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Source analysis of Putaohua reservoir in Gulongnan area

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Abstract: **-** The source analyses, which is to determine sediment source location and the nature as well as the process of moving path, which can also reflect the whole process of the basin structural evolution, is important analysis of basin evolution and restore the ancient environment of the basis. Gulongnan region is located in Daqing, Heilongjiang province, and it located in the central depression area in northern Songliao basin—southern of Gulong sag. The area is under the control of the system of multiple source, thereby dividing each source system control is of great significant to determine sedimentary microfacies types, sedimentary evolution and sedimentary microfacies distribution and predicting favorable facies belt development area .

Key words*: The provenance analysis, Basin evolution, Sedimentary microfacies*

I. INTRODUCTION

Provenance analysis has become an essential research topic for a basin; it is connected to the sedimentary basin and orogenic belt. Its research content includes not only the analysis of source location and parent rock area, the nature of the rocks and the characteristics of the portfolio, also includes sediment transport distance and transport way: according to provenance analysis data, we can further learn the provenance tectonic background and climate conditions, make out sedimentary microfacies and sedimentary system, so as to determine the plane microfacies distribution. With the improvement of modern science and technology means, provenance determination method is also increasing, and constantly supplement and complete. The more used methods are: heavy mineral method, clastic rock method, sedimentary method, geochemical method and isotope method, etc. The research object is mainly rock, mineral composition and their combination, the basis lies in the different source in the process of sediment transport and deposition will have different lithology and facies and geochemical characteristics of the response. According to the collection of relevant information, we apply heavy mineral analysis in the study area, the characteristics of the application of heavy mineral analysis, ZTR index analysis combined with sand ground than map for integrated study of the content source direction.

II. THE PROVENANCE ANALYSIS

2.1 Heavy mineral method

Because of its wear resistance and strong stability, heavy mineral can more retain its parent rock characteristics, and applied in the provenance analysis. The method includes single mineral analysis and heavy mineral combination analysis.

2.1.1 Single mineral analysis method

Heavy mineral analysis of single mineral grains mainly include: pyroxene, hornblende, epidote, staurolite, garnet, spinel, chlorite, tourmaline, wrong stone, apatite, rutile, chin iron ore and olivine, etc. we can analyze the content of the mineral, chemical composition and its types, optical properties, etc. by electronic probe, for each of the heavy mineral characteristics and specific element content, with the typical chemical composition determination figure or index to determine the content source.

2.1.2 Heavy mineral group legal

There is a strict symbiotic relationship between the heavy mineral, so the heavy mineral combination is extremely sensitive indicator of source change. In the same sedimentary basin, at the same time the sediment of

detrital component is consistent, but in different periods of sediment contained detrital material is different, accordingly, the use of different period's horizontally heavy mineral type and content of variation, suggests the direction of the source material.

2.2 Clastic rock class analysis method

2.2.1 Sandstone

The clastic components of clastic rock and structure characteristics can directly reflect the provenance and tectonic environment of sedimentary basins. Due to the weathering detrital material in the process of handling, with the increase of transportation distance, the farther the distance from source, the more fine sediment particle size, the better separation, particle grinding degree is higher, and sandstone percentage gradually decrease, reservoir sandstone percentage is also one of the ways to determine source direction. Thus Provenance direction can be judged by sandstone percentage plane change rule source direction.

2.2.2 Conglomerate

Conglomerate gravel composition, gravel path in such change is to determine the source of direct evidence. We can use different constituents in gravel content, particle size and white points than of statistical data to distinguish the main lithology of source rocks, transporting distance. Graded layer, gravel sorting, rounded; breccia body shape can also be used as a useful reference.

3. Gulongnan area Putaohua reservoir sediment source analysis

3.1 Analysis of heavy mineral

The main application to determine its provenance of the study area is heavy mineral analysis method. Through the analysis of single well heavy mineral content in the study area show that GuLongNa Putaohua oil layer contains heavy mineral include zircon, tourmaline, epidote, illite, black mica, garnet, amphibole, chlorite, titanium white stone, sphene, etc. Contains the main heavy mineral zircon (38.80% 81.76%), titanium white stone (0-47.2%), epidote (0-5.48%), biotite (0-5.8%), tourmaline (0-4.17%), and the total content of heavy mineral of about 90%. The rest of the secondary mineral, accounting for the rest of its total 4.25% - 16.1% .This study also mainly used zircon, titanium white stone, magnetite, siderite four main heavy mineral. Usually according to heavy mineral weathering resistance size, heavy mineral can be divided into two types: the stable and unstable heavy mineral. Stability of heavy mineral include rutile, white titanium ore, zircon, tourmaline, garnet and staurolite；While unstable include epidote, hornblende, magnetite, etc., Stability of heavy mineral feature weathering resistance ability, wide distribution and its content is relatively higher away from the provenance；On the other，unstable heavy mineral weathering resistance is weak, not widely distributed, and away from the provenance of its content is relatively less.

Stability coefficient of heavy mineral refers to relative stable heavy mineral content and the ratio of the relative contents of heavy mineral unstable type, with the increase of transportation distance, the stability coefficient increases gradually. Accordingly can according to heavy mineral plane stability coefficient change law judge provenance and source direction. With the increase of transportation distance, the stability coefficient increases gradually. Accordingly can according to heavy mineral plane stability coefficient change law judge provenance and source direction.

We select four heavy mineral, include steady heavy mineral: leucoxene and zircon; unstable minerals: magnetite, siderite. Isoline distribution of heavy mineral stability coefficient in the study area (Fig 3.1)shows that , GuLongNa Putaohua oil layer heavy mineral stability coefficient, on the whole from west to east, from north to south has a gradually increasing trend, Putaohua reservoir is mainly affected by the northern provenance and western provenance, ancient flow basically has two, one of this mainly from northwest to southeast, and the other from the northeast to the southwest, and it is mainly controlled by the northern provenance.

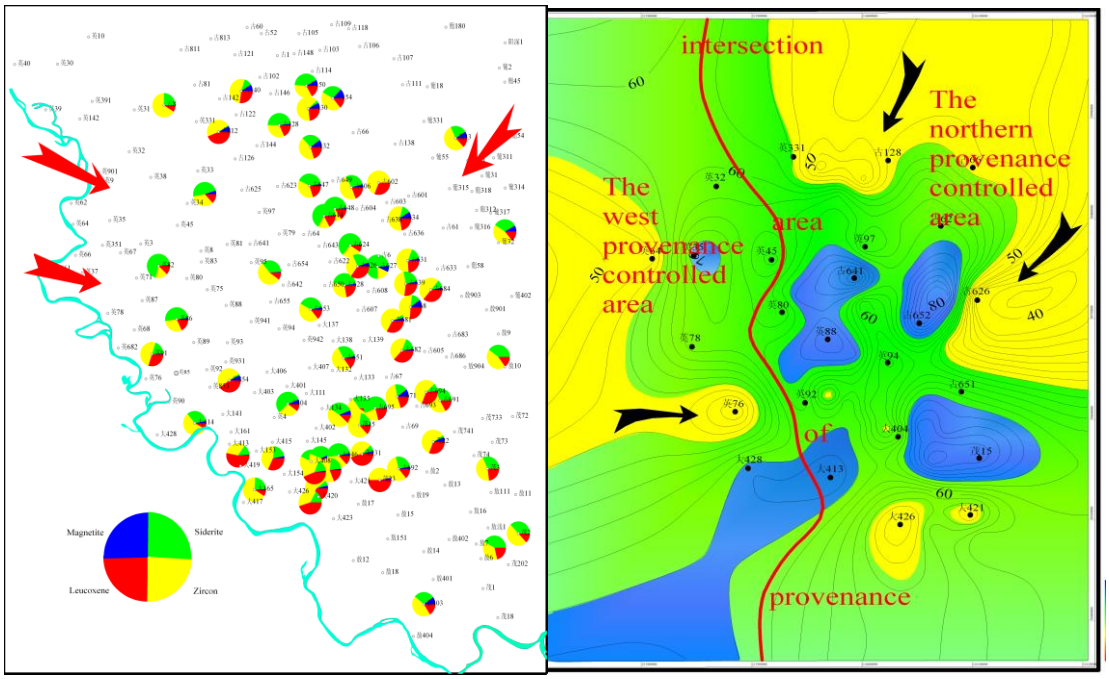

Fig3.1 The heavy mineral combination and stable coefficient distribution in the study area

3.2 The sandstone percentage

Due to the clast in the process of handling, with the increase of transportation distance, the farther the distance from source, the more fine sediment particle size, the better separation, particle grinding degree is higher, and sandstone percentage gradually decrease, reservoir sandstone percentage is also one of the ways to determine source direction. Thus source direction can be judged by sandstone percentage plane change rule.

The analysis of GuLongNa areas in Putaohua reservoir sand ground than the equivalent figure features can be seen, sandstone percentage showed high in northwest and north, and gradually reduce to south east direction, thus can generally reflect the provenance of Putaohua oil layer is located in the north and west in the study area (Fig3.2).

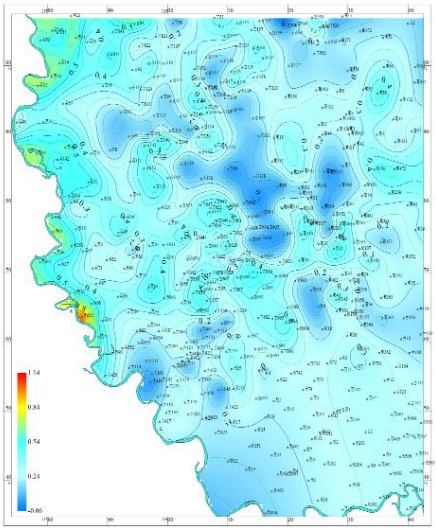

Fig3.2 GuLongNa Putaohua reservoir sand ground than the equivalent figure

Comprehensive the above analysis, combining previous research results can be determined; GuLongNa area Putaohua reservoir is mainly controlled by the northern and northwestern source.

III. CONCLUSION

Provenance analysis in the study area, through the heavy mineral analysis and clastic rock class analysis to obtain the very good proof draw a conclusion: (1) Through the ZTR index distribution, it can be seen that the study area is mainly controlled by the northeast and west provenance. On the control range, northern provenance dominant. (2) In the intersection area of coring wells were observed in the film of siltstone, thin layer with grey silty sandstone layer, the boundary is not clear, we think it is the intersection of the source. (3) Through the sandstone thickness contour map, sand body development, northern south gradually decreased; Sand body very development in the west and southeast to thin, also can draw the same conclusions.

Based on the analysis of the source, has the following for the sedimentary microfacies and phase plane distribution, laid a solid theoretical foundation.

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