[PS]Geomechanism Model of the Central African Shear Zone and its Relative Rift Basins*

Huang Tongfei[1], Zhang Guangya[1], Ke Weili[1], Luo Beiwei[1], and Wang Yanqi[1]

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[1]Research Institute of Petroleum Exploration & Development, CNPC, Beijing, China (huangtfei@126.com)

Abstract

The formation mechanism of the Central African Shear Zone (CASZ) and its related rift basins, such as the Muglad Basin, Salamat Basin, Doseo Basin, Doba Basin and Bongor Basin, has not yet been fully defined. By analyzing the structure of the African Plate basement, the structural events of the African Plate and the peripheral plates during the Late Jurassic to the Early Cretaceous and contrasting to the formation mechanism of the transitional fault of the African Mid-Atlantic Ridge, this article presents a new interpretation of the formation mechanism of the CASZ: that the formation mechanism is the same as the transition fault of the mid-ocean ridge, the formation time is from Late Jurassic to Early Cretaceous, and the tectonic position is the active belt between the Sahara Craton and the Congo Craton.

The background of formation is during Pan-African tectonic movement, the African Plate was composed of many stable craton nuclei and active belts, and the basement structure was heterogeneous. Since the Mesozoic, the disintegration of the western Gondwana Continent and the opening of the Atlantic Ocean from the south to the north had been undergoing. This difference in stress between the north and the south resulted in the rupture of the structural weak zone between the stable cratons and strike-slip faulting, resulting in formation of the CASZ between the Congo Craton and the Sahara Craton. When the shear zone extends in the northeast direction out of the Congo Craton, no longer subject to the constraints of the Congo craton, the property of the basement changed again, which led to, at the end of the shear zone, the strike-slip stress field converting to stretch stress fields, forming the Muglad Basin, the Bongor Basin, and the Salamat, Doseo and Doba basins within the fault zone. This model of formation mechanism is very useful to explain the formation time and position of the CASZ, and also provides evidence for the formation mechanism of the intracontinental rift basin.

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(Research Institute of Petroleum Exploration & development,CNPC)

0 background

Genetic mechanism of the Central Africa Shear Zone(CASZ),which was derived from the revival of a dextral shear zone occurring at about 500 Ma during the Pan-Africa Movement, and which was the same fault named as Pernambuco Dextral Shear Belt in Brazil, South America, was widely accepted. From this viewpoint, it was supposed that along with the breakup of Gandwana and segmented extension of the Atlantic Ocean in Mesozoic, the CASZ was activated and began moving dextrally in large scale, which led to the generation of the Central and Western Africa rift basins mainly including the Muglad Basin, Salamat Basin, Doseo Basin and Bongor Basin. However, there was no adequate evidence supporting this viewpoints, and the location, occurrence of the CASZ and the process how the strike-slip produced the extensional basins are also needed to be studied in detail.

1 Abstract

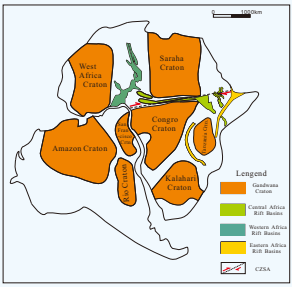
1)Workflow & Methods

a) To prove the architecture anisotropy of Africa Plate by analyzing the process how the Africa Plate cohered.
b) To figure out the event directly inducing the generation of the CASZ by studying the Evolutionary history between the Late Jurassic and the Early Cretaceous, especially the movement events taking place in the Africa Plate and its surrounding plates.
c) To compare the genetic mechanism of transform faults in mid-ocean ridge and propose the new model explaining the generation process of the CASZ.

Workflow of study

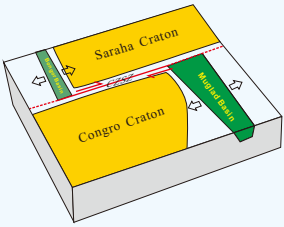
2)Main conclusions

a) Africa plate was composed of several stable cratons and instable activity belts which were cohered during the Pan-Africa Movement, which made the plate basement anisotropic. the extension of CASZ was confined in activity belts between the Sahara Craton and the Congo Craton.



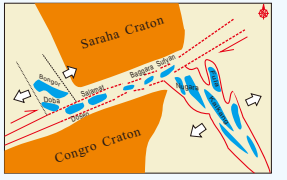
Early Western Ganwana Craton and late Rift Basins

b) Along with the breakup of Gandwana and segmented extension of Atlantic during the Late Jurassic ~ Early Cretaceous, the Africa Plate was exposed in the differential stress from the north to south, which resulted in the asynchronous movement of Africa Plate. Speed gap triggered the crack of instable weak- belt and formation of giant shear zone, CASZ.



Geomechanism Model of Central-Western Africa Rift Basins

c) As the shear fault protruded the confined zone between these two stable cratons, the property of the basement changed from a strait zone into a wide zone, which induced the shear stress to transform the extensional stress. And therefore the rift basins at the end of the shear zone were generated under the extensional stress, such as the exterior basins like Muglad Basin, Bongor Basin and the interior basins like Salamat Basin, Doseo Basin and Doba Basin.



Distribution of CASZ and Central-Western Africa Rift Basins
(Modified after Yassin,2017)

3 Main references:

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b).Mohamed A Yassin,et al.Evolution history of transtensional pull-apart,obique rift basin and its implication on hydrocarbon exploration:A case study from Sufyan Sub-basin,Muglad Basin,Sudan,Marine and Petroleum Geology,2017,79,282_299.

4 Brief introduction of the first author

Huang Tongfei,a doctor candidate of RIPED, has studied the geology and tectonic evolution of Muglad Basin since he sought for the master degree.
E-mail:huangtfei@petrochina.com.cn