

国家科学技术学术著作出版基金资助出版

板块构造演化与含油气盆地 形成和评价

翟光明 宋建国 靳久强 高维亮 著

石油工业出版社

内 容 简 介

本书共三篇。书中以中国板块构造演化为主线研究中西部含油气盆地的形成演化和油气成藏条件,探索油气勘探的新领域。编制了显生宙以来中国在全球板块构造演化过程中的地史复原图 17 张和相应的中国中西部分期构造—岩相古地理图。首次以板块构造演化控制含油气盆地生烃成藏的研究思路和方法,分析了构造与油源区的时空配置关系,科学预测现今油气藏的分布规律。明确指出 21 世纪初期中国中西部 15 个前陆盆地、10 个古隆起和我国早古生代海相地层是油气勘探的重要领域。为中国石油天然气工业可持续发展、加快开发西部的战略资源接替指明方向。

本书可供油气地质勘探领域的研究人员、工程技术人员以及高等院校师生参考。

图书在版编目 (CIP) 数据

板块构造演化与含油气盆地形成和评价/翟光明等著.

北京:石油工业出版社,2002.12

ISBN 7-5021-4034-4

I. 板…

II. 翟…

III. ①大地板块构造—研究

②含油气盆地—形成—研究—中国

IV. P618.130.2

中国版本图书馆 CIP 数据核字 (2002) 第 090559 号

石油工业出版社出版

(100011 北京安定门外安华里二区一号楼)

石油工业出版社印刷厂排版印刷

新华书店北京发行所发行

*

889×1194 毫米 16 开本 30.25 印张 870 千字 印 1—1500

2002 年 12 月北京第 1 版 2002 年 12 月北京第 1 次印刷

ISBN 7-5021-4034-4/TE·2882

定价: 80.00 元 (附图 17 张)

前 言

板块构造学说的诞生和发展,导致了地球科学的革命,开创了全球地质科学的新时代。

板块构造学说于 20 世纪 70 年代引入中国。并应用于中国的区域地质、矿产地质、海洋地质、地震地质和石油地质等各个方面,极大地丰富了板块构造学在中国的实践,推动了这一学说在中国的发展和应用。

如何把板块构造研究的成果应用于中国的含油气盆地评价,一直是我国石油地质工作者关注的焦点。本书在这方面开展了探索性的工作。

本书以板块构造演化为主线,从中国板块构造格局与特征出发,重建中国板块演化史,编制了显生宙以来不同时期以中国为中心的板块位置图,显示了中国板块演化的阶段性及小板块“多动性”的特征。本书另一个重要创新是以动态的、历史的研究思路,编制构造—岩相古地理图,反映不同时期的板块构造演化对沉积盆地的控制作用,并从生烃岩相带的展布特征来探讨油气的分布。此外,本书还提出了含油气盆地评价的研究思路与方法,通过编制分期构造图、烃源岩演化图及其二者的时空配置,为油气成藏研究与预测提供了科学依据。书中还提出多旋回盆地的分类方案,为中国叠合油气盆地分类与评价奠定了基础。

本书的宗旨是应用板块构造理论评价含油气盆地,探索油气勘探新领域,为中国石油天然气工业可持续发展,特别是为加快开发西部、西气东输落实潜在资源。

本书共分三篇:第一篇,中国及邻区板块构造格局与特征。运用最新有关重、磁、电、震、热等地球物理场资料,研究中国大陆板块的岩石圈结构、深部构造背景以及稳定地块与活动造山带之间的关系和格局。重建中国大陆板块与相邻板块的演化历史。第二篇,中国中西部板块构造演化与构造—岩相古地理。编制中国中西部显生宙以来不同地质时代的构造—岩相古地理图 17 张,分期论述盆地构造环境、盆地原型和烃源岩分布。第三篇,中国中西部含油气盆地综合研究与评价。以中西部六大含油气盆地(鄂尔多斯、四川、柴达木、吐哈、准噶尔、塔里木)为重点,研究板块构造演化对石油天然气成藏过程和后期调整改造过程的影响。指出:中国中西部 15 个前陆盆地是 21 世纪陆上油气勘探的重要领域;台盆区 10 个古隆起是寻找大型油气田的场所;并提出下古生界海相地层是接替领域。

本书是在翟光明指导下撰写完成的。初稿由翟光明、宋建国、靳久强、高维亮和薛超完成,全书统稿由靳久强完成。在审稿过程中,张清提出了有益的意见。

本书在撰写过程中,有关专家提供了原始资料。其中有马宗晋、汪集旻、周立发、罗志立、刘树根、车自成、张光亚、张家声、徐常芳、刘国栋、洪汉净、高祥林、刘和甫、李相博、陈刚、罗金海、陈世悦、汪泽成、孔志平、康竹林、徐杰、张功成等,笔者在此表示衷心感谢。

限于笔者水平,书中难免有不妥之处,敬请读者批评指正。

作者

2002.12

Preface

Establishment and development of plate tectonics lead to the revolution of geo-science, marking a new era of geological science worldwide. Introduced into China in the 1970s, plate tectonics find wide application in the country's regional geology, mineral geology, marine geology, seismic geology and petroleum geology. All those applications have vigorously promoted development of plate tectonics in China.

The Chinese petroleum geologists have always paid great attention to application of the plate tectonic research results for assessment of the oil and gas basins in China. This book is focused on such application of plate tectonics.

Based on the plate tectonic evolution, this book elaborates on China's plate tectonic distribution and characteristics, re-description of the plate tectonic evolution history and compilation of the plate tectonic location maps centering China in the different stages after Phanerozoic. The book also deals with the different stages of China's plate tectonic evolution and the "dynamic" characteristics of sub-plates. In the principle of dynamic and historical research, this book uses the structure-petrofacies palaeogeographic maps to reflect the controlling effect of the plate tectonic evolution on sedimentary basins in the different stages and discuss the oil and gas distribution on the basis of source rock distribution characteristics. In addition, this book proposes the research method for assessment of oil and gas basins and provides the scientific basis for the study and prediction of oil and gas reservoirs through compilation of the structural maps and source rock evolution maps in the different stages as well as the match of the two maps in time and space. The book also comes up with the plan for classification of multi-cycle basins, laying foundation for classification and assessment of China's overlap oil and gas basins.

This book aims at application of the plate tectonic theory for assessment of oil and gas basins to tap the new oil and gas exploration field for the sustainable development of the Chinese oil and gas industry, especially for development of Western China to locate the potential resources for the West-East gas transmission project.

This book is divided into three chapters. The first chapter is focused on the plate tectonic layout and characteristics in China and the adjacent regions. With the latest gravity, magnetic, electric, seismic and thermal data, the study centers the geosphere structure of China's continental plate, deep tectonic background and the stable relations between plates and active mountainous belts to re-construct the evolution history of China's continental plates and the adjacent ones. The second chapter describes the plate tectonic evolution and the structure-petrofacies paleogeography in China's central and western parts. It also includes 17 structural-petrofacies paleogeographic maps of the country's central and western parts in the different geological times after Phanerozoic in elaboration of the basin structural environment, the basin prototypes and the hydrocarbon source rock distribution. The third chapter is focused on the integrated study and assessment of the oil and gas basins in China's central and western parts. With the emphasis placed on the six major basins in those regions (Ordos, Sichuan, Qaidamu, Turpan-Hami, Junggar and Tarim), this chapter studies the effect of the plate tectonic evolution on oil and gas reservoir process and the later adjustment and renovation process. It points out that there are 15 foreland basins in the central

and western parts, which are the important field for onshore oil and gas exploration in the 21st century. Ten paleohighs in the tableland and basin areas are the locations for us to search for the large-scale oil and gas fields. The marine horizons of Lower Paleozoic are regarded as the replacement domain.

This book is written under the guidance of Zai Guangming. The draft version is completed by Zai Guangming, Song Jianguo, Jin Jiuqiang, Gao Weiliang and Xue Chao. Zhang Qing makes some helpful comments in examination the draft version.

Gratitude is extended to Ma Zongjing, Wang Jiyang, Zhou Lifang, Luo Zhili, Liu Shugen, Che Zicheng, Zhang Guangya, Zhang Jiasheng, Xu Changfang, Liu Guodong, Hong Hanjin, Gao Xianglin, Liu Hepu, Li Xiangbo, Chen Gang, Luo Jinhai, Chen Shirui, Wang Zecheng, Kong Zhiping, Kang Zhulin, Xu Jie and Zhang Gongcheng, who provide the original data for this book.

Author
December 2002

目 录

第一篇 中国及邻区板块构造格局与特征

第一章 中国及邻区板块构造划分	(3)
第一节 大陆板块构造演化历史的阶段性及主要拼合事件.....	(3)
一、大陆板块构造演化历史的阶段性.....	(3)
二、板块构造演化历史的主要拼合事件.....	(5)
第二节 中国及邻区大陆板块构造的基本格局.....	(5)
一、前寒武纪板块构造格局.....	(5)
二、中国大陆内与构造带有关的线性航磁异常带.....	(10)
三、古板块和现代板块构造体制.....	(11)
四、主要板块边界及其闭合时间.....	(16)
第二章 中国大陆及邻区板块构造演化	(21)
第一节 “始板块”构造演化.....	(21)
第二节 “古板块”构造演化.....	(24)
一、兴凯期 (800~510Ma): 大洋扩张期, 赤道型.....	(25)
二、加里东期 (510~407Ma): 南聚北散, 顺时针旋转.....	(25)
三、早海西期 (407~320Ma): 大陆会聚.....	(28)
四、晚海西期 (320~250Ma): 超级大陆与泛太平洋.....	(30)
五、印支期 (250~200Ma): 全球板块运动又一次加速.....	(31)
第三节 中生代以来的“现代板块构造”体制.....	(33)
一、燕山期 (200~80Ma): 大陆扩张, 板块运动加速.....	(33)
二、喜山期 (80~0Ma): 大陆会聚.....	(36)
第四节 古板块与现代板块构造演化的基本特征.....	(37)
第三章 中国及邻区盆山耦合作用分析	(39)
第一节 盆山耦合的基本模式.....	(39)
第二节 盆山的构造耦合关系.....	(40)
一、塔里木盆地—天山—准噶尔盆地耦合构造组.....	(41)
二、柴达木盆地—祁连山—河西走廊盆地耦合构造组.....	(45)
三、鄂尔多斯盆地—秦岭—四川盆地耦合构造组.....	(49)
四、渤海湾盆地—燕山—阴山—松辽盆地耦合构造组.....	(50)
第三节 亚洲大陆东南部构造及中国盆山构造分区.....	(55)
一、宏观构造格局.....	(55)
二、纬向和经向构造.....	(57)
三、斜向断裂.....	(57)
第四章 中国大陆板块构造特征及对油气分区的影响	(59)
第一节 板块构造和含油气盆地的主要特点.....	(59)
一、板块构造运动具有频繁性和多旋回性.....	(59)

二、古生代海相盆地·····	(59)
三、中、新生代陆相盆地·····	(60)
四、深部构造格局·····	(60)
第二节 中国中西部板块构造对油气分区的影响·····	(62)
一、西北油气区·····	(62)
二、青藏油气区·····	(63)
三、中部油气区·····	(63)

第二篇 中国中西部板块构造演化与构造—岩相古地理

第五章 中国中西部早古生代构造—岩相古地理及烃源岩分布·····	(67)
第一节 早古生代板块构造·····	(67)
一、震旦纪板块构造·····	(67)
二、早古生代的海侵海退旋回·····	(67)
三、主板块分裂与聚合周期的划分·····	(68)
四、西藏—滇西地区板块构造·····	(69)
五、华北板块北缘·····	(69)
六、北疆地区板块构造·····	(70)
第二节 早古生代构造—岩相古地理·····	(70)
一、震旦纪构造—岩相古地理(附图 1) ·····	(70)
二、寒武纪构造—岩相古地理(附图 2) ·····	(71)
三、早奥陶世构造—岩相古地理(附图 3) ·····	(74)
四、中—晚奥陶世构造—岩相古地理(附图 4) ·····	(77)
五、志留纪构造—岩相古地理(附图 5) ·····	(79)
第三节 早古生代构造—岩相古地理控制下的烃源岩分布·····	(81)
一、鄂尔多斯盆地地下古生界烃源岩及分布·····	(81)
二、四川盆地地下古生界烃源岩及分布·····	(83)
三、塔里木盆地地下古生界烃源岩及分布·····	(85)
第六章 中国中西部晚古生代构造—岩相古地理及烃源岩分布·····	(87)
第一节 晚古生代板块构造·····	(87)
一、北疆及鄂尔多斯北部边缘地区·····	(87)
二、中轴大陆(塔里木—中朝)地区·····	(87)
三、中轴造山带·····	(88)
四、古特提斯构造域·····	(88)
五、上扬子地区·····	(89)
第二节 晚古生代构造—岩相古地理·····	(89)
一、泥盆纪构造—岩相古地理(附图 6) ·····	(89)
二、早石炭世构造—岩相古地理(附图 7) ·····	(91)
三、中—晚石炭世构造—岩相古地理(附图 8) ·····	(94)
四、早二叠世构造—岩相古地理(附图 9) ·····	(99)
五、晚二叠世构造—岩相古地理(附图 10) ·····	(102)
第三节 晚古生代构造—岩相古地理控制下的烃源岩分布·····	(105)
一、鄂尔多斯—祁连—柴达木盆地上古生界烃源岩及分布·····	(105)

二、四川盆地上古生界烃源岩及分布·····	(110)
三、塔里木盆地上古生界烃源岩及分布·····	(112)
四、准噶尔盆地上古生界烃源岩及分布·····	(112)
五、吐哈、三塘湖及伊犁盆地烃源岩及分布·····	(117)
第七章 中国中西部古生代盆地原型·····	(119)
第一节 早古生代盆地原型·····	(119)
一、鄂尔多斯盆地早古生代盆地原型·····	(119)
二、四川盆地早古生代盆地原型·····	(121)
三、塔里木盆地早古生代盆地原型·····	(126)
第二节 晚古生代盆地原型·····	(131)
一、鄂尔多斯盆地晚古生代盆地原型·····	(131)
二、四川盆地晚古生代盆地原型·····	(135)
三、塔里木盆地晚古生代盆地原型·····	(138)
四、准噶尔盆地晚古生代盆地原型·····	(140)
五、吐哈、三塘湖及伊犁盆地晚古生代盆地原型·····	(143)
第八章 中国中西部中、新生代板块构造格局及其演化·····	(144)
第一节 中、新生代板块构造划分·····	(144)
一、板块构造划分·····	(144)
二、中、新生代板块缝合带及其构造意义·····	(144)
第二节 中、新生代板块构造的深部地球动力学背景及其结构特征·····	(146)
一、深部地球动力学背景·····	(146)
二、结构特征·····	(148)
第三节 中、新生代沉积盆地形成的板块动力学演化过程·····	(150)
一、中国中、新生代构造域的划分及其特征·····	(150)
二、古亚洲构造域的形成演化·····	(151)
三、特提斯构造域的形成演化·····	(152)
四、环太平洋构造域的形成演化·····	(157)
五、蒙古—鄂霍茨克构造域的形成演化·····	(158)
第四节 构造动力体系的联合与复合·····	(160)
一、构造动力体系的联合·····	(160)
二、构造动力体系的复合·····	(160)
第九章 中国中西部中、新生代板块构造演化与构造—岩相古地理及烃源岩分布·····	(161)
第一节 三叠纪板块构造演化与构造—岩相古地理·····	(161)
一、早—中三叠世构造—岩相古地理(附图 11)·····	(161)
二、晚三叠世构造—岩相古地理(附图 12)·····	(166)
三、构造—岩相古地理控制下的烃源岩分布·····	(171)
第二节 侏罗纪板块构造演化与构造—岩相古地理·····	(173)
一、早—中侏罗世构造—岩相古地理(附图 13)·····	(173)
二、晚侏罗世构造—岩相古地理(附图 14)·····	(184)
三、构造—岩相古地理控制下的烃源岩分布·····	(188)
第三节 白垩纪板块构造演化与构造—岩相古地理·····	(196)
一、白垩纪构造—岩相古地理(附图 15)·····	(196)

二、构造—岩相古地理控制下的烃源岩分布·····	(206)
第四节 第三纪板块构造演化与构造—岩相古地理·····	(211)
一、早第三纪构造—岩相古地理(附图 16)·····	(211)
二、晚第三纪构造—岩相古地理(附图 17)·····	(218)
三、构造—岩相古地理控制下的烃源岩分布·····	(225)
第十章 中国中西部中、新生代盆地类型 ·····	(229)
第一节 盆地分类原则及类型划分·····	(229)
一、盆地分类原则·····	(229)
二、单旋回盆地分类(盆地原型)·····	(229)
三、多旋回盆地分类(叠合盆地)·····	(230)
第二节 中、新生代沉积盆地类型的初步划分·····	(231)
一、中、新生代含油气盆地形成的区域构造背景·····	(231)
二、中、新生代构造旋回划分·····	(232)
三、中、新生代不同构造阶段单旋回盆地类型(盆地原型)和主要地质事件·····	(233)
四、中、新生代多旋回盆地类型·····	(236)

第三篇 中国中西部含油气盆地综合研究与目标评价

第十一章 中国中西部重点含油气盆地综合研究与评价 ·····	(241)
第一节 鄂尔多斯盆地·····	(241)
一、盆地基底的结构和构造特征·····	(241)
二、盆地构造层序与演化·····	(241)
三、含油气系统分析·····	(244)
四、有利勘探地区预测·····	(257)
第二节 四川盆地·····	(260)
一、盆地构造层序地层格架与盆地形成演化·····	(260)
二、早古生代古构造格局演变及其后期改造·····	(261)
三、晚古生代克拉通裂陷与有利储层段分布·····	(265)
四、中生代前陆盆地形成演化·····	(265)
五、含油气系统分析·····	(269)
六、天然气富集成藏条件与有利勘探地区预测·····	(271)
第三节 柴达木盆地·····	(276)
一、盆地形成与演化·····	(276)
二、盆地充填与层序地层特征·····	(278)
三、油气聚集规律·····	(278)
四、综合评价与有利地区预测·····	(287)
第四节 塔里木盆地·····	(290)
一、塔里木板块古生代盆地类型与油气成藏·····	(290)
二、塔里木板块中、新生代盆地类型与油气成藏·····	(294)
三、油气系统分析·····	(296)
四、有利含油气区预测·····	(302)
第五节 准噶尔盆地·····	(305)
一、基本构造特征·····	(305)

二、石炭系石油地质条件综合研究与评价·····	(307)
三、二叠系石油地质条件综合研究与评价·····	(312)
四、侏罗系石油地质条件综合研究与评价·····	(317)
五、含油气系统·····	(320)
六、油气勘探领域评价·····	(320)
第六节 吐哈盆地·····	(321)
一、基本构造特征·····	(321)
二、二叠系油气地质条件综合研究与评价·····	(322)
三、侏罗系油气地质条件综合研究与评价·····	(325)
第十二章 中国中西部下古生界含油气特征与评价 ·····	(331)
第一节 中西部早古生代板块构造演化及沉积特征·····	(331)
一、“古中国地台”形成及裂解·····	(331)
二、早古生代洋盆发育和闭合特征·····	(331)
三、超大陆形成和裂解以及洋盆发育对成盆成烃环境的影响·····	(337)
第二节 中西部早古生代大陆板块的古地理—构造特征及成藏条件·····	(339)
一、早古生代塔里木板块演化特征及成藏条件·····	(339)
二、早古生代华北板块构造演化及鄂尔多斯盆地形成和成藏条件·····	(344)
三、古生代扬子古板块构造演化及四川盆地形成和成藏条件·····	(349)
第三节 中西部三个克拉通盆地地下古生界含油气潜力与评价·····	(353)
一、塔里木盆地成藏条件良好,具有勘探大油气田的潜力及有利地区·····	(353)
二、鄂尔多斯盆地地下古生界有利地区评价·····	(356)
三、四川盆地地下古生界有利区块评价·····	(357)
第十三章 中国中西部古隆起含油气特征及评价 ·····	(359)
第一节 中西部古隆起基本概况·····	(359)
第二节 中西部古隆起的基本特征和含油气性·····	(360)
一、川中加里东古隆起的基本特征和含油气性·····	(360)
二、泸州古隆起的基本特征和含油气性·····	(364)
三、开江古隆起的基本特征和含油气性·····	(367)
四、鄂尔多斯盆地中央古隆起的基本特征和含油气性·····	(371)
五、塔北古隆起的基本特征和含油气性·····	(376)
六、塔中古隆起的基本特征和含油气性·····	(379)
七、陆梁古隆起的基本特征和含油气性·····	(383)
第三节 中西部古隆起的一般特征和油气藏分布的有序性·····	(387)
一、中西部古隆起的一般特征·····	(387)
二、中西部古隆起油气聚集的有利条件·····	(391)
第十四章 中国中西部前陆盆地形成演化与含油气特征 ·····	(393)
第一节 前陆盆地形成演化的区域构造背景·····	(393)
一、盆—山系统形成的地质背景·····	(393)
二、盆—山系统的基本特征·····	(395)
三、盆—山系统的耦合关系·····	(396)
第二节 主要前陆盆地基本特征和含油气性·····	(404)
一、川西前陆盆地基本特征和油气勘探方向·····	(404)

二、川北大巴山前陆盆地基本特征和含油气性·····	(410)
三、库车前陆盆地的基本特征和含油气性·····	(416)
四、塔西南前陆盆地的基本特征和含油气性·····	(422)
五、酒西前陆盆地的基本特征和含油气性·····	(428)
六、准噶尔南缘前陆盆地的基本特征和含油气性·····	(431)
第三节 中西部前陆盆地油气分布的有序性·····	(433)
一、前陆盆地的基本特征·····	(433)
二、前陆盆地油气分布的有序性·····	(435)
第十五章 中国中西部勘探领域分析·····	(440)
第一节 油气资源主要集中在六个盆地·····	(440)
第二节 前陆盆地是中西部油气勘探的重要领域·····	(440)
一、优越的石油地质条件·····	(440)
二、油气资源潜力巨大·····	(440)
三、分类评价·····	(440)
第三节 台盆区古隆起是寻找大型油气田的场所·····	(443)
一、古隆起的有利石油地质条件·····	(443)
二、台盆区古隆起勘探区域广阔·····	(443)
三、分类评价·····	(443)
第四节 下古生界海相地层是油气勘探的接替领域·····	(445)
一、下古生界海相地层的石油地质条件·····	(445)
二、下古生界海相地层勘探领域·····	(446)
参考文献·····	(447)
附图目录·····	(461)

Contents

Part I Plate tectonic framework and features of China and the neighboring areas

Chapter 1	Dividing of plate tectonics of China and its surrounding areas	(3)
Sec. 1	Stages and major matching events of continental plate tectonic evolution	(3)
1	Stages of continental plate tectonic evolution	(3)
2	Major matching events of continental plate tectonic evolution	(5)
Sec. 2	Plate tectonic framework of Chinese continent and its surrounding areas	(5)
1	Precambrian plate tectonic framework	(5)
2	Linear aeromagnetic anomalies associated with structural zones within Chinese continent	(10)
3	System of ancient and present plate tectonics	(11)
4	Major plate boundaries and their closing time	(16)
Chapter 2	Plate tectonic evolution of Chinese continent and its surrounding areas	(21)
Sec. 1	Prime plate tectonic evolution	(21)
Sec. 2	Paleo – plate tectonic evolution	(24)
1	Xingkai period (800~510 Ma): ocean spreading in equator area	(25)
2	Caledonian period (510~407 Ma): plates converging in the south and diverging in the north, with clockwise rotation	(25)
3	Early Hercynian period (407~320 Ma): continent convergence	(28)
4	Late Hercynian period (320~250 Ma): super – continent and pan – Pacific ocean	(30)
5	Indosinian period (250~200 Ma): Global plate movement acceleration	(31)
Sec. 3	Modern plate tectonic system since the Mesozoic	(33)
1	Yanshanian period (200~80 Ma): continental accretion and plate movement acceleration	(33)
2	Himalayan period (80~0 Ma): continental convergence	(36)
Sec. 4	General features of ancient and present plate tectonic evolution	(37)
Chapter 3	Analysis of basin – mountain coupling in China and the neighboring areas	(39)
Sec. 1	Basic models of basin – mountain coupling	(39)
Sec. 2	Structural coupling of basin and mountain	(40)
1	Tarim basin – Tianshan mountain – Jungger basin coupling group	(41)
2	Qaidam basin – Qilian mountain – Hexizoulang basin coupling group	(45)
3	Ordos basin – Qinling mountain – Sichuan basin coupling group	(49)
4	Bohai bay basin – Yashan mountain – Yinshan mountain – Songliao basin coupling group	(50)
Sec. 3	Tectonics of southeastern Asian continent and basin – mountain structural subdivision of China	(55)

1	Macroscopic structure framework	(55)
2	Latitudinal and longitudinal structures	(57)
3	Oblique structures	(57)
Chapter 4 Plate tectonic Features of Chinese continent and their influence on petroleum province		
		(59)
Sec. 1	General characteristics of plate tectonics and petroliferous basins	(59)
1	High frequency and multi – cycle of plate tectonic movement	(59)
2	Paleozoic marine basin	(59)
3	Mesozoic and Cenozoic continental basin	(60)
4	Deep structural framework	(60)
Sec. 2	Influence of central and western China plate tectonics on petroleum provinces	(62)
1	Northwestern petroleum province	(62)
2	Qinhai – Tibetan petroleum province	(63)
3	Central petroleum province	(63)

Part II Plate tectonic evolution of Central and Western China and the tectonic and petrographic – paleogeography

Chapter 5 Early Paleozoic tectonics and petrographic – paleogeography and source rock distribution in Central and western China		
		(67)
Sec. 1	Early Paleozoic plate tectonics	(67)
1	Sinian plate tectonics	(67)
2	Transgression and regression cycles of Early Paleozoic	(67)
3	Periodic dividing of major plate break – up and convergence	(68)
4	Plate tectonics of Tibetan and western Yunnan	(69)
5	Northern margin of North China plate	(69)
6	Plate tectonics of northern Xinjiang	(70)
Sec. 2	Early Paleozoic tectonics and petrographic – paleogeography	(70)
1	Sinian tectonics and petrographic – paleogeography (appended Fig. 1)	(70)
2	Cambrian tectonics and petrographic – paleogeography (appended Fig. 2)	(71)
3	Early Ordovician tectonics and petrographic – paleogeography (appended Fig. 3)	(74)
4	Middle – Late Ordovician tectonics and petrographic – paleogeography (appended Fig. 4)	(77)
5	Silurian tectonics and petrographic – paleogeography (appended Fig. 5)	(79)
Sec. 3	Source rock distribution controlled by Early Paleozoic tectonics and petrographic – paleogeography	(81)
1	Lower Paleozoic source rock and distribution in Ordos basin	(81)
2	Lower Paleozoic source rock and distribution in Sichuan basin	(83)
3	Lower Paleozoic source rock and distribution in Tarim basin	(85)
Chapter 6 late Paleozoic tectonics and petrographic – paleogeography and source rock distribution in Central and Western China		
		(87)
Sec. 1	Late Paleozoic tectonics	(87)
1	Northern Xinjiang and the northern margin of Ordos region	(87)

2	Central (Tarim – China – Korean) continent region	(87)
3	Mid – axial orogenic belt	(88)
4	Paleo – Tethyan tectonic domain	(88)
5	Upper Yangzi region	(89)
Sec. 2	Late Paleozoic tectonics and petrographic – paleogeography	(89)
1	Devonian tectonics and petrographic – paleogeography (appended Fig. 6)	(89)
2	Early Carboniferous tectonics and petrographic – paleogeography (appended Fig. 7)	(91)
3	Middle – Late Carboniferous tectonics and petrographic – paleogeography (appended Fig. 8)	(94)
4	Early Permian tectonics and petrographic – paleogeography (appended Fig. 9)	(99)
5	Late Permian tectonics and petrographic – paleogeography (appended Fig. 10)	(102)
Sec. 3	Source rock distribution controlled by Late Paleozoic tectonics and petrographic- paleogeography	(105)
1	Late Paleozoic source rock and distribution in Ordos – Qilian – Qaidam basin	(105)
2	Late Paleozoic source rock and distribution in Sichuan basin	(110)
3	Late Paleozoic source rock and distribution in Tarim basin	(112)
4	Late Paleozoic source rock and distribution in Jungger basin	(112)
5	Late Paleozoic source rock and distribution in Tuha, Santanghu and Yili basins	(117)
Chapter 7	Paleozoic proto – basin of Central and Western China	(119)
Sec. 1	Early Paleozoic proto – basin	(119)
1	Early Paleozoic proto – basin of Ordos basin	(119)
2	Early Paleozoic proto – basin of Sichuan basin	(121)
3	Early Paleozoic proto – basin of Tarim basin	(126)
Sec. 2	Late Paleozoic proto – basin	(131)
1	Late Paleozoic proto – basin of Ordos basin	(131)
2	Late Paleozoic proto – basin of Sichuan basin	(135)
3	Late Paleozoic proto – basin of Tarim basin	(138)
4	Late Paleozoic proto – basin of Jungger basin	(140)
5	Late Paleozoic proto – basin of Tuha, Santanghu and Yili basin	(143)
Chapter 8	Mesozoic and Cenozoic plate tectonic framework and evolution of Central and Western China	(144)
Sec. 1	Subdivision of Mesozoic and Cenozoic plate tectonics	(144)
1	Plate tectonic subdivision	(144)
2	Mesozoic and Cenozoic plate sutures and their tectonic meanings	(144)
Sec. 2	Deep geodynamic settings and structural features of Mesozoic and Cenozoic plate tectonics	(146)
1	Deep geodynamic settings	(146)
2	Structural features	(148)
Sec. 3	Plate dynamic evolution of Mesozoic and Cenozoic sedimentary basin formation	(150)
1	Classification and Characteristics of Mesozoic and Cenozoic tectonic domains in China	(150)
2	Formation and evolution of ancient Asian tectonic domain	(151)

3	Formation and evolution of Tethys tectonic domain	(152)
4	Formation and evolution of circum – Pacific ocean tectonic domain	(157)
5	Formation and evolution of Mongolian – Ehuocik tectonic domain	(158)
Sec. 4	Joining and complex of structural dynamic systems	(160)
1	Joining of structural dynamic systems	(160)
2	Complex of structural dynamic systems	(160)
Chapter 9	Mesozoic and Cenozoic plate tectonic evolution, petrographic – paleogeography	
	and source rock distribution of Central and Western China	(161)
Sec. 1	Triassic plate tectonic evolution and petrographic – paleogeography	(161)
1	Early – Middle Triassic tectonics and petrographic – paleogeography (appended Fig. 11)	(161)
2	Late Triassic tectonics and petrographic – paleogeography (appended Fig. 12)	(166)
3	Source rock distribution controlled by tectonics and petrographic – paleogeography	(171)
Sec. 2	Jurassic plate tectonic evolution and petrographic – paleogeography	(173)
1	Early – Middle Jurassic tectonics and petrographic – paleogeography (appended Fig. 13)	(173)
2	Late Jurassic tectonics and petrographic – paleogeography (appended Fig. 14)	(184)
3	Source rock distribution controlled by tectonics and petrographic – paleogeography	(188)
Sec. 3	Cretaceous plate tectonic evolution and petrographic – paleogeography	(196)
1	Cretaceous tectonics and petrographic – paleogeography (appended Fig. 15)	(196)
2	Source rock distribution controlled by tectonics and petrographic – paleogeography	(206)
Sec. 4	Tertiary plate tectonic evolution and petrographic – paleogeography	(211)
1	Early Tertiary tectonics and petrographic – paleogeography (appended Fig. 16)	(211)
2	Late Tertiary tectonics and petrographic – paleogeography (appended Fig. 17)	(218)
3	Source rock distribution controlled by tectonics and petrographic – paleogeography	(225)
Chapter 10	Mesozoic and Cenozoic basin types of Central and Western China	(229)
Sec. 1	Basin types and classification principles	(229)
1	Principles for basin classification	(229)
2	Classification of monocycle basin (proto basin)	(229)
3	Classification of multi – cycle basin (superimposed basin)	(230)
Sec. 2	Classification of Mesozoic and Cenozoic sedimentary basins	(231)
1	Regional Structural settings for the formation of Mesozoic – Cenozoic oil and gas basins	(231)
2	Subdivision of Mesozoic and Cenozoic structural cycles	(232)
3	Monocycle basin (proto basin) types and major geological events in different structural period of Mesozoic and Cenozoic	(233)
4	Types of Mesozoic and Cenozoic multi – cycle basins	(236)
 Part III Integrated study and evaluation of oil and gas basins in Central and Western China		
Chapter 11	Integrated study and evaluation of important oil and gas basins in Central and Western China	(241)

Sec. 1	Ordos basin	(241)
1	Basement framework and structural features	(241)
2	Basin structural sequences and evolution	(241)
3	Petroleum system analysis	(244)
4	Favorable prospecting areas	(257)
Sec. 2	Sichuan basin	(260)
1	Structural – Stratigraphic framework and basin formation and evolution	(260)
2	Early Paleozoic structural framework and evolution and the later deformation	(261)
3	Late cratonic rifting and favorable reservoir distribution	(265)
4	Formation and evolution of Mesozoic foreland basin	(265)
5	Petroleum system analysis	(269)
6	Pooling condition for natural gas accumulation and prospecting areas	(271)
Sec. 3	Qaidam basin	(276)
1	Basin formation and evolution	(276)
2	Basin infill and sequence stratigraphy	(278)
3	Hydrocarbon accumulation laws	(278)
4	Integrated evaluation and prediction for favorable areas	(287)
Sec. 4	Tarim basin	(290)
1	Paleozoic basin type and hydrocarbon pool formation of Tarim plate	(290)
2	Mesozoic and Cenozoic basin type and hydrocarbon pool formation of Tarim plate	(294)
3	Petroleum system analysis	(296)
4	Prediction of favorable petroliferous areas	(302)
Sec. 5	Jungger basin	(305)
1	General structural characteristics	(305)
2	Integrated study and evaluation of Carboniferous petroleum geologic condition	(307)
3	Integrated study and evaluation of Permian petroleum geologic condition	(312)
4	Integrated study and evaluation of Jurassic petroleum geologic condition	(317)
5	Petroleum systems	(320)
6	Evaluation of prospecting areas	(320)
Sec. 6	Tuha basin	(321)
1	General structural characteristics	(321)
2	Integrated study and evaluation of Permian petroleum geologic condition	(322)
3	Integrated study and evaluation of Jurassic petroleum geologic condition	(325)
Chapter 12	Hydrocarbon characteristics and evaluation of Lower Paleozoic in Central and Western China	(331)
Sec. 1	Early Paleozoic plate tectonic evolution and sedimentary features of Central and Western China	(331)
1	Formation and break – up of ancient China platform	(331)
2	Early Paleozoic oceanic basin development and closing	(331)
3	Influence of super – continent formation and break – up and oceanic basin development on the forming environment of basin and hydrocarbon	(337)
Sec. 2	Paleogeographic – tectonic features and hydrocarbon reservoir condition on Early	