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Structural Evolution and Characteristics Analysis of Carboniferous in Zhundong Area

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Abstract

In this paper, the tectonic evolution and characteristics of the Carboniferous in the eastern Junggar Basin (Zhundong area) are studied in detail, aiming to reveal the tectonic evolution history of the area and provide geological basis for deep oil and gas exploration. The study area is located in the eastern Junggar Basin. It has undergone multiple tectonic evolutions and formed a complex fault system and a chessboard distribution pattern. Due to the strong tectonic movement and denudation, the Paleozoic geological information is seriously lost and the drilling data is scarce, which restricts the resource evaluation and exploration decision-making. The results show that the tectonic evolution from Carboniferous to Cenozoic in Zhundong area has the characteristics of multi-cycle and multi-stage. In the early Carboniferous, the regional extension led to the formation of rift basins, and the shallow sea-coastal clastic rocks in the upper part of the Songkalsu Formation (C_1sb) were deposited. In the middle Carboniferous, intense volcanic activity formed the volcanic rocks and pyroclastic rocks of the Batamayineishan Formation (C_2b). In the late Carboniferous, the tectonic stress field was adjusted, and the sea-land alternating strata of the Shiqiantan Formation (C_2sh) were deposited. During the Permian period, the basin experienced lacustrine deposition and compressional tectonic events, forming high-quality source rocks and structural traps. From Triassic to Jurassic, the basin entered a relatively stable depression sedimentary stage, and local structural changes affected oil and gas migration and preservation. Influenced by the India-Eurasia plate collision in the Cenozoic, the tectonic activity was strong, and the thrust faults and closed folds readjusted the oil and gas distribution pattern. Through seismic profile interpretation and stratigraphic analysis, this paper reveals the tectonic evolution history from Carboniferous to Cenozoic in Zhundong area, and clarifies the influence of tectonic events in different periods on the geological structure and hydrocarbon accumulation conditions of the basin. The research results provide an important geological basis for deep oil and gas exploration in the eastern Junggar Basin.

Keywords

Eastern Junggar Basin, Carboniferous, Tectonic Evolution

1. Introduction

The study area is located in the eastern part of the Junggar Basin (the eastern part of the Junggar Basin). The Junggar Basin is located in the northwest of China. The north and south are bounded by Bogda Mountain and Kelameili Mountain, including depressions and bulges. The overall distribution pattern is a typical superimposed basin with abundant oil and gas resources in China (Li, 2002). The discovery of the carboniferous thousand trillion cubic large gas field in Kelameili Mountain also further proves the resource exploration potential of Junggar Basin (PetroChina Xinjiang Oilfield Company, 2018). After the formation of the Carboniferous basement, the basin in the eastern Junggar Basin has undergone multiple tectonic evolutions. Due to the different stress mechanisms in each tectonic period, different fault systems have been formed, which further complicates the basin structure. Due to the strong tectonic movement in the Zhundong area, the Paleozoic in the surrounding area is widely denuded and the geological information is lost. Due to the special geological conditions in the Zhundong area, the drilling data is scarce and the geological data is less. The study of the Carboniferous in the Zhundong area is relatively weak, which seriously restricts the resource evaluation and exploration decision-making in the Zhundong area. In view of the above problems, this paper systematically studies the structural evolution characteristics of the Carboniferous in the Zhundong area through comprehensive seismic profile interpretation, stratigraphic correlation and structural evolution analysis, aiming to provide key geological basis for deep oil and gas exploration.

2. Regional Geological Background

The northern part of the eastern Junggar Basin borders on the Kelameili Mountain, and the southern part is bounded by the Yilianhabierga Mountain and the Bogda Mountain. It can be divided into the quasi-northeast zone, the quasi-east central zone, and the quasi-southeast zone. The northern zone includes the Zhaobei fault fold belt, the Shishugou Depression, the Huangcaohu Uplift, the Shiqiantan Depression, the Heishan Uplift, the Wutongwozi Depression, and the Qitai Uplift. The central zone of the eastern Junggar Basin includes the Beisantai Uplift, the Jimsar Depression, the Guxi Uplift, the Gucheng Depression, the Gudong Uplift, the Mulei Depression, and the Santai Uplift. Bogda fault fold belt, including the western margin, the northern margin, Bogda mountain belt; the southeastern zone contains three-level tectonic units such as Yongfeng sub-sag Sangezhuang bulge and Dabancheng sub-sag. The whole presents a "chessboard" distribution pattern.

The Zhundong area presents different tectonic environments in different geological ages. It has experienced complex intracontinental tectonic deformation. Due to the complex tectonic activities, the Junggar Basin is a typical multi-cycle superimposed basin. There are different views on the evolution of Junggar Basin.Some scholars believe that from Devonian to Quaternary, the basin can be divided into four stages: 1) Devonian to Carboniferous marine basin stage, 2) Permian foreland basin stage, 3) Triassic to early Tertiary depression basin stage, 4) Late Tertiary to Quaternary foreland basin stage. It is generally believed that the Carboniferous to Permian in the Junggar Basin is a transitional stage from marine facies to continental facies. The Carboniferous of Junggar is under the background of extrusion, forming the basin basement of Junggar. From late Carboniferous to early Permian, most parts of the basin uplifted, and the strata suffered from different degrees of erosion. From the Middle Permian to the Jurassic, the basin was in an extensional tectonic background, and a series of fault depressions and depressions were developed. From the Late Jurassic to the Oligocene, the Indosinian movement and the Yanshan movement had a great influence on the basin. The basin attributes are mainly intracontinental depression basins and foreland basins. After the Oligocene, the basin is in the foreland basin stage (Li & Zhang, 2010). The tectonic evolution of the Junggar Basin has the characteristics of multi-cycle. In different periods and different tectonic units, the basin has different tectonic characteristics and structural styles.

3. Distribution Characteristics of Regional Strata

The oldest strata drilled in the eastern Junggar Basin is Carboniferous. According to the stratigraphic division scheme, the Carboniferous to Quaternary in the basin is divided into the upper section of Songkalsu Formation (C1sb), Batamayine Formation (C2b), Shiqiantan Formation (C2sh), Jingjingzigou Formation (p2jj), Lucaogou Formation (p2l), Wutonggou Formation (p3wt), Jiucaiyuan Formation (T1j), Shaofanggou Formation (T1S), Xiaoquangou Group (T2-3xq), Badaowan Formation (J1b), Sangonghe Formation (J1s), Xishanyao Formation (J2x), Toutunhe Formation (J2t), Qigu Formation (J3q), Kalazhazu (J3k), Tugulu Group (K1tg), Neogene (E). Quaternary (Q).

The stratigraphic distribution in the eastern Junggar Basin shows obvious cyclicity and difference. The stratigraphic distribution from Carboniferous to Quaternary reflects the superposition effect of multiple tectonic movements. The Carboniferous strata are dominated by rift basin deposits, the Permian is characterized by lacustrine deposits, and the Triassic and Jurassic are characterized by stable depression deposits. The Cenozoic strata are affected by the India-Eurasia plate collision, showing strong tectonic deformation and strata denudation. In general, the sedimentary center of the strata has undergone multiple migrations in different periods, reflecting the complexity of the tectonic evolution of the basin. Through the combination of well and seismic, the horizon is calibrated. Taking well J1 as an example (**Figure 1**, **Figure 2**). E interface is clearly reflected, which is one of the best reflection layers in the study area. Most of K is eroded in the study area, which is a stable marker layer in the whole area. J1b is in unconformity contact with the underlying strata, and the characteristics of coal seam are clear, which is a good marker layer in the study area. T1j is in integrated contact with the underlying strata, with low GR and medium and low resistance. P3wt is in unconformable contact with the underlying strata, the lithology interface is clear, low GR, medium and low resistance, and the reflection horizon is determined. P2l and the underlying strata are integrated contact, low GR, serrated high resistance, clear reflection horizon is determined. P2jj is mainly distributed in Shishugou sag, Jimsar sag and Jinan sag in the work area, which is in unconformity contact with the top surface of Carboniferous system. The lithology is mainly brown and gray mudstone with red and brown glutenite and sandstone. The lithology of C2b is dominated by volcanic rocks and pyroclastic rocks, with low GR and medium-high resistance. C1sb lithology is dominated by sedimentary rocks, mixed with a small amount of volcanic rocks, low GR, toothed and massive high resistance. According to the characteristics of the rock and electricity changes in the vertical strata of the drilled wells, the accuracy of the strata is guaranteed by referring to the special lithology marker layer and the unconformity surface.

stratum				Thickness (m)	Lithology Profile	Lithology Description	Sedimentary Facies
Kingdom	System	Series	Formation				
Cenozoic	Quaternary			200-300		Yellow and yellowish - brown unconsolidated clay, gray and variegated gravel layers.	
	Neogene			800-970		Interbedded light grayish - yellow and brownish - red mudstone and muddy siltstone; variegated fine conglomerate at the base	
	Paleogene			100-310		Greenish - gray and reddish - brown mudstone interbedded with muddy siltstone in the middle and upper parts; reddish - brown and variegated muddy siltstone, siltstone, fine sandstone, and fine conglomerate in the lower part.	
Mesozoic	Cretaceous			0-520		Very thick layers of brownish mudstone and grayish sandy mudstone in the upper and middle parts; very thick layers of gray pebbly conglomerate, sandstone, and conglomerate at the base.	
	Jurassic	Upper Series	Qigu Formation	0-700		Interbedded gray mudstone, sandstone, and siltstone of unequal thickness. Gray mudstone interbedded with sandy mudstone and sandstone.	Braided River Delta Facies
		Middle Series	Toutunhe Formation	0-500		Mainly gray mudstone and blackish carbonaceous mudstone interbedded with light gray and gray muddy siltstone, calcareous siltstone, fine sand, and gravel, occasionally with thin coal seams.	Lacustrine Shore Facies
			Shanxiyao Formation	0-550			Lacustrine - Paludal Facies
		Lower Series	Sangonghe Formation	0-170		Interbedded gray and dark gray mudstone and muddy siltstone in the upper part, thick - bedded fine sandstone in the lower part.	Braided River Delta Facies
			Badaowan Formation	0-560		Mainly gray mudstone and blackish carbonaceous mudstone in the middle and upper parts, interbedded with gray and light gray muddy siltstone, siltstone, calcareous siltstone, occasionally with coal seams; interbedded gray mudstone and calcareous siltstone of unequal thickness in the lower part.	Lacustrine - Paludal Facies
	Triassic	Middle Series	Karamay Formation	0-350		Interbedded medium - thick variegated mudstone, gray muddy siltstone, fine sandstone, and siltstone of unequal thickness.	Fluvial Facies
		Lower Series	Shaofanggou Formation	0-300		Mainly thick - bedded dark brown mudstone and pebbly mudstone, interbedded with thin - to thick - bedded grayish - brown and brownish - gray muddy siltstone and siltstone, with a thick - bedded brownish - gray pebbly medium - grained sandstone at the base.	
			Jiucaiyuan Formation	0-340		Mainly medium - thick to very thick dark brown and dark grayish - brown pebbly mudstone and sandy mudstone, interbedded with thin - to thick - bedded gray siltstone, muddy fine sandstone, and fine sandstone.	
Paleozoic	Permian	Upper Series	Upper Wuerhe Formation	0-450		Thick - bedded gray mudstone and sandy mudstone interbedded with siltstone and fine sandstone, thick - bedded fine sandstone, medium - grained sandstone, conglomeratic sandstone, and gravel in the middle and lower parts.	Fan Delta Facies
		Middle Series	Lucao Formation	0-300		Thick - bedded gray, dark gray, and blackish mudstone, dolomitic mudstone, and carbonaceous mudstone interbedded with dolomite - clastic sandstone, dolomite - clastic dolostone, muddy dolomite, and muddy siltstone.	Saline Lake Facies interbedded with Delta Facies
			Jingjingzigou Formation	0-800		Mainly brown, grayish - brown, and reddish - brown mudstone interbedded with brownish - gray and grayish - brown siltstone and fine sandstone.	Meandering River Delta Facies Lacustrine Shore Facies
	Carboniferous	Upper Series	Bashan Formation	0-300		Well - developed large breccia and andesite.	Volcanic Facies
		Lower Series	Songkaersu B Member	0-800		Large mudstone interbedded with thin tuff and breccia tuff.	Lacustrine Facies
			Songkaersu A Member	400-1000		Large volcanic breccia, tuff, and lava.	Volcanic Facies

Figure 1. Comprehensive histogram of strata in Jimsar sag.

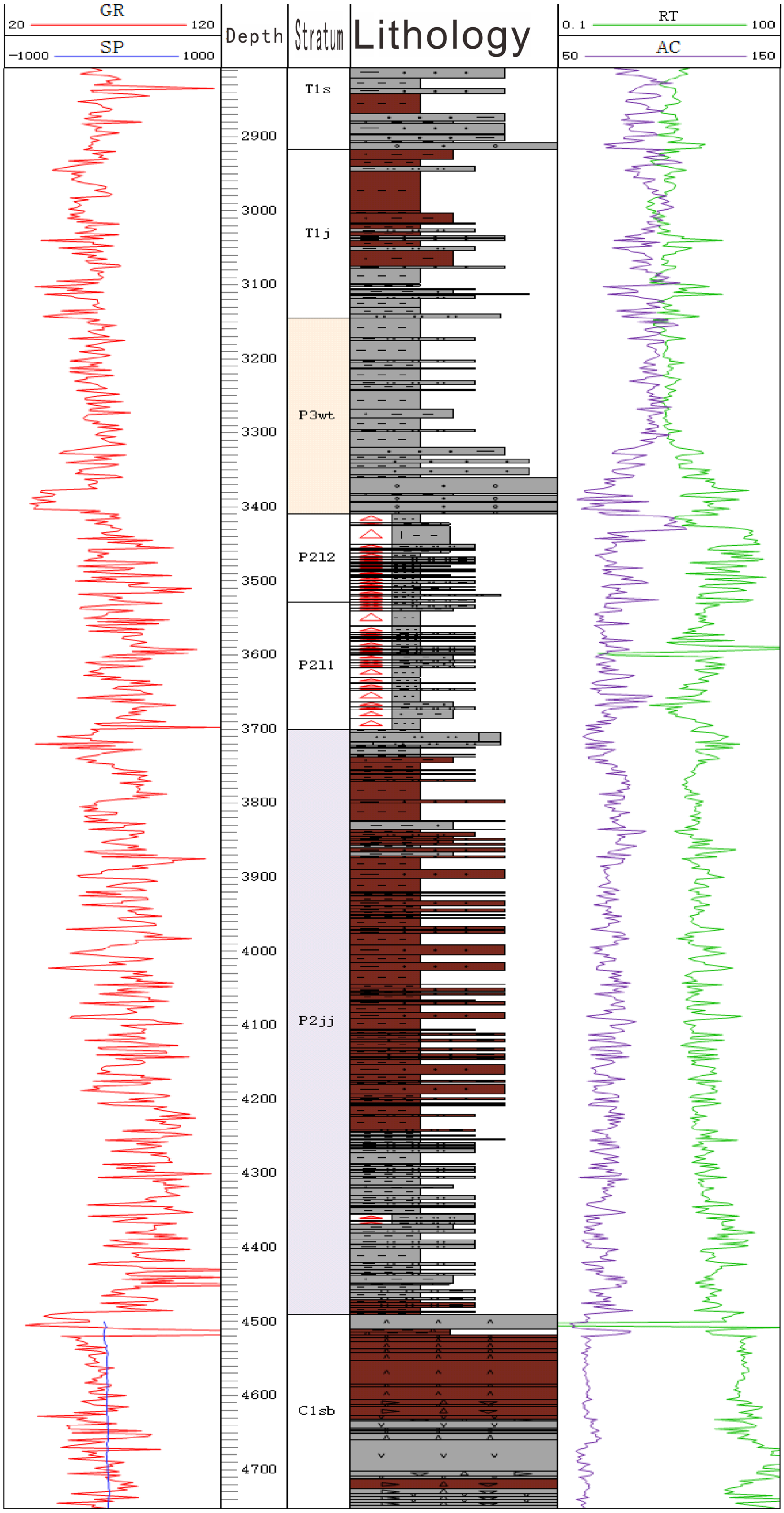


Figure 2. Comprehensive histogram of J1 well drilled in Jimsar sag.

4. Seismic Profile Interpretation

Figure 3, the Fukang fault zone shows significant stratigraphic dislocation in the profile. The fault zone presents a steeply dipping fault interface, which is characterized by a deep and continuous thrust fault with obvious extrusion characteristics. The northern side of the fault zone is characterized by stratum uplift, and local fold structures appear, indicating strong thrust movement, indicating that the fault activity has caused strong deformation to the surrounding strata. The Ji'nan sag is a typical sedimentary low-lying area in the profile. The boundary of the Ji'nan sag is controlled by the influence of the Fukang fault zone and the secondary fault. These tectonic activities lead to the differential deposition of the strata in the sag. Especially in the Cenozoic stage, the activity of faults may further promote the increase of sedimentary thickness. The Jimusar sag is adjacent to the Jinan sag, which is a typical boundary fault depression. The seismic profile shows that the internal sediments are distributed in a wedge-shaped structure, and the thickness of the strata gradually increases from the edge to the center, indicating

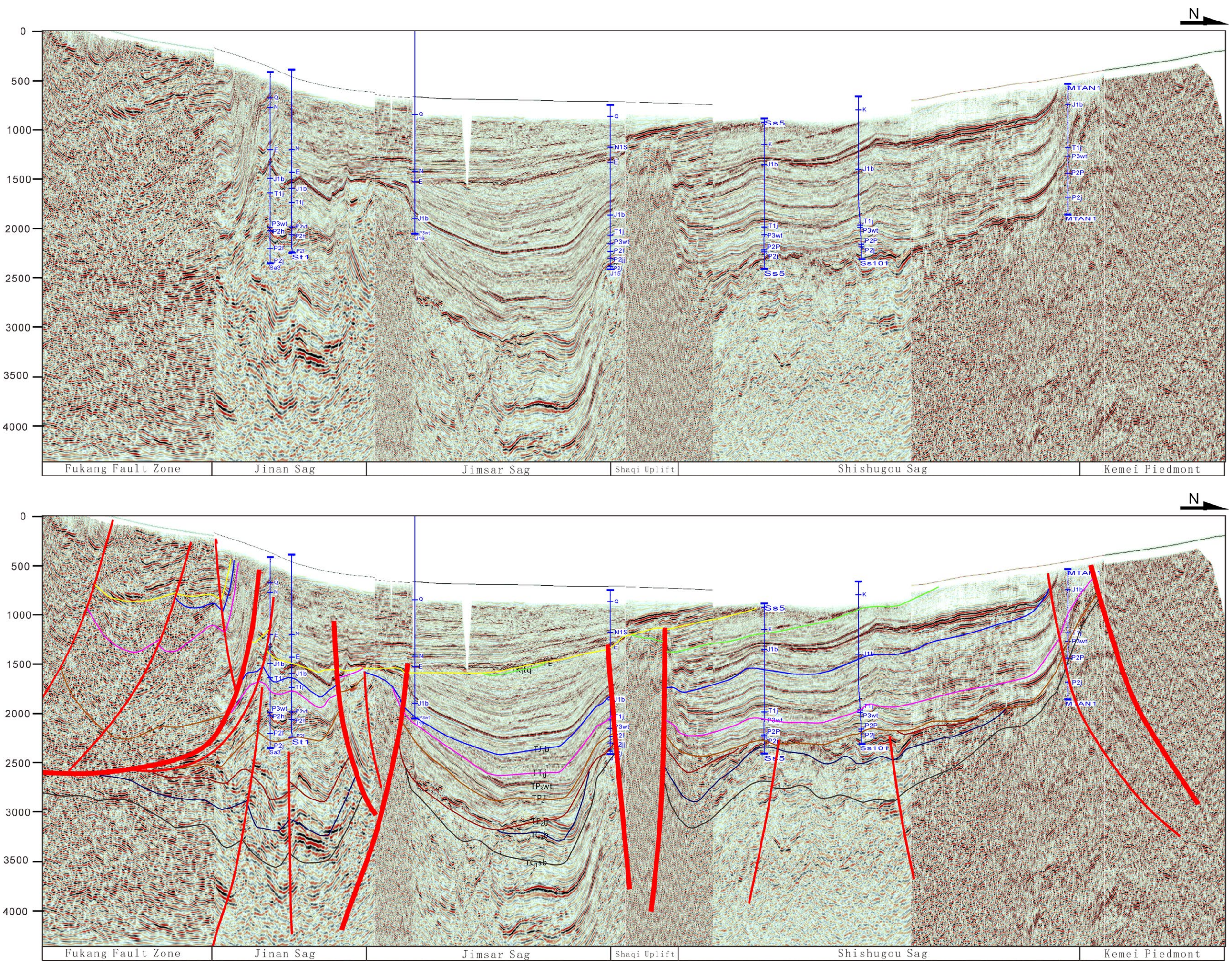


Figure 3. Fukang fault zone-Jinan sag-Jimusaer sag-Shaqi uplift-Shishugou sag-Kemeishan piedmont north-south seismic framework profile in eastern Junggar basin.

that the deposition in the region is affected by fault activity. In particular, the boundary faults of the sag control the distribution of the sedimentary center, and the sedimentary sequence in the sag reflects the characteristics of lacustrine deposits. The Shaqi uplift is a typical structural highland in the section, and the structural form is in stark contrast to the surrounding depression. It is mainly manifested in the obvious thinning of the stratum in the convex area, and the section shows the lack of stratum and the erosion of the overlying stratum. This phenomenon indicates that the Shaqi uplift may have experienced strong tectonic uplift, especially in the late Mesozoic to Cenozoic. As a structural highland, Shaqi uplift plays a barrier role in the sedimentation of surrounding depressions (such as Jimsar depression and Shishugou depression), affecting the source and distribution of sediments. The Shaqi uplift has undergone long-term tectonic evolution, and the early sedimentary strata have been denuded to form the current stratigraphic pattern. The Shishugou sag is small in scale, but it shows a complete sedimentary filling sequence in the seismic profile. The depression is mainly controlled by secondary fault activity, and the reflection characteristics of the sedimentary layer show a gradual thickening trend from the edge to the center, indicating that the sedimentary process is closely related to the fault activity. The piedmont area of the Kemei Mountain is a piedmont thrust tectonic system, which shows obvious fault lines and compressive deformation in the seismic profile.

Figure 4, the north fault-fold belt in the section is characterized by a series of thrust faults and fold structures, and the structural characteristics are complex. The fault-fold zone is composed of several secondary faults. The faults are mainly high-angle thrusts, which significantly affect the deformation of the surrounding strata. The strata show obvious compressive fold morphology in the fault-fold zone, showing wavy bending. It is speculated that the fault-fold zone is an important result of regional compressive tectonic activity. The sedimentary characteristics of the area are denudation, and the reflection interface of the strata at the top of the uplift is discontinuous, which indicates that the denudation has been experienced. The reflection signal of the middle and deep strata (Jurassic-Cretaceous) is relatively weak, and it is speculated that there may be sandstone of lacustrine or delta facies in this area. The Jimsar sag is the most significant sedimentary center in the profile. The thickness of the strata is large, and the reflection interface is parallel and continuous, showing long-term sedimentation. The fault system at the boundary of the sag has played a significant role in controlling the distribution and thickness of the sedimentary layers, especially in the area bordering the Shaqi uplift and the Zhangbei fault-fold belt. Several sedimentary cycles have developed in the eastern Junggar Basin, and the sedimentary center of the strata has migrated many times from old to new. The overall performance is that the vertical continuous deposition and stratigraphic loss are superimposed on each other, and the stratigraphic unconformity is very common. In the eastern part of the basin, the basin base is uplifted as a whole. Whether it is a bulge or a depression, the Permian, Triassic, and Cretaceous are all subjected to large-scale erosion.

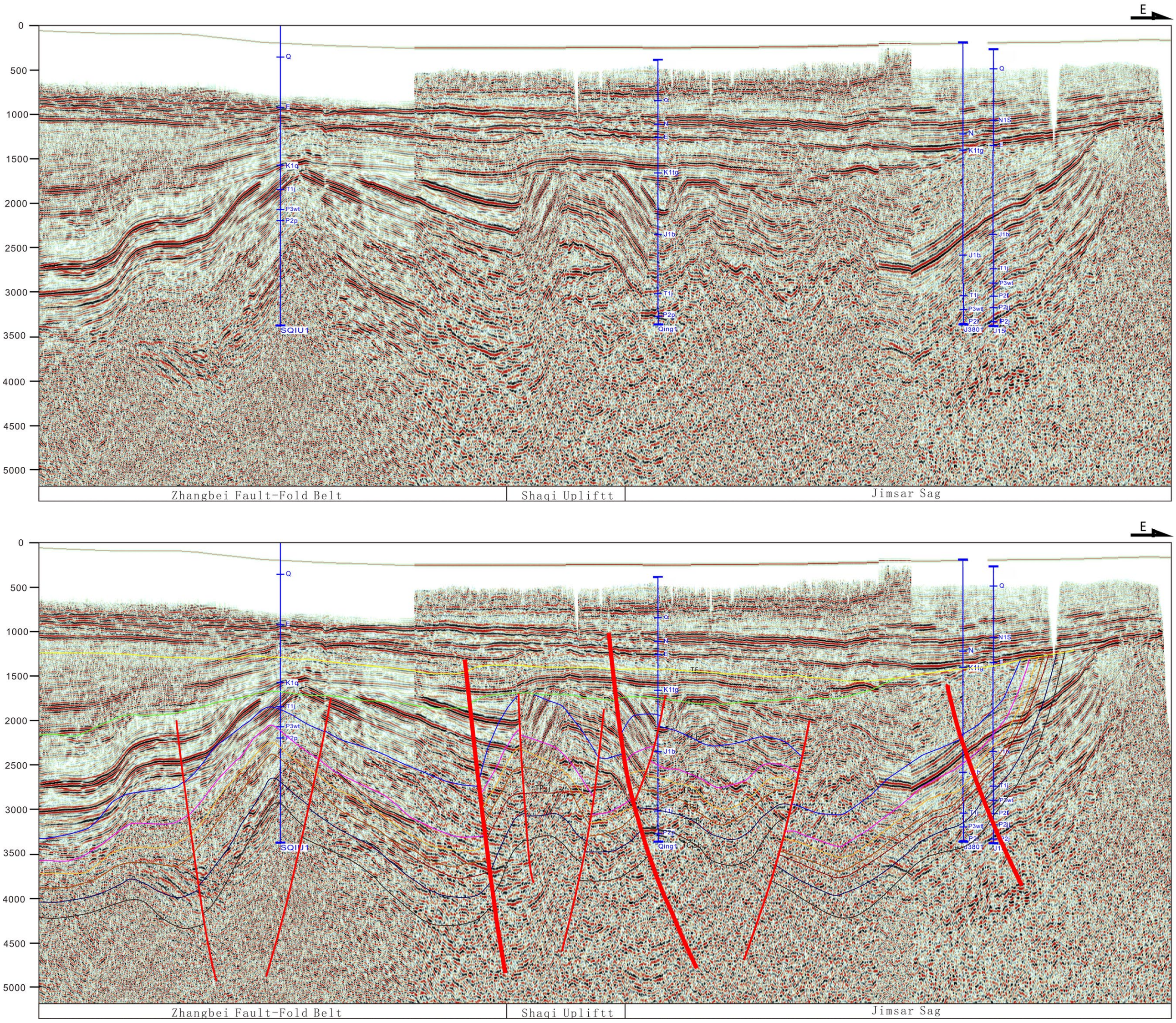
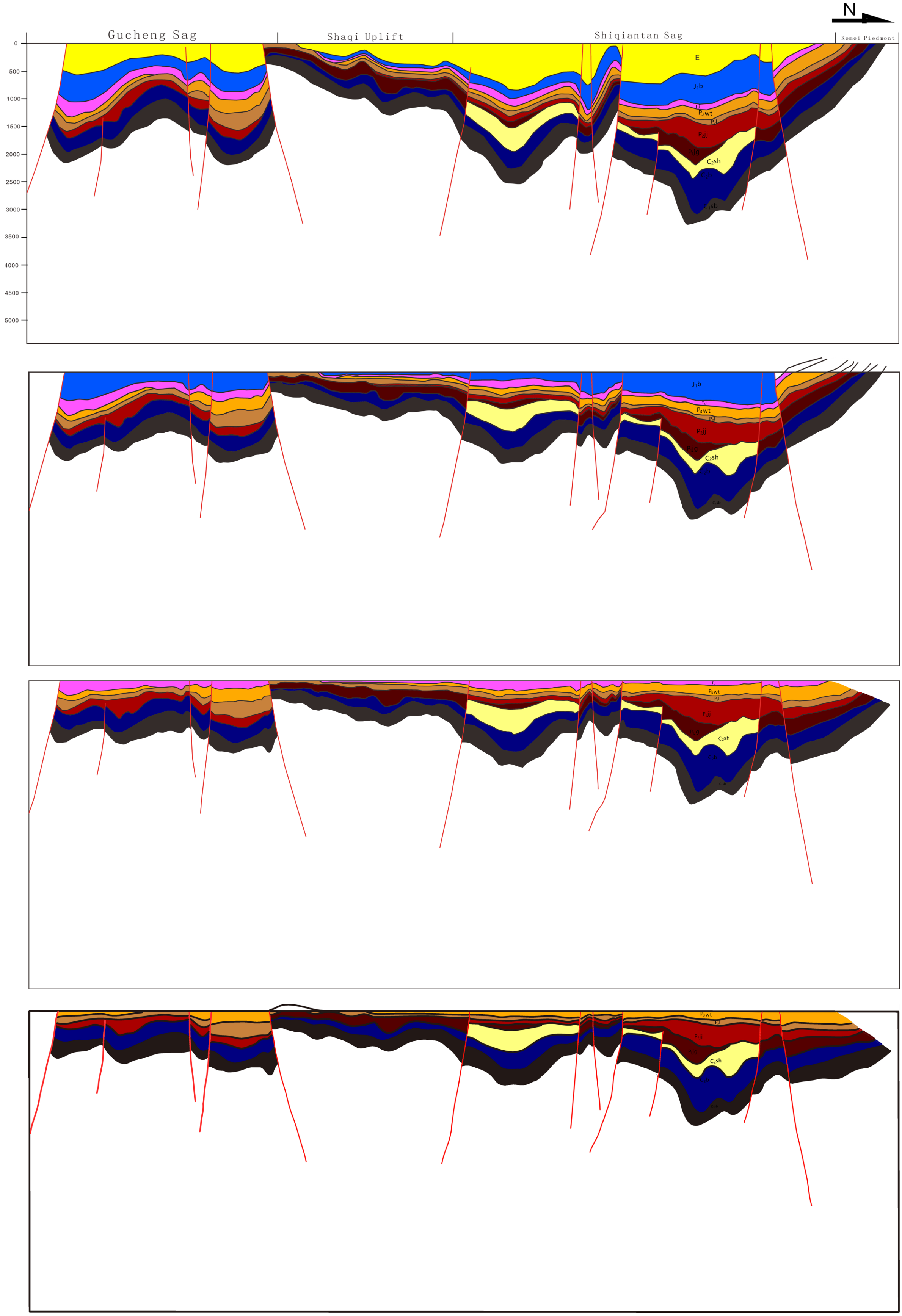


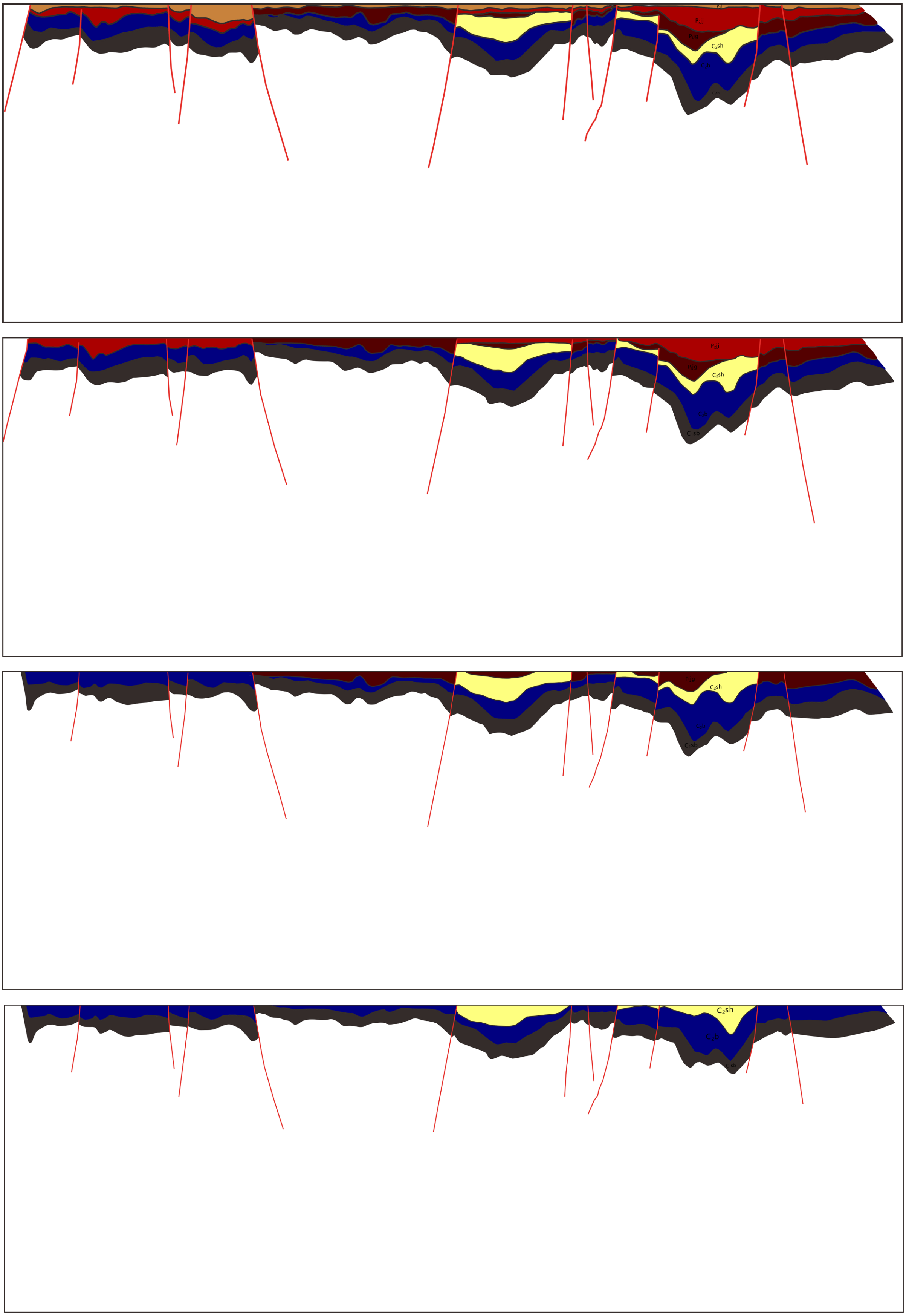
Figure 4. East-west seismic framework profile of zhangbei fault-fold belt-Shaqi uplift-Jimsar sag in Zhundong area.

5. Tectonic Evolution

1) Early Carboniferous: rifting and shallow sea deposits

Figure 5, in the early Carboniferous, the Junggar area opened the prelude of tectonic evolution under the action of regional extensional tectonic stress. At this time, the lithosphere was stretched and thinned, forming many rift basins, which became the place for the deposition of the upper part of the Songkalsu Formation (C1sb). In these rift basins, thicker sediments are accumulated in areas with faster subsidence rates. The upper part of the Songkaersu Formation is mainly composed of shallow sea-coastal clastic deposits, indicating that the Junggar area was in a shallow sea environment at that time, and the seawater advanced and regressed frequently. The source of the sediments is mainly the weathering and denudation products of the surrounding land. It can be seen from the structural evolution profile that there are obvious differences in the thickness of the upper


N
Gucheng Sag
Shaqi Uplift
Shiqiantan Sag
Kemei Piedmont
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
E
J_1b
P_3wt
C_2sh



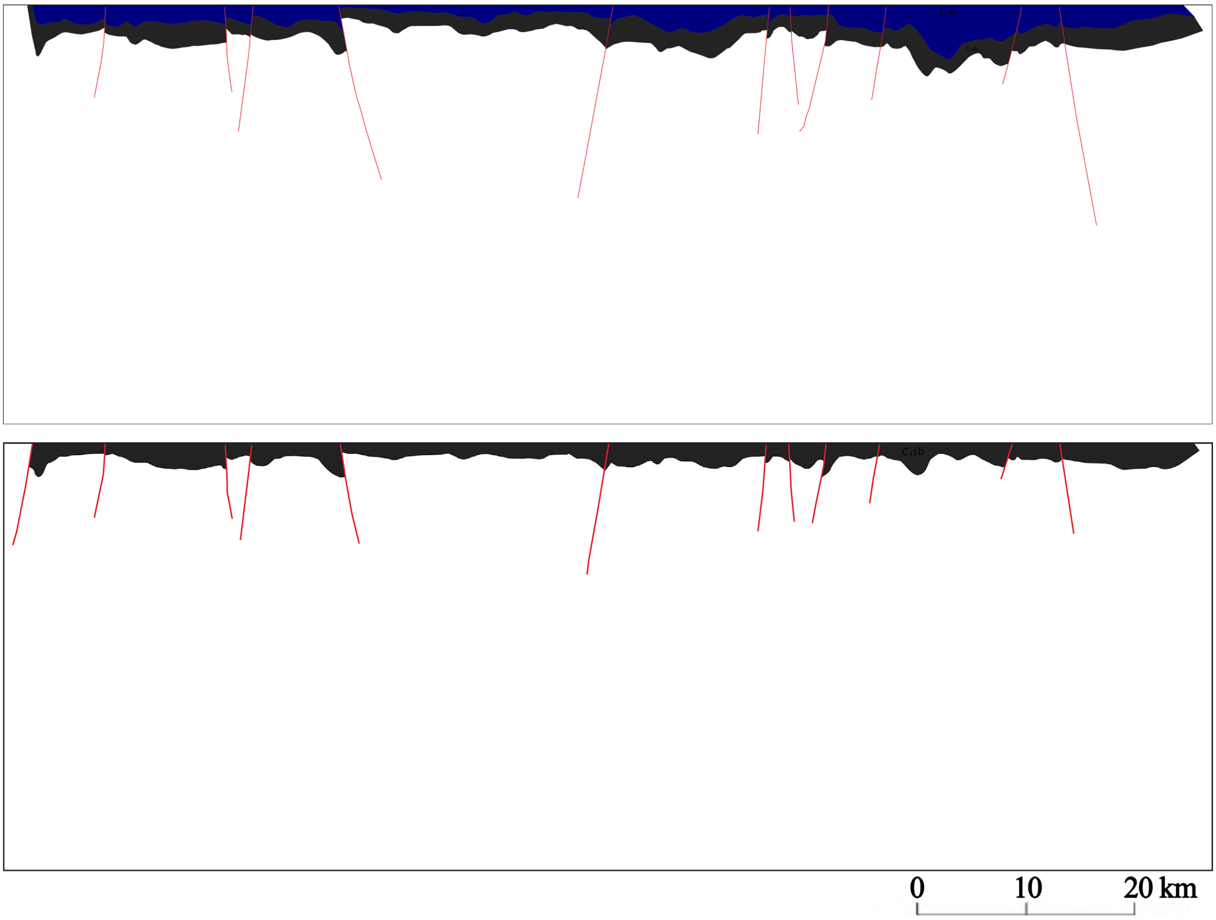


Figure 5. The tectonic evolution profile of Gucheng sag-Kemeishan piedmont section in Zhundong area.

part of the Songkaersu Formation in different regions, which reflects the migration of the subsidence center in the rift basin and the fluctuation of the paleotopography. This rifting activity is closely related to the tectonic evolution of the Central Asian orogenic belt. During this period, the Central Asian orogenic belt was at the edge of plate convergence. The Junggar region was affected by its remote extensional stress, and the crust was stretched to form rifts.

2) Middle Carboniferous: Volcanic activity and sedimentary environment transformation

In the middle of the Carboniferous, the regional tectonic activity changed significantly, and the volcanic activity began to intensify, ushering in the deposition of the Bashan Formation (C2b) (Zhao et al., 2012). The strong volcanic activity originated from plate subduction. Around the Junggar area, there may be a subduction of the oceanic crust to the continental crust. The rocks in the deep part of the subduction zone are partially melted, forming magma and rising and erupting along the weak zone of the crust. Volcanic eruptions bring a large amount of volcanic material, such as volcanic ash, lava flow, etc., which accumulate rapidly and change the original sedimentary environment. The original shallow sea environment has changed due to the injection of volcanic materials, the nature of the water body has changed, and the biological community has also changed. It can be seen from the structural evolution section that the volcanic rocks of the Batamayineishan Formation are distributed in layers, sandwiched between other sedimentary strata, which indicates that the volcanic activity is intermittent, and there is still normal sedimentation during the intermittent period of eruption. Moreover, the geological phenomena such as earthquakes caused by volcanic activity make the formation produce small fractures and folds, which lay the foundation for subsequent structural deformation.

3) Late Carboniferous: tectonic adjustment and marine-continental alternating deposition

In the late Carboniferous, the Shiqiantan Formation (C2sh) began to deposit. At this time, the regional tectonic stress field entered the adjustment stage, the volcanic activity was weakened, but the tectonic activity was still active. The volcanic terrain formed by the early volcanic activity is gradually flattened under the external dynamic geological effects such as weathering and erosion, and the seawater invades again, forming a marine-terrigenous sedimentary environment. There are both marine fossils and terrigenous clastic materials in the Shiqiantan Formation, which fully proves the sedimentary characteristics of sea-land alternation during this period. From the analysis of the tectonic evolution profile, the folds and fractures of the strata during this period are more obvious, reflecting the complexity of regional tectonic stress. It may be due to the continuous collision and extrusion of the surrounding plates, so that the Junggar area is subjected to different degrees of stress in the north-south and east-west directions, resulting in deformation of the strata. At the same time, these structural deformations also affect the accumulation and distribution of sediments. At the top of the anticline, the sediments are relatively thin, while the syncline accumulates thicker strata.

In the early Permian, the tectonic activity was still active during the deposition of the Jiamuhe Formation (P1j), which was the continuation and development of the tectonic event at the end of the Carboniferous. Although the volcanic activity has weakened, it is still relatively frequent, and pyroclastic rocks and lavas are widely distributed in the strata. During this period, the regional stress field began to change, from extension to extrusion-extension.

In the Middle Permian, the sedimentary stage of the Lucaogou Formation (P2l) and the Jingjingzigou Formation (P2jj) (Zhang & Deng, 2003), the tectonic environment was relatively stable and entered a large-scale lacustrine sedimentary period. This is related to the regional tectonic subsidence event. The lake basin is expanding and the water body is deepening, forming a stable semi-deep lake-deep lake facies environment, which is conducive to the development of high-quality source rocks. However, in the edge of the lake basin, delta and other sedimentary systems were developed due to the influence of local tectonic activities.

In the late Permian, when the Wutonggou Formation (P3wt) was deposited, the basin underwent significant structural changes. The regional tectonic stress field is dominated by extrusion, which leads to the uplift of the basin edge, the shrinkage of the lake basin, and the transformation of the sedimentary environment into continental facies. This tectonic event not only made the early sedimentary strata fold and fracture, forming a series of structural traps, but also provided favorable conditions for the accumulation and preservation of oil and gas.

4) Triassic-Jurassic stable deposition and local tectonic change

In the early Triassic, the sedimentary stage of the Jiucaiyuan Formation (T1j), after the structural changes at the end of the Permian, the regional tectonic activity was relatively weakened and entered a relatively stable depression sedimentary stage. However, there are still tectonic lifting activities in some areas, which affect the sedimentary thickness and lithologic distribution of the Jiucaiyuan Formation. For example, in some inherited tectonic uplifts, the thickness of the Jiucaiyuan Formation is thinner, and the lithology is mainly coarse clastic; in the center of the depression, the thickness is larger and the lithology is finer.

In Jurassic, during the sedimentary period of Badaowan Formation (J1b), the tectonic environment was further stable, and the swamp-fluvial sedimentary environment was developed. However, there are still local tectonic deformations near the edge of the basin or some active fault zones due to the influence of tectonic activities. Although these structural deformations are small in scale, they have a significant impact on the continuity and stability of coal seams, and also provide potential channels for later oil and gas migration.

5) Cenozoic tectonic evolution and stratum deformation

In the Cenozoic era, influenced by the remote effect of the India-Eurasian plate collision (Jia et al., 2005), the tectonic activity in the Junggar region was once again strong. This tectonic event led to the reactivation of the old faults in the region and the formation of a large number of new faults. For example, in the area near the Kemei Mountain, a series of thrust faults and closed folds were developed due to the uplift and compression of the orogenic belt. These structural deformations not only change the spatial morphology of the strata, but also change the spatial distribution of the previous oil and gas reservoirs through thrust faults and closed folds, which have an important impact on the accumulation and preservation of oil and gas. At the same time, the Cenozoic tectonic activities also led to significant changes in regional landforms, forming different topographic units such as mountains and basins. The tectonic uplift area was denuded, while the center of the basin received deposition. The sedimentary thickness and lithology of the Cenozoic (E) strata in different regions were significantly different, reflecting the complex tectonic evolution process and tectonic events during this period.

6. Conclusion

Through the detailed study of the tectonic evolution of the eastern Junggar Basin, this paper reveals the complex tectonic evolution history of the region from Carboniferous to Cenozoic. The rift basin and volcanic activity in the Carboniferous, the lacustrine deposition and compression structure in the Permian, the stable deposition from the Triassic to the Jurassic, and the strong tectonic activity in the

Cenozoic jointly shaped the geological pattern of the basin. These tectonic events not only affect the deposition and distribution of strata, but also provide important geological conditions for the generation, migration and accumulation of oil and gas (Jia et al., 2005).

Specifically, the rifting in the early Carboniferous laid the basic structural framework for the basin, and volcanic activity enriched the material source of the basin. The lacustrine deposits in the Permian provided a favorable environment for the formation of high-quality source rocks, while the compressional structures in the late Permian formed a large number of structural traps, creating conditions for oil and gas accumulation. Although the tectonic activity was relatively weakened in the stable sedimentary stage from Triassic to Jurassic, the local tectonic change still had an important influence on the migration and preservation of oil and gas. The strong tectonic activity in the Cenozoic not only changed the geomorphological characteristics of the basin, but also re-adjusted the distribution pattern of oil and gas through thrust faults and closed folds. In summary, the tectonic evolution of the eastern Junggar Basin has the characteristics of multi-cycle and multi-stage. The tectonic events in different periods have a profound impact on the geological structure and hydrocarbon accumulation conditions of the basin.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Jia, C. Z., He, D. F., & Wei, G. Q. (2005). Structural Evolution and Hydrocarbon Accumulation in Junggar Basin. *Oil Exploration and Development, 32,* 1-7.

Li, D. S. (2002). *Tectonics of Petroliferous Basins in China*. Petroleum Industry Press.

Li, Z., & Zhang, S. C. (2010). Characteristics and Tectonic Significance of Carboniferous Volcanic Rocks in Junggar Basin. *Acta Geologica Sinica, 84,* 654-665.

PetroChina Xinjiang Oilfield Company (2018). Major Breakthrough in Carboniferous Natural Gas Exploration in Kelameili Mountain Area of Junggar Basin. *China Petroleum Exploration, 23,* 1-10.

Zhang, P. Z., & Deng, Q. D. (2003). Effects of the India-Eurasia Collision on the Tectonic Evolution of Northwestern China. *Geophysical Journal, 46,* 179-189.

Zhao, W. Z., Zou, C., & Li, J. Z. (2012). Prediction of Formation Environment and Distribution of High-Quality Hydrocarbon Source Rocks in Continental Lake Basins in China. *Petroleum Journal, 33,* 1-10.