps of granitoids in Asia. On the scale of China, central eastern and southern Asia, we summarized the spatial and temporal distribution of granitoids in the Central Asian Orogenic Belt, the Central China Belt, Tethys and the West Pacific Belt. From the viewpoint of continent convergence and separation, we sketched out the basic tectono-magmatic evolution framework of China and Asia. (2) We reconstructed the geochronological framework of granitoids in some important orogenic belts and analyzed the tectonic evolution of several important orogenic belts and the regional crustal deformation, based on a large number of new and previously published data, through comparing granitoids in domestic and adjacent foreign areas. A model on Granitic Tectonic Dynamics was proposed. (3) We used isotopic mapping of granitoids to develop crustal growth models and to determine the composition of the deep crust. This is a new approach to understand the origin, evolution and geochemical character of granitoids.

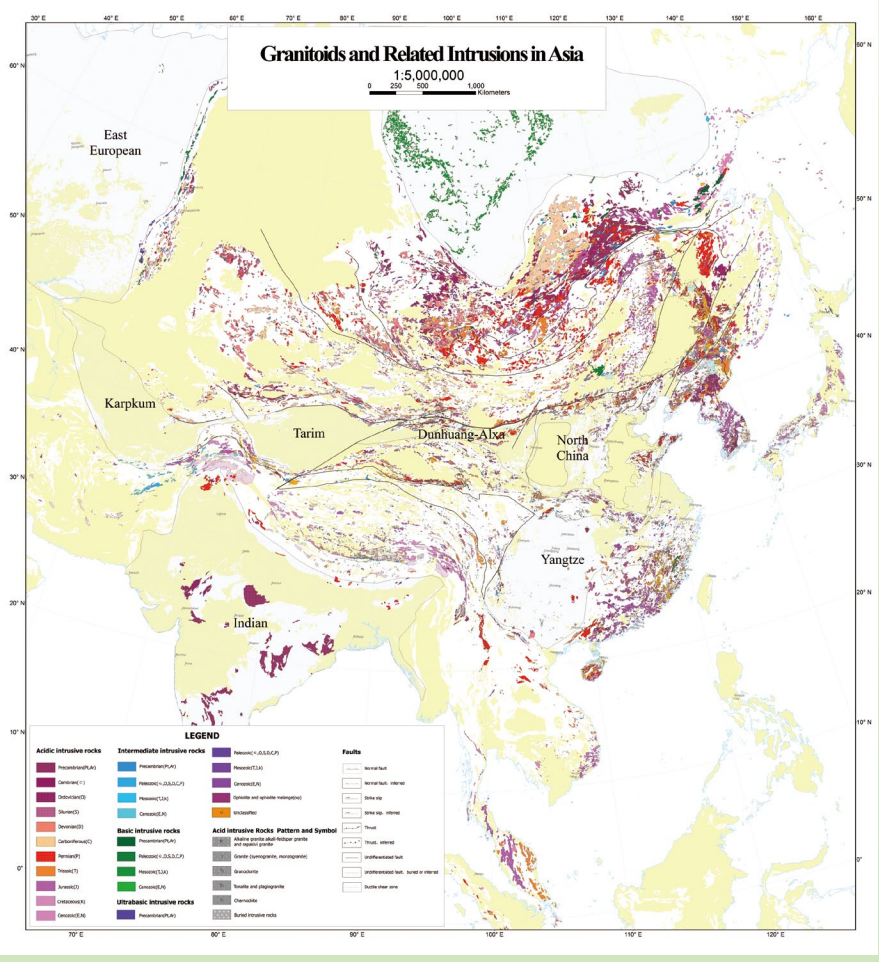

Fig 3.4.1. Map of granitoids and related intrusions in Asia

One project won the second grade award of the Ministry of Land and Resources, China:

Metamorphism and tectonic evolution of the southern Tibetan Plateau (ZHANG Zeming, DONG Xin, and XIANG Hua et al.)

(1) The Neoproterozoic HP metamorphic rocks located in the North Lhasa terrane witnessed the origin and early tectonic evolution of the Lhasa terrane. (2) The Triassic MP metamorphic belt in the center of the Lhasa terrane recorded the collision of the North and South Lhasa terranes. (3) Research on the Amdo terrane contributed to the terrane composition and attribution of the southern Tibetan Plateau. (4) The Late Cretaceous Gangdese charnockite provided evidence for Neo-Tethyan mid-ocean ridge subduction. (5) Late Devonian granite was first reported in the South Lhasa terrane and is restricted to the Paleozoic orogeny of the northern margin of Gondwana. (6) The Nyingchi Complex represents the exposed lower crust of the Gangdese magmatic arc, suggesting crustal growth during arc accretion. (7) The composition and multiple reworking of the High Himalaya crystalline sequence provided important constrains on the formation and evolution of India. (8) The Himalaya orogenic belt underwent long-lived HP/HT granulite-facies metamorphism and associated anatexis. (9) We constructed a tectonic evolutionary model for the Lhasa terrane since the Neoproterozoic.

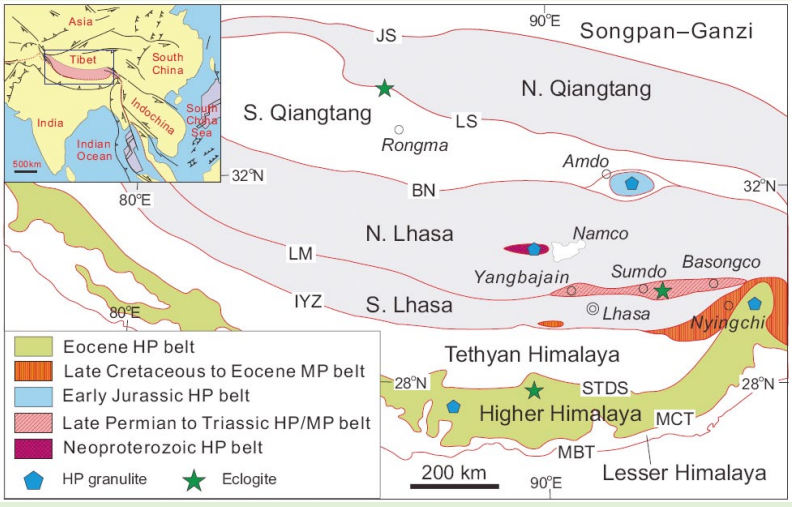

Fig 3.4.2. Metamorphic map of the Lhasa terrane

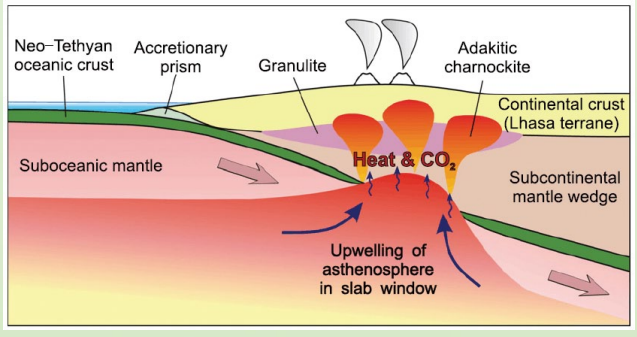

Fig 3.4.3. Tectonic model for the origin of the Gangdese charnockites

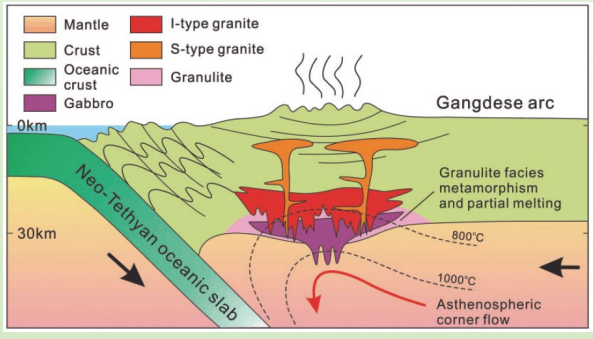

Fig 3.4.4. Paleocene tectonic model for the southeastern Gangdese arc.

One research project was recognized as one of "Ten Great Scientific Achievements of the Chinese Academy of Geological Sciences and China Geological Survey in 2015":

Rank 10: New discoveries in the study of the feathered dinosaurs and pterosaurs (LÜ Junchang, PU Hanyong, XU Li, SHEN Caizhi et al.)

The research group led by Professor Lü Junchang, Institute of Geology, Chinese Academy of Geological Sciences, cooperated with Henan Geological Museum and University of Edinburgh, and was funded by the National Natural Science Foundation of China and the China Geological Survey. It discovered a new oviraptorid dinosaur--Huanansaurus ganzhouensis from Late Cretaceous deposits in Ganzhou, Jiangxi Province. This new oviraptorid dinosaur provides new insights into the craniofacial evolution of oviraptorosaurid dinosaurs, their paleogeographical distribution and paleoecological environments. The newly discovered Zhenyuanlong suni from the Early Cretaceous of western Liaoning Province is a large, short-armed, winged dromaeosaurid dinosaur. It provides the first evidence of feather morphology and distribution in a short-armed dromaeosaurid dinosaur. The discovery of Zhenyuanlong also provides important evidence for the study of the diversity, the origin of feathers and the flight of Liaoning dromaeosaurid dinosaurs. Orientognathus chaoyngensisis the first Late Jurassic pterosaur in western Liaoning, and it is the largest rhamphorhynchinae pterosaur. The discovery of Orientognathus not only fills the temporal gap between the Middle Jurassic and Early Cretaceous pterosaur faunas of China, but also plays an important role in the understanding of radiation evolution of rhamphorhynchids from the Late Jurassic.

The above important discoveries provide a key role to our understanding of hotly debated and difficult issues such as the evolution of oviraptorid dinosaurs, the feather evolution in dromaeosaurid dinosaurs and the origin of bird feathers. In particular, the Ganzhou Dinosaurian Fauna is named based on the new taxon.

A science and technology innovation team for dinosaur research, geological survey, excavation and repair has been educated during the project.

Fig 3.4.5. The holotype of Huanansaurus ganzhouensis (HGM41HIII-0443) gen. et sp. nov. (A); a close up of the phalanges of the right and left hand (B).

Fig 3.4.6. The living scene of Huanansaurus (Drawn by Zhao Chuang)

Fig 3.4.7. The holotype of Zhenyuanlong suni

4. International Cooperation and Academic Exchange

4.1 Attendance at International Conferences

HE Bizhu attended the AAPG European Regional Conference & Exhibition Lisbon 2015 (Lisbon, Portugal)

Invited by Dr. Jeremy Richardson, Director of AAPG Europe, Dr. HE Bizhu attended the AAPG "Tethys-Atlantic Interaction along the European-Iberian-African Plate Boundaries" Conference in Lisbon, on 17-21 May, 2015. She delivered a presentation entitled "Reconstruction of the tectonic paleogeography of the Tarim Basin and its adjacent areas (NW China) during the Middle and Late Caledonian".

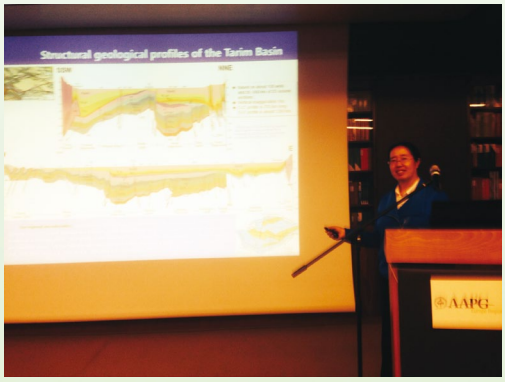

Fig. 4.1.1. HE Bizhu giving a presentation at the meeting.

Fig. 4.1.2 Group photo taken during the post-conference field trip to Telheiro, South Portugal.

YIN Chongyu and GAO Linzhi attended the STRATI 2015 (Graz, Austria)

Invited by the organizing committee of the 2nd International Congress on Stratigraphy, Dr.YIN Chongyu and Dr. GAO Linzhi, as Voting Members of the Subcommission on Ediacaran Stratigraphy and the Subcommission on Cryogenian Stratigraphy of the International Commission on Stratigraphy respectively, attended STRATI 2015 held on 18-27 July in the Institute of Earth Sciences, University of Graz, Austria.

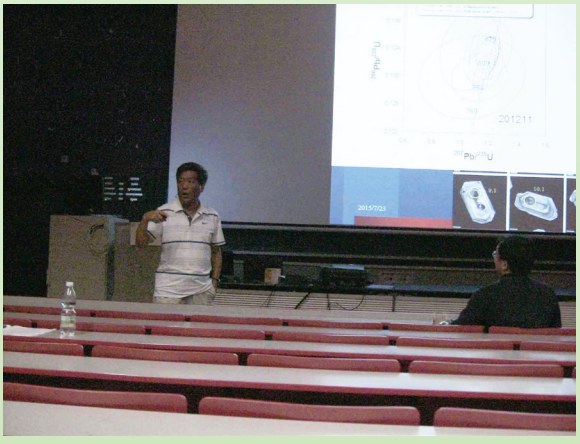

Fig. 4.1.3. GAO Linzhi giving an oral presentation at the congress.

Fig. 4.1.4. YIN Chongyu giving a poster presentation at the congress.

ZHU Xiangkun and colleagues attended the 2015 Goldschmidt Conference (Prague, Czech Republic)

Invited by Prof. Martin Novák of the Czech Geological Survey, Dr. ZHU Xiangkun, Dr. YANG Jingsui and Dr. LI Jin attended the Goldschmidt 2015 conference, held on 16-21 August 2015 in Prague, Czech Republic, at the Prague Convention Centre. They delivered the following presentations at the meeting: Iron isotope fractionation during differentiation of mafic magma and its bearing on Fe mineralisation: A case study from the Panzhihua layered intrusion, China (ZHU Xiangkun); Ca-Perovskite: A first report of a lower mantle mineral in ophiolite-hosted diamond (YANG Jingsui); Molybdenum isotopic composition of Wafangzi ferromanganese oxide deposit and its paleoceanographic implications (LI Jin).

Fig. 4.1.5. ZHU Xiangkun giving a presentation at the conference.

Fig. 4.1.6. YANG Jingsui giving a presentation at the conference.

LV Junchang attended the 75th Annual Society of Vertebrate Paleontology Meeting (Dallas, USA)

Invited by Dr. Dale A. Winkler of the 75th Society of Vertebrate Paleontology (SVP) Annual Meeting Host Committee, Dr. LV Junchang attended this meeting held on 14-17 October 2015 in Dallas, Texas, USA. He delivered an oral presentation entitled “A new oviraptorid dinosaur (Dinosauria: Oviraptorosauria) from the Late Cretaceous of southern China”

JIN Xiaochi and HUANG Hao attended the 4th International Symposium of IGCP-589: Development of the Asian Tethyan Realm: Genesis, processes and outcomes (Bangkok, Thailand)

The 4th International Symposium of IGCP-589: “Development of the Asian Tethyan Realm: Genesis, processes and outcomes” was held in Bangkok, Thailand, on 25 October-3 November, 2015. As the IGCP-589 Project leader, Dr. JIN Xiaochi, hosted the symposium and delivered an oral presentation entitled “Is the West Burma block Gondwana or Cathaysian derived? A Permian paleobiogeographic and regional geological reappraisal”. Dr. Huang Hao attended the symposium and gave an oral presentation entitled “Mid-Permian fusulinids of the Bawei Section in the southern Baoshan Block of western Yunnan, China, with a discussion on paleogeographic implications”. They also participated in the field excursion after the symposium.

Fig. 4.1.7. JIN Xiaochi hosting the symposium.

Fig.4.1.8. Group photo taken during the field excursion.

YANG Jingsui and colleagues attended the 2015 Geological Society of America (GSA) Annual Meeting and Exposition (Baltimore, USA)

Invited by Dr. Vicki S. McConnell, Executive Director of GSA, Drs. YANG Jingsui, XIONG Fahui and LIU Fei attend the Geological Society of America (GSA) Annual Meeting and Exposition held on 1-4 November 2015 in Baltimore, Maryland, USA. Dr. YANG Jingsui, together with Prof. Yildirim DILEK of the University of Miami, organized and hosted a session on "Ophiolite-hosted diamonds and UHP minerals" at the meeting. He deliverd a presentation with the title "Formation of ophiolite-hosted diamonds by deep subduction of oceanic lithosphere: evidence from mineral inclusions", XIONG Fahui gave a presentation of "Mineral and pertolgogy of Cr-rich ophiolitic chromitites of Bulqiza, eastern ophiolitic belt, Albania" and LIU Fei's presentation was "Structure, geochemistry and geochronology of the western Yarlung Zangbo ophiolites in southern Tibet (China), and implications for neotethyan tectonics".

Fig. 4.1.9. YANG Jingsui giving a presentation at the meeting.

Fig.4.1.10. Group photo with Profs. Paul ROBINSON, Yildirim DILEK, etc. at the meeting.

LV Junchang attended the 2nd International Symposium of Asian Dinosaurs (Bangkok, Thailand)

Invited by Dr. Yoshikazu Noda, Executive Secretary General of the Asia Dinosaurs Association (ADA), Dr. LV Junchang, as Vice Executive Secretary General of ADA, attended the 2nd International Symposium of Asian Dinosaurs held on 19 November 2015 in Bangkok, Thailand. He delivered a keynote address entitled "The King of Mesozoic Sky—Recent Advances in the Study of Chinese Pterosaurs"

LIU Dongliang and Marie-Luce Chevalier attended the 2015 Fall Meeting of the American Geophysical Union (AGU) in San Francisco, USA

The 2015 Fall Meeting of the American Geophysical Union (AGU) was held on 14-18 December 2015 in San Francisco, USA. Drs. LIU Dongliang and Marie-Luce CHEVALIER attended the meeting and delivered poster presentations with the titles "Fault-rock magnetism from the Wenchuan Earthquake Fault Scientific Drilling Project (WFSD) implies different slip dynamics" and "Large-scale geometry of intra-continental strike-slip faults: Example of the Karakorum fault, western Tibet" respectively. Dr. Marie-Luce CHEVALIER also delivered an oral presentation entitled "Structure, frictional melting and fault weakening during the 2008 Mw 7.9 Wenchuan Earthquake: Observation from the WFSD Drilling Cores" on behalf of Dr. LI Haibing who could not attend the meeting.

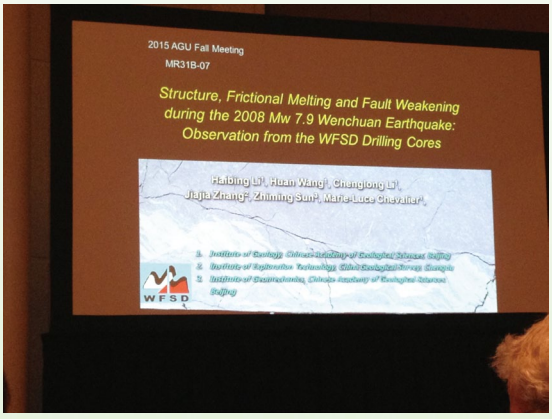

Fig. 4.1.11. Marie-Luce CHEVALIER delivering LI Haibing's presentation.

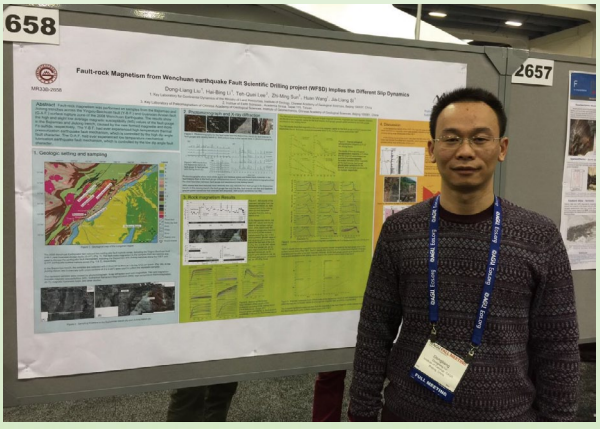

Fig. 4.1.12. LIU Dongliang and his poster at the meeting.

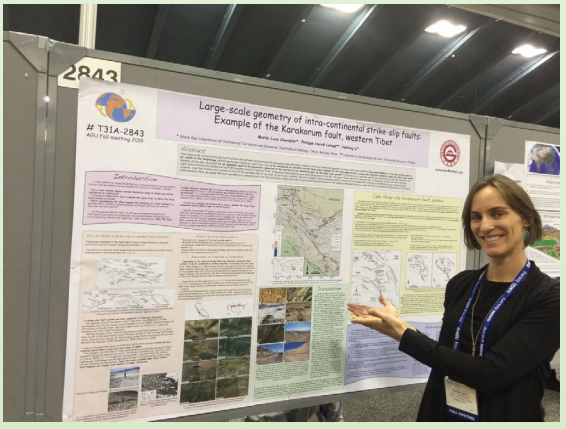

Fig. 4.1.13. Marie-Luce CHEVALIER and her poster at the meeting.

4.2 Foreign visits by members of the Institute

LIU Yingchao visited the Australian National University (Canberra, Australia)

Invited by Dr. Mark Kendrick of the Australian National University (ANU), Australia, Dr.LIU Yingchao visited the Research School of Earth Sciences of this university to accept the honorary status as an Occupational Trainee from 31 December 2014 to 29 April 2015.

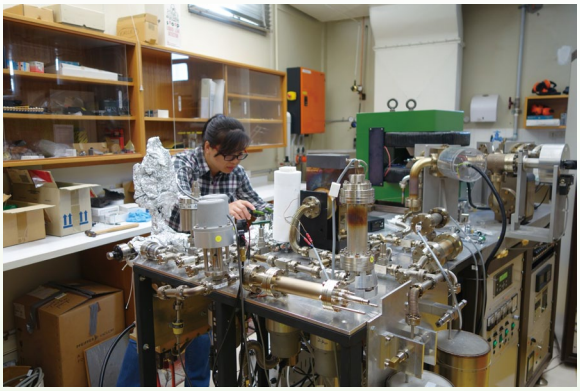

Fig. 4.2.1. LIU Yingchao working in the Laboratory of ANU.

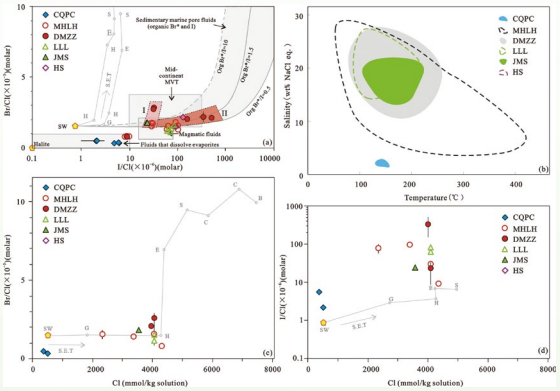

Fig. 4.2.2. Summary of fluid inclusion halogen and microthermometric data. a) Fluid inclusion Br/Cl versus I/Cl ratios, b) fluid inclusion salinities versus temperatures, c) salinity versus Br/Cl and d) salinity versus I/Cl ratio.

ZHANG Hongrui conducted cooperative research at James Cook University (Townsville, Australia)

Invited by Prof. Paul Dirks of James Cook University (JCU), Dr. ZHANG Hongrui visited the Economic Geology Research Center, School of Earth and Environmental Sciences of this university to carry out cooperative research from October 2014 to June 2015 on tectonic evolution and metallogeny of the Tibetan orogenic belt.

LI Shan conducted cooperative research at the National Taiwan University (Taipei, Taiwan)

Invited by Prof. Sun-Lin Chung of the Department of Geosciences, College of Science of the National Taiwan University, Dr. LI Shan visited this university and participated in research work of Prof. Sun-Lin Chung's project entitled "Across Tibet: Comparative study on two collisional orogenic belts of the Earth" from August 2014 to July 2015.

Fig. 4.2.3. LI Shan at the Department of Geosciences of the National Taiwan University.

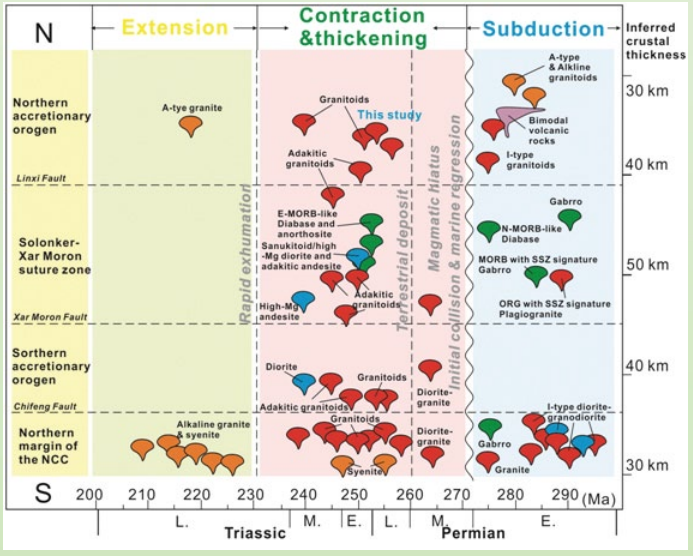

Fig. 4.2.4. Spatial and temporal distribution of magmatic activity and relations with major tectonic events during the early Permian to Triassic evolution of the Solonker-Xar Moron suture zone.

GUAN Ye and LU Zhanwu visited the University of California, San Diego, the University of Southern California, Los Angeles, and the Reflection in Motion LLC for academic exchanges (California, USA)

Invited by Dr. Kai LIN, Research Scientist of the University of California, San Diego (UCSD), Drs. GUAN Ye and LU Zhanwu visited the San Diego Supercomputing Center to discuss the current developments in earth science large data storage and management, data computation, and visualization, etc., and invited by Prof. Yonggang LI of the University of Southern California, they visited the Department of Earth Science and Southern California Earthquake Center of this university to discuss mutual interests in earthquake data processing and visualization from 15 to 20 May 2015. Dr. Jonathan Rich, President of the Reflection in Motion LLC, hosted their visit between 20 and 25 May 2015 to discuss and exchange issues in earth science visualization, recent progress in AVE visualization technologies, large data and real-time web technologies, and to address technical details in developing SinoProbe CAVES and data management.

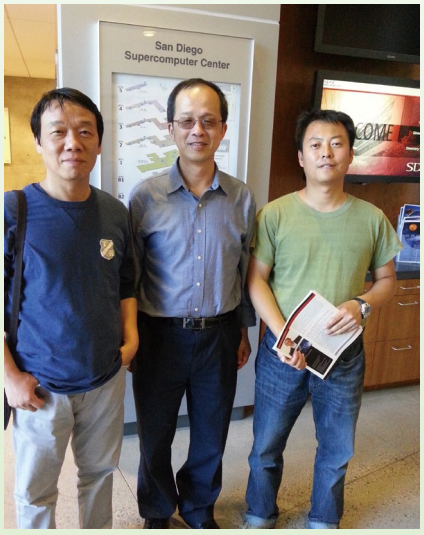

Fig.4.2.5. Group photo with Dr. Kai LIN (center) at the San Diego Supercomputing Center.

Fig.4.2.6. Visiting the UCSD.

XIE Hangqiang undertook collaborastive fieldwork in South Africa

Invited by Prof. Axel HOFMANN of the Department of Geology, University of Johannesburg, Dr. XIE Hangqiang undertook joint fieldwork in the Limpopo belt with Dr. G. BRANDL of the South African Geological Survey, as well as rock sampling with Prof. A. HOFMANN in the Assegaai and Commondale greenstone belts of South Africa during 29 June to 27 July 2015.

Fig.4.2.7. Working with Prof. Axel HOFMANN and another team member during the field trip.

Marie-Luce Chevalier and PAN Jiawei conducted collaborative research at the Institut de Physique du Globe de Strasbourg and Ecole et Observatoiredes Sciences de la Terre (Strasbourg, France)

Invited by Dr. Jerome van der Woerd of Institut de Physique du Globe de Strasbourg and Ecole et Observatoire des Sciences de la Terre (EOST), France, Drs. Marie-Luce CHEVALIER and PAN Jiawei visited this institute to work on a project of active tectonics, in particular concentrating on the processing of rock samples for cosmogenic nuclide dating in May and August 2015, respectively.

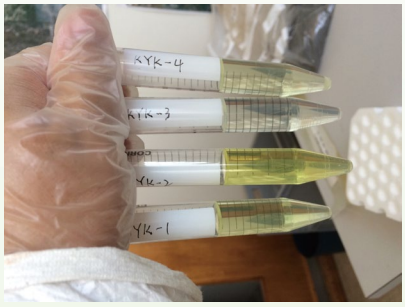

Fig.4.2.8. PAN Jiawei doing tests at EOST.

KUANG Hongwei and PENG Nan conducted cooperative research with the Utah Geological Survey (Utah, USA)

Fig.4.2.9. KUANG Hongwei and PENG Nan working with Dr. James KIRKLAND.

Invited by Dr. James Kirkland, State Paleontologist of the Utah Geological Survey, Drs. KUANG Hongwei and PENG Nan visited the Utah Geological Survey to conduct cooperative research on the Upper Jurassic Morrison Fm., Lower Cretaceous Cedar Mountain Fm., and Upper Cretaceous on the Colorado Plateau of Utah from 31 July to 6 September 2015.

DING Xiaozhong and colleagues visited the University of Sydney (Australia)

Invited by Prof. Phil McManus, Head of the School of Geosciences, University of Sydney, Australia, Drs. DING Xiaozhong, GAO Linzhi, REN Liudong, LIU Yanxue and HAN Kunying visited this university to carry out exchange research as visiting scholars from 5 to 25 August 2015.

Fig.4.2.10. Group photo taken at the University of Sydney.

Fig.4.2.11. Academic exchanges at the University of Sydney (Dr. HAN Kunying giving an oral presentation).

TONG Ying and colleagues participated in a joint field trip to central Mongolia (Mongolia)

Invited by Dr. Kh. Tsogtbaatar, Director of the Institute of Paleontology and Geology, Mongolian Academy of Sciences, Drs. TONG Ying, GUO Lei and ZHANG Lei visited this Institute and attended international fieldwork on the Project "Geology, tectonics and metallogenesis of Central Asian orogenic belt" during 12 August to 10 September 2015.

Fig. 4.2.12. Group photo of participants in the field trip.

Fig. 4.2.13. TONG Ying and GUO Lei at the field trip.

Fig. 4.2.14. ZHANG Lei at the field trip.

LIU Fulai and colleagues accepted Visiting Fellowships at the University of Tokyo (Tokyo, Japan)

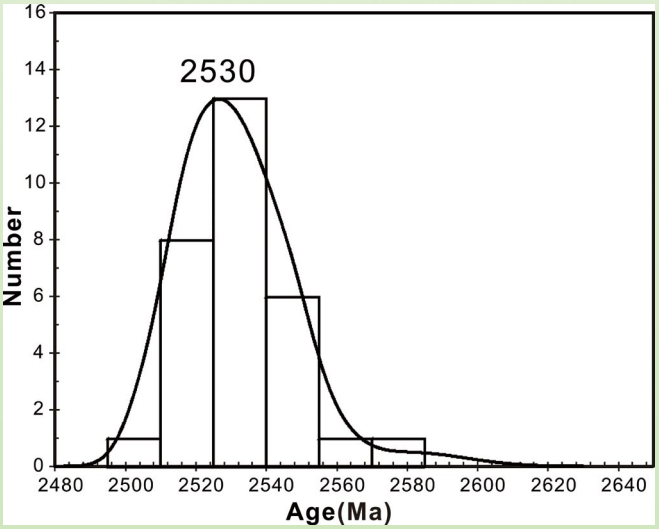

Fig.4.2.15. Histogram of monazite U-Pb ages.

Invited by Dr. Tsuyoshi IIZUKA of the Department of Earth and Planetary Science, University of Tokyo, Drs. LIU Fulai, WANG Fang and CAI Jia accepted Visiting Fellowships at this University and conducted U-Th-Pb dating, REE and Lu-Hfisotopic analyses on zircon and monazite, etc., from 15 August to 13 September 2015.

ZHANG Yinghui undertook further geosciences cooperation under the terms of the MOU between CGS and SGS at the Saskatchewan Geological Survey (Saskatoon, Canada)

Under the terms of the Memorandum of Understanding (MOU), signed between the Saskatchewan Geological Survey (SGS), Saskatchewan Ministry of the Economy, Canada, and the China Geological Survey (CGS) in May 2013, and invited by Dr. Gary DELANEY, Chief Geologist of SGS, Dr. ZHANG Yinghui visited Saskatchewan, Canada, from 10 August to 8 September 2015 to undertake further geosciences cooperation under the terms of the MOU and as detailed in the subsequently agreed Project Annex to the MOU.

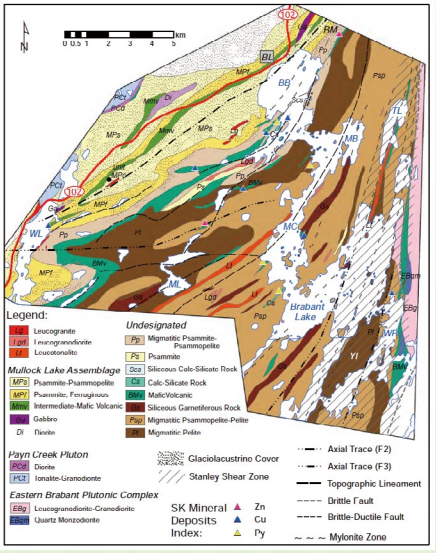

Fig.4.2.16. Draft geological map of the Brabant Lake at 1:20000.

Fig.4.2.17. ZHANG Yinghui doing mapping work at the Brabant Lake.

TONG Ying conducted cooperative research at the National Taiwan University (Taipei, Taiwan)

Invited by Dr. Kuo-Lung Wang of the Institute of Earth Sciences, Academia Sinica, Taipei, Dr. TONG Ying visited this institute to conduct a cooperative research, from 9 October to 7 November 2015. During his stay at the institute, he completed chemical analyses of granite samples.

Fig. 4.2.18. TONG Ying conducting tests at Academia Sinica.

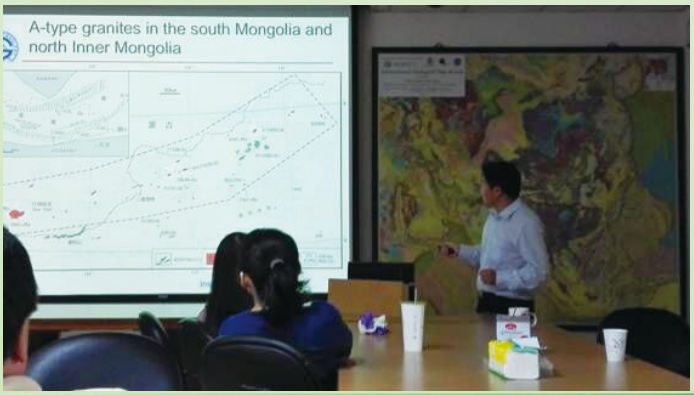

Fig. 4.2.19. TONG Ying giving a presentation.

HE Rizheng conducted cooperative research at the Helmholtz Center Postdam, GFZ German Research Center for Geosciences (Potsdam, Germany)

Invited by Dr. Xiaohui YUAN of the Helmholtz Center Postdam, GFZ German Research Center for Geosciences, Germany, Dr. HE Rizheng visited this center to work on the collaborative Sino-German scientific research project "North-South broadband passive-source seismic array and reflection profiling in the Tibetan Plateau", from 5-13 November 2015.

GAO Li'er conducted cooperative research at the California Institute of Technology (California, USA)

Invited by Prof. Paul Asimow of the Division of Geological & Planetary Sciences at the California Institute of Technology, USA, Dr. GAO Li'er collaborated with Prof. Paul Asimow on a series of experiments and geochemical analyses related to the origin and geochemical characteristics of Himalayan granites and discussed the results of these experiments and began writing conference abstracts and scientific publications from 1 September to 30 November 2015.

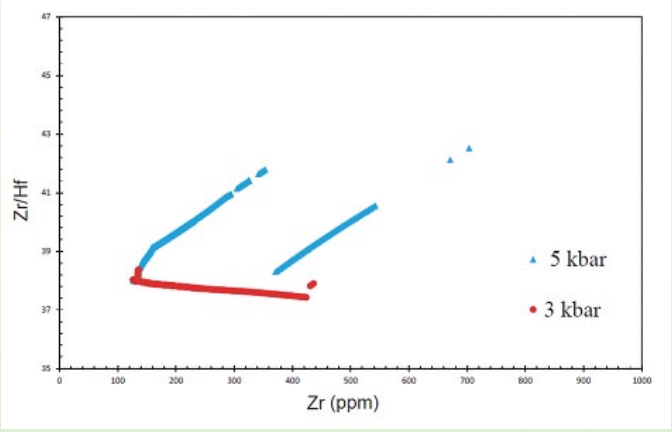

Fig. 4.2.20. Zr-Zr/Hf systematics for leucogranitic melts from software MELTS.

Fig. 4.2.21. Group photo of GAO Li'er and Prof. P. J. WYLLIE, former Dean of the Division of Geological & Planetary Sciences of the California Institute of Technology.

LI Yibing analyzed geological samples at the laboratory of the University of Tokyo, (Tokyo, Japan)

Invited by Dr. Tsuyoshi Komiya of the Department of Earth Science & Astronomy, University of Tokyo, Japan, Dr. LI Yibing studied the petrology and mineralogy of mantle rocks, discussed joint research, and analyzed some geological samples at the laboratory of this Department from 30 November to 23 December 2015.

GAO Rui and colleagues worked with American experts on CMP data processing and interpretation of data from SinoProbe profiles (Houston and San Francisco, USA)

Invited by Prof. Simon KLEMPERER of Stanford University, Prof. Fenglin NIU of Rice University, and Prof. Xiaodong SONG of the University of Illinois at Urbana-Champaign, Academician GAO Rui and Drs. LI Qiusheng and LU Zhanwu jointly worked on CMP data processing and interpretation from SinoProbe profiles along Zanda-Gar and Pulan, integrated the seismic images of both sides, as well as exchanged ideas on their interpretations at

the above-mentioned universities from 12 to 24 December 2015 (GAO Rui and LI Qiusheng) and from 15 to 26 December 2015 (LU Zhanwu).

Fig. 4.2.22. GAO Rui (left) exchanging ideas with Prof. Fenglin NIU (right) at Rice Uneversity.

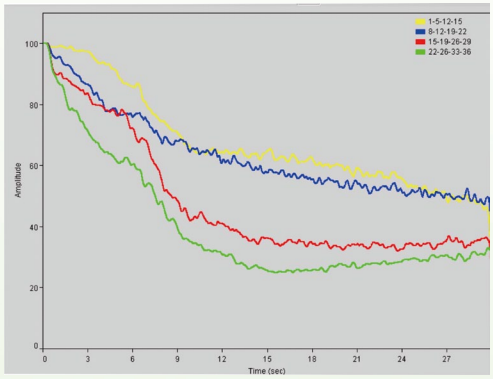

Fig. 4.2.23. Frequency spectrum analysis result of the HKT profiles

LI Zhonghai conducted collaborative research at the Institute of Geophysics, ETH-Zürich (Zürich, Switzerland)

Invited by Prof. Taras Gerya of Institute of Geophysics, ETH-Zürich, Switzerland, Dr. LI Zhonghai, as a visiting scholar at ETH-Zürich, conducted collaborative research on "Numerical modeling of seismic anisotropy in the subduction-collision system" in the framework of a collaborative project between the Institute of Geology at Chinese Academy of Geological Sciences and the Geophysical Fluid Dynamics Group of the Institute of Geophysics at ETH-Zürich for two weeks (from 28 December 2015 to 9 January 2016).

LIU Dongliang conducted analyses and tests at the Institute of Earth Sciences, Academia Sinica (Taipei, Taiwan)

Invited by Prof. Shengrong SONG of the Department of Geosciences, National Taiwan University, Dr. LIU Dongliang visited this university and the Institute of Earth Sciences, Academia Sinica, Taipei and conducted analyses and tests of rock samples at its Paleomagnetism Laboratory from 29 December 2015 to 10 February 2016.

4.3 Academic Visitors

Visit of David LEACH from the U.S. Geological Survey

Invited by Dr. SONG Yucai, Dr. David LEACH, former researcher of the U.S. Geological Survey, who is an Honorary Professor of the Institute of Geology, visited the Institute of Geology and conducted fieldwork in Yunnan Province, China from 27 February to 19 March 2015, together with SONG Yucai and several other team members.

Visit of Igor Pospelov from the A.P. Karpinsky Russian Geological Research Institute (FGUP "VSEGEI")

Invited by Academician LI Tingdong and Dr. GENG Shufang, Dr. Igor Pospelov of the A.P. Karpinsky Russian Geological Research Institute (FGUP "VSEGEI") visited the Institute of Geology for mapping collaboration between 16-20 March 2015.

Visit of Ian Williams and colleagues from the Australian National University

Invited by Prof. LIU Dunyi, SHRIMP specialists Prof. Ian Williams from the Research School of Earth Sciences, Australian National University, and his colleagues (Mr. John Hyder and Dr. John Foster) visited the Beijing SHRIMP Center of the Institute of Geology from 10 March to 9 April 2015. Their purpose of visit was to repair the control motor in the multi-ion collector of SHRIMP IIe-MC and recalibrate the instrument after repair. The higher collector slit was also replaced in order to obtain much better stability of the SHRIMP performance.

Visit of Dr. Tsuyoshi Komiya and his team from the University of Tokyo, Japan

Invited by Dr. LI Yibing, Dr. Tsuyoshi KOMIYA and his team of the Department of Earth Science & Astronomy, University of Tokyo, Japan, visited the Institute of Geology and participated in a joint field trip to Anshan, Liaoning Province, China between 13-19 April 2015.

Visit of Soloman Buckman from the University of Wollongong, Australia

Invited by Dr. YAN Zhen, Dr. Soloman BUCKMAN and his two students from the University of Wollongong, Australia, visited the Institute of Geology and participated in a joint field trip to the Qinling orogenic belt of northwestern China between 14-30 April 2015.

Fig.4.3.1. Discussion during the field trip.

Fig.4.3.2. Dr. Soloman BUCKMAN giving a presentation.

Visit of James Jiro Mori of Kyoto University, Japan

Invited by Dr. LI Haibing, Prof. James Jiro MORI of the Earthquake Hazards Division, Disaster Prevention Research Institute, Kyoto University, Japan, visited the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology between 4-6 May 2015 for academic exchanges.

Visit of Isabelle Francoise COUTAND from Dalhousie University, Canada

Invited by Dr. LI Haibing, Prof. Isabelle Francoise COUTAND of Dalhousie University, Canada, visited the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology and delivered presentations on thermochronology and geochronology from 21 May to 9 June 2015. She also participated in a joint field trip to Sichuan Province of China.

Visit of Tsuyoshi Iizuka and Keita Itano from the University of Tokyo, Japan

Invited by Dr.LIU Fulai, Dr. Tsuyoshi IIZUKA and his student Keita ITANO of the University of Tokyo, Japan, visited the Institute of Geology between 15-17 June 2015 and delivered two presentations.

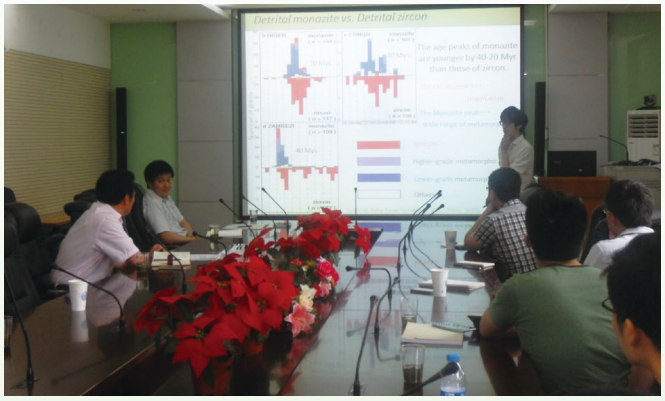

Fig.4.3.3 Dr. LIU Fulai (first from left) and Dr.Tsuyoshi IIZUKA (second from left) discussing academic issues during the presentation.

Visit of Chris Mattinson from Central Washington University, USA

Invited by Dr. ZHANG Jianxin, Dr. Chris MATTINSON of the Department of Geological Sciences, Central Washington University, USA, visited the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology, between 20-30 June 2015 for academic exchanges. He also participated in a joint field trip to Anhui Province of China.

Visit of Steve CLEMENT from Ion Optical Consulting, Canada

Invited by Prof. LIU Dunyi, Dr. Steve CLEMENT, internationally well-known Canadian specialist on mass spectrometry and ion optical design, visited the Beijing SHRIMP Centre twice in March and August of 2015, respectively. The main purpose of his visits was to complete the annual work plan of the Specially-Funded Programme on National Key Scientific Instruments and Equipment Development – “New models of TOF-SIMS for Isotope Geology”.

Visit of Jonathan Aitchison from the University of Queensland and Soloman Buckman from the University of Wollongong, Australia

Invited by Dr. YAN Zhen, Prof. Jonathan Aitchison from the School of Geography Planning and Environmental Management, University of Queensland, Australia, and Dr. Soloman BUCKMAN from the University of Wollongong, Australia, participated in a joint field trip to the Lajishan area of the South Qilian orogenic belt, on 10-16 August 2015.

Fig.4.3.4. Prof. Jonathan AITCHISON (middle) demonstrating how to recognize the ophiolitic mélange on the geological map.

Fig.4.3.5. Prof. Jonathan AITCHISON (right) and Dr. Soloman BUCKMAN (left) giving a presentation

Visit of Jeremy Richards from the University of Alberta, Canada

Invited by Dr. HOU Zengqian, Prof. Jeremy RICHARDS of the Department of Earth and Atmospheric Sciences, University of Alberta, Canada, visited the Institute of Geology between 12-18 August 2015, for academic exchanges. He also participated in a joint field trip to Yunnan Province of China.

Fig.4.3.6. Prof. Jeremy RICHARDS (right) working at the drill core store in Yunnan.

Fig.4.3.7. Prof. Jeremy RICHARDS giving a presentation.

Visit of ZHANG Ruyuan from Stanford University, USA

Invited by Dr. YANG Jingsui, Prof. ZHANG Ruyuan of Stanford University, USA, visited the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology from 17 August to 25 October 2015 for academic exchanges.

Visit of Cees Roelof van Staal and Shoufa Lin from the University of Waterloo, Canada

Invited by Dr. TONG Ying, Profs. Cees Roelof VAN STAAL and Shoufa LIN from the University of Waterloo, Canada, conducted cooperative research in the Institute of Geology from 10 September to 5 October 2015.

Visit of Simon Wilde from Curtin University, Perth, Australia, and Michael Brown from the University of Maryland, USA

Invited by the Director of the SHRIMP Center, Prof. LIU Dunyi, the key members of the International Precambrian Research Centre of China (IPRCC), Prof. Simon Wilde from Curtin University, Perth, Australia, and Prof. Michael Brown from the University of Maryland, USA, visited the Center from 15 to 23 October 2015. Both professors participated in the IPRCC Short Course 2015 "Precambrian Surface Processes" as well as an International Field Excursion in the Daqingshan Area, Inner Mongolia, during their visits.

Visit of Julian PEARCE from Cardiff University, UK

Invited by Dr. YANG Jingsui, Prof. Julian PEARCE of Cardiff University, UK, conducted cooperative research in the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology from 1 October to 31 December 2015.

Visit of KUO Chenhao and SU Poli from the National Central University, Taiwan

Invited by Dr. LI Qiusheng, Drs. KUO Chenhao and SU Poli from the Department of Earth Science, National Central University, Taiwan, visited the Institute of Geology between 6-20 November 2015, for academic exchanges.

Visit of Alfred KRÖNER and Yamirka ROJAS-AGRAMONTE from the University of Mainz, Germany

World famous geologist and Honorary Professor of the Beijing SHRIMP Center of the Institute of Geology, Prof. Alfred KRÖNER, visited the Beijing SHRIMP Center for collaborative research from March to April and from September to November of 2015, respectively. Post-doctoral researcher Yamirka ROJAS-AGRAMONTE also visited the Beijing SHRIMP Center in October 2015. During their visits, Prof. Kröner and Dr. Rojas-Agramonte also helped with the organization of the International Precambrian Research Centre of China (IPRCC) annual academic events.

Visit of Jian-xin ZHAO from the University of Queensland, Australia

Approved by the China Geological Survey (CGS) and the Chinese Academy of Geological Sciences (CAGS), Prof. Jian-xin Zhao was appointed as Senior Overseas Visiting Scholar in early 2015. Prof. ZHAO will work in the Beijing SHRIMP Center for at least 3 months every year. His work is to help the Center to establish an Open Innovation Platform based on non-traditional isotope ultra-clean laboratory, and techniques such as U-Th series dating, other young sediments dating as well as isotopic tracing.

During his stay in Beijing for carrying out his research work, Prof. Zhao gave an academic presentation entitled "Applications of isotope geochemistry and chronology in research of neotectonics, ore-forming hydrothermal processes and sedimentary basins" in the Institute of Geology. A series of courses on "Quaternary chronology and related methodology" was also given to young scientists in the Center.

Fig.4.3.8. Prof. Jian-xin ZHAO giving a presentation.

Other visits to the Beijing SHRIMP Center of the Institute of Geology

On 2 November 2015, 29 Pakistan trainees from the Pakistan Ministry of Oil & Natural Resources, who participated in the China Geological Survey (CGS) 2015 training course on geology and mineral resources exploration and development, visited the Beijing SHRIMP Center New Laboratory Building.

Fig.4.3.9. Pakistan trainees visiting the Research and Development Centre of TOF-SIMS in the Beijing SHRIMP New Lab Building.

Fig.4.3.10. Group photo of the Pakistan trainees at the center

5. Important Academic Activities in 2015

5.1 International conferences and field excursions organized and held by the Institute

IGCP-649 Workshop on Ophiolite and Related High-Pressure Rocks in the Qilian Mountains, Xining, China

The IGCP-649 Workshop on "Ophiolite and Related High-Pressure Rocks in the Qilian Mountains", sponsored by UNESCO (United Nations Educational, Scientific and Cultural Organization) and IUGS (International Union of Geological Sciences), and jointly organized by the Key Laboratory of Continental Tectonics and Dynamics of the Institute of Geology and the Science and Technology Department of Qinghai Province, was successfully held between 5-10 August 2015 in Xining, China.

Prof. YANG Jingsui, the first leader of the IGCP-649 Project, presided over the workshop. More than 10 internationally well-known experts and scholars, such as Prof. Yildirim DILEK, Vice President of the International Union of Geological Sciences (IUGS), delivered presentations at the workshop. More than 100 delegates from more than 9 countries such as USA, Australia, Germany, Russia, Cuba, Mongolia, Iran, and Turkey, etc. attended the workshop and participated in the post-conference field excursion to the Qilian Mountains.

Fig 5.1.1. Opening ceremony of the Workshop.

Fig 5.1.2. Prof. YANG Jingsui giving a presentation.

Fig 5.1.3. Group photo of the attendees of the Workshop.

Fig 5.1.4. Group photo of the attendees during the field excursion.

First China-Russia International Meeting on the Central Asian Orogenic Belt and IGCP-592 Workshop

The First China-Russia International Meeting on the Central Asian Orogenic Belt and IGCP-592 Workshop, co-organized by the Institute of the Earth's Crust, Siberian Branch, Russian Academy of Sciences, Irkutsk, Russia, Peking University, and the China-SCO Geosciences Cooperation Center, was held at the Chinese Academy of Geological Sciences (CAGS) in Beijing on 23-25 September 2015. More than 20 internationally known experts and scholars from more than 9 countries such as Russia, Australia, Germany, Canada, Mongolia, and China, etc., such as Dr. Dmitrii Gladkochub, Director of the Institute of the Earth's Crust, Siberian Branch, Russian Academy of Sciences, in Irkutsk and Dr. Inna Safonova, chief scientist and leader of Project IGCP-592, delivered presentations at the workshop. More than 130 geologists who have undertaken research on the Central Asian Orogenic Belt attended the workshop and most participated in a post-conference field excursion to Inner Mongolia of China.

The Workshop has set a new platform to implement the Belt and Road Initiative and promote international geosciences cooperation.

Fig 5.1.5. Prof. WANG Tao, Chinese organizer of the Workshop, giving a lecture.

Fig 5.1.6. Dr. Dmitrii Gladkochub giving a lecture.

Fig 5.1.7. Dr. Inna Safonova giving a lecture.

Fig 5.1.8. Group photo of the attendees of the Workshop.

2015 Short Course of the International Precambrian Research Centre of China (IPRCC) on "Precambrian Surface Processes"

The IPRCC Short Course 2015, "Precambrian Surface Processes" was held at CAGS in Beijing on 16-18 October 2015. Three world-famous specialists, Professor Christoph HEUBECK of the University of Jena, Germany, Professor Nicolas BEUKES of the University of Johannesburg, South Africa, and Professor Kurt KONHAUSER of the University of Alberta, Edmonton, Canada, were invited as lecturers for the course. More than 70 postgraduate students and young geologists from all over China participated in the course.

In order to help young Chinese geologists to have a better understanding of the most important and cutting-edge progress in recent geological research, and to promote international cooperation between Chinese and foreign geologists, the IPRCC has organized 6 short courses on different topics since 2010. Several world-famous specialists were invited to China as lecturers for the course every year. This series of courses has already become one of the most representative academic activities organized by IPRCC and are very popular among university students and young geologists.

Fig 5.1.9. 2015 Short Course-Precambrian Surface Processes

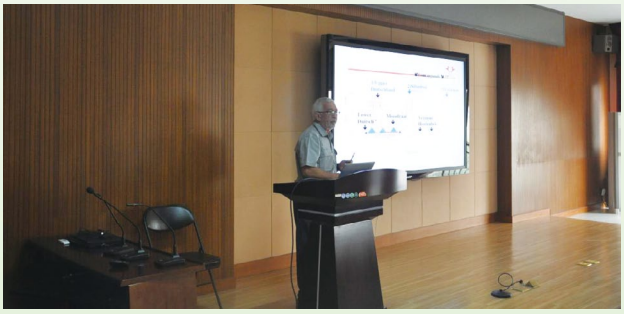

Fig 5.1.10. Prof. Nicolas BEUKES giving a lecture.

Fig 5.1.11. Prof. Christoph HEUBECK giving a lecture.

Fig 5.1.12. Prof. Kurt KONHAUSER giving a lecture.

IPRCC 2015 Field Workshop

The IPRCC 2015 Field Workshop was held in the Daqingshan area in Baotou, Inner Mongolia, from 19 to 22 October 2015. More than 10 geologists and postgraduates from the USA, Germany, Australia and the SHRIMP Center participated in the workshop. The trip examined outcrops of supracrustal rocks in the lower Wulashan Group, Hadamen-Gou, Daqingshan Area and anatexis phenomena in the early Palaeoproterozoic Daqingshan supracrustal rocks. Geologists of the Center prepared a field guidebook and introduced some important research results obtained in this area, and also discussed the regional tectonic evolution with all participants.

Fig 5.1.13 International Field Excursion in the Daqingshan Area.

The First Sino-German Workshop on Seismic Rupture and Faulting

The First Sino-German Workshop on Seismic Rupture and Faulting, sponsored by the Sino-German Center for Research Promotion, and co-organized by the Institute of Exploration Technology, China Geological Survey, was held successfully from31 October to 6 November 2015 in Chengdu, Sichuan Province of China. The Workshop was co-convened by Prof. LI Haibing of the Institute of Geology and Prof. Christoph JANSSEN of GFZ, Germany.

Thirty one internationally well-known experts and scholars from China (Taiwan included), Germany, and Japan delivered presentations at the workshop. Nearly 100 geologists attended the workshop and participated in a post-conference field excursion to the earthquake faults, thus getting a better understanding of the 2008 Wenchuan Earthquake Fault.

Fig 5.1.14. Prof. LI Haibing giving a presentation.

Fig 5.1.15. Discussion during the meeting.

Fig 5.1.16. Post-conference field trip to the Wenchuan earthquake fault scientific drilling site (WFSD-2)

Fig 5.1.17. Group photo of the attendees of the Workshop.

5.2 Other Academic Activities and news

The 2015 Academic Workshop of the Institute of Geology was held on January 21-22, 2016

In order to exchange and discuss the scientific and technological achievements obtained in 2015, the Institute of Geology held the 2015 Academic Workshop on 21 and 22 January 2016. Forty-seven experts recommended by different divisions (centers) of the Institute, such as Acadmician XU Zhiqin, Acadmician GAO Rui and Professor LIU Dunyi, and so on, gave academic presentations. About 120 scientists, including the leaders of the Institute as well as some of the researchers and postgraduate students attended the workshop.

Subsequently, some divisions (centers) organized special sessions for further discussion. The Annual Workshop

was a great success and facilitated exchange and discussion of ideas and promoted the research capabilities of the Institute.

Fig 5.2.1. Acadmician XU Zhiqin giving a presentation.

Fig 5.2.2. Acadmician GAO Rui answering questions.

Fig 5.2.3. Professor LIU Dunyi giving a presentation.

Fig 5.2.4. Researchers and students attending the Workshop.

The 46th Earth Day: activities to popularize scientific geological knowledge

(1) Academician XU Zhiqin delivered a lecture on popular geological science

In order to mark the 46th Earth Day, arouse public awareness of protecting the environment and resources, and help the young to get a better understanding of the Earth, Academician XU Zhiqin delivered a lecture entitled “Life-Earth—a song to Mother Earth” for the young geologists and postgraduates on 22 April 2015. Vice President WANG Ruijiang of the Chinese Academy of Geological Sciences chaired the lecture, more than 100 young geologists and postgraduates from the Institute of Geology, Peking University, China University of Geosciences (Beijing), the Institute of Mineral Resources of CAGS, etc. attended the lecture. After the lecture, Academician XU Zhiqin patiently answered questions, evoking heated discussion.

Fig. 5.2.5. Acadmician XU Zhiqin delivering the lecture

Fig. 5.2.6. Acadmician XU Zhiqin answering questions

(2) The Museum of Continental Dynamics of the Key Laboratory of Continental Tectonics and Dynamics opened to the public

The Museum of Continental Dynamics of the Key Laboratory of Continental Tectonics and Dynamics welcomed over 100 visitors from the Primary School and High School affiliated with Renmin University, Peking University, and China University of Geosciences (Beijing). The Museum of Continental Dynamics is themed with cutting-edge "Continental Dynamics", which accumulated more than 30 years of research results by the staff of the Key Laboratory. It is a small, but unique professional museum with science and fun.

The volunteer instructor of the Museum spent time away from busy work to carefully introduce the popular science knowledge of the Earth, environment and geological hazards to guide the students to understand geological phenomena. He also led them to recognize geological maps, cores, rock specimens, etc., encouraging them to become geologists in the future.

Fig. 5.2.7. Volunteer instructor of the Museum introducing knowledge of popular geological science.

(3) The Beijing SHRIMP Center welcomed pupils from Beijing Zhanlanlu Primary School

The Beijing SHRIMP Center of the Institute of Geology opened to the public on 22-23 April 2015 to fulfill its social responsibility for public service, disseminating knowledge in the geological sciences.

More than 40 pupils from Beijing Zhanlanlu Primary School visited the Beijing SHRIMP Center New Laboratory Building. The staff members WANG Chen and CHE Xiao prepared an elaborate Powerpoint presentation to introduce the knowledge of the birth and evolution of the Earth, the development of geochronology, and part of the important research outcomes that the Center achieved on the early evolution of the Earth and lunar chronology, arousing great interests of the pupils in the earth sciences. The pupils also visited the two key SHRIMP instruments and the Exhibition Room of rock samples of the Center. Through this visit, the pupils obtained a better understanding of the Earth and strengthened their awareness and responsibility of caring for the Earth and protecting the environment.

Fig. 5.2.8. Powerpoint presentation to the pupils on the origin and evolution of the Earth

Fig. 5.2.9. Pupils visiting the Lab of the Center

Fig. 5.2.10. Group photo of the visitors and staff members of the Center

Senior Research Fellow GAO Rui elected as member of the Chinese Academy of Sciences in 2015

Prof. GAO Rui of the Institute of Geology was elected to be one of the Academicians of the Chinese Academy of Sciences in December 2015.

Fig. 5.2.11. Academician GAO Rui.

GAO Rui, born in 1950, graduated from the former Changchun Institute of Geology (now Jilin University) as an applied geophysics major with a Master's Degree. He has worked in the Chinese Academy of Geological Sciences since 1981. At present he holds the position of Director of the Lithosphere Research Center of the Institute of Geology as well as Director of the Key Laboratory of Earthprobe and Geodynamics, Ministry of Land and Resources of China, devoting himself for many years to the scientific research of geophysics and the deep structure of the Earth.

Senior Research Fellow ZENG Lingsen was listed among the National Millions of Talents Project, and honored "Young Expert with Special Contributions"

The Ministry of Human Resources and Social Security of China officially unveiled the 2015 list of the National Millions of Talents Project, among which Senior Research Fellow ZENG Lingsen of the Institute of Geology was selected as one of the grantees and was honored as "Young Expert with Special Contributions". He was the only grantee of this honor from the Ministry of Land and Resources in 2015.

Fig. 5.2.12. Prof. ZENG Lingsen.

Senior Research Fellow HOU Zenqian won the J. S. Lee Honorary Prize for Geosciences

In 2015, Prof. HOU Zenqian of the Institute of Geology was among the 14 geologists who won the 14th J. S. Lee Honorary Prize for Geosciences of China.

Dr. ZHAI Qingguo won the 15th Youth Geological Science & Technology Award-Silver Hammer Award

In 2015, 50 young geologists won the 15th Youth Geological Science & Technology Award (Gold Hammer Award and Silver Hammer Award), 10 of whom won a Gold Hammer Award and 40 won a Silver Hammer Award. Dr. ZHAI Qingguo of the Institute of Geology was among the 40 who won a Silver Hammer Award.

Fig. 5.2.13. Dr. ZHAI Qingguo

6. Postgraduate Education

6.1 Postgraduate advisors

There were 98 postgraduate students in the Institute in 2015, including 45 doctoral and 53 master degree candidates. The Institute had 15 new candidates for the doctoral degree and 17 for the master degree. Detailed information on the 36 professorial advisors of doctoral students and 36 advisors of master students is listed below.

Advisors of doctoral students

No.	Name	Speciality	E-mail address
1	SHEN Qihan	Early Precambrian geology and metamorphic methodology	huixiasong@cags.ac.cn
2	XIAO Xuchang	Tectonic geology, ophiolites, and HP metamorphic belts	xxchng@public.bta.net.cn
3	XU Zhiqin	Micro- and macrotectonics, geodynamics	xzq@ccsd.cn
4	REN Jishun	Geotonics and global tectonics	renjishun@cags.ac.cn
5	YANG Wencai	Geophysics	yangwencai@ccsd.org.cn
6	LI Tingdong	Regional geology	litdong@163.com
7	GAO Rui	Deep geophysical probing, lithospheric structure, and geodynamics	gaorui@cags.ac.cn
8	HOU Zengqian	Regional metallogeny	houzengqian@126.com
9	LIU Dunyi	Isotope geochronology and isotope geochemistry	liudunyi@bjshrimp.cn
10	YANG Jingsui	Petrology	yangjingsui@yahoo.com.cn
11	YAO Jianxin	Conodont fauna, stratigraphy	yaojianxin@gmail.com
12	WANG Tao	Tectonics and magmatic geology	taowang@cags.net.cn
13	LI Jinyi	Tectonics	jyli2003@126.com
14	CHEN Wen	Isotope geochronology	chenwenf@vip.sina.com
15	ZHU Xiangkun	Isotope geochronology	xkzhu0824@gmail.com
16	WU Cailai	Regional igneous petrology, agrogeology	wucailai@126.com
17	WAN Yusheng	SHRIMP geochronology, isotope geochemistry, and early Precambrian geology	wanyusheng@bjshrimp.cn
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6.2 Educational Activities and News

Eighteen graduate students were awarded diplomas at the 2015 Graduation Ceremony

Ten doctoral and eight postgraduate students completed their studies and obtained their degrees in 2015. YANG Deting won the CHENG Yuqi Excellent Graduate Award; WANG Huan received the CHENG Yuqi Excellent Thesis Award; TIAN Yazhou, DING Huixia and SHI Xingjun were awarded the academic "Outstanding Graduate" honor of the Chinese Academy of Geological Sciences (CAGS), and twelve additional graduate students received the academic "excellent student" honorary title of CAGS. HE Miao was awarded "excellent graduate student" by the Beijing Education Department.

In 2015, DING Xiaozhong, WANG Yanbin, REN Liudong, SHI Yuruo and ZHANG Jin were promoted to advisers of doctoral candidate students, SONG Yucai, QU Junfeng, LIU Pinghua, LIU Chaohui, YIN Jiyuan and ZHAO Lei were approved to be advisors of Master students by the Degree Assessing Committee of CAGS.

Fig. 6.2.1 Graduation Ceremony of the 2015 postgraduate students.

Fig. 6.2.2 Group photo.

7. Publications

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