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Abstract

The eastern Branch of the East African Rift System (EARS) is composed of more than 10 depressions. The formation of the EARS is usually thought to be controlled by the uplift of the Afar dome 31Ma ago, Late Oligocene, in the northern Ethiopia and depressions developed southwards successively from the Afar dome. However, the strata age in the north is much younger than the south, which don't agree with the process of evolution, so it needs to be studied detailedly. Integrated with well data, seismic, outcrop, paleontology and volcanic rock dating data, stratigraphic chronology and formation time of each depression are clarified first, and then through the analysis of volcanic activity in this area and physical simulation in the lab, the evolution process and dynamic mechanism of the study area are determined. According to the study, three conclusions were got: 1) Besides the Afar dome, the Kenya dome also influenced the area, which was located in the central and northern Kenya and uplifted in Late Miocene. 2) Physical simulation shows that the uplift of mantle leads to the formation of rift, which can be divided into three sections: uplift, compression and extension section. The driving force of the uplift section is mainly the active upwelling of mantle material, while the driving force of compression and extension section is mainly the horizontal flow of mantle material. Several rifts develop in the uplift and extension section. The extensional rate of rifts in the extension section is far greater than this in uplift section. 3) The depressions in the southern part such as South Lokichar and Kerio Valley depression were controlled by the Afar dome, which formed in Late Oligocene and the driving force is horizontal flow of mantle material. While the depressions in the central and northern parts such as Omo, Chew Bahir and Turkana depression were controlled by the Kenya dome, which formed in Late Miocene and the driving force is the active upwelling of mantle material. The research about formation and evolution of the Eastern branch of the EARS has been done little. Some detailed work about this issue has been done in the paper and it can provide evidence for selecting favorable depressions and plays.

Key words: Eastern Branch of the EARS; structural evolution; volcanic activity; Afar dome; Kenya dome.