贾承造 主编：塔里木盆地石油地质与勘探丛书（卷一）

TARIM BASIN

塔里木盆地

板块构造与大陆动力学

贾承造 等著

石油工业出版社
PETROLEUM INDUSTRY PRESS

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内 容 提 要

本书系统阐述了塔里木板块的基底组成和边缘演化，解析了塔里木板块演化成为欧亚大陆一部分后，在欧亚板块边缘俯冲或碰撞作用过程中，塔里木边缘和内部的构造响应过程和构造特征，揭示了碰撞拼合后的大陆动力学过程。其研究成果对塔里木盆地油气勘探具有指导作用，研究思路和方法对我国大陆动力学研究具有重要借鉴作用。

本书可供从事构造地质学与石油地质学研究的科技工作者参考。

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《塔里木盆地石油地质与勘探丛书》

编　委　会

序

以“九五”期间勘探与研究成果为内容的《塔里木盆地石油地质与勘探丛书》一套十二卷即将面世，这是“九五”期间奋战在塔里木盆地这块热土上的全体石油地质工作者集体劳动的结晶，也是石油工业出版社同志们辛勤劳动的产物。它是塔里木盆地油气勘探史上重要的一环。丛书的出版，必将引起国内外石油界的广泛瞩目和浓厚的兴趣，我对丛书的出版表示热烈祝贺。

塔里木盆地的油气勘探从20世纪50年代算起已经有50多年了，其间因为种种原因，经历了“几上几下”的曲折历程，也积累了丰富的资料和经验教训。1989年4月经国务院批准由中国石油天然气总公司组织了塔里木盆地石油会战，从而为在塔里木盆地大规模全面展开油气勘探迈出了扎实的历史性的步伐。与此同时国家也组织了相应的以塔里木盆地油气勘探为内容的“八五”和“九五”的重点攻关项目。

《塔里木盆地石油地质与勘探丛书》的内容，正是在广大石油工作者近40年野外和盆地周边地质调查和钻探、石油地球物理勘探局挺进大漠后连续苦干近20年所取得的丰硕资料，在“七五”和“八五”国家重点攻关研究工作的基础上，通过5年或更长时间的实践和研究所取得的成果，在此期间，对重点地区和重点层系进行了艰苦有效的研究和实践，应该说取得了令人满意的勘探成果，开创和深化了新的理论和认识，特别在复杂断裂构造带和碳酸盐岩中进行油气勘探，积累和丰富了大量储层描述和评价、地震采集和处理、测井、完井、试油等一系列理论、技术和工作方法。

“九五”期间，共发现或探明了13个大、中型油气田，27个工业性含油气构造。发现和探明了大型整装的克拉2大气田，探明天然气地质储量$2840\times10^8m^3$，发现了库车坳陷的富天然气聚集带，为“西气东输”奠定了资源基础；继续探明了塔河—轮南大油田。近5年来新增油气地质储量5.905×10^8t（当量），其中石油地质储量1.908×10^8t，天然气地质储量为$3997\times10^8m^3$，2000年生产原油440×10^4t。

通过“九五”期间勘探和研究，对库车前陆盆地石油地质的认识取得了重大进展，初步形成了库车大气区的石油地质理论基础；在古生代海相碳酸盐岩油气成藏规律研究、克拉通主力烃源岩评价、海相碳酸盐岩和碎屑岩储层发育机制及成藏期与成藏模式研究等方面，取得了新进展，丰富了海相石油地质理论，深化了对古老克拉通盆地海相油气分布规律的认识；对塔里木盆地石油地质的深入研究，明确了塔里木中、新生代盆地大地构造背景及包括塔里木盆地在内的特提斯北缘盆地群的油气地质特征；进一步总结和完善了塔里木盆地油气的富集成藏规律，评价优选出了一大批有利勘探区带和目标，明确了塔里木盆地油气勘探的战略发展方向，并形成了一系列油气勘探的技术和方法。

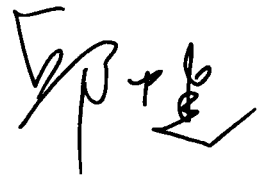
特别是库车前陆盆地创造性地运用断层相关褶皱理论，在库车前陆盆地褶皱—逆冲构造带建立了10种构造模型，并用于地震剖面精细构造解释和制图；应用煤成烃理论，深入分析和系统评价了库车前陆盆地三叠—侏罗系煤系地层烃源岩。提出库车前陆盆地发育分布广、厚度大、有机质丰度高、有机质类型以腐殖型为主、成熟度高的煤系地层烃源岩等，初步认识了库车大气区的石油地质特征。

针对山地地震勘探、高陡构造钻井、超高压气藏测试和评价、碳酸盐岩孔、洞、缝型储层的识别和预测及超深、低幅度薄层砂岩油藏勘探等一系列难题，加大了勘探技术攻关的力度，初步形成了五套油气勘探评价技术系列，基本满足了当前塔里木盆地油气勘探的需要。

这套丛书系统总结了“九五”及前人对塔里木盆地的勘探和研究工作，特点是总结了5年的勘探实践和认识。其中既有勘探的认识和基础研究成果，也有油气富集规律的总结和新技术、新方法的应用，内容十分丰富，对今后塔里木盆地乃至其它相似盆地的油气勘探有一定的借鉴意义。但我们认为，这些成果并不都是十分成熟、十全十美的，正相反，毕竟塔里木盆地情况十分复杂，勘探程度还比较低，许多难题还尚未解决，勘探的道路还很漫长，我们的认识虽有大的进步，但还有很多不清楚和不明白的环节和规律。可贵的是，塔里木盆地的石油地质工作者勇于实践，勇于探索，锲而不舍，不断进取，及时总结经验和教训，敢于把这些成果亮出来，接受实践的检验，在实践中深化认识。我相信，这套丛书的出版，定会丰富中国石油地质学的理论与实践，并对今后的勘探工作起到重要的指导作用。

随着塔里木盆地油气勘探不断深入并取得更大进展，人们的认识将会更加接近客观实际和事物的本来面目，通过继续不断地努力和探索，定会实现油气勘探的飞跃。到那时，中国石油工业的希望——塔里木盆地，将出现更多的克拉2和塔河一轮南型的大型油气田，进入新的油气储量增长的高峰期，塔里木盆地真正成为中国石油工业战略接替基地，我对此充满信心。

最后，我衷心希望丛书的出版能够起到“抛砖引玉”的作用，能够在一定程度上满足全国石油地质界关心和支持塔里木盆地找油事业的专家同仁的需要，并引起更多人的兴趣，从而参加到塔里木盆地油气勘探的接力赛的行列中来，共同投身到富有诱惑、充满挑战而又奥秘神奇的塔里木盆地这块热土中来。



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Preface

The 12-volume collection of *Petroleum Geology and Exploration of Tarim Basin*, the content of which is the exploration and research achievements during the "Ninth Five-Year Plan" period, will be published. This collection is the crystallization of all petroleum geologists ever fought in hot land of Tarim Basin during the "Ninth Five-Year Plan" period and the product of arduous work of comrades of Petroleum Industry Press. It is one important page of the hydrocarbon exploration history of Tarim Basin. After being published, this collection will undoubtedly be widely cared by domestic and foreign petroleum circles and bring them great interest. I hereby express my congratulation to the publishing of this collection.

Hydrocarbon exploration work in Tarim Basin started in 1950s and till now it has an over-50-year's history. In this course, the exploration personnel had suffered with many frustrations for various reasons but they also obtained rich materials, experiences and lessons. China National Petroleum Corporation, after approved by the State Council, organized a mass petroleum exploration campaign in April 1989, which was a firm and historic step for the large-scale overall hydrocarbon exploration in Tarim Basin. Meanwhile, the state also organized some "Eighth Five-year Plan" and "Ninth Five-Year Plan" brainstorm projects focusing on hydrocarbon exploration of Tarim Basin.

The content of the collection of *Petroleum Geology and Exploration of Tarim Basin* is full of the plentiful and substantial materials that have been obtained by a lot of petroleum workers through field geologic survey and drilling work around the basin in nearly 40 years and through continuous hard work for nearly 20 years after the Bureau of Geophysical Prospecting. This collection also contains the achievements that have been obtained through the practice and research for five years or more time based on the national key brainstorm research work during the "Seventh Five-year Plan" and "Eighth Five-year Plan" period; during this period, geologists had conducted hard but effective studies and practice on key regions and key series of strata. This course does obtain satisfying exploration achievements and initiate and deepen new theories and understandings. Especially, the hydrocarbon exploration work in complicated fracture zones and carbonate helps geologists in accumulating and enriching a series of theories, technologies and work methods such as large reservoir description and evaluation, seismic acquisition and processing, well logging, well completion and oil test and so forth.

During the "Ninth Five-Year Plan" period, 13 large/middle oilfields / gasfields and 27 gas-/oil-bearing structures available for industrial application in total have been discovered or proven. The large self-contained Kela-2 Large Gasfield was discovered and proven during this period, the proven geological reserves of natural gases of which are $2{,}840\times10^{8}m^{3}$, while the rich natural gas accumulation zone was discovered in Kuche Depression, which establishing the resource foundation for the "West-East Pipeline Project". Later, Tahe-Lunnan Large Oilfield was ascertained. In recent five years, $5.905\times10^{8}t$ (equivalent weight) of geological reserves of oil and gas have been

ascertained, including $1.908x10^8t$ of geological reserves of petroleum, $3,997x10^8m^3$ of geological reserves of natural gas. In 2000, the production of crude oil reached $440x10^4t$.

Through the exploration and research during the "Ninth Five-Year Plan" period, the understanding to petroleum geology of Kuche Foreland Basin has had an important breakthrough, and the theoretical foundation for petroleum geology has been preliminarily established for the large natural gas area in Kuche. In such aspects of research on Paleozoic marine carbonate hydrocarbon reservoir formation law, evaluation on major hydrocarbon source rock in Craton, research on development mechanism of marine carbonate and clastic reservoir, reservoir formation period and reservoir formation model and so on, some new progresses have been obtained, which has enriched the theory relating to marine petroleum geology, deepened the understanding on marine hydrocarbon distribution law of ancient cratonic basin. The deep research on petroleum geology of Tarim Basin ascertains the tectonic background of the Cenozoic basin of Tarim and the geological characteristics of hydrocarbon in basin groups in north edge of Tethys including Tarim Basin; it further concludes and perfects the occurrence and reservoir formation laws of hydrocarbons in Tarim Basin, evaluates and optimizes a large batch of favorable exploration areas, zones and destinations, determines the strategic development direction for hydrocarbon exploration of Tarim Basin and obtains a series of hydrocarbon exploration technologies and methods.

Especially, in Kuche foreland basin, geologists have innovatively applied the fault-related folding theory to establish 10 structure models in the fold-thrust structure zones of Kuche foreland basin and used it for interpretation and plotting of fine structures of seismic profile; the theory that states how coal is turned into hydrocarbon has been used to deeply analyze and systematically evaluate the hydrocarbon source rocks in the Triassic-Jurassic coal measure strata in Kuche foreland basin. It proposes the opinion that the coal measure strata hydrocarbon source rocks of wide distribution range, large thickness, high organic matter abundance, humus as main organic matter and high maturity are developing in Kuche foreland basin, while preliminarily understanding the petroleum geological characteristics of Kuche large gas area.

The brainstorm strength of exploration technologies is increased for a series of difficulties such as mountainous seismic exploration, drilling of high and steep structure, testing and evaluation on super-high pressure gas reservoir, recognition and prediction of carbonate hole, pore and seam-shaped reservoir, exploration of super-deep, low-amplitude thin sandstone oil reservoir, preliminarily establishing five sets of hydrocarbon exploration and evaluation technologies, which basically meet the current hydrocarbon exploration need of Tarim Basin.

This collection systematically concludes the exploration and research work that was carried during the "Ninth Five-Year Plan" period and by predecessors. Especially, it concludes the exploration practice and understandings obtained in past five years, including the understandings to existing exploration and basic research achievements and also including the conclusions of hydrocarbon occurrence law and application of new technologies and methods. Its contents are very rich and have a certain guiding significance to the future hydrocarbon exploration in Tarim Basin and other similar basin. However, we do not think that these achievements are very mature and perfect. On the

contrary, as the situations of Tarim Basin are very complicated, its exploration degree is relatively low, there are many difficulties unsolved and the exploration road is still very long, in our understandings there still are many unclear links and laws although there is a large progress. It is notable that the petroleum geologists in Tarim Basin are brave in practice and probing into new fields, they can work with perseverance for greater progress, and they are always summarizing experiences and taking lessons from practice, and they are brave to inspect their achievements in practice so as to deepen their understandings in practice. I believe that this collection will undoubtedly enrich the theories and practice of China's petroleum geology and play an important guidance role to the future exploration work.

As the hydrocarbon exploration in Tarim Basin has been continuously deepened and more progress has been obtained, our understandings will be closer to the reality and the original appearance of things. Through continuous efforts and exploration, our hydrocarbon exploration will undoubtedly have a forward leap. Till then, the hope of China's petroleum industry--Tarim Basin will produce more large oilfields and gasfields like Kela-2# and Tahe-Lunnan and get into a new peak stage of hydrocarbon reservoir, and Tarim Basin will really become the strategic base of China's petroleum industry. I am confident in this.

Finally, I sincerely hope that the publishing of this collection can play the role that offers a few commonplace remarks by way of introduction so that others may come up with valuable opinions, can in a certain degree meet the need of those experts in the national petroleum geology field who concerns with and support the petroleum exploration work in Tarim Basin, and can intrigue more people, so that there are more people to throw themselves into the hydrocarbon exploration relay race of Tarim Basin and to step into the charming and mystic Tarim Basin full of challenges.

Qiu Zhongjian

June 2003

前　言

过去 40 年以来，板块构造理论在阐明全球大地构造形成演化获得了巨大成功。板块构造理论的核心是相对刚性的岩石圈板块相互作用，在板块边缘形成如裂谷、盆地和造山带等构造，并造成地震活动、火山活动及矿产资源富集。对于大陆内部的构造演化，特别是中国大陆内部，由于其由多个小型克拉通、在多期碰撞造山作用过程中形成，构造演化历史复杂、漫长，虽然板块构造理论也同样获得了很大成功，但还存在很多重要科学问题需要探索和研究。这些科学问题包括超大陆的裂解、拼合及其相关的沉积盆地和造山带演化，大陆内部的不同克拉通基底的历史重建，大陆内部构造变形及巨型盆—山系统形成演化的动力学等。对这些科学问题的探索和研究，形成了当今国际地球科学发展的重要前沿领域——大陆动力学。

大陆动力学也是板块构造理论的发展前沿，即根据板块构造理论框架，如何阐明大陆内部构造演化和动力学。最近几年在元古代 Rodinia 超大陆的裂解和重建取得了重要进展。根据板块构造理论的研究方法，通过超大陆裂解和拼合的历史重建，可以了解组成大陆不同克拉通基底的来源和漂移历史。

大陆内部构造演化的一个重要特点是继承性。由不同克拉通基底拼合形成的大陆具有明显的横向不均一性，表现在这些基底与焊接它们的造山带地壳结构、物质组成具有明显的差异性。拼合形成的大陆，在新的板块俯冲或碰撞作用下，内部构造响应和构造演化与基底的横向不均一性之间存在明显的相关性，即大陆内部构造演化的具有所谓继承性的特点。大陆内部构造响应和演化继承性问题不能按经典板块构造理论来解释，需要用新的思路来研究，需要研究基底横向不均一性及其地球动力学性质的差异性，探索构造响应和构造继承性的主控因素。这也是大陆动力学所面临的新的科学问题。

塔里木盆地是我国西部研究大陆动力学的理想区域，也是油气勘探的重要地区，已成为我国“西气东输”工程的主要天然气资源基地。“八五”期间，我们完成了国家重点科技攻关项目，研究揭示了塔里木盆地是一大型叠合复合盆地，塔里木在震旦纪—泥盆纪为独立漂移板块，石炭纪以后成为欧亚大陆内部块体，经历了复杂的板内构造变形，并于 1997 年出版了《中国塔里木盆地构造特征与油气》专著。“九五”期间，我们在塔里木盆地油气勘探研究过程中，关注到我国西部（包括塔里木盆地）大陆内部的一些构造理论问题，针对大陆动力学问题开展研究。首先根据板块构造理论探索把塔里木作为独立板块，研究了它的基底组成和边缘演化；其次，详细解析塔里木板块演化成为欧亚大陆一部分后，在欧亚板块边缘俯冲或碰撞作用过程中，塔里木边缘和内部的构造响应过程和构造特征，揭示碰撞拼合后的大陆动力学过程；同时，采用地球物理和构造地质密切结合的方法，揭示基底结构横向不均一性及其地球动力学性质，包括岩石圈热—流变学结构和岩石圈强度，探索大陆动力学过程和大陆内部构造响应的继承性与岩石圈地球动力学性质横向差异性的关系。按上述思路开展研究是一个初步尝试，也取得了一些进展。本书是这些进展的总结，以期研究思路和方法对我国大陆动力学研究起到借鉴作用，研究成果对塔里木盆地油气勘探和资源评价起到参考作用。

本书主要研究进展如下：

（1）南北塔里木地块基底组成和特征明显不同，北塔里木地块具有太古宙—早元古代结晶基底，其上第一套盖层为中元古界。塔中深钻岩心研究表明，塔里木中央可能发育一条晚元古代地岩浆弧。南北塔里木地块晚元古代曾被洋盆分割，阿尔金北缘晚元古代蛇绿岩是该洋盆闭合的残留，南北塔里木地块震旦纪前沿中央磁异常高带缝合，阿克苏蓝片岩可能来自中央缝合带。南北塔里木地块的拼合事件，是晚元古代全球 Rodinia 超大陆事件的组成部分。震旦纪后塔里木自 Rodinia 超大陆裂解分离后，成为独立的板块。

（2）根据地球物理场分析和地震波速测量，推断了塔里木板块的地壳物质组成和地壳结构的分区特征。根据岩石圈流变学结构分析，揭示了塔里木板块目前是一“冷”的刚性块体。新生代的变形和前陆盆地的形成和分布与塔里木岩石圈这一地球动力学特性相关。塔里木板块拼合到欧亚大陆内部，中、新生代构造响应具有“继承性”特点，也与塔里木岩石圈这一地球动力学特性相关。

（3）揭示了震旦纪—泥盆纪塔里木作为独立漂移板块的演化历史，即震旦纪—奥陶纪的伸展过程和志留纪—泥盆纪南缘和北缘的活动或被动大陆边缘演化过程。震旦纪—奥陶纪塔里木板块的东北部发育库鲁克塔格—满加尔拗拉槽，震旦纪—早奥陶世快速沉降，中、晚奥陶世快速充填沉积，晚奥陶世拗拉槽消亡。塔里木板块北缘中、晚志留世开始扩张成南天山洋盆，晚泥盆世南天山已由扩张阶段转化为收缩阶段。塔里木板块南缘奥陶纪—中志留世的古昆仑洋沿着乌依塔格—库地—阿其克库勒湖—香日德一线向南俯冲消减，晚志留世中昆仑地体与塔里木板块发生碰撞，形成晚志留世碰撞造山带。志留纪—泥盆纪塔里木南北缘的板块构造活动对板块内部构造变形产生了重要影响。

（4）阐明了石炭纪—三叠纪塔里木板块北缘和南缘的陆缘性质和碰撞拼合过程。在塔里木板块北部，南天山洋盆向北俯冲，形成了中天山岛弧，并在晚石炭世发生弧陆碰撞。而在塔里木板块南缘，古特提斯洋形成，并在早二叠世开始向塔里木板块发生俯冲，并在晚三叠世古特提斯洋俯冲殆尽，羌塘地体与塔里木板块发生碰撞。其中早二叠纪塔里木中央裂谷带与南缘的活动大陆边缘相关，塔里木盆地北缘冲断构造活动主要与板块北缘的活动有关。

（5）指出侏罗纪—渐新世塔里木盆地属于碰撞后板内构造发展阶段。自从三叠纪晚期羌塘地体与塔里木板块碰撞拼合之后，塔里木板块边缘漫长的活动大陆边缘演化历史及其多期的碰撞造山作用宣告结束。塔里木盆地作为欧亚大陆（劳亚大陆）内部具有较刚性的稳定克拉通基底的沉积盆地，接受了广泛的侏罗纪—渐新世河流湖泊相碎屑沉积。这个大陆内部沉积盆地的发展，与中亚大陆南缘的地体拼贴事件以及大陆边缘不断向南迁移的过程有着密切的关系。总结了侏罗纪盆地的沉积特征和构造性质，白垩纪红色磨拉石沉积、海侵和早第三纪新特提斯海的衰亡过程。

（6）阐明了晚第三纪以来印—藏碰撞过程在刚性的塔里木块体边缘的构造响应，指出塔里木与其周边的天山、昆仑山系在喜马拉雅运动形成典型的巨型盆—山系统。在塔里木北缘和西南缘形成了规模巨大的再生前陆盆地和冲断构造，在塔里木东南缘形成了与阿尔金断裂走滑相关的走滑构造带。其中，塔里木北缘自东向西发育库车再生前陆冲断构造带、乌什再生前陆冲断带、柯坪再生前陆冲断构造带和喀什再生前陆冲断构造带；而塔里木西南缘冲断构造带由北而南可以进一步划分为帕米尔北缘弧形构造带、齐姆根构造带、柯克亚—桑株构造带和皮山—和田等四个构造带。晚第三纪以来的构造响应过程对塔里木盆地油气成藏具有重要的控制作用。

本书主要作者为贾承造、王良书、魏国齐、陈汉林、贾东、郭召杰、肖安成。各章作者分工如下：

前言：贾承造、王良书；第一章：贾承造、郭召杰、张志诚；第二章：王良书、贾承造、徐鸣洁、刘绍文、李成、李华；第三章：贾承造、魏国齐、陈汉林、郭召杰；第四章：陈汉林、杨树锋、程晓敢、肖安成；第五章：贾东、卢华复、阎福礼、于际民；第六章：贾承造、肖安成、杨树锋、王良书、魏国齐、陈汉林、程晓敢。

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作者

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Foreword

Plate tectonic theory has been quite successful in elaboration of the global tectonic formation and development in the past four decades. The core of the plate tectonic theory is that the relatively rigid lithosphere plates were interactive to each other and formed such structures as rifts, basins and mountainous belts on the periphery of the pates, causing earthquake, volcanic activities and accumulation of mineral resources. As for the structural evolution inside the continent, China's continent in particular, a number of small cratons were formed under the effect of multi-stage collision and mountain building process. The structural evolution history is complicated and long. There are a lot of important scientific issues that need to be brought under study though the plate tectonic theory has become a great success. Those scientific issues include dissolution and merger of super-continents and its related sedimentary basins and mountain-building belts, historical re-construction of different cratonic basements inside the continents, structural deformation inside the continents and the dynamics for formation and development of giant basin-mountain systems. The study of those scientific issues has shaped the important frontier field of the current international geo-scientific development--continental dynamics.

Continental dynamics is the frontier for development of the plate tectonic theory, namely elaboration of structural evolution inside the continents and dynamics according to the plate tectonic theoretical framework. Important progress has been made in dissolution and re-construction of Proterozoic Rodinia super-continents. Based on the plate tectonic theory and study method, dissolution, merger and historical re-construction of super-continents can lead to understanding of the sources and migration history of the different cratonic basements that formed the continents.

One important characteristic for structural development inside the continents is succession. The continents composed of different cratonic basements have the apparent horizontal heterogeneous property. The obvious differences existed in those basements and the crust structures of mountainous belts connecting them as well as the material composition. Under the effect of subduction and collision of new plates, the merged continents have an apparent correlation between the internal structural response as well as structural evolution and the horizontal heterogeneous property of basement. Namely, the continental internal structural evolution has the so-called property of succession. The succession issue of the continental internal structural response and evolution cannot be explained according to the typical plate tectonic theory. It is necessary to use the new method to study the difference in the basement horizontal heterogeneous property and its geo-dynamic property. It is necessary to study the main controlling factors of the structural response and structural succession. This is also the new scientific issue facing the

continental dynamics.

Tarim Basin is the desirable region for the study of the continental dynamics in the western region of China and the important oil and gas exploration area. It has become the main natural gas resource base for the country's "West-East natural gas transmission project". We completed the country's key scientific research project during the "Eighth Five-Year Plan" period. The study indicated Tarim Basin is a large superposed composite basin. The works of *Structural Characteristics and Oil and Gas of Tarim Basin in China* were published in 1997. During the "Ninth Five-Year Plan" period, we focused our study of oil and gas exploration in Tarim basin on the theoretical issues concerning the structures inside the continents in China's western region (including Tarim Basin), making research on the continental dynamic issues. First of all, Tarim Basin was studied as an independent plate according to the plate tectonic theory so that the composition of the basement and the peripheral development are brought under study. Then, the detailed interpretation and analysis are made on the peripheral and internal structural response process and structural characteristics of Tarim under the process of the effect exerted by the peripheral subduction and collision of the Eurasia plate after the Tarim plate was developed into a part of Eurasia continent. The study shows the continental dynamic process following the collision and merger. Meanwhile, the method combining geophysics closely with structural geology indicates the basement structural horizontal heterogeneous property and other geo-dynamic properties, including the lithosphere thermal-rheological structure and the lithosphere strength. The study is also made on the continental dynamic process and the relations between the continental internal structural response succession and the lithosphere geo-dynamic horizontal difference. The study on the basis of the above-mentioned method is a preliminary experiment with some progress made in this field. This book sums up the study so that the results can be borrowed in China's continental dynamic study. The research results are of reference to oil and gas exploration and resources assessment in Tarim Basin.

The research results of this book are as follows:

1. The basement compositions are quite different in the northern and southern parts of Tarim plate. The north Tarim plate has (Archaeozoic)-Early Proterozoic crystalline basement. The first set of caprock on the basement is Middle Proterozoic. The core from the deep wells in Tazhong shows that the central part of Tarim is likely to have development of a Late Proterozoic magmatic arc. The south and north of Tarim plate was separated by an oceanic basin in Late Proterozoic. Late Proterozoic ophiolite on the northern periphery of Aerjin is the residue left over from closure of this oceanic basin. The south and north of Tarim plate came together in Sinian and Arkesu blueschist is likely to come from the central connection belt. Tarim became an independent plate since dissolution of Rodinia super-continent after Sinian.

2. Based on geophysical field analysis and seismic wave velocity measurement, we can find crust material composition of Tarim plate and the zonal characteristics of crust

structure. The lithosphere rheological structural analysis indicates that Tarim plate is currently a "cold" rigid plate. Cenozoic deformation and formation and distribution of foreland basin are related to this Tarim lithosphere geo-dynamic property. With Tarim plate merged into the Eurasia continent, Mesozoic and Cenozoic structural response has the characteristic of succession and is also related to the Tarim lithosphere geo-dynamic property.

3. It is shown that from Sinian to Devonian Tarim has a development history as independent migration plate, namely the Sinian-Ordovician extensional process and the southern and northern peripheral Silurian-Devonian activities or the passive continental peripheral development process. The northeastern part of Tarim plate had development of Kuluketag-Manjiaer aulacogen from Sinian to Ordovician, which subsided rapidly in Sinian-Early Ordovician, filled and deposited rapidly at Middle and Late Ordovician and disappeared at Late Ordovician. The northern periphery of Tarim plate started to expand into South Tianshan oceanic basin in Middle and Late Silurian. South Tianshan Mountain turned into the dwindling stage from the expansion stage in Late Devonian. The ancient Kunlun ocean of Ordovician-Middle Silurian on the southern periphery of Tarim plate subducted and dwindled southward along the Wuyitage-Kudi-Aqikekule Lake-Xiangride route. Kunlun terrain collided into Tarim plate in the middle of Late Silurian and formed the collided mountainous belt in Late Silurian. The plate tectonic activities on the southern and northern peripheries of Tarim in Silurian-Devonian exerted important influence on the plate internal structural deformation.

4. The book elaborates the land peripheral properties of northern and southern peripheries of Tarim and the collision and merger process in Carboniferous-Triassic. In the northern part of Tarim plate, South Tianshan Mountain underthrust towards the north and formed Central Tianshan island arc. The arc-continent collision took place in Late Carboniferous. Ancient Tethys Ocean took shape on the southern periphery of Tarim plate and started to underthrust towards Tarim plate from Early Permian. Ancient Tethys Ocean underthrust and disappeared in Late Triassic while Qiangtang terrain collided into Tarim plate. The central rift belt in Early Permian Tarim is related to the activities on the southern periphery of the plate. The obduction structural activities on the northern periphery of Tarim Basin are related mainly to the activities on the northern periphery of the plate.

5. The book points out that in Jurassic-Oligocene Tarim Basin belongs to the post-collision plate internal structural development stage. On the periphery of Tarim plate, the long and active continental peripheral development history and the multi-stage collided mountain-building effect came to an end after Qiangtang terrain collided and merged with Tarim plate in Late Triassic. As a sedimentary basin with the relatively rigid and stable cratonic basement inside Eurasia plate, Tarim Basin received the extensive Jurassic-Oligocene clastic sedimentation of alluvial and lacustrine facies. This continental internal sedimentary basin development is closely related to the terrain merger events on the southern periphery of Central Asian Continent and the continuous southward

migration of the continental periphery. The book sums up the sedimentary characteristics and structural properties of Jurassic basin, Cretaceous red molasses sedimentation and marine invasion, and the destruction process of Early Tertiary new Tethys Ocean.

6. This book elaborates the India-Tibetan collision process and the structural response of the rigid Tarim plate periphery since Late Tertiary. The regenerated foreland basins and obduction structures were formed in the northern periphery and the southwestern periphery of Tarim. The strike-slip structural belts related to Aerjin strike-slip fault were formed in the southeastern periphery of Tarim. Kuche regenerated foreland thrust structural belt, Wushi regenerated foreland thrust belt, Keping regenerated foreland thrust structural belt and Kashi regenerated foreland thrust structural belt developed from the east to the west on the northern periphery of Tarim. The thrust structural belt on the southwestern periphery of Tarim can be further divided into four structural belts from the north to the south-- northern Pamier arc structural belt, Qimugen structural belt, Kekeya-Sangzhu structural belt and Pishan-Hetian structural belt. The structural response process since Late Tertiary has important controlling effect on formation of oil and gas reservoirs in Tarim Basin.

The main authors of this book include: Jia Chengzao, Wang Liangshu, Wei Guoqi, Chen Hanlin, Jia Dong, Guo Zhaojie and Xiao Ancheng. Jia Chengzao and Wang Liangshu are responsible for the preface, Jia Chengzao, Guo Zhaojie and Zhang Zhicheng for the first chapter, Wang Liangshu, Jia Chengzao, Xu Mingjie, Liu Shaowen, Li Cheng and Li Hua for the second chapter, Jia Chengzao, Wei Guoqi, Chen Hanlin and Guo Zhaojie for the third chapter, Chen Hanlin, Yang Shufeng, Cheng Xiaogan and Xiao Ancheng for the fourth chapter, Jia Dong, Lu Huafu, Yan Fuli and Yu Jimin for the fifth chapter and Jia Chengzao, Xiao Ancheng, Yang Shufeng, Wang Liangshu, Wei Guoqi, Chen Hanlin and Cheng Xiaogan for the sixth chapter.

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