

盆地构造

沔阳—当阳中生代前陆盆地构造特征及油气勘探

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摘 要 沔阳—当阳前陆盆地自北而南可划分为五个构造单元:桐柏山—大别山基底卷入推覆构造带、南大巴山—大洪山叠瓦逆冲断裂构造带、沔阳—当阳拗陷变形带、宜昌—沙市前陆斜坡带、黄陵—松滋前缘隆起带。盆地的形成与南大巴山—大洪山造山带的发育密切相关。盆地经历了加里东期、海西—印支期南秦岭洋盆、北华南洋盆的两次“开(降)、合(升)”,燕山早期陆内俯冲造山成盆及燕山晚期—喜马拉雅期陆内伸展断陷的演化。盆地油气资源丰富,具三套有效烃源岩:晚奥陶世—早志留世广海陆棚泥页岩,二叠纪滨岸沼泽相含煤泥岩,晚三叠世—早侏罗世湖泊—沼泽相暗色泥页岩、煤系泥岩和煤岩。中三叠世—早第三纪为油气生成高峰期。油气运移指向主要为南西方向的前缘隆起。

主题词 中生代 前陆盆地 构造特征 构造演化 油气潜力 沔阳—当阳盆地

1 概 况

沔阳—当阳盆地为一印支期形成的前陆盆地,位于中扬子地台东北边缘,靠近且平行于秦岭褶皱系(图1)。盆地的基底为三叠系中统巴东组(蒲圻组)及其以下地层,其上充填堆积了厚约4 000余米的河湖相沉积。

在漫长的地质历史中,该盆地在中生代晚期表现为鲜明的前陆盆地性质,是形成大中型油气田的有利地区。然而,由于受晚燕山期—喜马拉雅期伸展运动的改造,使得该前陆盆地面貌变复杂,且不完整,并增加了勘探难度。

本文从地质结构、构造变形及构造演化出发来探讨该前陆盆地的油气勘探方向。

2 盆地地质结构及构造变形特征

沔阳—当阳前陆盆地的形成、发展、演化与大别山—大巴山的发育密切相关。按照前陆盆地的观点^[1]和本区构造变形特点^[2],大别山—大巴山南段自北而南依次可划分为五个构造单元(图1),它们是桐柏山—大别山基底卷入推覆构造带()、南大

巴山—大洪山叠瓦逆冲断裂构造带()、沔阳—当阳拗陷变形带()、宜昌—沙市前陆斜坡带()、黄陵—松滋前缘隆起带()^[3]。

桐柏山—大别山基底卷入推覆构造带 该带北部以山阳—桐柏断裂(F1)为界与秦岭地槽相邻,南部以襄樊—广济断裂(F6)为界与中扬子地台相接。山阳—桐柏断裂走向北西西,断面北倾,推覆体由元古宇变质岩系组成,燕山期大型花岗岩体呈同斜枝状侵入;襄樊—广济断裂走向北西,断面北东倾,推覆体亦由元古宇变质岩系组成,发育同斜倒转褶皱、塑性流变褶皱和箭鞘褶皱,沿断裂带发育糜棱岩、拉伸线理和挤压叠加褶皱^[2,4~5]。

南大巴山—大洪山叠瓦逆冲断裂构造带 该带以南漳—荆门断裂(F9)、净潭—乌龙泉断裂(F7)为其前缘逆冲断层,其推覆体由震旦系—中三叠统组成。该带发育大型单冲式铲形逆冲断裂,并组合成台阶式叠瓦状逆冲推覆席体。该带构造线走向为北西—北北西向,由北东向南西,由热剪切应变向冷剪切应变过渡,构造变形变位由强变弱,基底卷入地层由老变新,变形滑脱层次由深变浅,呈背驮式叠瓦片体逐渐扩展^[2],表明北部的逆冲断裂和断层相关褶

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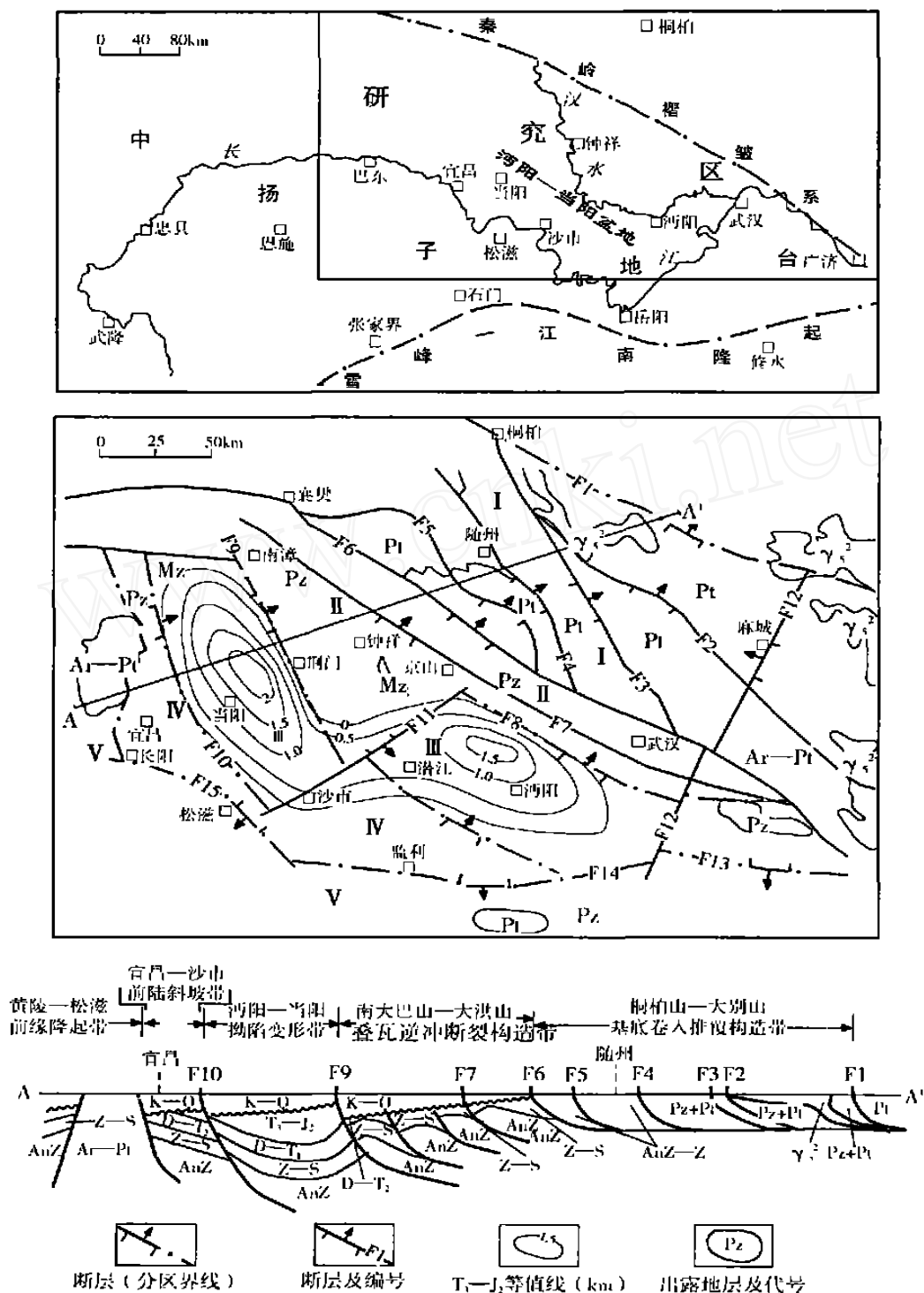


图1 沔阳—当阳前陆盆地构造纲要图

构造单元： 桐柏山—大别山基底卷入推覆构造带； 南大巴山—大洪山叠瓦逆冲断裂构造带； 沔阳—当阳拗陷变形带； 宜昌—沙市前陆斜坡带； 黄陵—松滋前缘隆起带

断裂： F1 山阳—桐柏断裂； F2 英店—太湖断裂； F3 桐柏—黄陂断裂； F4 太山庙—肖家巷断裂； F5 太碑店—王家桥断裂； F6 襄樊—广济断裂； F7 净潭—乌龙泉断裂； F8 京山断裂； F9 南漳—荆门断裂； F10 通天河断裂； F11 纪山寺—潜北—天门河断裂； F12 麻城断裂； F13 阳新断裂； F14 监利—蒲圻—咸宁断裂； F15 天阳坪—公安断裂

地层： Ar 太古宇； Pt 元古宇； Pz 古生界； Mz 中生界； γ_2^3 侏罗纪侵入岩

皱形成早,而南部的形成晚。在襄樊—广济断裂(F6)与京山断裂(F8)夹持的区域,构造变形变位强烈,东部地区发育断层滑脱褶皱和断层传播褶皱(断展褶皱),中西部地区发育断层转折褶皱(断弯褶皱)和断展褶皱,褶皱紧闭线状,普遍倒转,褶皱轴面常被挤压断层冲破。在京山断裂、南漳—荆门断裂与净潭—乌龙泉断裂夹持的区域,构造变形变位减弱,主要发育断弯褶皱,褶皱倒转不常见。褶皱西翼陡,东翼缓。

沔阳—当阳拗陷变形带^[6] 拗陷内沉积了巨厚的晚三叠世—侏罗纪地层。北东沉积较厚,南西沉积较薄,呈楔状充填,沉积中心也由北东向南西迁移。该带以通城河断裂为其前缘逆冲断层,其推覆体由震旦系—侏罗系组成,构造变形变位较弱。北部构造线走向为北西—北西西向,主要发育双重构造、叠瓦扇构造、断弯褶皱,断弯褶皱西翼较陡、东翼较缓,在有些背斜转折端有突破断层;中、南部构造走向西部为北北西向,东部为北北东—北东东向,主要发育断展褶皱、断滑褶皱、构造三角带,断展褶皱多表现为左行雁列式,西翼较陡,东翼较缓,在背斜转折端发育突破断层。

宜昌—沙市前陆斜坡带 为前陆隆起与前陆拗陷之间的过渡带,是一长期发育的斜坡。早古生代为南倾斜坡,石炭纪以后转变为北倾斜坡,晚三叠世—侏罗纪,随着沔阳—当阳盆地的发展,该带亦转变为北东倾斜坡,并形成部分断展褶皱,构造走向北西向。

黄陵—松滋前缘隆起带 为一长期继承性古隆起,形成于震旦纪,发育于泥盆纪,并遭受剥蚀,出现黄陵隆起雏形。二叠纪再次沉入水下接受沉积,晚三叠世以后全面抬升成陆^[2]。侏罗纪末期,黄陵—松滋隆起带定形,作为沔阳—当阳盆地的前缘隆起。该带断裂不发育,构造简单,为大型低缓背斜,即黄陵背斜,核部出露太古宇—古元古界中—深变质的花岗岩体。

3 盆地沉积特征

沔阳—当阳盆地从晚震旦世开始到侏罗纪,除泥盆纪和早石炭世外,各时代地层发育较全(图2)。

自晚震旦世开始至志留纪,扬子区经历了三次大的海进、海退旋回:晚震旦世早期(陡山沱期)、早寒武世早期(水井沱—石牌期)、晚奥陶世—早志留

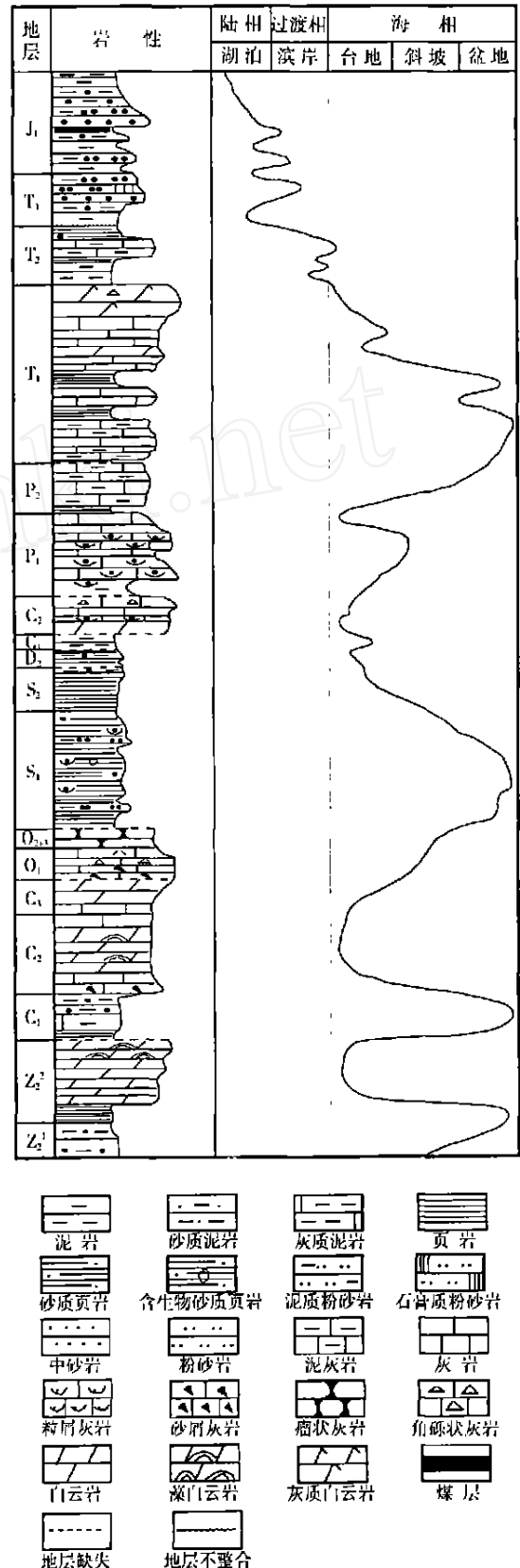


图2 沔阳—当阳前陆盆地示意地层柱状图

世早期(龙马溪期)为三次大的海进期;晚震旦世晚期(灯影期)、早寒武世晚期(石龙洞期)至晚寒武世及志留纪中—晚期为三次大的海退期。海进期,碳酸盐岩台地范围局限于鄂北与当阳—沙市一带,宜昌、宜都、松滋等地先后被台前斜坡泥灰岩与广海陆棚相泥页岩、砂泥岩所取代,最大海进期甚至鄂北与当阳等地均沦为广海陆棚相泥页岩、泥质灰岩沉积;海退期,台地范围扩大,宜昌、宜都、松滋、沙市等地均为台地相碳酸盐岩沉积。中志留世海退,渐向滨岸相碎屑岩沉积过渡。晚志留世地壳抬升,造成上志留统一下泥盆统缺失,同时使中—上志留统遭受严重剥蚀。中泥盆世至晚二叠世,整体沉积序列表现为,由滨岸相碎屑岩向台地相碳酸盐岩、广海陆棚相泥页岩沉积变化的岩石组合。

早三叠世基本继承了晚古生代的沉积特征,由大规模的海进逐步变为持续的海退环境,沉积序列上表现为广海陆棚相沉积向开阔台地相及蒸发台地相沉积的转变。中三叠世时期,海水由西向东大规模退出,转入滨岸相碎屑岩夹碳酸盐岩沉积阶段。中三叠世末,南部特提斯海关闭,中扬子海相沉积史结束,转入内陆湖盆相沉积阶段。

晚三叠世至早侏罗世,盆地自下而上沉积了上三叠统九里岗组、王龙滩组、下侏罗统桐竹园组,纵、横向岩性和岩相变化频繁,厚度变化大,总趋势是自下而上粒度由粗变细,北厚南薄。九里岗组厚约530 m,横向变化较大:在叠瓦逆冲断裂带北缘为洪积相砾岩、砂砾岩沉积,在其南缘为河流相中—粗粒岩屑长石砂岩夹粉砂岩和泥岩沉积,在前陆拗陷带为浅湖相暗色泥岩夹砂岩沉积,在前陆斜坡带则为滨湖相砂岩夹泥岩沉积。王龙滩组厚约526 m,横向变化亦较大:在叠瓦逆冲断裂带为洪积相—河流相—沼泽相砂砾岩、中—细粒长石砂岩夹粉砂岩、泥页岩及薄煤层或煤线沉积,在前陆拗陷带为深、浅湖相暗色泥页岩夹粉砂岩、砂岩沉积,在前陆斜坡带则为滨浅湖相砂岩、粉砂岩、炭质泥岩沉积。桐竹园组厚约600 m,横向较稳定:在叠瓦逆冲断裂带北缘为洪积相—河流相砂砾岩、中—粗粒长石岩屑砂岩夹粉砂岩、泥岩沉积,在其南缘为河流相—滨湖相粗粒长石岩屑砂岩、杂砂岩、粉砂岩、泥岩夹薄煤层或煤线及含砾粗砂岩沉积,在前陆拗陷带为深湖相暗色泥页岩夹粉砂岩沉积,在前陆斜坡带则为滨浅湖相砂岩、粉砂岩、泥岩沉积。

中侏罗世至晚侏罗世时期,地壳抬升,气候变干燥,为河流相红色碎屑沉积,自下而上粒度由细变粗。白垩纪至第三纪时期,由于构造伸展,前陆地区产生块断差异升降,隆升断块遭受剥蚀,下降断块接受内陆湖泊相碎屑岩夹盐岩沉积。

4 盆地的形成演化

沔阳—当阳前陆盆地的形成演化与南大巴山—大洪山造山带的发育密切相关,二者均是在古生代洋盆及被动大陆边缘陆棚—陆坡相沉积建造的基础上发展起来的,经历了加里东期、海西—印支期南秦岭洋盆、北华南洋盆的两次“开(降)、合(升)”,燕山早期陆内俯冲造山成盆及燕山晚期—喜马拉雅期陆内伸展断陷的演化^[2]。

早震旦世早期,中扬子陆块南北边缘裂陷,形成裂谷,充填式沉积了一套滨海—深水盆地相陆源碎屑岩及火山岩、火山碎屑岩、凝灰岩;而陆块内部则遭受剥蚀,仅在山间接受大陆冲积相粗碎屑岩填平补齐式沉积,晚期接受了范围较广的陆相冰碛岩堆积。晚震旦世—早奥陶世时期,随着裂陷作用加剧和海底扩张,中扬子海盆形成并不断发展。陆缘带为盆地相沉积,陆块内部为台地相沉积,其间为斜坡相沉积。中奥陶世—志留纪时期,南、北缘海槽及中扬子地区相继闭合造山及隆升成陆,中扬子陆块与华南陆块拼合成统一陆块。在江南隆起北缘,变质和岩浆活动强烈,而南大巴山—大洪山变质较弱。

中泥盆世,古扬子板块沿着加里东期陆壳拼接薄弱带再次裂陷为裂谷,随后,堆积了岩相复杂的海相碎屑岩与碳酸盐岩沉积,夹火山集块岩。至晚石炭纪,南、北陆缘大规模裂陷,海水广泛入侵,结束了江南古陆与南大巴山—大洪山古陆分隔南、北海水入侵的局面。早三叠世—中三叠世时期,南、北海槽闭合,华北板块与华南板块强烈碰撞造山,结束海域沉积。

中三叠世末,中扬子地区南、北陆间海槽关闭,华南板块与华北板块强烈碰撞,并向华北板块俯冲,造成大巴山迅速崛起。在造山带前缘逆冲断裂发育,并楔状堆积了山麓冲积相粗碎屑磨拉石沉积;在山前拗陷则为内陆浅水湖盆、湖沼含煤沉积,沉积中心逐渐由当阳扩展到沔阳一带。从晚三叠世至晚侏罗世,逆冲变形变位活动由弱变强,相应地,构造样式由断弯褶皱、断展褶皱单一形式,发展为与双重构

造、叠瓦扇构造等共存的多种形式;从晚三叠世至晚侏罗世,逆冲断裂构造由北东向南西逐渐扩展,相应

地,卷入构造地层由老变新(图3)。

进入白垩纪,本区大型挤压冲断层伸展反转,形

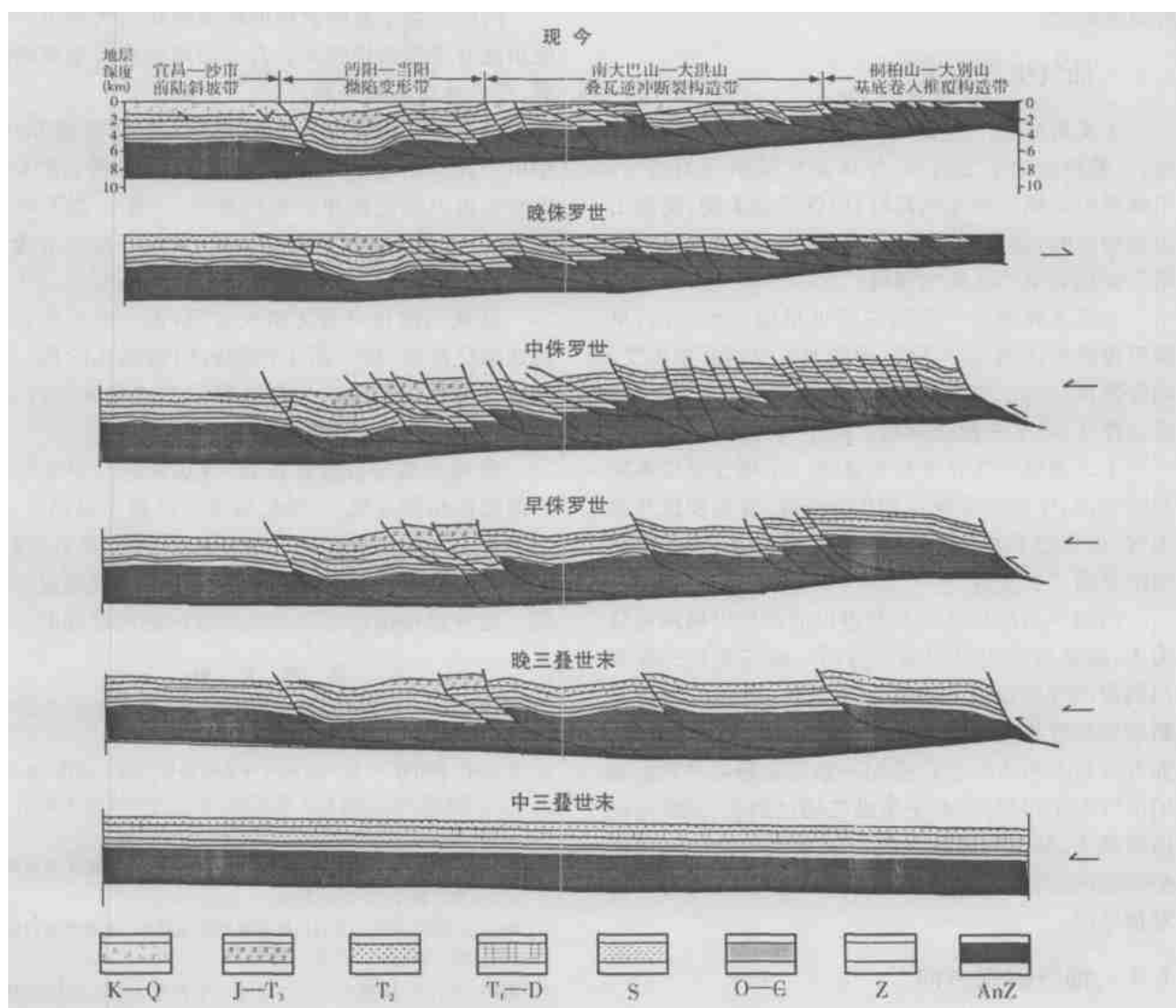


图3 沔阳—当阳盆地宜昌—随州大剖面构造演化示意图

成半地堑式箕状凹陷,早期拉张伸展强烈,为断陷,晚期减弱,为断拗。进入第三纪,伸展再次增强,并产生北东向平移拉张断裂,与前期北西、北北西向断裂斜交,组合成数个大小多异的菱形断块,全区呈似隔槽式复背斜与复向斜,早期前陆凹陷亦可能平移错动。早第三纪晚期,伸展活动减弱,并逐渐抬升。

4 油气潜力及勘探

4.1 烃源岩特征及分布

由前述可知,在沔阳—当阳盆地,古、中生代沉积了巨厚的多旋回碳酸盐岩和碎屑岩,但可以作为

烃源岩的地层主要是上奥陶统—下志留统、二叠系、上三叠统—下侏罗统的暗色灰岩、泥页岩及煤系泥岩和煤岩^[7~8]。

沔阳—当阳地区晚奥陶世—早志留世主要发育广海陆棚沉积,形成五峰组(O_3w)、龙马溪组(S_1l)暗色泥岩和笔石页岩烃源岩;早二叠世早期主要发育滨岸沼泽沉积,形成栖霞组(P_1q)含煤泥岩烃源岩;早二叠世晚期至晚二叠世早期主要发育台地前缘斜坡—盆地相沉积,形成吴家坪组(P_2w)和大隆组(P_2d)暗色泥岩和碳质页岩烃源岩、茅口组二—四段(P_1m^{2-4})暗色灰岩烃源岩;晚三叠世—早侏罗世主要发育湖泊—沼泽沉积,形成暗色泥页岩、煤系泥岩

和煤岩烃源岩。它们是沔阳—当阳前陆盆地的有效烃源岩。

4.2 油气生成及运移

上奥陶统—下志留统烃源岩 于二叠纪开始生油,三叠纪达到生油高峰;早侏罗纪晚期开始生气,中侏罗纪早期达到生气高峰;中侏罗世末期,受燕山运动的影响,烃源岩演化减缓或停止,中白垩世—早第三纪达到第二次生气高峰。

二叠系烃源岩 于晚三叠世早期开始生油,早侏罗世晚期达到生油高峰;中侏罗世中期开始生气,晚侏罗世达到生气高峰;侏罗纪末期烃源岩演化减缓或停止,早第三纪达到第二次生气高峰。

上三叠统—下侏罗统烃源岩 于早侏罗世末期开始生油,中晚侏罗世达到生油高峰;晚侏罗世开始生气,侏罗纪末期烃源岩演化减缓或停止,进入早第三纪开始二次生烃。

沔阳—当阳地区晚三叠世以前油气以横向运移为主,运移指向主要为南西方向。晚三叠世—侏罗纪期间油气除以横向运移为主以外,尚有少量通过断裂和裂缝作垂向运移,运移指向主要为南西方向,亦有少量北东方向。白垩纪—第三纪期间早期形成的油气发生再分配,断垒带油气通过断裂、裂缝垂向运移散失,断凹内的油气则与二次生成的油气向断垒带横向运移,并可能穿过断层运移至不同时代的对接地层。

4.3 油气勘探方向

由前述可知,黄陵—松滋前陆隆起与宜昌—沙市前陆斜坡以寻找奥陶系—志留系、二叠系原生气藏为主,沔阳—当阳前陆拗陷以寻找奥陶系—志留系、二叠系次生气藏与上三叠统—下侏罗统原生气藏为主,伸展期的断垒带、挤压期的弱变形带不失为有利勘探区。

5 结 论

沔阳—当阳前陆盆地的形成演化与大别山—大巴山隆升推覆密切相关。自北而南构造变形逐渐减弱,卷入地层逐渐变新。

据盆地的结构样式概略分为五个构造单元:桐柏山—大别山基底卷入厚皮推覆构造带、南大巴山—大洪山叠瓦逆冲断裂构造带、沔阳—当阳拗陷变形带、宜昌—沙市前陆斜坡带、黄陵—松滋前缘隆起带。

盆地的演化可分为两大阶段:古—中生代板块构造演化阶段,中—新生代陆内构造演化阶段。其中晚三叠世—侏罗纪为前陆盆地形成发展阶段,白垩纪以后为陆内断拗陷形成发展阶段。

盆地具多套有效烃源岩:晚奥陶世—早志留世广海陆棚相泥页岩、二叠纪滨岸沼泽相含煤泥岩、晚三叠世—早侏罗世湖泊—沼泽相暗色泥页岩、煤系泥岩和煤岩。中三叠世—早第三纪为油气生成高峰期。油气运移指向主要为南西方向的前缘隆起。

参 考 文 献

- 1 何登发,吕修祥,林永汉等. 前陆盆地分析. 北京:石油工业出版社,1996
- 2 张文荣,熊洁明. 中扬子地区对冲逆掩推覆构造的成因、展布及含油气地质条件. 见:石宝珩主编. 扬子海相地质与油气. 北京:石油工业出版社,1993
- 3 田作基,宋建国. 塔里木库车新生代前陆盆地构造特征及形成演化. 石油学报,1999,(4):7~13
- 4 杨志坚. 试论桐柏—大别山地质构造演化特征. 地质学报,1982,(2):123~135
- 5 赫杰,刘小汉. 桐柏—大别碰撞造山带推覆—滑脱构造及其演化. 地质科学,1988,(1):1~10
- 6 胡纯心,周雁,陈红. 江汉盆地变形变位期形成的构造及其演化. 湖北地矿,1999,(增刊):8~10
- 7 汪仕忠,戴少武. 湖北省及邻区海相地层油气勘探及其前景. 海相油气地质,1997,2(2):31~38
- 8 刘小玲,曾庆立. 当阳复向斜上组合生烃潜力及其含油气系统. 海相油气地质,1997,2(3):45~51

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ABSTRACTS & KEYWORDS

Progress of Petroleum Geology Research for the East China Sea and On Tectonic Evolution of Cenozoic Basins in the Continental Margins along the West Pacific Ocean :An Evolutional Model of Oceanwards-receding Residual Rear-arc Basins/ Sun Zhao'ai * // MOPG 2004 ,9(1 - 2) :1 ~ 17

Several great progresses have been made in researching petroleum geology of the East China Sea Basin. It has been proved that the East China Sea Basin consists of a group of epicontinental Cenozoic basins from the west to east. An entire table of Cenozoic stratigraphic subdivision to formation units in the basin shelf region has set up. The inner structures of Xihu Depression has been divided in detail. It is confirmed that coal and coal-measure sediments are the major rocks of hydrocarbon source. It is validated by drills that there are three different original types of traps in the basin. Based upon the geodynamic background formed in basins surrounding west Pacific Ocean, the west Pacific Ocean is a whole trench-arc-basin (epicontinental sea) system from north to south. Generally bounding the Taiwan Straits, the East China Sea Basin belongs to the convergent margin evolved from a transform or passive margin and the South China Sea Basin belongs to the passive margin evolved from active or convergent margin. The fact that the East China Sea is similar with the Philippine Sea Basin in space-time evolution has proved that the Cenozoic East China Sea Basin is a residual rear-back basin receding oceanwards from trench.

Key words : West Pacific Ocean , Continental Margin , Trench-arc-basin system , Residual rear-arc basin , Tectonic evolution , Evolution model , The East China Sea Basin , The South China Sea Basin

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Seismic Information Shows Styles of Vertical Structures and the Relationship of Them with Hydrocarbon Accumulation in Eastern China/ Yang Kesheng * // MOPG 2004 ,9(1 - 2) :19 ~ 28

Vertical structures that are common in exploration are resulted from small scale of vertically gravitational elevation and subsidence. Vertical structures are generally developed in the Mesozoic and Cenozoic basins in eastern China. As having synchronously yielded with sedimentation, Vertical structures are commonly no obviously compacted and folded deformation common. In original classification, vertical structures can be collapsing, compacted and diapirized in style. Subdivision of styles can be sorted and their features are introduced and analyzed in detail in this paper. In Yingge Sea Basin, there

are a number of seismic abnormal structures, which are diapir-like, called "gas pipestems", and in fact are different with the common diapirs in essential.

Key words : Vertical Structure , Structural type , Structural interpretation , Seismic interpretation , Hydrocarbon Accumulation , Eastern China

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Influence of Fractured Slope-break Zone on Sedimentary Sequence : Cases of Ordovician Marine Carbonate Rock in the Western Margin Area of Ordos Basin / Li Zhenhong * , Cui Zehong , Li Lintao // MOPG 2004 ,9(1 - 2) :31 ~ 36

A fractured slope-break zone was initiated by the long-term activity of syndepositional structures and resulted in abrupt steepness change of the depositional slope. Good primary porosity and post-synsedimentary secondary porosity are favorable to set up within a sedimentary sequence of olistostrome-debris-turbidite flows that was commonly deposited downwards along the slope of the zone. The space where there is the downthrown side is generally available to accumulating hydrocarbon. As the western margin area of Ordos Basin was in the stage of development of the marine fault basin during the Ordovician period, synsedimentary faults are quite developed and breccia-predominated olistostromic breccia are developed also, which made a great deal of reservoir space for hydrocarbon accumulation. Cases of well data that are compared with each other have proved that the Ordovician fractured slope-break zone can influence sedimentary sequence and control the conditions of hydrocarbon accumulation in this area, so that there are good reservoir-cap assemblages and good potential for oil exploration.

Key words : Ordos Basin , Fractured slope-break zone , Marine deposit , olistostromic breccia , Sedimentary sequence , Synsedimentary fault , Reservoir , Hydrocarbon accumulation

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Tectonics and Oil Exploration of Mianyang-Dangyang Mesozoic Foreland Basin/ Wu Guanghong * , Hu Chunxin // MOPG 2004 ,9(1 - 2) :37 ~ 42

Mianyang-Dangyang Basin can be divided into five tectonic belts. Formation of the basin is closely relative to the development of the South Dabashan-Dahongshan Orogenic Belt. The tectonic evolution of it experienced twice opens and twice closes of ancient ocean basins during Caledonian and Hercy-

nain-Indosinian epochs, formation of the intracontinental orogenic basin by subduction during early Yanshan, and intracontinental extending and faulting during late Yanshanian-Himalayan. In the basin that possesses of rich hydrocarbon resource, there are three sets of effective source rocks, which are the Late Ordovician-Early Silurian sea shelf argillaceous shale, the Permian shore marsh coat mudstone and the Late Triassic-Early Jurassic lacustrine-mash dark argillaceous shale, coal measures mudstone and coal rock. The Peak of hydrocarbon generation was during Middle Triassic-Paleogene stage and the hydrocarbon mostly migrated southwestwards to the frontal uplift.

Key words: Mesozoic, Foreland basin, Tectonics, Tectonic Evolution, Oil potential, Mianyang-Dangyang Basin

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Tectonics and Sedimentology of Shizhu Palaeohigh in Western Hubei Eastern Chongqing Area/ Sheng Xiancai*, Wang Shaohua, Wen Kedong, Chen Lijun// MOPG 2004, 9(1-2): 43~52

Shizhu Palaeohigh that is located in the central of Yangtze landmass covers two basement tectonic belts, which the western Hubei-Hunan basement-involved belt and the eastern Sichuan-western Hubei basement-relief belt. The presence of it effected and controlled hydrocarbon generation, migration and accumulation in this area. The history of tectonic evolution can be divided into five stages including the Caledonian, the Hercynian-early Indosinian, the late Indosinian-early Yanshan, the late Yanshan-early Himalayan and the late Himalayan. During the Hercynian-early Indosinian and the late Indosinian-early Yanshan stages that were crucial for formation and successive development of Shizhu palaeohigh, a huge thickness (more than 5000m) of Carboniferous, Permian, Triassic and Jurassic sequences were deposited and developed and several plays were formed. When the paleotrap with an enclosure about 100m high formed during Triassic compaction movement, the Lower Silurian and Lower Permian source rocks was buried deep to more than 2600m, which was fairly within the peak stage of hydrocarbon generation. The Shizhu palaeohigh is just the good place that hydrocarbon migrated to and accumulated in during Triassic and Jurassic and remigrated to and reaccumulated in by the end of Jurassic and Cretaceous. It is convinced that the nowadays traps exiting in the area of Shizhu palaeohigh and its peripheries with good conditions for hydrocarbon accumulation can be regarded as the good targets for gas exploration.

Key words: Palaeouplift, Sedimentary history; Tectonic evolution, Sichuan Basin

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The Origin of Hydrocarbon Accumulation below the Lower Permian Salt Bed and the Prospecting in the East Part of Pre-Caspian Basin/ Liu Dongzhou*, Dou Lirong, Hao Yinqun, Zhang Yanzhang, Li Jinliang// MOPG 2004, 9(1-2): 53~58

The wide-distributing Lower Permian Kungurian salt bed acts as a good regional seal cap in Pre-Caspian, on and beneath of which a multi-play lies respectively. The lower multi-play includes three plays which were developed during the continual intensive late-Hercynian orogeny in the east part of the basin. Reservoirs in these plays are wide in scale and hydrocarbon is rich in reserves. The large- and/or moderate-sized reservoirs are mostly relative with the both beds of Carboniferous marine carbonate rock, the target horizons, KT¹ and KT². In the discovered 10 reservoirs below the salt bed, both the KT¹ and the KT² pays are all covered by their overlying mudstone caps and the hydrocarbon in them are derived from the lower own Lower Carboniferous bioclastic limestone and the overlying Lower Permian shale. The organic matter belongs to mixed types. Porosity is developed and was secondarily reconstructed in these reservoirs. The "Carbonate blocks-Reef (dolomitization)-Gypsum/Salt" has been ever regarded as the model of hydrocarbon accumulation and tectonics has been counted for acting as an minor role in Pre-Caspian Basin. Having Studied the geological setting and delimited the boundaries of plays by the influenced factors of hydrocarbon accumulation in this area, the author suggests that tectonic evolution is the major factor of controlling carbonate deposition, trap forming, and hydrocarbon accumulation. The 90 percent of failed wells were owing to drilling in uncertain structure locations so it is important that accurate drill sites must be offered for exploration.

Key words: Early Permian, Carboniferous, Carbonate rock, Salt rock, Carbonate reservoir, Reservoir below salt bed, Play, Pre-Caspian Basin

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Exploration Levels and Comprehensive Evaluation of Petroleum Preservation Units in Marine Strata in Southern China/ Liang Xing*, Ye Zhou, Ma Li, Wu Shaohua, Zhang Tingshan, Liu Jiaduo, Xu Keding// MOPG 2004, 9(1-2): 59~76

Depending upon the evaluation results of exploration in the prospecting marine sedimentary regions in southern China during the past 10 years, 51 petroleum preservation units that are distributed in eight favorite prospecting blocks are classified from three geographical regions, the southern Chongqing-western Hunan and Hubei, Middle-Lower Yangzi and Yunnan-Guizhou-Guangxi regions, and these units are ranked into four levels of comprehensive evaluation of oil exploration. The units of Level are the ones located in the ar-