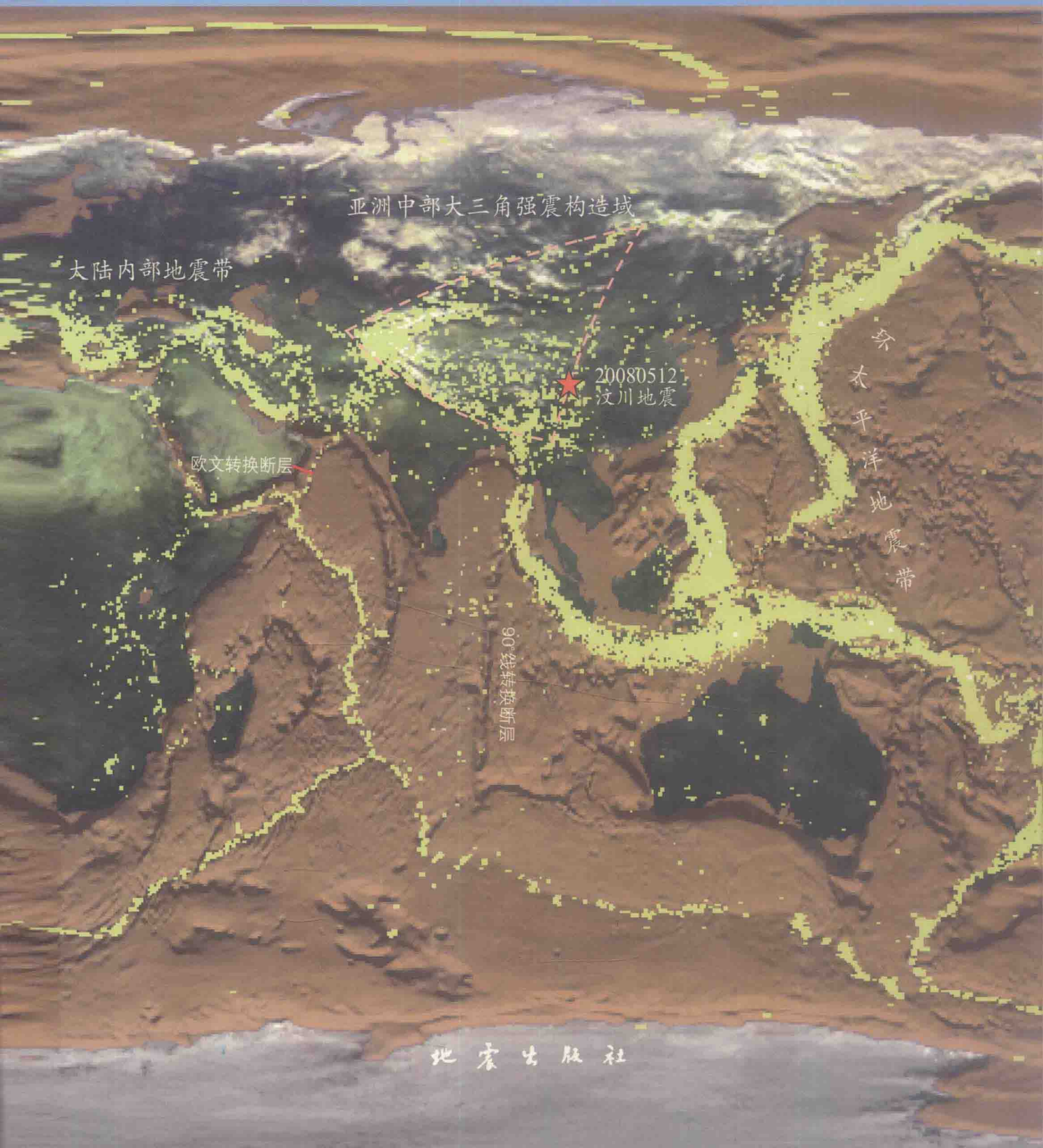
亚洲中部地震构造图集

Atlas of Seismotectonics in Central Asia

张家声 高祥林 马宗晋 主编



地震出版社

国家重点基础研究发展计划（973）项目第三课题（2008CB425703）：
汶川地震发生机理及其大区动力环境研究
科技部国际科技合作项目（2008DFA20700）：
亚欧大陆中新生代构造变动及其与地震灾害和油气资源关系的研究
联合资助

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图书在版编目（CIP）数据

亚洲中部地震构造图集 / 张家声等主编 . —北京：地震出版社，2013.11

ISBN 978-7-5028-4328-1

Ⅰ . ①亚… Ⅱ . ①张… Ⅲ . ①地震构造—中亚—图集

Ⅳ . ① P316.36-64

中国版本图书馆 CIP 数据核字（2013）第 169673 号

地震版 XM2357

亚洲中部地震构造图集

张家声　高祥林　马宗晋　主编

责任编辑：张友联

责任校对：庞亚萍

出版发行　地震出版社

北京民族学院南路 9 号　　邮编：100081

发行部：68423031　68467993　　传真：88421706

门市部：68467991　　传真：68467991

总编室：68462709　68423029　　传真：68455221

专业图书部：68467982　68721991

http：//www.dzpress.com.cn

经销：全国各地新华书店

印刷：北京鑫丰华彩印有限公司

版（印）次：2013 年 11 月第一版　2013 年 11 月第一次印刷

开本：880 × 1230　1/16

字数：280 千字

印张：8.75

书号：ISBN 978-7-5028-4328-1/P（5017）

定价：150.00 元

亚洲中部地震构造图集

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前　言

为了查明2008年5月12日汶川8.0级地震发生的区域动力学条件和机理，科技部国家重点基础研究发展计划（973）项目（2008CB425700）资助开展了“中亚大陆强震构造格局及其动力学环境”（2008CB425703）的课题研究。与此同时，秉承中俄总理定期会晤委员会科技合作分委员会第九届例会（2005年8月20日）议定书项目第22项“合作编制亚欧新构造及其与资源、灾害关系系列图件”，科技部资助开展了国际合作（中俄）重点项目“亚欧大陆中、新生代构造变动及其与地震灾害和油气资源关系的研究”（2008DFA20700）。《亚洲中部地震构造图集》是参与上述项目的中俄科学家协同努力的部分成果。即将出版的《亚洲中部地震构造》（地震出版社，2014）是对本图集相关科学内容的详细阐述。

受板块构造驱动，自青藏高原的东、西构造结，北抵贝加尔裂谷的三角形范围，新构造运动强烈，7.0级以上强震活动频繁，2008年5月12日汶川地震即发生在它的东边界中段。源自印度洋底的欧文转换断层（西侧）和“90°线”转换断层（东侧）将印度洋中脊的横向扩张向北传递，是导致印度-欧亚大陆碰撞，亚洲中部强震构造域出现的主要驱动。前者经恰曼断裂、南天山、阿尔泰山、萨彦-贝加尔，将左行剪切位移向欧亚大陆内部传递，至少诱发了7个以上8.0级地震；后者经缅甸实皆断裂向北沿滇西、龙门山、鄂尔多斯西缘等先存断层系传递，形成总体近SN向的地震构造带，至少5个8.0级地震与东边界的构造变动有关。地质构造和地球物理数据给出了三个时间尺度与地震相关的信息：①1900年以来的数字地震记录和最近十年的GPS观测数据代表百年尺度的构造变动；②地形地貌、重力异常、地壳热流状态等百万年尺度的地球物理过程；③地质历史时期形成的岩石-构造单元和错综复杂的断裂组合。多学科、多时段的信息资源，记录了自印度-欧亚板块碰撞以来的持续变形和应变积累，是深入解读亚洲中部地震构造的科学依据。地震构造研究涉及现今地壳运动状态和地震活动与断裂构造之间的复杂联系。基于研究区1900年以来的全部地震记录和最近十年的GPS观测等精确定位的海量数据，建立多元融合和信息提取的计算机工作平台。在查明地壳断裂构造（数字化1:20万断层数据库）的地震属性，构建百年地震构造格局的基础上，分析地震孕育的环境条件和触发机理，跟踪强震迁移趋势，加深了对2008年5月12日汶川8.0级地震的成因理解。

根据马宗晋院士关于“地震构造研究的整体地球观”，《亚洲中部地震构造图集》汇集了30幅独立的地质构造、地震活动和地球物理图件，分为基础（I-1~8）、区域（II. 1~14）和典型地震构造（III. 1~8）三个图组。每一幅图包括一个简要的中、英文说明、主图和必要的解释图件。基础图组提供了亚洲中部地质构造和地球物理背景；区域图组主要展现亚洲中部强震构造域的现今动力学环境和条件；典型地震构造图组介绍亚洲中部一些典型地区的地震构造研究成果。各图组的参考文献和作者信息列入本图集的附录中。

INTRODUCTION

To clarify the regional dynamic conditions and mechanisms of the 12 May 2008 Wenchuan M_S8.0 earthquake, a research project "Tectonic pattern and dynamic context of major earthquakes in Central Asia" (2008CB425703) has been carried out as a part of the National Key Basic Research Development Program (973) (2008CB425700) supported by the Ministry of Science and Technology of China. This project was also attributed to the China-Russia cooperative project "Mesozoic and Cenozoic tectonic deformation of Central Asia in relation to seismic hazards and hydrocarbon resources" (2008DFA20700) supported by the Ministry of Science and Technology of China, as the 22th item in the protocol from the 9th regular conference of the science and technology branch of the Committee for China-Russia Premier meeting (20 August 2005). This "Atlas of seismotectonics in Central Asia" reflects partial results of joint efforts of the Chinese and Russian scientists who took part in the two projects aforementioned. The book "Seismotectonics in Central Asia", which will be published by Seismological Press in 2014, includes the detailed elucidations to the relevant subjects of this atlas.

Driven by plate tectonics, a vast triangle region, from the eastern and western syntaxes of the Himalayas northwards to the Baikal rift, is undergoing intense neotectonic movements and frequent $M \geqslant 7$ earthquakes. The northward transfer of right-angle spreading of the Indian mid-ocean ridge accommodated by the Owen transform fault in the west and E90° transform fault in the east is responsible for the India-Eurasia continental collision as well as the creation of the major-earthquake tectonic domain in Central Asia. In the west, the left-lateral shear along the Chaman fault, through the South Tian Shan, and Altai to Sayan-Baikal, transfers into the Asian continent, at least causing seven M8 earthquakes there. In the east, right-slip motion is transmitted along the Sagaing fault, northward over preexisting faults in western Yunnan, the Longmen Shan and western edge of Ordos, resulting in a nearly NS seismic zone in which more than five M8 events have taken place. Data of geology and geophysics provide information relevant to earthquakes on three time-scales: ① Digital seismic records since 1900 and GPS measurements in recent ten odd years representing tectonic deformation at a 100-year scale; ② Topography, landforms, gravity anomalies, thermal state of crust as geophysical processes of million-year scales, and ③ Rock-structure units and complicated fault combinations forming in geological times. These information sources of multiple disciplines and multiple time periods record steady deformation and strain accumulation since the India-Eurasia plate collision, and is the scientific evidence for understanding the seismotectonics of Central Asia. Studies on seismotectonics involve the complex relationships between current crustal movement, seismicity and faults. As a characteristic part of this atlas, a computer work platform for multiple element integration and information extraction was constructed based on all seismic records in the study area since 1900 and flood data of GPS measurements in the last ten years. Its purpose is to analyze the tectonic settings and triggering mechanisms of major earthquakes, determine the migration trends of big events based on seismic attributes of faults in crust (a 1∶200,000 digital database of faults) and seismotectonic patterns of hundred-year scales, and help understand the genesis of the 12 May 2008 Wenchuan M8.0 earthquake.

The atlas of seismotectonics in Central Asia collects 30 independent maps of geological tectonics, seismicity and geophysics, which are divided into three map sets: basic (I. 1-8), regional (II. 1-14) and typical seismotectonics (III. 1-8). Each map includes brief instructions in Chinese and English, main map, and interpretive maps necessary. The basic maps delineate geological tectonics and geophysical background of Central Asia. The regional maps exhibit current dynamic context and conditions for major earthquakes of Central Asia. And the typical maps present the research results on seismotectonics of some typical regions in Central Asia. The references and author's information of each map are listed in the Appendix of the atlas.

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一、基础图组 Foundation Maps

Ⅰ-1 亚洲大陆中东部中－新生代构造动力学

马宗晋

（中国地震局地质研究所）

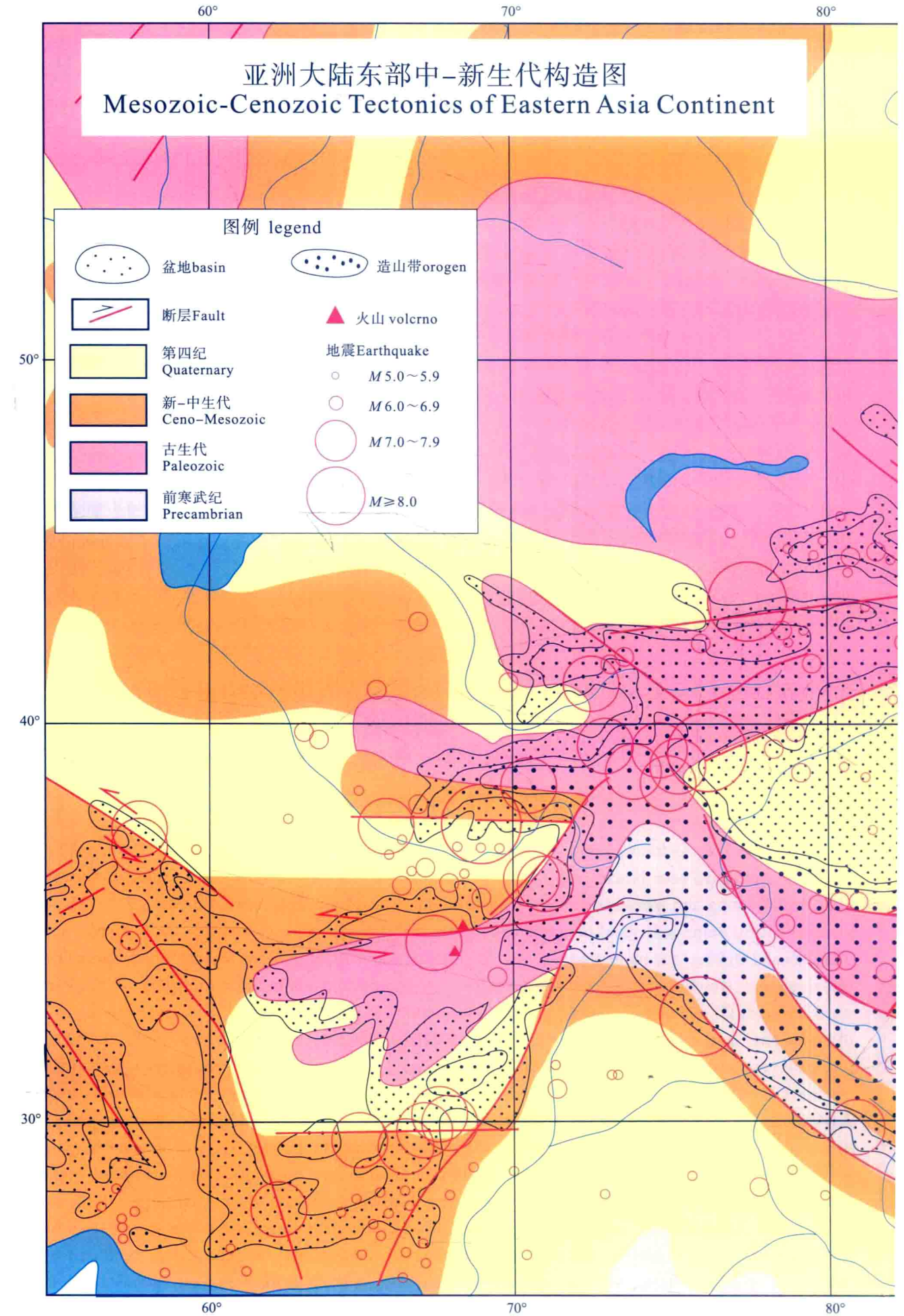
现今的亚洲大陆东部是三个一级构造单元的拼合体：①稳定的陆块或称克拉通，深部是火成岩和变质岩，近地表可能有沉积岩层覆盖；有些克拉通一直保持结构完整、刚性和稳定，如哈萨克斯坦、西伯利亚、塔里木、华南等；有些则已碎裂，转化为活动的构造区，如华北陆块。②活动的造山带，一般是比较狭长的山脉，以强烈地壳变形、火山岩和变质作用为特征，有些造山带位于克拉通边缘或稳定陆块之间，如天山、秦岭；有些造山带则分布于活动的高原区，如青藏高原。③大陆边缘，大陆与大洋之间的过渡区。中生代（180Ma），向西扩张的太平洋海底向欧亚大陆俯冲，形成亚洲大陆东边缘的增生；印度洋海底向北扩张，原位于南半球的几个陆块以较大的速率向北漂移，与欧亚大陆会聚。新生代（约50Ma），印度次大陆与欧亚大陆碰撞，并向北继续移动，俯冲到喜马拉雅－西藏下面，造成地壳增厚和缩短，变形逐步向北扩展，一直到天山、阿尔泰一带；太平洋和菲律宾海板块向西俯冲，同时海沟向东后退，形成亚洲东部边缘海的弧后扩张，亚洲大陆东部向东伸展。大致以帕米尔、天山、阿尔泰、贝加尔一线为界，亚洲大陆的西北部基本上是稳定的构造区域，地壳变形微弱，地震活动很少，如哈萨克斯坦、西伯利亚等；大陆的东南部有多个活动的构造区域，地壳变形强烈，地震活动较多，如青藏高原、华北平原、蒙古西部和贝加尔地区等。本图以红色线条表示大陆中－新生带构造特征线，它们可以是有地表显示的断裂，也可以是岩石圈深部结构的边界。该图突出了大陆盆地－山脉－高原－构造系统和南北向、东西向、北东向、北西向4组构造特征线的展布，反映了形成这些构造特征的板块运动动力背景。

Dynamics of Mesozoic and Cenozoic tectonics in the central-east Asia continent

Ma Zongjin

(Institute of Geology, China Earthquake Administration)

The present eastern Asia continent is a collage composed of three types of first-order tectonic units: ①Stable blocks, called cratons, underlain by igneous and metamorphic rocks, somewhere with sedimentary cover on the surface. Of them, some cratons remain intact, rigid and stable, such as Kazakhstan, Siberia, Tarim and South China, while some have been broken and transformed into active tectonics such as North China. ②Active orogenic belts, usually long and narrow mountain ranges, characterized by intense crustal deformation, volcanism and metamorphism. Some individual orogenic belts lie on margins of cratons or between stable blocks, such as the Tianshan and Qinling, and more orogenic belts are distributed on active plateaus like the Tibetan plateau. ③Continental margins, which are transitional regions between continents and oceans.Since Mesozoic (180Ma), with westward spreading of seafloor, the Pacific plate was subducted beneath the Eurasian continent, resulting in accretion of continental margins in eastern Asia. The seafloor of the India Ocean spread toward north, several continents that were previously in the southern hemisphere moved to north at big rates and then converged with the Eurasian continent. By Cenozoic (50Ma), the India subcontinent collided with Eurasia, and continued to move to north, underthrusting below the Himalaya and Tibet. This collision caused crustal thickening and shortening, and spawned deformation that spread to north as far as the Tianshan and Altai. In the east, the Pacific and Philippine plates were subducted toward west, meanwhile the trenches retreated to east, resulting in back-arc spread and eastward extension of eastern Asia. Roughly bounded by the line from the Pamir, Tianshan, Altai to Baikal, the northwestern Asia remains stable with weak crustal deformation and little earthquakes, while the southeastern Asia plays host to many regions of active tectonics with intensive crustal deformation and high seismicity. By a whole view, basin-range-plateau systems, four characteristic tectonic lines in north-south, east-west, northeast and northwest directions characterize the central Asia continent.


亚洲大陆东部中-新生代构造图
Mesozoic-Cenozoic Tectonics of Eastern Asia Continent
图例 legend
盆地basin
造山带orogen
断层Fault
火山 volcrno
地震Earthquake
第四纪
Quaternary
新-中生代
Ceno-Mesozoic
古生代
Paleozoic
前寒武纪
Precambrian
M 5.0～5.9
M 6.0～6.9
M 7.0～7.9
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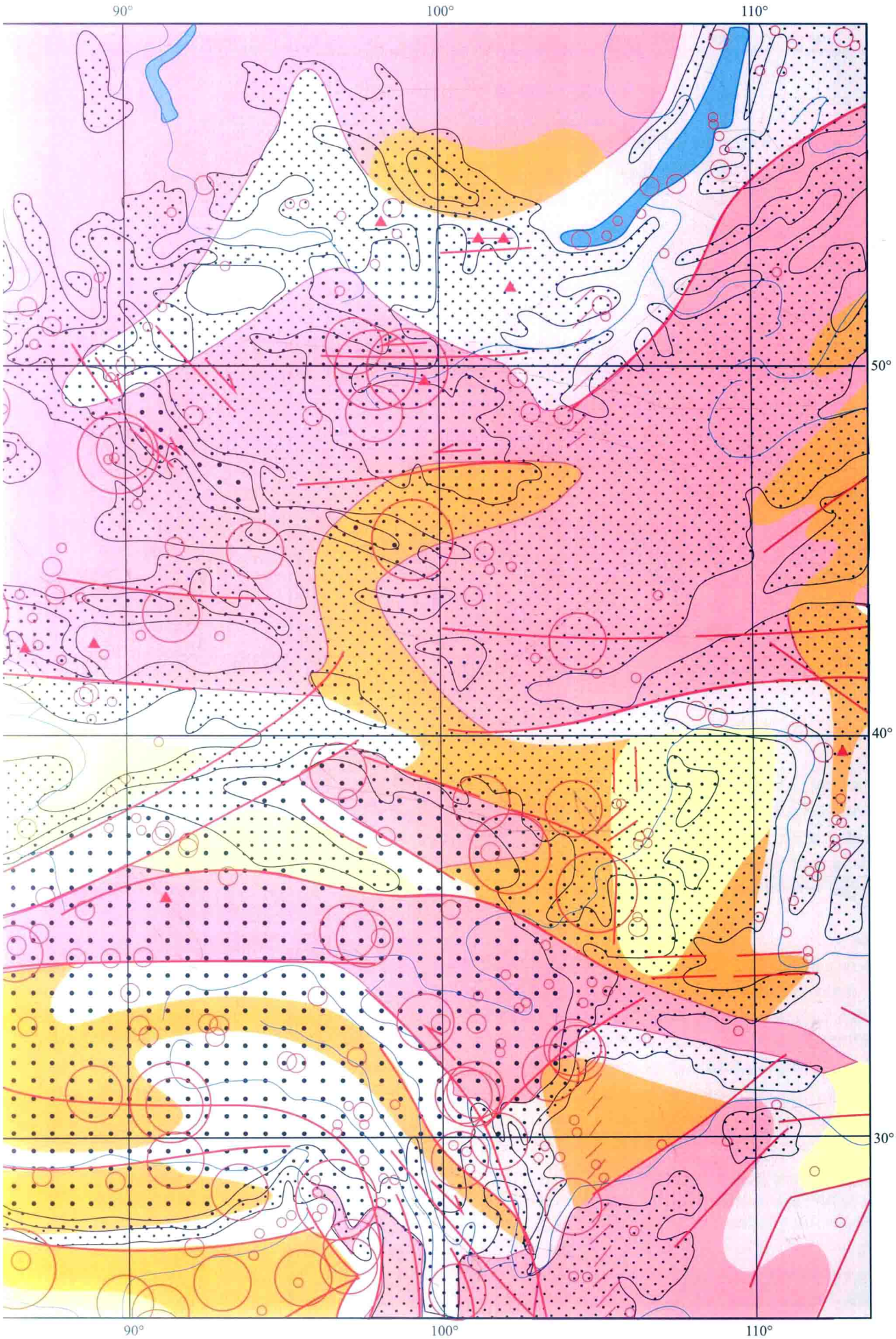
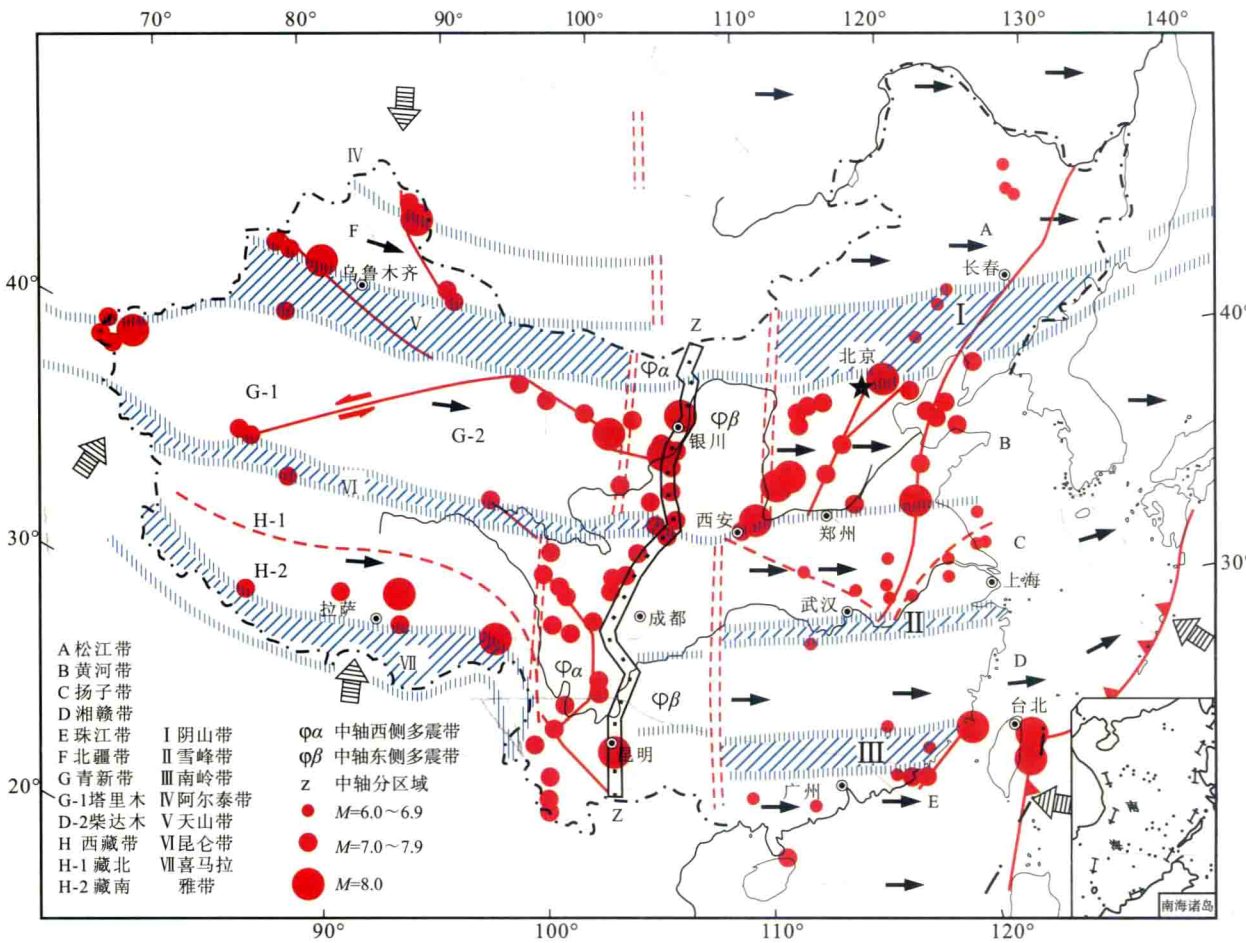
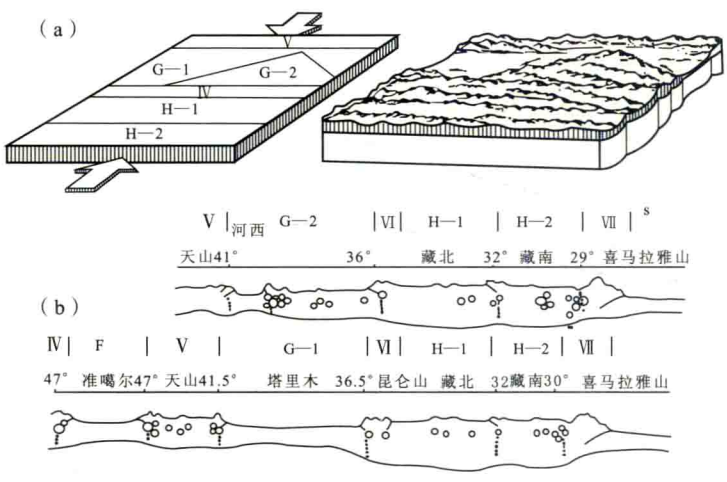




中国大陆地震分区图

Seismic Zonation of Mainland China



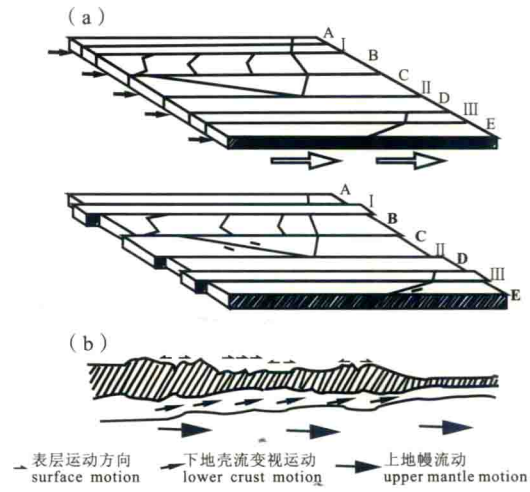
中国西部构造分区示意图

(a)平面分区和边界动力(左)，地形(右)；

(b) 南北向剖面和震源Sketch of Tectonic Zonation in Western China.

(a) left: planar division and boundary force, right: terrene;

(b) NS profile and hypocenters



中国东部构造分区示意图

(a) 变形前(上)和变形后(下)； (b) 构造运动剖面

Sketch of Tectonic Zonation in Eastern China.

(a) upper: before deformation, lower: after deformation;

(b) tectonic motions on profile

I –2　亚洲中部大地构造

杨巍然　王　杰

（中国地质大学（武汉））

亚洲构造演化包括大陆基底的形成及萨拉伊尔、加里东、海西、海西－印支、印支、燕山、喜马拉雅山等大地构造旋回，大陆基底在造山带的演化中起着控制作用。面积大，发育有盖层和上叠盆地或成为陆源碎屑供给区的称陆块，被转入造山带的基底称为地块。亚洲由西伯利亚陆块、古中华陆块（含中朝、塔里木、扬子三个陆块）、印度陆块和太平洋板块等组成，分别以它们为核心划分了北亚、中亚、南亚和东亚四个构造集群，以及 11 个二级和 86 个三级构造单位。构造集群系指具有成生联系的陆块、大小不同的地块和各个时期的造山带的集合体。两构造集群之间有一个构造结合区。

中亚构造集群基本呈东西向展布；分别受围绕西伯利亚陆块分布的向南突出的弧形构造和围绕印度陆块分布的主体向北北东突出的弧形构造（仅内弧出现了向南突出的喜马拉雅弧）的挤压；它们又受太平洋板块俯冲到亚洲大陆之下的强烈改造和叠加，出现了北北东向展布的东亚构造活化带。这种构造格局反映古中华陆块在亚洲大地构造演化中起着“中流砥柱”的重要作用。

亚洲大地构造时空演化与全球同步经历了哥伦比亚古陆、罗迪尼亚古陆和潘基亚古陆三次重要造陆事件。在此过程中，中亚构造集群独具特色：其哥伦比亚古陆形成稍早于南亚和北亚构造集群；罗迪尼亚古陆形成时晚于南北两侧；210Ma 印支运动形成潘基亚古陆时也比全球普遍于 250Ma 形成的时间晚。印支运动的广泛发育和强烈影响是中亚构造集群乃至亚洲最显著的特征。

总结出背向俯冲对接式、单向运移拼贴式和原地开合手风琴式三种构造运动程式。背向俯冲对接式的动因是地幔对流（软流圈对流或地幔柱对流）；单向运移拼贴式可能与地幔上升产生的地幔层流有关；原地开合手风琴式推测是深部地幔“热点”所致。

Tectonics of Central Asia

Yang Weiran　Wang Jie

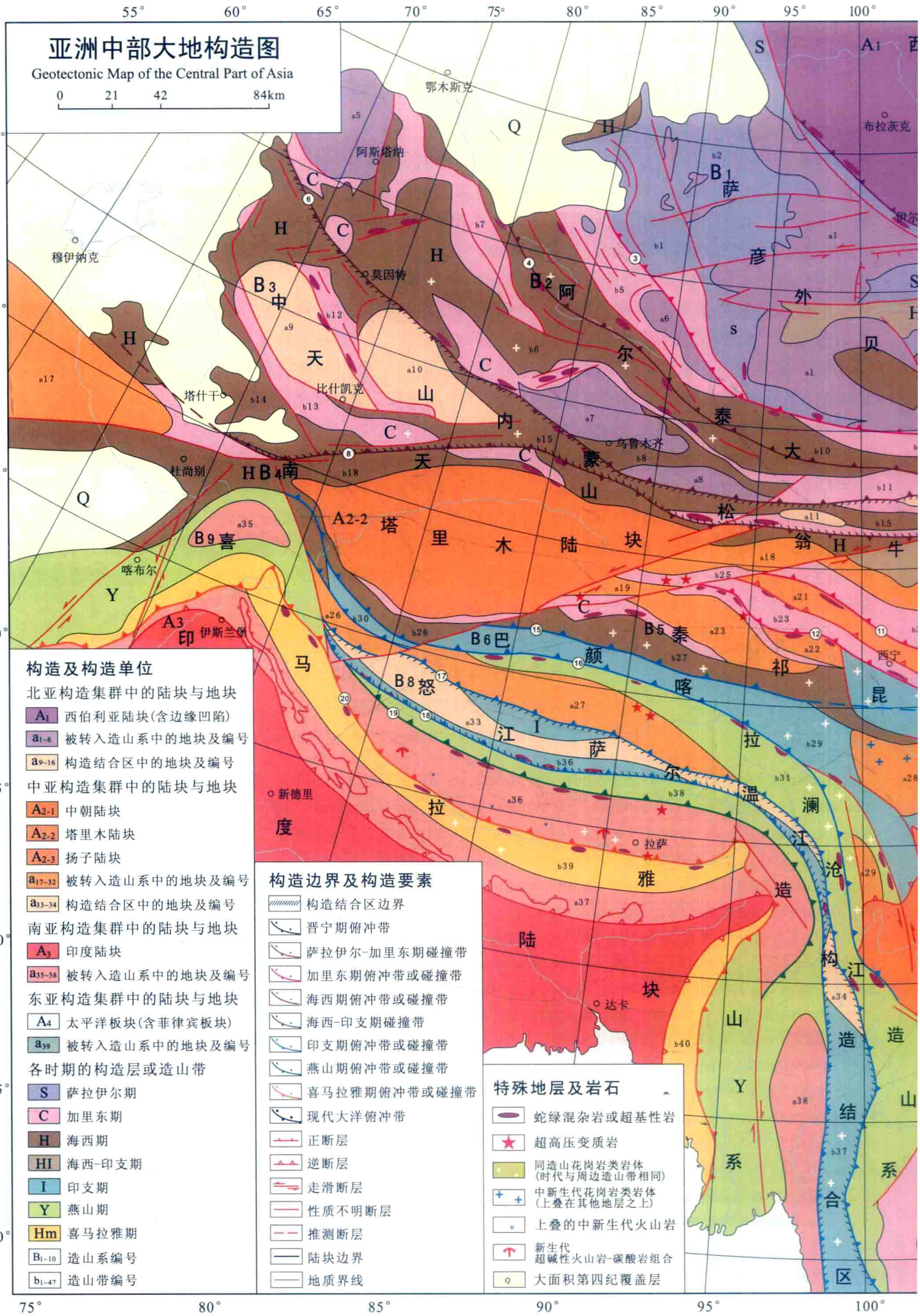
(China University of Geosciences (Wuhan))

Tectonic evolution of Asia includes the formation of its continental basement and a series of geotectonic cycles such as Salayirian, Caledonian, Hercynian, Hercynian- Indosinian, Indosinian,Yanshanian and Hemalayan. Asia consists of 3 continental blocks: Siberian continental block, Paleo-Chinese continental block (including Sinokorean, Tarim and Yangtze blocks), Indian continental block, and the Pacific plate. Taking them as the kerns, North Asia, Central Asia, South Asia and East Asia, the 4 tectonic assemblages can be subdivided, together with the 11 second-order and 86 third-order tectonic units.

The Central Asia tectonic assemblage trends basically in EW. It is compressed respectively by the southward protruding arc-tectoniocs surrounding the Siberian continental block and by the mainly NNE-trending arc-tectonics surrounding the Indian continental block (only the Himalayas in the inner arc protruding to the south). They, in turn, are intensively reworked and superimposed by the subduction of the Pacific plate beneath the Asian continent, and thus formed the NNE-trending East Asian tectonic mobile belt.

The geotectonic temporal-spatial evolution of Asia is synchronous with that of the whole Earth, and had undergone 3 major epeirogenic events, namely, the Columbian paleo-continent, the Rodinian paleo-continent and Pangean paleo-continent. During this process the Central Asia tectonic assemblage is unique: the formation of Columbian paleo-continent is slightly earlier than that of the South and North Asian tectonic assemblages; the formation of the Rodinian is also later than its south and north neighbors; the formation of Pangean paleo-continent at 210 Ma by Indosinian movement is also later than the general formation age of the Earth at 250 Ma.

The three tectonic patterns, backward-subduction-docking pattern, single-directional migration collage pattern and in situ opening closing accordion pattern are summarized. The kinetic origin of the backward-subduction- docking pattern is mantle convection (asthenospheric or plume convection); the single-directional migration collage pattern is probably caused by mantle flow induced by mantle upwelling; and in situ opening closing accordion pattern is probably related with the “ hot spot” in deep mantle.


亚洲中部大地构造图
Geotectonic Map of the Central Part of Asia
0 21 42 84km
构造及构造单位
北亚构造集群中的陆块与地块
A1 西伯利亚陆块(含边缘凹陷)
a1~8 被转入造山系中的地块及编号
a9~16 构造结合区中的地块及编号
中亚构造集群中的陆块与地块
A2-1 中朝陆块
A2-2 塔里木陆块
A2-3 扬子陆块
a17~32 被转入造山系中的地块及编号
a33~34 构造结合区中的地块及编号
南亚构造集群中的陆块与地块
A3 印度陆块
a35~38 被转入造山系中的地块及编号
东亚构造集群中的陆块与地块
A4 太平洋板块(含菲律宾板块)
a39 被转入造山系中的地块及编号
各时期的构造层或造山带
S 萨拉伊尔期
C 加里东期
H 海西期
HI 海西-印支期
I 印支期
Y 燕山期
Hm 喜马拉雅期
B1~10 造山系编号
b1~47 造山带编号
构造边界及构造要素
构造结合区边界
晋宁期俯冲带
萨拉伊尔-加里东期碰撞带
加里东期俯冲带或碰撞带
海西期俯冲带或碰撞带
海西-印支期碰撞带
印支期俯冲带或碰撞带
燕山期俯冲带或碰撞带
喜马拉雅期俯冲带或碰撞带
现代大洋俯冲带
正断层
逆断层
走滑断层
性质不明断层
推测断层
陆块边界
地质界线
特殊地层及岩石
蛇绿混杂岩或超基性岩
超高压变质岩
同造山花岗岩类岩体 (时代与周边造山带相同)
中新生代花岗岩类岩体 (上叠在其他地层之上)
上叠的中新生代火山岩
新生代 超碱性火山岩-碳酸岩组合
大面积第四纪覆盖层
塔里木陆块
中天山
南天山
阿尔泰
内蒙
萨彦外贝
巴颜喀拉
泰祁昆
松翁
喜马拉雅
印度陆块
怒江-萨尔温江-澜沧江造山系
构江结合区
阿斯塔纳
莫因特
比什凯克
塔什干
杜尚别
喀布尔
伊斯兰堡
新德里
拉萨
达卡
乌鲁木齐
西宁
布拉茨克
穆伊纳克
鄂木斯克

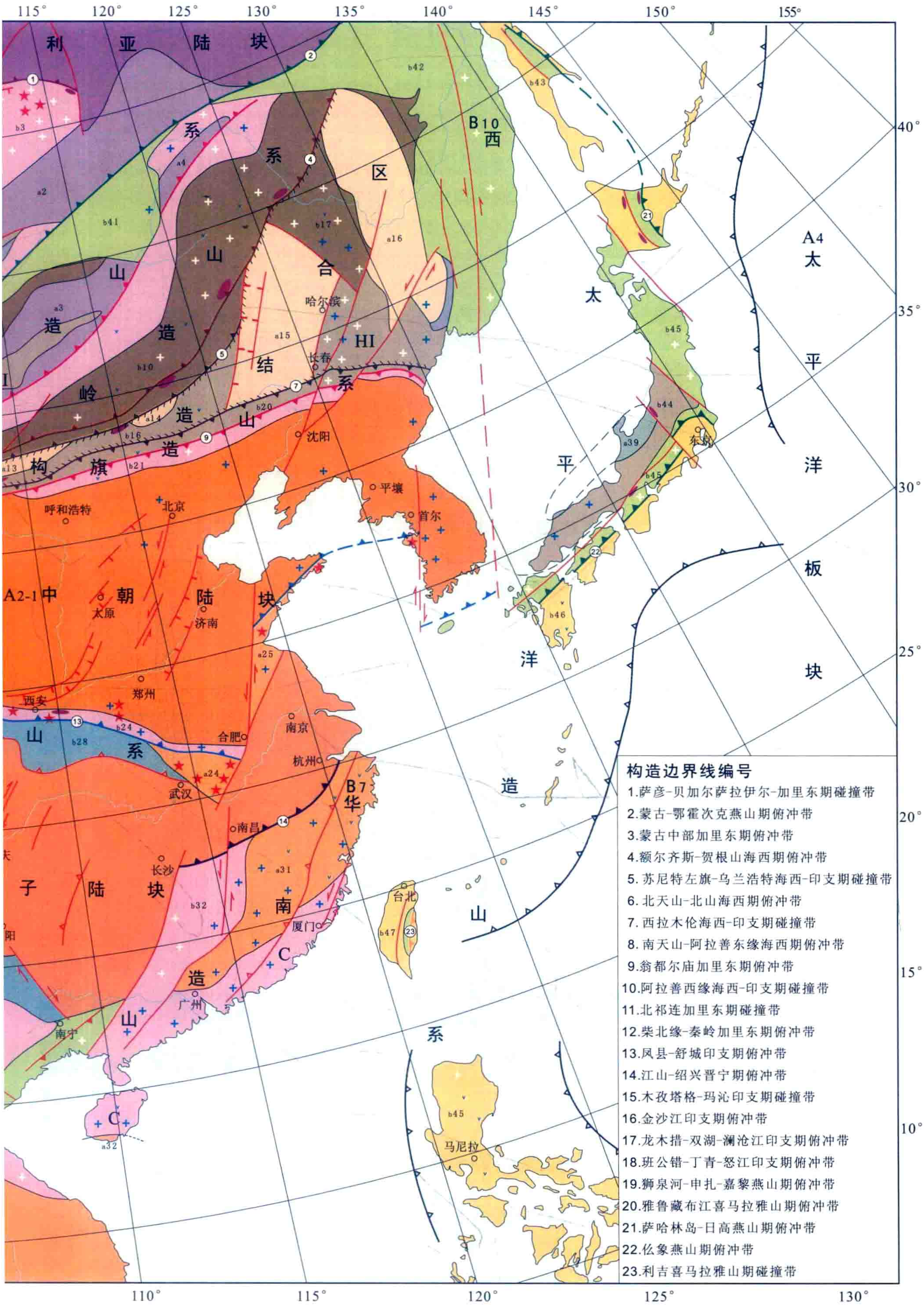

利 亚 陆 块
系 系 区
山 合
山 造
造 结 HI
岭 造 山 系
构 旗 造
B10 西
A4 太 平 洋 板 块
太 平 洋 造 山 系
A2-1 中 朝 陆 块
山 系
B7 华
子 陆 块
南
C
造
山
C
哈尔滨
长春
沈阳
平壤
首尔
东京
呼和浩特
北京
太原
济南
郑州
西安
合肥
南京
杭州
武汉
南昌
长沙
厦门
广州
南宁
台北
马尼拉
构造边界线编号
1.萨彦-贝加尔萨拉伊尔-加里东期碰撞带
2.蒙古-鄂霍次克燕山期俯冲带
3.蒙古中部加里东期俯冲带
4.额尔齐斯-贺根山海西期俯冲带
5.苏尼特左旗-乌兰浩特海西-印支期碰撞带
6.北天山-北山海西期俯冲带
7.西拉木伦海西-印支期碰撞带
8.南天山-阿拉善东缘海西期俯冲带
9.翁都尔庙加里东期俯冲带
10.阿拉善西缘海西-印支期碰撞带
11.北祁连加里东期碰撞带
12.柴北缘-秦岭加里东期俯冲带
13.凤县-舒城印支期俯冲带
14.江山-绍兴晋宁期俯冲带
15.木孜塔格-玛沁印支期碰撞带
16.金沙江印支期俯冲带
17.龙木措-双湖-澜沧江印支期俯冲带
18.班公错-丁青-怒江印支期俯冲带
19.狮泉河-申扎-嘉黎燕山期俯冲带
20.雅鲁藏布江喜马拉雅山期俯冲带
21.萨哈林岛-日高燕山期俯冲带
22.仫象燕山期俯冲带
23.利吉喜马拉雅山期碰撞带

表1　亚洲中部构造单位表

Table.1　Tectonic units of central part of Asia

一级	二级	三级	
	A1西伯利亚陆块		
北亚构造集群	B1萨彦-外贝加尔造山系	a1图瓦-蒙古地块；a2雅布洛夫地块；a3中蒙古地块；a4额尔古纳地块	b1萨拉伊尔造山带(S)；b2萨彦造山带(S)；b3外贝加尔造山带(C)；b4中蒙古造山带(H~HI)
	B2阿尔泰-大兴安岭造山系	a5阿斯塔纳地块；a6阿尔泰-蒙古地块；a7准噶尔地块；a8吐鲁番地块	b5阿尔泰造山带(C) b6斋桑-准噶尔造山带(H) b7成吉思汗造山带(C) b8博格达山造山带(H) b9戈壁-阿尔泰-额尔齐斯造山带(C) b10南蒙古-大兴安岭造山带(H) b11戈壁-天山造山带(C)
	B3中天山-内蒙-松辽构造结合区	a9伊塞克地块a10巴斯喀什-伊犁地块a11马崇山地块a12查干乌勒地块a13胡达克乌勒地块a14锡林浩特地块a15松嫩地块a16布列亚-佳木斯-兴凯地块	b12纳昂-贾拉伊尔(C~H) b13曼依阿赖造山带(H) b14卡拉套-天山造山带(H) b15公婆泉-北山造山带(H) b16北山-索伦山造山带(HI) b17张广才岭造山带(H~HI)
中亚构造集群	A2-1中朝陆块		
	A2-2塔里木陆块		
	A2-3扬子陆块		
	B4南天山-翁牛特旗造山系	a17卡拉库姆地块a18敦煌地块	b18塔里木北缘造山带(C~H) b19色尔乌拉-雅布拉造山带(HI) b20阿拉善左旗-通辽造山带(HI) b21翁都尔庙造山带(C)
	B5秦祁昆造山系	a19阿中地块a20阿拉善地块a215祁连地块a22全吉地块a23柴达木地块a24大别地块a25胶东地块	
	B6巴颜喀拉-澜沧江造山带	a26塔什库尔干地块a27北羌塘-昌都地块a28松潘地块a29义敦地块a30印支地块	b22北祁连造山带(C) b23南祁连造山带(C) b24北秦岭-二郎坪造山带(C) b25阿尔金造山带(C) b26西昆仑北部造山带(H) b27东昆仑造山带(H) b28秦岭造山带(I)
	B7华南造山系	a31华夏地块a32南海地块	b29巴颜喀拉造山带(I) b30西昆仑中部造山带(I) b31澜沧江造山带(Y)
南亚构造集群	B8怒江-萨尔温江构造结合区	a33南羌塘地块a34保山地块	b32东南造山带(C) b33富宁-那坡造山带(C) b34右江造山带(I) b35印支地块北缘造山带(C)
	A3印度陆块		b36怒江造山带(I) b37萨尔温江造山带(I)
	B9喜马拉雅造山系	a35帕米尔地块a36冈底斯地块a37拉萨地块a38缅甸地块	
东亚构造集群	A4太平洋板块		b38改则-那曲造山带(Y) b39雅鲁藏布江造山带(Hm) b40若开造山带(Hm)
	B10西太平洋造山系	a39隐岐-飞驒外来地块	b41蒙古-鄂霍茨克海造山带(Y) b42锡霍特造山带(Y) b43萨哈林-北海道造山带(Y~Hm) b44三郡-丹波造山带(HI) b45佐川造山带(Y) b46四万十-琉球造山带(Hm) b47台湾-菲律宾造山带(Hm)

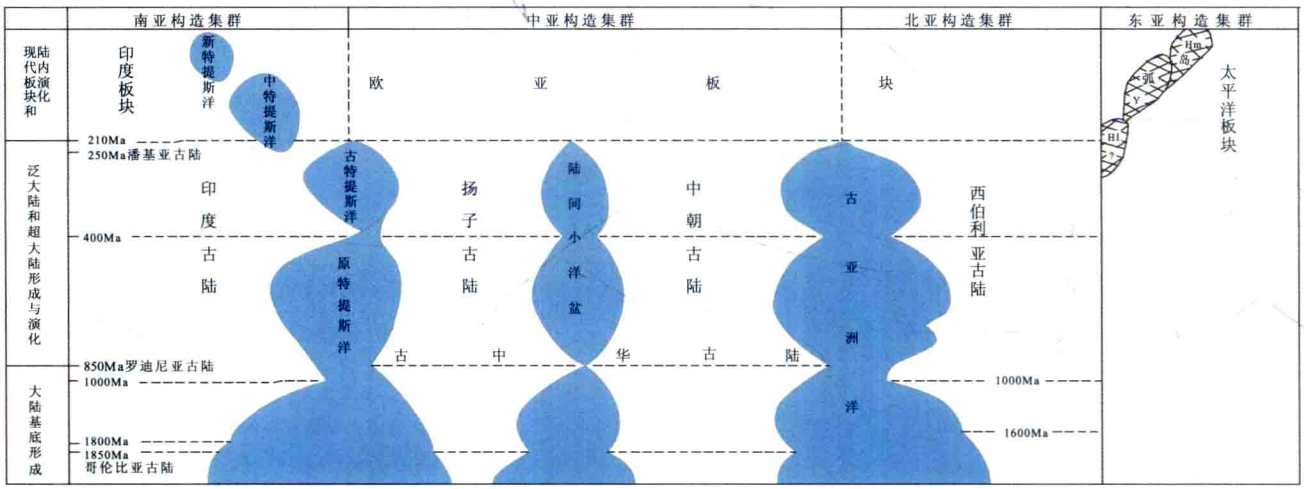


图2　亚洲中部大地构造时空演化历程图

Fig.2　Time-space evolution process of tectonics in central Asia

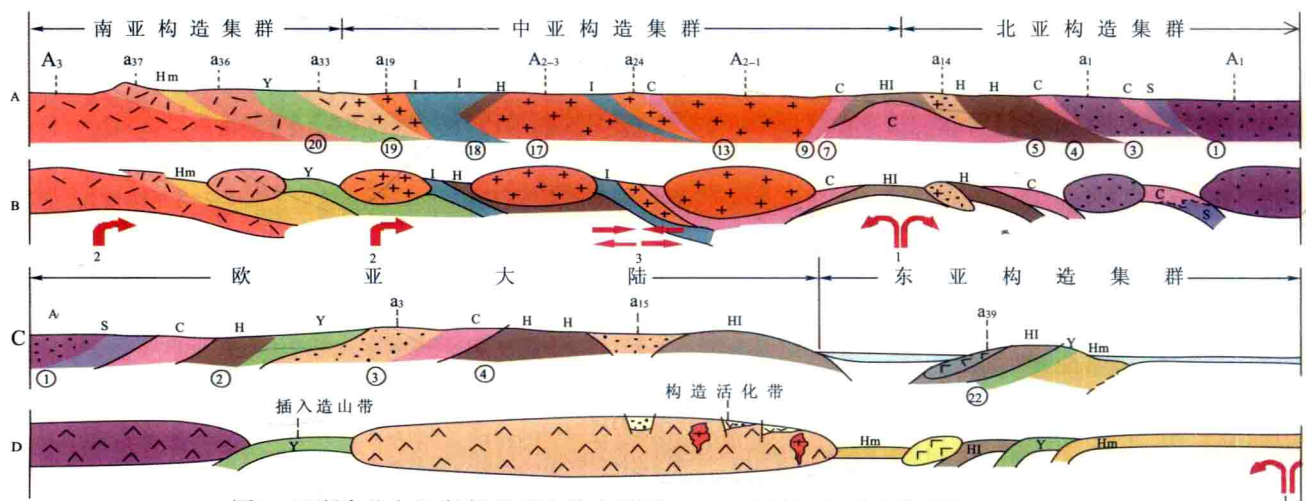


图3　亚洲南北向及南东-北西向综合剖面（A、C）及构造运动程式图(B、D)

Fig.3　Comprehensive profile of Asia in SE-NW and SN directions and the tectonic movement pattern

1.背向俯冲对接式；2.单向运移拼贴式；3.原地开合手风琴式

I –3　欧亚大陆的地貌构造

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欧亚是地球上最大的陆块，它的地貌呈现中心辐射状格局，由4类构造单元组成：地台；年轻的造山带；复活的古老造山带；大陆－大洋过渡带。像西伯利亚那样的一些大型地台，晚新生代以来缓慢上升，几乎没有内部变形；年轻的山脉丛集分布构成巨大的阿尔卑斯－喜马拉雅构造带，具有最强烈的现代构造活动；复活的造山带显示出多种地貌特征，如圆丘状隆起、块状隆起和山间盆地；洋－陆过渡带是大陆边缘裂谷或伸展盆地，是晚新生代以来亚洲大陆与太平洋、菲律宾海相互作用的结果。特别显著的是，欧亚大部分地区位于地球上最大范围大地水准面低的位置，乌拉尔－阿曼南北向线性构造带与大地水准面斜坡的断裂相一致，表明地貌构造与地球深部结构变化之间的成因联系，如密度的不均匀性，这样的深部结构一直延伸到核幔边界。此外，欧亚的大尺度地貌构造和地球动力学特征还显示了北半球与南半球之间的总体反差，包括洋－陆分布、构造活动、热状态、大地水准面等。因此，地球表面的大尺度地貌构造，主要是由地球深部动力学过程产生的，它们组成了统一的地球动力学系统。

Morphotectonics of the Eurasian continent

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Eurasia is the largest continental block on the Earth. Morphotectonically, it exhibits a radial-concentric pattern consisting of four kinds of tectonic units: platforms, rejuvenated and youthful mobile belts, and the continent-ocean transition zones. Vast areas of young and ancient platforms, such as Siberia, have experienced slow-rate Late-Cenozoic uplift and little interior deformation. The youthful orogenic belts are clustered into giant Alpine-Himalayan megabelt. The rejuvenated mountain belts are characterized by a variety of structural-morphological types of orogens, such as domelike uplifts, block uplifts and intermountain basins. The continent-ocean transition zones in Eurasian Asia, including marginal rifts and extensional basins, are resulted from interaction between the continental block and Pacific Ocean and Philippine Sea since the Late Cenozoic. One of the conspicuous features of Eurasia is that most areas lie in the largest geoid depression of the Earth, and the NS trending Uralian-Oman lineament expresses a break on the geoid slope, implying a relationship to deep structure, including density inhomogeneities, downward to the core-mantle interface. Besides, the Eurasian continent fully demonstrates morphotectonic and recent geodynamic features of the Northern Hemisphere of the Earth, just in contrast to that of the Southern Hemisphere including distribution of oceens and continents, tectonic activity, thermel regime and geoid. It is best to view the surface morphotectonics and deep structure of the Earth as a geodynamic ensemble which has spawned the large-scale geomorphic features on the surface.