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The control of tectonic evolution on hydrocarbon accumulation

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Abstract: The tectonic evolution of the basin is the important content of the analysis of sedimentary basins. Tectonic evolution and its characteristic determine the shape and scope of the basin, and determine the various elements of petroleum geology. Tectonic evolution along with the long-term tectonic movement, produces a series of faults, fractures and various tectonic phenomena, controls and affects the basin hydrocarbon source rock, reservoir and seal development, restricts hydrocarbon evolution and hydrocarbon migration process and storage conditions, so as to control the formation and distribution of oil and gas reservoirs.

Key words: Tectonic evolution, Hydrocarbon generation, Gas reservoirs

1. Introduction:

Tectonic movement, regulate and control the distribution of hydrocarbon basins stereotypes final hydrocarbon accumulation and eventually finalize the oil and gas fields. And other tectonic history in different parts of different experiences, so as to have different evolutionary stages of construction, but in restricting hydrocarbon accumulation of various geological conditions, the impact of tectonic evolution throughout each reservoir of hydrocarbon generation, migration, accumulation and preservation conditions. Tectonic evolution of the long-term and multi-phase activity controls the depositional basin-fill deposition process and its evolution. At different times, with different evolution, resulting in different tectonic movement characteristics, fracture combination types, controls or provenance Palaeogeomorphology and ancient climate and other factors, the study of hydrocarbon source rock evolution, hydrocarbon accumulation, hydrocarbon cracking and late hydrocarbon accumulation process is of great significance.

2. Control of tectonic evolution of hydrocarbon source rock and evolution

2.1. Development and distribution of source rocks

Source rocks are mainly distributed in the sedimentary basin subsidence in the long-term sustainability, and the setting time, the relationship between the deposition rate and the sedimentation rate determines the vertical development and horizontal distribution of source rocks. If the sedimentation rate exceeds deposition rate, a sharp change deep water, after biological death, sinking process vulnerable to thick body of water contained in the oxidation of oxygen is destroyed; Conversely, if the subsidence rate is less than the deposition rate, rapid shallow water, even the basin rise to the land, the sedimentary exposed to the surface, vulnerable to organic matter in the air oxidation of organic matter is not conducive to the accumulation and preservation. Only long lasting sinking process is accompanied by appropriate movements, when sedimentation rate and deposition rate similar to or slightly larger than the former, in order to maintain a lasting reduction environment conducive to the preservation of the original organic matter, making it easy to form a deposit thickness, burial depth, the ground temperature high gradient of source rocks.

2.2. Organic matter abundance and type of source rocks

Differences tectonic evolution of source rocks can cause abundance and type of change, distribution of source rocks by style and depositional environment of the basin controlled enrichment of source rocks is mainly controlled by tectonic basin scale, continuous structure time and tectonic activity and structural strength of times.

Due to differences in the basin tectonic evolution of different, resulting in the distribution, types of source rocks, as well as different types of spatial distribution of the organic phase. By tectonic uplift of source rocks, shallow burial, maturity is relatively low, amounting to less than effective hydrocarbon threshold, it will not become a major hydrocarbon source rock system; on the contrary, if the period of tectonic movement is deep depth, experience tectonic evolution of the long-term, relatively high maturity of source rocks will be a good layer of oil and gas.

2.3. Control the thermal evolution of source rocks

Hydrocarbon source rocks in the process depend on temperature history and burial history it had experienced and burial history and tectonic evolution geothermal basin constrained by history. Due to the different tectonic evolution stages, there is a significant difference between the thermal evolutions of source rocks in construction sites. Settlement of long-term succession Sag Basin, Sag center due to its slope deposition differential settlement conditions, thermal evolution there is a big difference between the two. Depression center of hydrocarbon source rocks buried deep center parity, high temperature and organic matter is subjected to a temperature increase and heat for a long time, priority to enter the hydrocarbon generation period, while the slope area relatively shallow depth, organic matter can not reach the threshold of hydrocarbon generation, the thermal evolution of relatively low, a relatively small amount of hydrocarbon, the latter through the multi-stage tectonic evolution in order to enter a large number of hydrocarbon (as shown in Figure1), the long-term uplift and erosion inevitably affects the thermal evolution process of hydrocarbon source rocks..

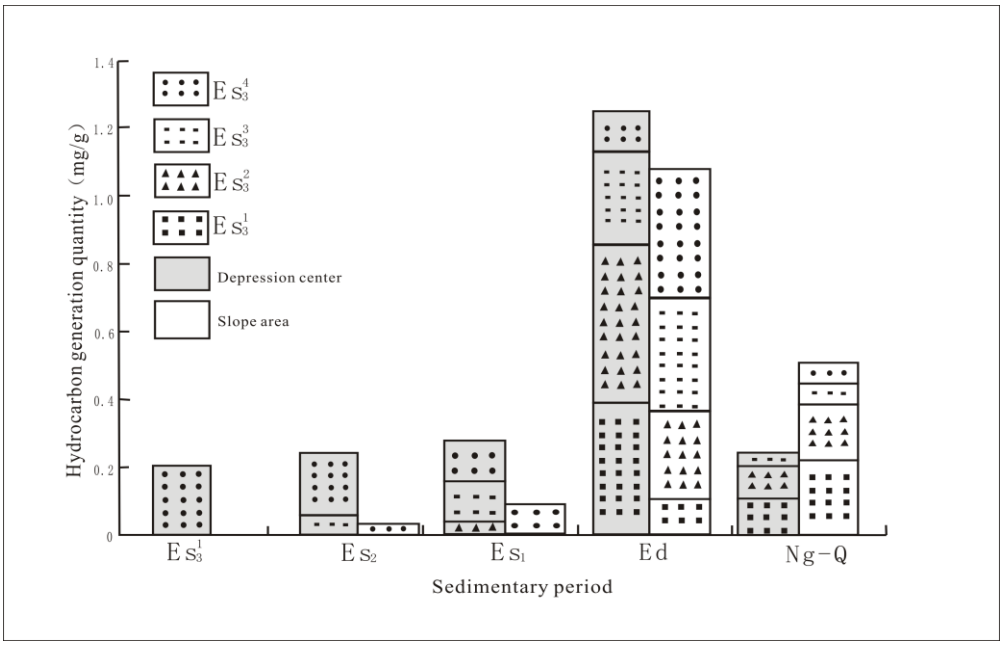

Figure 1.1A comparison of hydrocarbon quantity in depression center and the slope area

3. Control of tectonic evolution on hydrocarbon reservoir cap portfolio

3.1. Reservoir conditions

Reservoir space includes pores, cracks and holes. Primary porosity is mainly controlled by sedimentary factors, secondary pores are mainly controlled by diagenesis, and the crack is mainly controlled by the late tectonic movement.

Tectonic activity can lead to periodic variations of space that can accommodate the size of the

sedimentary basin. When the accommodation space is enough big, the rate of growth of space is larger and sediment supply relatively insufficient, the grain size of sediment mainly deposited in fine particles; while when the accommodation space is small or the rate of growth is lesser, give priority to with coarse sediment. Sedimentary basin can accommodate changes in space, affecting the oil and gas within the reservoir-cap space matching relation. T Such sedimentary cycle control the biological reproduction, preservation and transformation of the ancient topography, ancient geology, paleoclimate and sedimentation rate and other conditions of the formation of oil and gas, but also decided that reservoir and cap rock development, thereby affecting the reservoir cap portfolio diversity. Due to the deposition of a multi-cycle resistance, in sedimentary basin is also prone to frequent sandstone and mudstone interbedded.If the source rocks of mudstone, interbedded will form a type of reservoir and cap at this time mudstone layer is both source and cap rock, which is important for the formation of oil and gas accumulation and large reservoirs.

3.2. Sealing conditions

Sealing Condition on the oil and gas accumulation and preservation of oil and gas reservoirs have an important role in the evolution of the ability to cover the major sedimentary environments and sedimentary conditions, and diagenetic, epigenesis and intensity of tectonic movements are also factors restricting sealing condition. Tectonic uplift can cause the formation of such cap suffered broken or eroded, it will give the whole reservoir spatially eroded and disappeared completely.

4. Control of tectonic evolution on traps

Traps are a necessary condition for the formation of oil and gas reservoirs. Tectonic evolution results in different faulting, sedimentary basin tectonic pattern such different styles as well as multiple phases, structural styles of different nature, thus the formation of different types of traps for hydrocarbon accumulation provides a good condition. Tectonic movement lead to deformation or displacement strata formed structural traps. For example, due to the tectonic strata make bending forming anticline. The tectonic movements accompanied by a large number of cracks and magma or karst, which provides favorable conditions for the formation of lithologic traps, traps and compound fractured reservoir.

Tectonic evolution can form different structural styles, and the relation between a structure and style between depositional systems determine the favorable structural lithologic facies distribution, thereby affecting the development and distribution of traps. Years of petroleum exploration data indicate that: Scroll half-duplex and half-graben graben structure styles and delta front and delta plain system configuration is the most mutually advantageous structure and lithological zone, which is the hydrocarbon accumulation of favorable facies belts.

5. Control of tectonic evolution on hydrocarbon migration process

After the initial hydrocarbon migrating into the reservoir, the control by episodic tectonic movement, but also the occurrence of secondary migration of oil and gas will give priority to filling in favorable structural facies, tectonic evolution of this process is affected by the constraints.

Tectonic evolution, along with the very active faulting, abundant developmental faults and fractures, is favorable channel for hydrocarbon migration underground. Fault system can be connected to different parts of the longitudinal source rocks and traps, it is an important bridge of oil and gas in the underground migration; transverse faults can cross different times strata, oil and gas long-distance transport channel advantage. On many vertical distance deep formations of source rocks in shallow reservoirs, faults play an important role in the channel. As seen from the northern Songliao Basin oil and gas distribution and oil-source correlation analysis, the gas reservoirs are mainly along the deep gas migration and accumulation into breaking up. Tectonic

evolution of the periodic migration will lead to many oil and gas, to change the distribution pattern of oil and gas. Tectonic activity controlled hydrocarbon accumulation period, the result of tectonic movements more and more of the accumulation process, every regional tectonic activity formed a group of traps, once oil and gas expulsion, migration and accumulation, accumulation process, such a "curtain "type of process is conducive to the formation of large reservoirs.

6. Control of tectonic evolution on hydrocarbon preservation conditions

Hydrocarbon source rocks can generate aggregate accumulation; it has an important relationship with hydrocarbon preservation conditions. Reservoirs during the formation and preservation conditions and tectonic evolution of the basin after the formation have a very close relationship.

Good regional seal is an important barrier to make oil and gas in basin from the destruction. The lithologic generally have mudstone cap rocks, cream rocks and carbonate rocks, and as a regional cap generally must be cream mudstone rocks combined into rock formation. Gypsum rock with high plasticity and poor permeability and porosity, affected by tectonic movement is not easy to fracture, s best suited as a regional cap rock types. Tectonic evolution within the region is generally accompanied by intense tectonic movement which can cause ground uplift, so the cap layer has been eroded, lost a lot of oil and gas; tectonic movement will produce a series of fault, if fault disconnect cap to the surface, then cause loss of oil and gas or suffer oxidation, even the destruction of oil and gas reservoirs; tectonic movement will be accompanied by a series of magmatic activity and thermal evolution of motion, oil and gas will be burned by high temperature , which is also a disadvantage for hydrocarbon preservation.

7. Conclusion

Tectonic evolution of the control of the various reservoirs accumulation factors, controls the distribution of source rocks, thermal characteristics and evolution, the type of reservoir and cap combination, the type and distribution of traps, and affects the oil and gas preservation conditions, is of great significance for the analysis and exploration of oil and gas distribution containing reservoir basin.

References

[1]. ZHANG Yonghui, XIA Bin, Controls on the Hydrocarbon Accumulations in the Chexi Sag [J]. Geotectonica ET Metallogenia, 2010.11, 593-598.

[2]. Pang Xiongqi, ZHOU Xinyuan, Hydrocarbon Reservoirs Formation, Evolution, Prediction and Evaluation in the Superimpose Basins [J]. Acta geological sinica, 2012.1, 1-10.

[3]. YUAN Qing-dong, LI Ben-liang, he tectonics evolution and lithofacies palaeogeography in the northwest of the Sichuan Basin [J].Journal Of Daqing Petroleum Institute, 2010, 34(6):42- 52.

[4]. Li D. The principal characteristics of the lithosphere of China [J].Geoscience Frontier, 2010, 1(1): 45-56.

[5]. Wang D Z, Shu L S, Faure M, et al. Mesozoic Magmatism andGranitic Dome in the Wugongshan Massif, Jiangxi Province and Their Genetical Relationship to the Tectonic Events in Southeast China [J]. Tectonophysics2001, 339, 259-277.、

[6]. Li Z X, Li X H. Formation of the 1300-km-wide intracontinentalorogen and postorogenic magmatic province in Mesozoic South China: A flat-slab subduction model [J]. Geology, 2007, 35(2): 179-182.