Scholars Journal of Engineering and Technology (SJET) **ISSN 2321-435X (Online)**
Sch. J. Eng. Tech., 2015; 3(6):612-620 **ISSN 2347-9523 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublisher.com

Research Article

High resolution sequence stratigraphic analysis of the 1 blocks of the ancient block of the block of the Daqing Oilfield

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Abstract: According to the core, drilling, logging, seismic and combined with the production test and other data, application of high resolution sequence stratigraphy theory, the Daqing oilfield in the ancient 1 block of the oilfield H2 oil layer group is divided into 1 Mid cycle, 10 short-term cycles, 1 blocks of the Daqing oil field, the formation of single sand body level high resolution sequence stratigraphic framework, for the study of the small layer, the connectivity of sand and sand body, as well as the study of sedimentary microfacies provides a very important significance for oil and gas exploration and development.
Keywords: high resolution sequence stratigraphy, base level cycle, stratigraphic correlation, and Western oil field, sedimentary microfacies.

INTRODUCTION

It is considered that the fine stratigraphic division and correlation can not only provide basic data for the study area, but also solve the geological problems in many oilfield development [1-4]. So I in Puxi oilfield ancient block 1 Black Emperor Temple Reservoir delta front sub facies, for example, under the guidance of fine high resolution sequence stratigraphy and sedimentology using coring data core drilling, logging and seismic data in study area were analyzed, through to fine classification and correlation of every datum level cycles, the establishment of high resolution sequence stratigraphic framework, and finally study the levels of base level cycles of evolution and the characteristics of formation and development.

REGIONAL GEOLOGICAL SURVEY

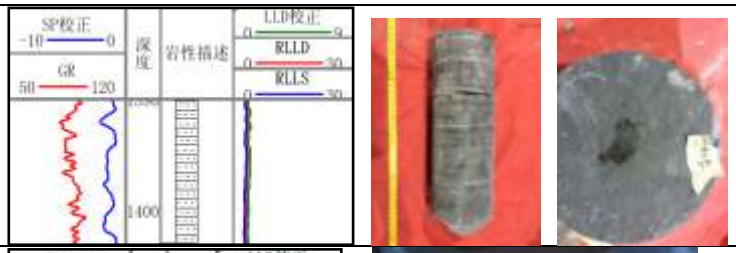
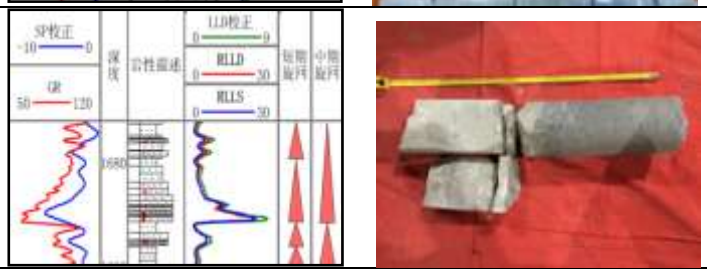
Puxi oilfield ancient block 1 Black Emperor Temple Reservoir is to rely on fluvial camp force and is accompanied by a wave geologic forces, to delta front sub facies of strata formation, which is located in the central depression of Songliao basin depression area, Qijia Gulong sag of Southern Puxi nose like structure of the front shaft, the central fault Zone cutting [5]. Puxi oilfield drilling encountered strata from top to bottom, from new to old, followed by Quaternary and the third Department of Taikang formation, Cretaceous system Mingshui group, Sifangtai formation, Cretaceous system in Nenjiang group, Yao Jiazu, Castle Peak Export Group and Quantou Formation [6]. Black Temple reservoir thickness is generally about 80m - 100m, lithology is dark gray, grayish black mudstone and grayish silt sandstone, fine sandstone and grey brown oil, oil stain powder sandstone, fine sandstone composition three obvious reverse cycle belongs to delta front subfacies sedimentary facies, and underlain by a conformable contact.

THE HIGH RESOLUTION SEQUENCE STRATIGRAPHY OF THE BLACK EMPEROR TEMPLE

1. Sequence boundary identification

Fine isochronous comprehensive and well and put forward on the basis of cross high resolution sequence stratigraphic correlation principle [8], the application of "step by step standard (Reference) surface control approach the base level cycle interface contrast" [9-14] comparison method, and then through the study area GX1a2 GX1b6 core logging data analysis (table 1), it is concluded that the study area black Emperor Temple Reservoir has obvious characteristics in Puxi oilfield black Emperor Temple Reservoir H2 formation were identified a medium-term base level cycles, 5 a short-term base level cycles, 10 ultra short term base level cycles, so as to realize the black Emperor Temple Reservoir 310 wells 10 ultra short term base level cycle sequence comparison.

Table-1: Sequence boundary types and characteristics of the black Emperor Temple Reservoir

Interface type and level	The interface formation	Core, logging characteristics
Long term base level (up to down conversion surface	The maximum flooding surface	
Medium / short term base level (down to up conversion surface)	The secondary Lake flooding surface	
The short-term base level (down to up conversion surface)	The bottom of channel erosion surface	

2. Fine contrast method for the oil layer of the black Emperor

The high resolution sequence stratigraphic correlation method is the combination of basic level cycles and formation. In this method, it is the most obvious characteristics of the nearest feature of the range base level cycle interface, which is called the standard. Specific methods are as follows:

① Standard, etc., the long-term base level cycle control cycle

Standards and other time interface should be the following features: the region's large range of distribution, characteristics, based on reliable. It is very important to identify criteria and so on. We must use the standard to determine the top and bottom of the long-term base level cycles, which can provide a favorable basis for the identification of the long-term base level cycles.

The top boundary of the oil layer of the black emperor is in the seismic section, and it can control the development of the top layer of the upper part of the top layer of the long base level of the T05 reservoir. Black emperor temple reservoir bottom face should be on the seismic profile T06 layer for surface, interface was developed in the lower set of grey mudstone and the interface for tender and tender in the second stage of the interface. The two standard layers are well developed in the region, and the characteristics are obvious, and the top bottom interface of the black emperor temple oil layer is controlled well, as shown in Figure 1.

②Regional well seismic contrast control of long-term base level cycle sequence stratigraphic correlation

Although seismic data has a great difficulty to the thickness of sand and mudstone, but the seismic data (Figure 2) can be determined by the thickness of the strata of the thickness variation trend, the follow-up comparison has a certain reference value.

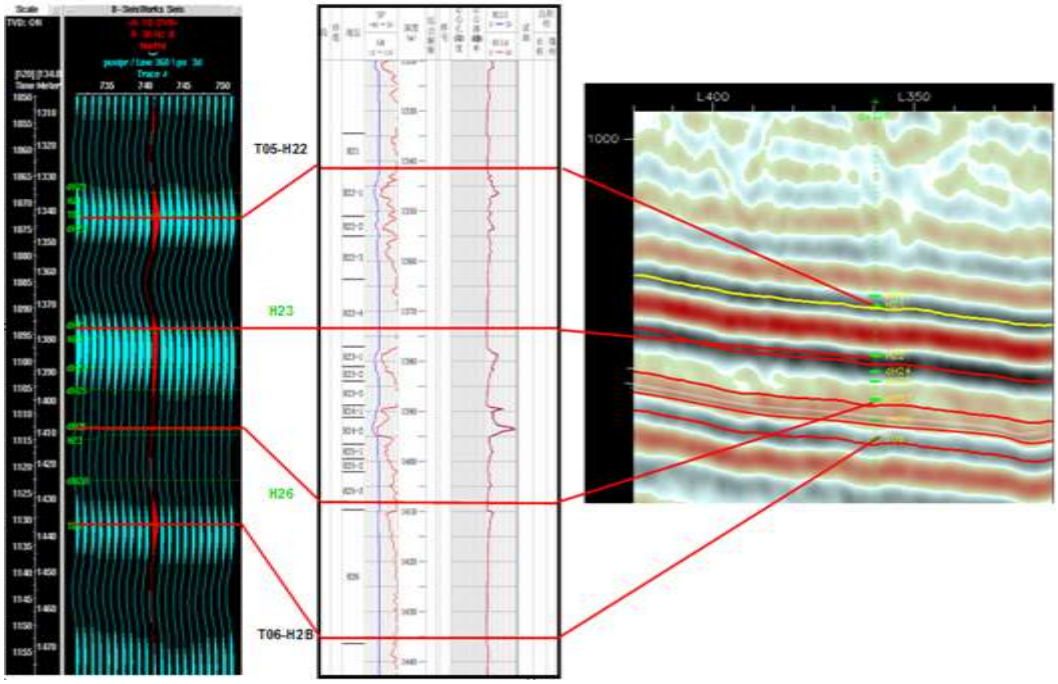


Fig. 1: Comparison Chart of G128 well earthquake

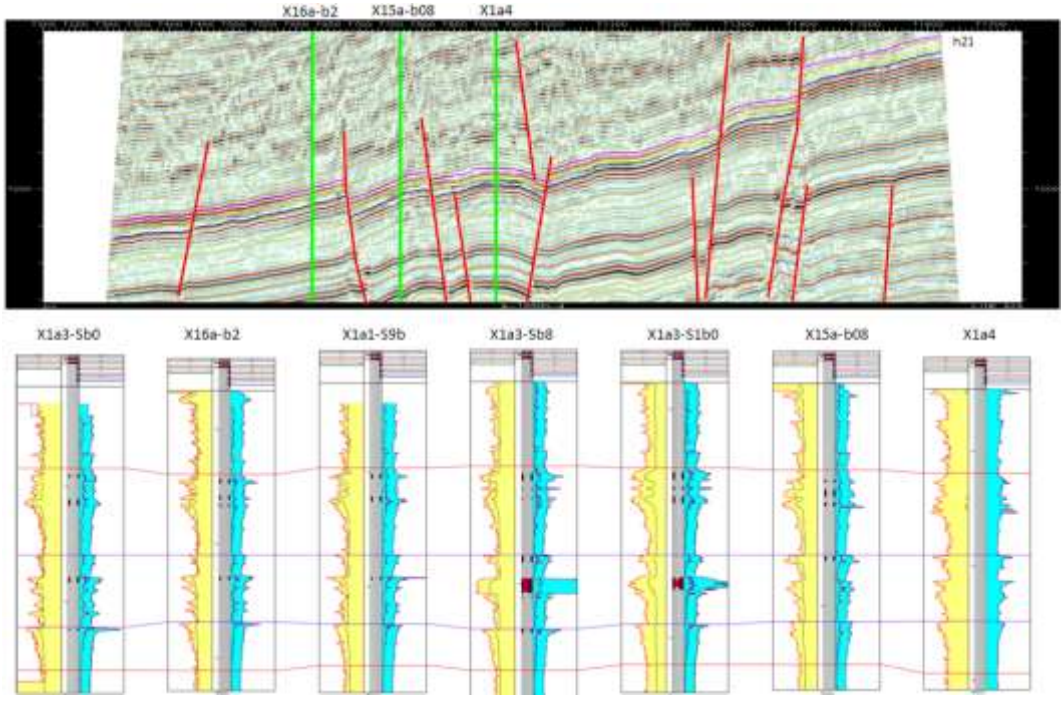


Fig. 2: Comparison of the "well seismic combination" of the black emperor temple in the study area

3. The fine contrast of the base level cycle of the river sedimentary model

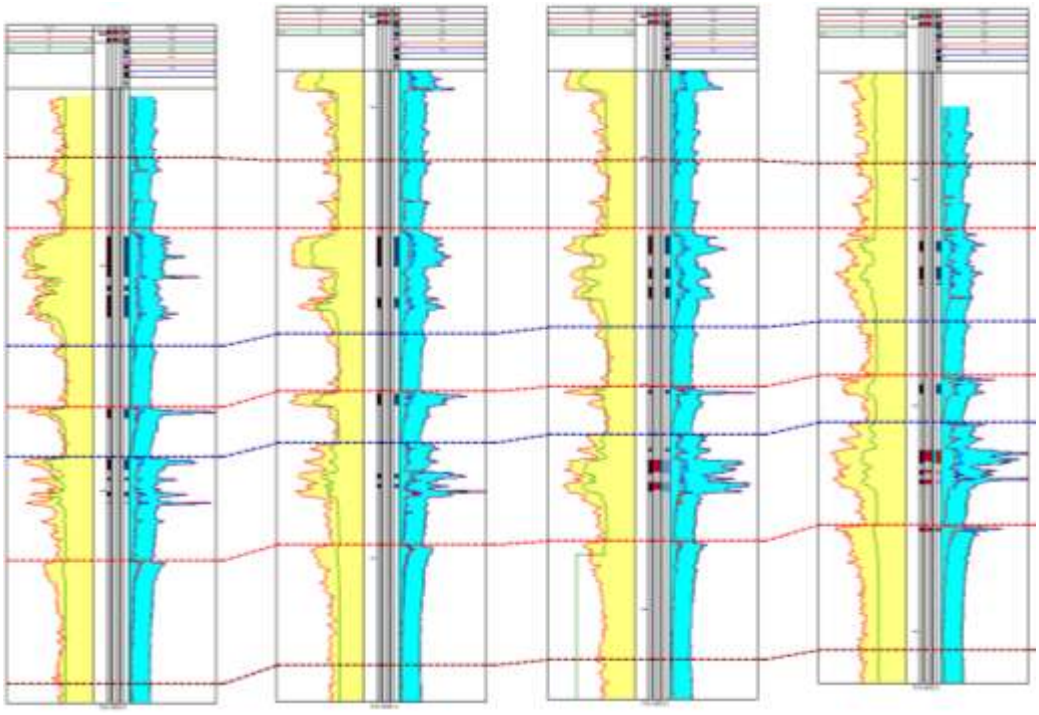


Fig.3: Comparison of sedimentary patterns

In the study area, the main delta front sub facies of delta front are the main channel of the water diversion channel, which has been superimposed on the main channel:

(1) According to the direction of the river, it is difficult to find the water diversion channel sand body in the profile, which makes it difficult to find the water diversion channel sand body. At this point, we should analyze the source direction of the research area, establish the direction of the study area, and make a comparison between the river and the direction of the river,

(2) The river sedimentary model is not a one. So, when the river is relatively more than the river, the direction of the water system, the water direction and other factors, the top surface of the river can be used as a waiting time.

(3) Local reference to the control of the short-term base level cycle sequence comparison

In the study area, there are a large number of local reference surfaces, in contrast to the work, it should take full advantage of these local reference surface to carry out the contrast between wells, and finally achieve the fine contrast of the whole region.

Heidimiao oil reservoir in the short and medium term base level cycles down up conversion surface base level cycle interface, there often exist in complex thick sand layers are in direct contrast to the words will very difficult. However, in accordance with the above characteristics, a wide range of features, small range controllable and can be a continuous tracking of the sand and the short - term reference, such as the short - term base level cycle sequence, these signs are not a wide range of development, but by alternating convergence method can achieve the region's internal, short-term base level cycle interface identification and comparison.

4. High resolution sequence stratigraphic division

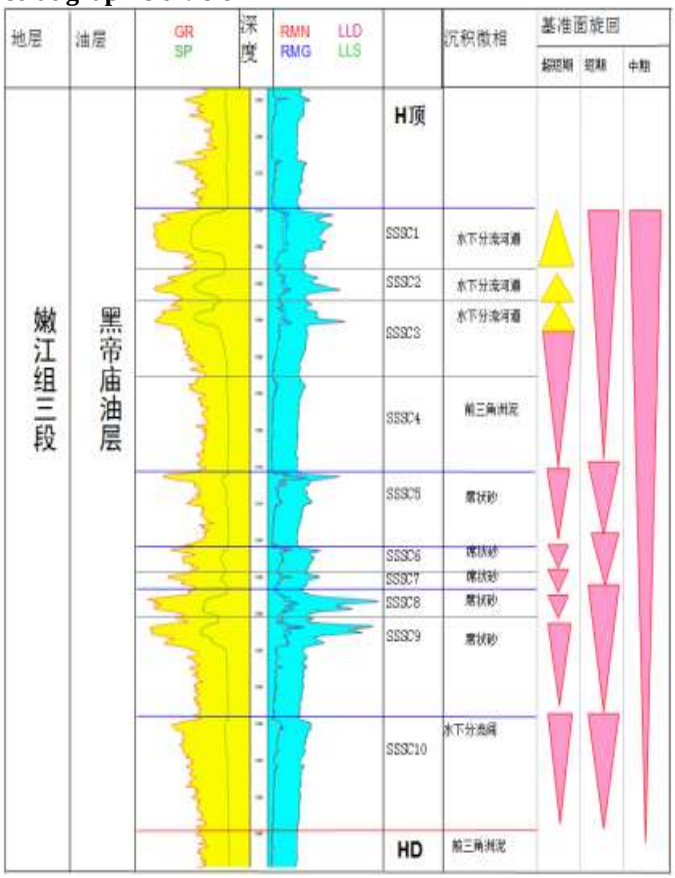


Fig.4 High resolution sequence stratigraphic division of the lack emperor temple in G153-80 well

In accordance with the above sequence classification principle and interface identification characteristics, the sequence of the study area is classified as follows:

This study divided the study area into 1 medium-term base level cyclic sequence (MSC), that is, the Cretaceous Nenjiang formation and the three stage, and then the 1 Mid cycle is divided into 5 short-term cycles SSC1~SSC5, and then subdivided into 10 short-term base level cycles (SSSC1~SSSC10), as shown in figure 4.

5. High resolution sequence stratigraphic framework

Because of the limited vertical resolution of seismic data, we mainly rely on the data of well logging, core and other data to carry out the contrast between the well and well pattern in the high resolution sequence stratigraphy. Comparison of the workload, high accuracy, according to the above principles and methods, not only for the short term, ultra short term base level cycle, also explored the region well network of the comparison route and method. Using the above method, the identification problem of the short and ultra short base cycles in the well is not only solved, but also the 310 wells in the study area are determined. In this area, 1 MSC, 5 SSSC, 10 SSC are used in this study. Specific steps are as follows:

1, The establishment of a closed framework contrast section

Well obviously ancient 153-80 rhythmic cycles, the average thickness is moderate overall thickness in the region, sandstones are well developed, divisibility obvious, so the ancient 153-80 as stratification criteria, oblique 171- 104 ancient wells, ancient 169- 94, 159-108 hierarchical auxiliary ancient wells in the study area and Choice repeated studies last departure optimized provenance direction parallel to the vertical direction of the source material from the standard vertical wells 5 5 cross-section, fully closed, and across the entire study area, well within the preferred standard backbone cross section is "relatively whole logs, sand-developed, sequence cycles are more clearly marked, less than fault" in accordance with the above principles, where appropriate times, the last preferably through a 10 closed backbone sectional area of dense well network, then compare the dense region outside the well, controlled the region contrast, press "MSC, SSC, SSSC" order progressively fine contrast, progressive closure verification, this can greatly reduce the error counterweight workload, you can make a unified contrast region, mastered the flat base level cycle variation in the study area, laying a solid foundation for the subsequent geological research.

2, Closed section control, classification, comparison, closed

The base level cycle of the search for a large to small. First of all, combined with seismic and logging data of the comprehensive profile of the area of the upper boundary and the bottom of the area, determine the medium-term base level cycle of MSC interface, the study area of the upper and lower end of the upper and lower part of the upper and lower part of the upper and lower part of the large sets of sandstone. In the MSc interface is determined based, inner and short cycle comparison, find short-term cycles which references when surface, starting from the profile until the completion of the closed region, finished in contrasting to the SSC interface in the establishment of the SSC interface based on the final fine SSSC circles face than that established in the mid and short duration cyclic correlation based on, the orders of sequence interface or a reliable correlation marker, complete closure of SSSC interface correlation. Finally, a high resolution stratigraphic framework is established.

The above mentioned above includes two meanings: one is to choose the sequence of sequence, and the sequence of the major sequence is determined by the sequence of the minor sequence. Two, the comparison of the level of the whole region and the whole region is completed.

3. Indirect comparison

In the course of comparison, many difficulties will be encountered. If there is a big change in the thickness of the fault, the thickness of the strata, and the sign of the not easy to contrast, the more obvious characteristics of the well, the characteristics of the well, the characteristics of the well, and the comparison of the well.

4. Close verification and comparison

When after the end of the comparison in the study area for all interface finally should be closed in the region, if found not closed well to contrast, until the closure of the region, from any direction of the connecting well section should gradually closed, only so that the region of the SSSC division to the end of.

Through the above method, the 1 MSC interface, 5 SSC interface and 10 SSSC interface of the interface, 6200 SSSC interfaces are completed. The 10 SSSC interface system database of the 310 wells in the western oil reservoir is established. The analysis of sedimentary sequence, sedimentary facies and single sand body identification is shown in Figure 5.

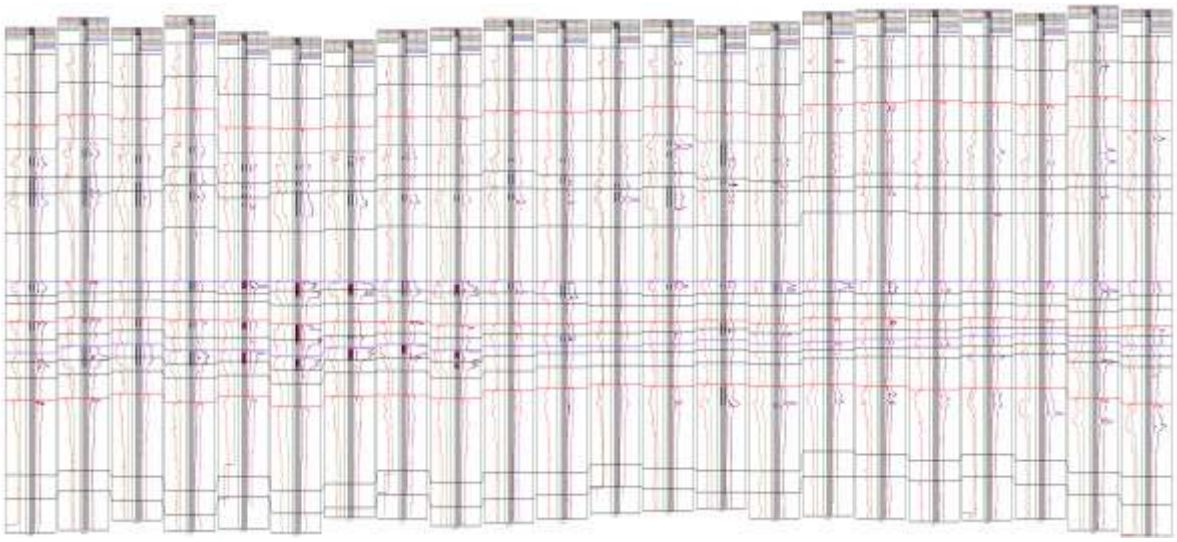


Fig. 5 high resolution sequence stratigraphic framework of the black emperor temple

HIGH RESOLUTION SEQUENCE STRATIGRAPHIC ANALYSIS OF THE BLACK EMPEROR TEMPLE

1. Control of phase sequence and phase domain datum change

The research finds that the target area is the main force of the river sediment and the wave of the geological formation, the formation of the delta front sub facies, in which the development of the reference plane and the surface of the lake has a close relationship with the rise and down. Base level rise, the lake level rises; the datum plane falls, the lake level falls (Figure 6).

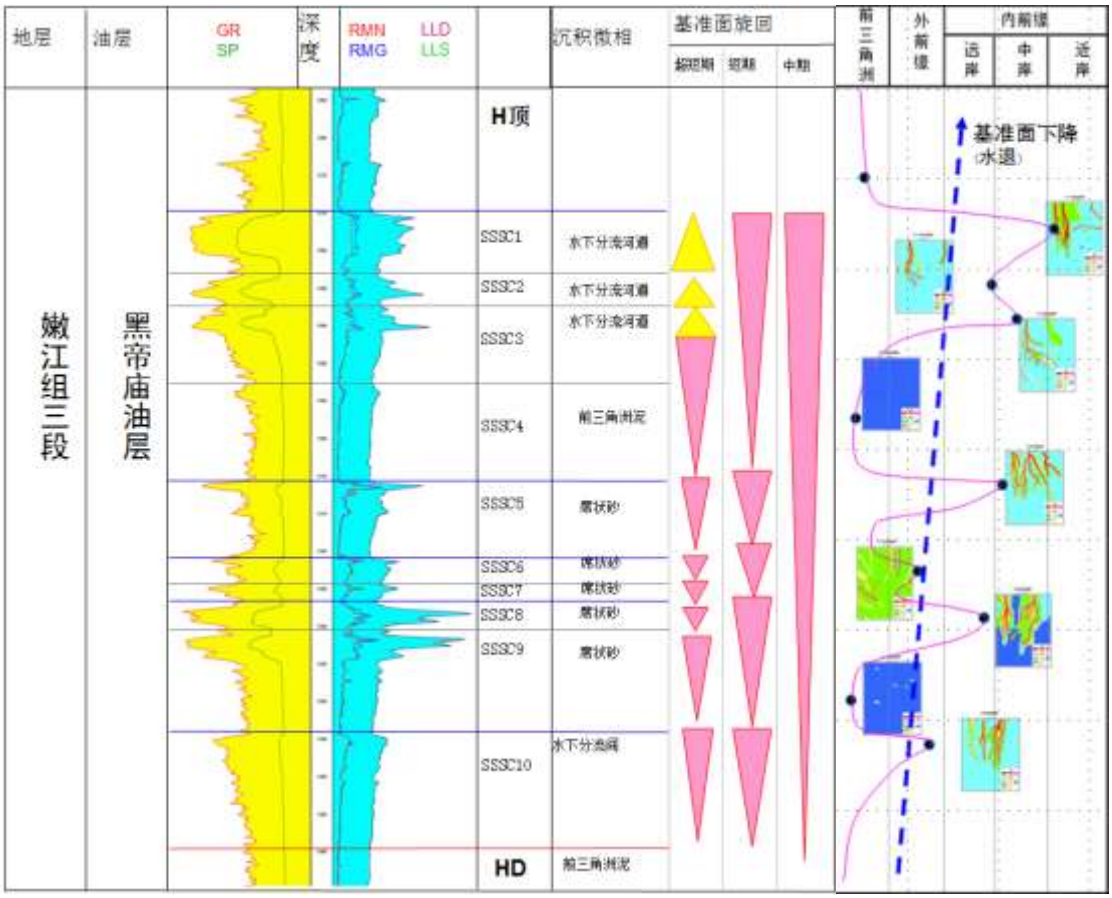


Fig. 6. High resolution sequence stratigraphic division of the black emperor temple

During the deposition of the Ssc1, in the long-term base level rising - a decrease in conversion at, in the period of decline, the datum decreased rapidly, mainly under the condition of high accommodation space formed a ultra short term cycles. At this time, the main development of the black emperor temple in the delta front deposition, the main sedimentary microfacies is mainly based on the water diversion between the main flow and the main flow between the main flow and the separation of the mudstone.

SSC2 deposition period, in the early stage of the decline in the medium term, the benchmark surface is slow, mainly in the two to the upward trend of the asymmetric short-term cycle of vertical superimposed. At this time, the main development of the delta front deposition, deposition of micro - phase for the sand table,

In the middle and late stage of the SSC3 deposition, the datum plane dropped slowly, and the overall performance of the two upward trend is lower than that of the upper layer.

In the middle period of the mid cycle, the SSC4 is in the middle stage, and the main is a super short cycle which can accommodate the space conditions. The black ground reservoir sedimentary and sedimentary microfacies and SSC3.

In the middle and late period of the middle cycle, the SSC5 deposition period is a short cycle, which is a short cycle, which mainly contains two stages, which is the asymmetric super short cycle and the multiple upward variable. During the early stage of the cycle, the base surface is rapidly declining, and the main sedimentary deposits are mainly mud, and the middle and later period of the cycle, the base surface is slowly rising, and the area is dominated by delta front sub facies.

2. The change of the change of the 3.2 reference surface to the aggregate form of the sand body

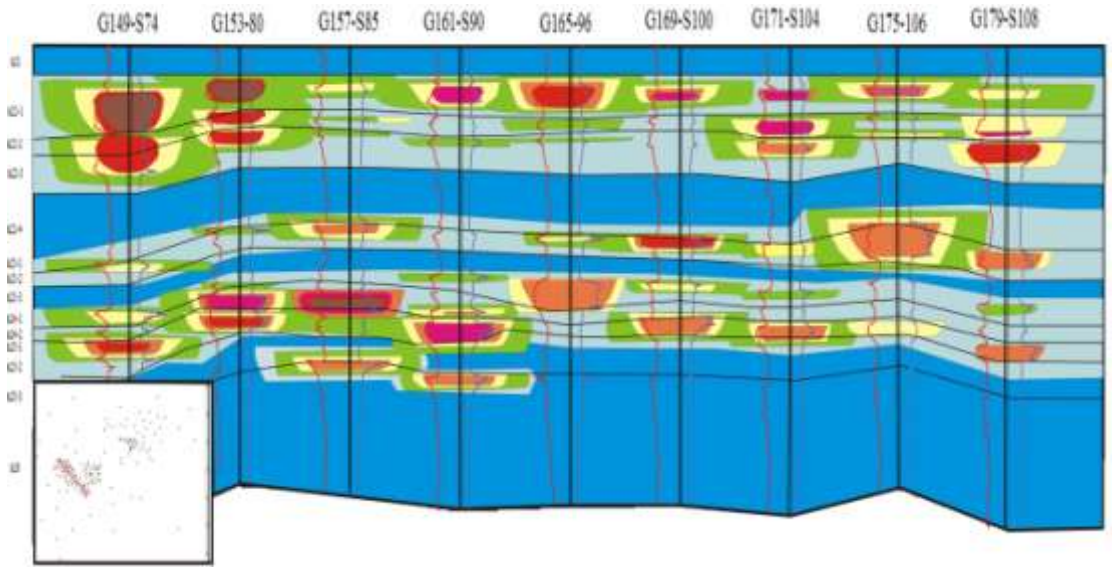


Fig. 7: Comparison Chart of high resolution sequence stratigraphic framework and single sand body in the reservoir

The A/S ratio or the change of the reference surface affect the structure of the sand body space. The distance of the source of material and the symmetry of the cycle. In the East and north of the study area, the source of the sediment is abundant, the space is relatively small, the A/S ratio is low, the river sand body is relatively developed, and the sand body is well connected. The sand body is connected with the source. The A/S value increases, and the sand body is in the main.

CONCLUSIONS

(1) the contrast of the wells in the area of 6200 wells in the region of 310 wells, the comparison of the sequence division and the single sand body in the Delta, and the method of dividing and comparing the delta system.

(2) based on the theory of high resolution sequence stratigraphy, the fine base level cycle identification of 310 wells in the ancient 1 block of the block of the western oil field, the first research area of the study area is divided into 1 medium-term base level cycles, 5 short-term base level cycles, 10 ultra short term reference plane.

(3) the fine on the region's super short term base level cycle sequence comparison, we can see that the region well layer thickness has little change, resulting in formation thickness difference between willing to is mainly due to the breakpoints, sandstone differences, late differential compaction factor, Puxi oil field Heidimiao oil layer sedimentary types as a whole continuous water back, mainly developed reverse cycle, "formation thin west east thick and thin in South Beihou, SSSC1 is the largest water back surface, general datum continued to decline in the stratigraphic model.

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