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北黄海盆地下白垩统层序构成特点及控制因素

王任[1], 石万忠[1,2], 肖丹[1], 夏飞[1], 夏治旻[1], 徐清海[1]

1. 中国地质大学资源学院 湖北武汉 430074;
2. 中国地质大学构造与油气资源教育部重点实验室 湖北武汉 430074

Architecture characteristics and control factors of Lower Cretaceous sequence in North Yellow Sea Basin

Wang Ren[1], Shi Wanzhong[1,2], Xiao Dan[1], Xia Fei[1], Xia Zhimin[1], Xu Qinghai[1]

1. Faculty of Earth Resources, China University of Geosciences, Hubei Wuhan 430074, China;
2. Key Laboratory of Tectonics and Petroleum Resources of the Ministry of Education, China University of Geosciences, Hubei Wuhan 430074, China

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摘要

北黄海盆地下白垩统属于湖相沉积。通过钻井及高精度三维地震资料可以清楚地在下白垩统下部地层中识别出层序的低位体系域、水进体系域、高位体系域、初次水进面以及最大洪泛面的特征。低位体系域包括下切谷、低位进积楔以及低位扇;高位体系域被层序顶界面及最大洪泛面所限定,并以发育有进积型准层序组为特征;水进体系域位于低位体系域与高位体系域中间,以退积型准层序组为主要特征。通过地质分析可以概括出层序发育的主要控制因素:1根据火成岩测试年龄及地震解释成果认为,晚侏罗世晚期—早白垩世早期岩浆活动造成地层抬升减薄,导致了构造坡折带的形成。2基于坡折带以上4口井的岩性资料发现,水进体系域和高位体系域沉积夹杂有红色泥岩。地震剖面显示层序顶界面超覆于底界面之上,层序分布范围明显小于其上覆和下伏层序的范围,同时在坡折带以下地区识别出了低位扇体和进积楔。以上证据表明该时期湖平面下降至坡折带以下地区且沉积中心发生迁移。3地震资料所显示的斜坡扇沉积,岩心资料所证实的砾石颗粒支撑和泥质填隙、泥砾的存在以及录井岩性所显示的高含砂量(60 % ~70 %)均显示出早白垩世早期为持续大物源供给。因此,控制北黄海盆地下白垩统层序形成的3个控制因素可以概括为构造坡折带的形成、湖平面的下降以及大物源的供给。

关键词 : 层序构成, 控制因素, 构造坡折, 下白垩统, 北黄海盆地

Abstract:

Lower Cretaceous sediments in North Yellow Sea Basin show lacustrine facies. Based on drilling and high-precision 3D seismic data, the sequence characteristics, such as lowstand system tract, transgressive system tract, highstand system tract, initial transgressive surface and maximum flooding surface, can be clearly identified from the bottom of Lower Cretaceous strata. The lowstand system tract includes incised valley, lowstand progradational wedge and lowstand fans. The highstand system tract is not only confined by sequence top surface and maximum flooding surface, but also characterized by the development of progradational parasequence set. The transgressive system tract is located between lowstand system tract and highstand system tract, primarily characterized by retrogradational parasequence set. The following major control factors can be concluded through geological analysis:(1) According to the test ages of igneous rocks and seismic data interpretation, it is considered that magmatic activities from the late period of Late Jurassic to the early period of Early Cretaceous resulted in the strata uplifting and thinning, leading to the formation of structural slope-break belt. (2) Based on the lithologic data of four wells above the slope-break belt, it is found that the sediments in transgressive and highstand system tracts contain red mudstones. Seismic profiles indicate that the sequence top surface is overlapping bottom surface, and distribution range of the sequence is significantly smaller than that of overlying and underlying sequences. Meanwhile, the lowstand fan and progradational wedge can be clearly identified beneath the structural slope-break belt. These evidences prove that the lake level dropped down to the area beneath the structural slope-break belt, and the sedimentary center migrated in this period. (3) Persistent large provenance supply in the early period of Early Cretaceous is revealed through the slope fan identified by seismic data, the gravel grain support and the existence of muddy fillings and boulder clay confirmed by core data, as well as the higher sand content (60 % -70 %) verified by logging lithology. Therefore, three control factors for the formation of Lower Cretaceous sequence in North Yellow Sea Basin can be summarized as the generation of structural slope-break belt, lake-level drop and large provenance supply.

Key words: sequence architecture control factors structural slope-break belt Lower Cretaceous North Yellow Sea Basin

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通讯作者: 石万忠,男,1973年1月生,1996年获中国地质大学(武汉)学士学位,2006年获中国地质大学(武汉)博士学位,现为中国地质大学(武汉)资源学院教授、博士生导师,主要从事层序地层学、成藏动力学及页岩气的研究工作。Email:shiwz@cug.edu.cn **E-mail:** shiwz@cug.edu.cn

作者简介: 王任,男,1990年12月生,2013年获中国地质大学(武汉)学士学位,现为中国地质大学(武汉)资源学院硕士研究生,主要从事层序地层学、岩性油气藏勘探的研究工作。Email:leoren1282@126.com

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