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The research status of Hailar basin in Jurassic stratigraphic

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Abstract: - Hailaer basin is located in the part of the central Asia, Mongolia aulacogen. Taking the Derbugan fracture as the boundary, the west belongs to Erguna fold system, the east is of Inner Mongolia - the greater hinggan mountains fold system. Basin is divided into three depressions, two uplifts with five first-order tectonic units in total,and in the order from west to east is Jalainur depression, Cuogang uplift, Beier Lake depression, Ba Yanshan uplift and Huhehu depression. It can further divided into four uplifts, 16 depressions with 20 secondary structures. After years of exploration, in Wuerxun, Beier and Hulun Lake three depressions we have found Wuerxun, Bayantala, Hohnoren, Sudeerte ,Huoduomoer , Sunrenuoer ,and Xiaohekou altogether 7 industrial oil and gas accumulation zones. Surrounding the Hailaer basin, the Mesozoic cretaceous formation developed well, Paleozoic strata is better developed, but the Triassic and Jurassic stratas are in the poor with rare field outcrops. However, multiple combinations of rocks , the evolution of Mesozoic Cenozoic structural is so complicated that stratigraphic correlation is beyond description. Furthermore, there still exists divergence on the issue of the division and correlation of Budate group .Besides, the development and evolution of the basin and many other issues need to go through a variety of study approach for further research.

Keywords: - *Hailar basin; Jurassic stratigraphic; Budate group*

I. CURRENT SITUATION

By the end of 2013, the whole basin has been completed 1:200000 gravity, magnetic, electric and high-precision aeromagnetic survey . In addition to the area which is covered by water, the total depressions have been carried out general and detailed earthquake investigations, including 1 multiply 2, 2 multiply4, 4 multiply 4 km measured by two-dimensional digital seism. The precise seismic survey (0.5 multiply 1 km) and three-dimensional seismic work have been conducted in some areas,where two-dimensional earthquake measured 33433.66 km,and three-dimensional measured 5966.39 square km.It has been found that 386 wells can be explored and evaluated, 116 wells gained industrial oil , 10 wells acquired industrial gas and 7 reservoirs in Beier, Wuerxun depression(Surennuoer,Wuerxun,Bayantala,Sudeerte, Hohnoren,Huoduomoer and Beier reservoir). Three sets of hydrocarbon source rocks,the rocks of Tongbomiao Formation and Nantun Formation and lacustrine facies mudstones of Damoguaihe Formation have been discovered ,where major reservoirs are distributed in .

Hailaer basin ,proving up oil-geology reserves about 2.287247 multiply 108t and the remaining control reserves up to 80 multiply 104t,remaining control gas geologic reserves measured 113.30 multiply 108 cubic metres and 7565 multiply 104 t predicted remaining geological reserves. According to the three resource evaluation, the basin resources achieve 8.39 multiply 108 t, the remaining resource reach 6.27 x 108 t, which mainly distributed in the central part of the depression belt in Wuerxun and Beier depression and the surrounding part in Huhe Lake and Bayanhushu depression .The four depressions are the focus of the recent exploration.

Tab.1 the prospecting situation of Hailaer basin

Project name	Oil and gas reserves		Oil and gas resource product	The workload of seism		The workload of exploratory well	
	explored	availabl e		2D seismic	3D seismi c	Well numbers	footage
	(100million tons）			(kilometre)	(square kilometre)	(mouth)	(ten thousand metre)
Hailaer basin	2.28	0.46	8.39	33433.66	5966.39	361	87.6
Beier depression	1.59	0.32	1.63	7106.2	2284.20	165	39.1
Wuerxun depression	0.69	0.14	3.39	4529	2667.09	166	41.0
Huhehu depression			0.97	5704.83	816.1	17	4.7
Bayanhushu sag			0.32	1855.43	199.56	10	2.0
Chagannuoer sag			0.64	3149.24		5	1.2

II. THE CURRENT SITUATION OF STUDY

Hailaer basin since 1982`s large-scale exploration, geologists, who take the tireless efforts on the tectonic characteristics and evolution of the basin, sedimentary characteristics and petroleum accumulation characteristics and various aspects have made profound understanding.

2.1 seismic profiles

Stratigraphic division and correlation of work has been the focus in the work of exploration and development in Hailaer basin, with multiple layering schemes. In 1990, on the basis of geological data completed about the exploratory well, Daqing Oilfield organized national 14 units of the country with 57pundits in Hailar Basin Formation seminar, the formation in the basin were conducted a systematic system layer, and determined the formation of 25 well layers. From 2002 to 2003, 32 exploratory wells in Beier Depression have been carried on the system layer, and the Klym group of three, two period are merged, delimiting volcanic rocks in Xinganling group. In 2003-2004, 48 wells in Beier Depression and 14 development evaluation - control Wells has carried on the system layer, the stratigraphic framework in the major interface layer and submit reserves area uniform, but in age, belonging to the horizon is difference. The geological layer in widespread use from bottom to top is carboniferous-permian basement,Triassic Budate group, Jurassic Xinganling group (including intermediate basic volcanic rocks in the upper section, the central part of the volcanic rocks with coal seam, the lower part of the intermediate-acid volcanic rock), Cretaceous Tongbomiao formation, Nantun formation (south firet section, south second section), Damoguaihe formation (the first section and the second section), Yimin formation (first,second,and third section),Qingyuangang formation, Tertiary and Quaternary formations[1].

Then, according to the requirements of oilfield production, many geologists have made a careful study of the stratigraphic classification and correlation of Hailaer Basin.At present has been carried out over the lithostratigraphy, biostratigraphy , seismic stratigraphy, sequence stratigraphy, logging stratigraphy , isotope stratigraphy, magnetic stratigraphy, event stratigraphy and geochemical stratigraphy ,and other stratigraphy branches of study.

The nine indicators in the process of stratigraphic classification and correlation function is different, leads to the result of the classification and correlation some consistent and some cross. Like Wan Chuanbiao [2] has studied algae in the Hailaer Basin;Ye Dequan and so on [3] using the paleontological characteristics of Hailaer Basin carried on the division and correlation of strata, Wei Kuisheng [4] to carry out the study of sequence stratigraphy to the Wuerxun and Beier depressions in Hailaer Basin . Ren Yanguang ,Zhang Xiaodong , Li Chunbai etc [5] predict and evaluate the study such as high yield enrichment regions and complex fault blocks in Hailaer Basin, and sequence system has carried on in Beier-Wuerxun sag of the massive layers, to pull through the different strata hierarchical relationship between 3 d seismic work areas, to identify the 10 different classes of unconformity surface, to divide the sequence stratigraphy of lower Cretaceous strata.Lin Changsong etc[6] also sequence the strata of Hailaer Basin to the classification and correlation.

On the whole , the large stratigraphic sequence framework have been known more clearly in Hailaer Basin, especially for the layer of lower Cretaceous is very meticulous.But the deep Jurassic due to fewer drilling results and seismic reflection feature ,which leads to be ignored and shelved.However, exploration of small basin nearing the hailaer basin proved Jurassic is common develop, and has potential hydrocarbon source rock distribution, and found that the Jurassic formation outcrop frequently in surrounding area. All these indicate that the local area of the Jurassic is developed,and even developed thick .They should be recognized again.

2.2 structural evolution and sedimentary characteristics

Many scholars such as Zhang Xiaodong, Yun Jinbiao [7], Cao Ruicheng[8], Chen Junliang [9] carried out deep research and analysis on tectonic evolution process in Hailaer basin . They think the hailaer basin belongs to a part of central Asia - Mongolia aulacogen, taking the Derbugan fracture as the boundary, the west belongs to Erguna fold system,and the east is of Inner Mongolia - the greater hinggan mountains fold system. Regional tectonic movement in Late Mesozoic, resulting in the pre-existence of deep fracture network and the tectonic stress field in basining epoch decide the formation and distribution in basin.Early for left-handed torsion stress field, hailaer basin in the middle and late Jurassic turned into dextral transtensional stress field, and in the Cretaceous period changed to the former.Different types of stress field formed in different tectonic belt and configuration.Accordingly,upwelling of deep mantle and the strong tension on the earth's crust caused Bayanshan uplift of the basin as the center, to the sides stretch tension, formed in Jalainur depression,Beier depression and Huhrhu depression. Overall hailaer basin belongs to pure shear properties of tensile basin.

Permo-Carboniferous marine sedimentary rocks and its metamorphic rocks composed of the Hercynian folded basement , does not belong to the ancient basement - crystalline basement. The lithology includes dolomite marble,black sandy slate, argillaceous slate, graphite, gray silicide quartzite, etc.So the Carboniferous – Permian in Hailaer Basin for neritic- bathyal facies sedimentary area.

Budate group belongs to Triassic strata, the Hailaer Basin is in a relatively stable state, just the local area with volcanic activities or magma invasions.From actual drilling data can see that the Budate group are widely distributed in Hailaer Basin.The lithology is mainly grey, green grey, black ash, greyish mudstones, gray tuffaceous mudstones;Grey, green gray, gray green pelitic siltstone., siltstone;Gray, grayish white, and motley sandy gravel;Gray, grayish green, grey-purple, purple alteration andesite;Green gray quartz diorite porphyrite.Therefore Triassic in Hailaer Basin is fan-delta sedimentary area under the background of coast and shallow lake - deep lake sedimentary environment (Ren Lihua, 2006).

The Xinganling group of corresponding geological period is the Jurassic period, which is in the early stage of the basin tension.The tension activity caused the formation differences of the rise and fall , combining with local strong volcanic activities, formed a more complex depositional environment. Fluvial facies, fan-delta facies, half deep lake facies are in the lower parts of the ancient geographical environment , such as Beier lake-Hongqi depression, local structure of Beier depression.And in volcanic activity area, a set of volcanic rocks, volcanic rocks with intercalation of sedimentary rocks strata are formed, such as Huhehu depression and Jiangjunmiao tectonic belt.The layer is characterized by rapid phase transition, and most of the area is missing in the formation

The early Cretaceous sedimentary formations include Tongbomiao - Nantun group and Damoguaihe and Yimin group.Tongbimiao group for sedimentary basin subsidence curtain in the temple. At this time the crustal extension, fracture activity and different subsidence of fault blocks is obvious, and deposited a set of rifting period shallow lake basin sequence, developed alluvial fan -fluvial,local fairly deep lake and shallow lake and fan delta sedimentary.Nantun group is the act strongly chasmic subsidence of sedimentary filling, at this time rifting strongly, expand the basin and form a set of split in fairly deep lake - deep lake basin sequence, and develop fan-delta, braided river- delta, sublacustrine fan - prodelta turbidite and shallow lake - deep lake deposits.Damoguaihe group, is in the region of settlement again of the formation of sedimentary filling, on the whole is in the period of fault - depressed sedimentation,resulting in the deposition of a set of deep lake basin sequence, developing river deltas, braided river-delta, sublacustrine fan and turbidite -prodelta and deep lake - fairly deep lake deposits.Yimin group were depression- local faulted depression sedimentary formed during the filling, dominated by limnetic facies sediments,was a set of the interbed of sand mudstone and coal seam in different thickness of sedimentary. (Lin Changsong, 2007).

However, at present the Hailaer Basin tectonic evolution and sedimentary researchs are mostly confined to a single depression.Within the research results are “a concave view”,lack of integrity.There are large differences between various schools, , also did not undertake area mapping.

2.3 the geological characteristics of oil

Study found (Lu Shuangfang, 1995; Jiang Fujie, 2008; Wu Haibo, 2012), the Hailaer Basin mainly developed two sets of hydrocarbon source layer: Nantun group and Damoguaihe group.In addition, Tongbomiao group and Budate group are local hydrocarbon source layer.Source rocks are mainly dark mudstone, generally 400 ~ 1000 m thick. Higher abundance of organic matter and organic carbon content for 1.37% ~ 1.37%, generally about 2%.Chloroform bitumen "A" content for 0.031% ~ 0.031%, generally about 0.1%.Total hydrocarbon content of 234 ~ 3227 mg/kg, generally bigger than 250 mg/kg.Amount of potential of generating hydrocarbon (S1 + S2) is 0.84 ~ 7.73 kg/t, general bigger than 4 kg/t, which the hydrocarbon generation conditions of Nantun group is best.Yimin group,Damoguaihe group,Nan and Tongbomiao group have coal measures hydrocarbon source layer and the Tongbomiao group in Wuerxun depression gas rate of coal seam even up to 96 m3 / t, oil production rate can be up to 13.5 kg/t,it also can be used as a secondary source bed.But poor type of hydrocarbon source rocks in parent materials, mainly for Ⅱ type, followed by Ⅲ type, including Nantun group Ⅰ plus Ⅱ type up to 70%.

Has a wide distribution of reservoir in Hailaer Basin, on the longitudinal development is Palaeozoic era, Budate group, Tongbomiao group, N1,N2,D1,D2and even more sets of reservoir, and all have gained industrial or low yield of oil and gas flows.Horizontal development is many kinds of reservoir facies belt ,such as fan-delta, sublittoral subaqueous fan , turbidite fan, the beach and bar and so on.Reservoir lithology types have mainly sandstone and siltstone, sandstone, conglomerate, volcanic rocks and volcanic clastic rocks (sedimentary tuff)and metamorphic rock, etc, of which the sandstone reservoir develop most. The lithology is mainly feldspar sandstone and lithic feldspar sandstone (Liu Li, 2006; Wang Yuhua, 2007; Cao Ruicheng, 2009 etc).

In addition, the sandstones and mudstones in the middle and lower Jurassic Budate group slightly metamorphosed, is a set of noise contains tuffaceous glutenite, siltstone, silty mudstone and mudstone, with different thickness interbedded.Shale has been silicon or sericitization, brecciated structure with rupture or palimpsest texture, forming dissolved structure and solution pores, water-eroded cave reservoirs.Statistics show that the main reservoirs are of low permeability reservoirs.Tongbomiao group porosity is 3.64% ~ 30.7%, averaging 11.6%, permeability of 0.01 ~ 1863 x 10-3 um2, with an average of 21.73 x 10-3 um2, belongs to low

porosity and low permeability reservoir.Nan porosity is of 5.0% ~ 25.2%, with an average of 12.5%, permeability of 0.01 ~ 1708 x 10-3 um2, with an average of 47.54 x 10-3 um2, belongs to low porosity and low permeability reservoir.Nan of the porosity of 3.13% ~ 29.5%, the average was 14%, the permeability was of 0.01 ~ 5555 x 10-3 um2, with an average of 101.28 x 10-3 um2, belongs to low porosity medium permeability reservoir. the porosity of D1 is 5.0% ~ 25.1%, with an average of 16%.Permeability is 0.01 ~ 9.59 x 10-3 um2, with an average of 2.99 x 10-3 um2, belongs to medium porosity and low permeability reservoir.The porosity ofD2 is 6.4% ~ 35.5%, with an average of 22.1%.The permeability is 0.01 ~ 1792 x 10-3 um2, with an average of 62.55 x 10-3 um2, belongs to medium porosity and low permeability reservoir.

Caprocks in Hailaer Basin are mainly distributed inD1,N1 andY1, the former is regional seal and the rest are partial covers.Lithology is both shale rock.There are four types of source-reservoir-cap assemblages in basin .(PangXiongqi, 2005) : the lower-generation and up per-storage pattern, source and reservoir in the same bed pattern, new source rock and old reservoir pattern,and old souce rock and new reservoir pattern.

At present, oil and gas exploration target stratas in Hailaer Basin are mainly concentrated in the Cretaceous, but in Budate group ,Xinganling group and else deep level also has a great discovery (Beier depression).In the plane, the distribution of oil and gas strictly restricted by source sag, they are mainly distributed in and near the oil source, or on the oil source area and its surrounding fault zone.

III. MAJOR KNOWING

At present, oil and gas exploration target stratas in Hailaer Basin are mainly concentrated in the Cretaceous, but in Budate group ,Xinganling group and else deep level also has a great discovery (Beier depression).In the plane, the distribution of oil and gas strictly restricted by source sag, they are mainly distributed in and near the oil source, or on the oil source area and its surrounding fault zone.

(1) The Hailar - Erlian basin is a Cenozoic sedimentary basin, with similar basic structural characteristics,and the tectonic deformation zone is in the complex tectonic deformation zone between Siberia and sino-korean plate. Basin formed by mantle material upwelling, okhotsk ocean closed, Yizuonaiqi oceanic plate subduction, the collapse of the lithosphere etc factors control.

(2) Identify the Hailar – Erlian basin basic tectonic pattern .Hailaer basin is divided into two uplifts and three depression tectonic framework, from west to east in order to be Huhehu depression, Bayanshan uplift, Beierhu depression,Cuogang uplift, Jalainuoer depression, and can be further subdivided into 16 depression and four uplift.Erlian basin is consist of five depression (Manite, Wunite, Wulanchabu, Chuanjing and Tenggeer depression), four uplifts(Sunite uplift, Bayinbailige uplift ,Daxinganling uplift and Wenduermiao uplift) containing 56 depression and 21 uplift in total.

(3) The formation of sedimentary cover in Hailar - Erlian basin has been basically clear.The strata in the hailaer basin from bottom to top is Triassic Budate group, Jurassic Xinganling group (including the basic volcanic rocks in the upper section, the central part of the volcanic rocks of lower coal seam , acidic volcanic rock in the lower part), the Cretaceous Tongbomiao and Nantun groups, Damoguaihe formation, Yimin group, Qingyuangang group ,Tertiary and Quaternary system.Erlian basin mainly developed in Jurassic (from bottom to top is Aqitu group, Gerile group,Qiha group, Hugeqiletu group and Hegenshan group), Cretaceous (Dongwu group,Tenggeer group and Saihantala group) Tertiary and Quaternary.

(4) The structural evolution and depositional filling of Hailar - Erlian basin is preliminarily defined.Hailaer basin mainly experiences the fault subsided and depressed stages and inversion phase . Depressed phase can be further divided into fault inoculation phase (Jurassic), strong tension phase , rapid subsidence phase, stable tension and contraction phase.Erlian basin went through the stretch fault basin phase(early Jurassic to middle Jurassic), regional tectonic inversion period (at the end of late Jurassic), strong fault basin stage (early and middle early Cretaceous), southeast of the basin uplift period (late early cretaceous to late cretaceous), north west basin uplifting period (Paleogene, Neogene) basin in the southern uplifting period (Quaternary) etc. six stages in total. In Triassic ,Hailaer basin is fan-delta sedimentary environment under the background of strand shallow lake – fairly deep lake sedimentary.And Jurassic is in fluvial facies, fan-delta facies,fairly deep lake facies and volcanic facies sedimentary filling.The Cretaceous age as a fluvial facies- fan-delta facies - lacustrine facies sedimentary filling.Erlian basin in Jurassic is coal measure strata, the coarse clastic rock and volcanic sedimentary filling, and in Cretaceous is alluvial fan, fan-delta, braided river-delta, lacustrine and limnetic facies sedimentary filling, etc.

(5) Preliminarily clear about the Hailar - Erlian basin Mesozoic petroleum geological characteristics. Hailaer Basin mainly developed two sets of hydrocarbon source layer: Nantun group and Damoguaihe group.In addition, Tongbomiao group and Budate group are local hydrocarbon source layer. Reservoirs on the longitudinal development are Palaeozoic ,Budate group, Tongbomiao group, D1,D2,N1,N2and other sets of reservoirs, on the transverse development are fan-delta, near-bank submerged fan , turbidite fan, the beach and bar and various reservoir facies belt. The types of reservoir lithology are mainly sandstone, glutenite, conglomerate, volcanic rock and volcanic clastic rock (sedimentary tuff) and metamorphic bolt holes, etc.Cap

rocks are mainly distributed inD1,N1,Y1, the former is the regional cap rocks, after them are local seals,and lithology of them are both argillaceous rocks. The four types of source-reservoir-cap assemblages in basin are the lower-generation and up per-storage pattern, source and reservoir in the same bed pattern, new source rock and old reservoir pattern,and old souce rock and new reservoir pattern. At present, oil and gas exploration target stratas are mainly concentrated in Cretaceous, but in Budate group ,Xinganling group and else deep level also has a great discovery.The hydrocarbon source rocks in Erlian basin mainly developed in Cretaceous Bayanhua group(lithology is dark mudstone)and two sets of hydrocarbon source rock are T1 and Aershan group.The Jurassic also have development of hydrocarbon source rocks, mainly in the middle and lower Jurassic,of which lithology is dark mudstone, carbonaceous mudstone and coal.Reservoir types including clastic rocks , volcanic rocks, pyroclastic rocks, metamorphic rocks and carbonate rocks.Cover layer is mainly for mudstone cap rocks in the Tenggeer group and Aershan group.In Erlian basin, the main oil and gas layers are mainly concentrated in the lower Cretaceous, but we also can find the Jurassic oil and gas in part of the depression.

(6) exploration breakthrough of Jurassic in the surrounding area of Hailar - Erlian basin

Tuquan basin developed two sets of hydrocarbon source rocks. The Hongqi group mudstone sedimentary is thicker, with a certain spatial distribution and high organic matter abundance of mudstone.The organic matter is in the stage of mature to high mature evolution ,belonging to type two,and have good material basis for hydrocarbon generation .Wanbao group of dark mudstone, argillaceous siltstone also have certain hydrocarbon-generating potential.In reservoir, Hongqi group and Wanbao group of conglomerate and conglomeratic sandstone can be used as a good reservoir.In capping conditions, the mudstone section developed in coal measures strata in Baotu basin, provides several seals or interlayer for each layer.Widespread distribution of middle and late Jurassic volcanic rocks association, formed a thick layer of oil and gas blocking or sealing, for which oil and gas migrate and accumulate largely .

Wulangai basin , two sets of hydrocarbon generations, the mudstone in the lower Jurassic Hongqi group sedimented thicker.The organic matter abundance higher , in the mature stage, has a good hydrocarbon generation potential.Lower Cretaceous Damoguaihe group mudstone sediment thicker, has a larger spatial expansion scale. The organic matter is in the mature stage, with a high abundance of mudstone, also has a very good hydrocarbon generation potential.In reservoir, glutenite in the lower Cretaceous Damoguaihe group , siltstone and glutenite in the lower Jurassic Hongqi group, and middle Carboniferous Amushan group bioclastic limestone, glutenite and sandstone can serve as a good reservoir. In capping conditions, the upper Jurassic Manketouebo group, Manitu group and Baiyingaolao group of volcanic rocks and Damoguaihe group mudstone and silty mudstone, can be used as a cap rock.

IV. CONCLUSION

1. the features of Jurassic prototype basin in Hailar - Erlian basin is not clear.

The prototype basin of Hailar - Erlian basin in Cretaceous is basically clear, but the Jurassic lithologic basin characteristics is not.From the tectonic evolution study, the Santanghu basin and Yine basin are in the midwest of Tianshan – Xingmeng orogenic belt, the Sangtanghu basin in Jurassic is depression basin,and Yine basin in Jurassic is fault basin.The study of Erlian basin reveals early Jurassic occurred extensional tectonic activity and late Jurassic tectonic evolution process of inversion. But regional geology research shows that the Jurassic influenced by mantle material upwelling, Ehuocike ocean closed and the subduction of Yizuonaiqi oceanic plate, experienced the extension in early Jurassic, extrusion in middle Jurassic and complex tectonic deformation process in late Jurassic.It has certain differences with earlier basin evolution. In addition, structural evolution and prototype basin recovery in Jurassic Hailar Basin is almost blank.Therefore, Jurassic Hailar - Erlian basin prototype basin including is faulted basin or transtensional basin or depression basin.It needed further study about the basin pattern, scope, forming time, mechanism, whether experienced tectonic inversion and the reversal time , the lithofacies paleogeographic characteristics and so on.

2. the stratigraphic classification and correlation of Jurassic is not uniform

Although Hailar - Erlian basin belongs to a stratigraphic division, but now the field outcrop Jurassic stratigraphic division and basin division is not consistent, do not have a unified stratigraphic division between basin and basin, such as in the field use the dividing sheme for Hongqi group and Wanbao group.Erlian basin in Jurassic is divided into Aqitu group,Gerile group,Qiha group,Hugeqiletu group and Hegenshan group,and the hailar basin in Jurassic and Triassic does not distinguish strictly, and are collectively referred to Budate group.Although some scholars realized the existing problems and carried on the preliminary research, in the current division and correlation is still confused .Therefore, we need to establish a unified division scheme, outcrops outside the basin , basin drilling and seismic should be conduct unified classification comparison.Moreover, establish a unified stratigraphic correlation framework.

3. the limit of Jurassic hydrocarbon source rock

We have a preliminary understanding about Erlian basin in Jurassic hydrocarbon source rock development. Erlian basin, the middle and lower Jurassic is moderate to good hydrocarbon source rocks and the quality of

hydrocarbon source rock is consist with Tuha ,Santanghu ,Jizhongsuqiao area. But only five sag hydrocarbon source rock have been evaluated,others need further study . In the east field out of Hailaer basin discovered Jurassic Nanping group (Wanbao group) carbonaceous shale, but can not currently reveals the strata in Hailar Basin, the distribution and hydrocarbon generation potential remains to be further in-depth study.This severely restricts Jurassic resource evaluation in two basins.

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