Jiyang depression, bounded on the east by Tanlu fault, is a Mesozoic and Cenozoic interior depression with basin-ridge structure. The strike-slip movement along the Tanlu fault is responsible for the Cenozoic transtension and transpression, which have significant effect on the evolution of the surrounding basin. In recent years, efforts have been made to understand the tectonic relationship between the strike-slip along Tanlu fault and the formation of the Jiyang depression. Careful study of basin tectonic history is an effective approach to unravel the linkage between the Tanlu fault and sedimentary basin development. The purpose of this study is to constrain the timing of the uplift of salients in the south of the Jiyang depression applying fission track technique and discuss the dynamic mechanism of the uplift.

Jiyang depression, situated at the southeastern margin of the Bohai Bay, eastern China, formed during the Mesozoic and Cenozoic on the Archean and Paleozoic basement of the North China block. During the Mesozoic and Cenozoic, the area experienced strong tectonic movement and polycyclic alternation of extension and uplift, which resulted in the development of several salients and subbasins such as Chezhen sag, Zhanhua sag, Huimin sag and Dongying sag. A series of shallow salients such as Chenjiazhuang salient, Binxian salient, Qingcheng salient, Linfanzui salient and Qudi-Renfeng salient can be recognized between the Huimin sag and Dongying sag. Their formation time is a key to reconstruct Mesozoic and Cenozoic basin. The NE-trending transtensional faults separate both salient zone from the Dongying sag and Huimin sag. Each shallow salient is bounded at the south by normal fault and overlain by the Mesozoic and/or the Cenozoic strata. The dustpan-shaped sag and salient situated between the Huimin sag and Dongying sag comprise the basin-ridge geomorphology. The Cenozoic strata overlapped unconformity on the Mesozoic, Paleozoic, or Archean in both salient zones.

The T-t path for all apatite samples is simulated using AFT Solve software based on the age, length and length distribution of AFT [1]. Some constraint conditions such as burial depth, unconformity among different units and burial temperature are considered during processing of T-t simulation. The T-t path of representative sample and uplift times of each salient are showed in Fig 1 and Fig 2. The T-t paths of all samples from different salient indicate that the Chenjiazhuang salient, Binxian salient, Qingcheng salient and Qudi-Renfeng salient began the first fast uplift and denudation during 72.6-64.91Ma, 76.5-65.6Ma, 96.9-65Ma and 75-65Ma (Fig.1); the timing of the uplift can be supported by the presence of unconformity between Kongdian Formation (Ek) and underlying Mesozoic strata in both salient zones and adjacent sags. Therefore, the uplift at the end of the Yanshan is a regional uplift. The relief thickness and deposition thickness of the Mesozoic, suggested by the T-t path, indicate that the most Mesozoic deposited in these salients had been removed by denudation during the Cenozoic. The Dongying sag and Huimin sag were interconnected forming gigantic size basin during Mesozoic. No salients separated Dongying sag from the Huimin sag during the Mesozoic.

The T-t paths indicate that the salients mainly were formed in different times of the Cenozoic (Fig.2). The Chenjiazhuang salient, Binxian salient and Qingcheng salient were formed during 56.7Ma-42.12Ma, 58.2Ma-50.8Ma and 52.5Ma-23.63Ma, respectively. All salients in eastern salient zone are characterized as tilted uplift from south to north with simple-phase of the uplift. Multi-stages
of the uplift are identified in the western salient zone. The Qudi-Renfeng salient and Linfanjia salient began to uplift during 55.13Ma-50.48Ma and 49.44Ma-40Ma. The Qudi-Renfeng salient kept slow uplift while the Linfanjia salient began uplift drastically at 30.29 -23.15 Ma. The uplift time in the first stage in Qudi-Renfeng salient is consistent with that of 55.13-50.48 Ma in eastern salient zone (Fig.2). The uplift time in western salient zone indicate that the uplift is multi-stage and progressive process from Qudi-Renfeng salient to Linfanjia salient (Fig.2). The Chenjiazhuang salient, Binxian salient, Qingcheng salient and Qudi-Renfeng salient were formed during 58.2 Ma-42.12Ma while Linfanjai salient was formed during 49.4-40Ma.

The uplift ages of 96-65Ma correspond to K/Ar ages of 62-100.5Ma from basalt in the central Bohai Bay [2]. The geochemical research of Mesozoic and Cenozoic magmatic rocks indicates that the magma originated from lithospheric mantle. From the Mesozoic to the Cenozoic, the nature of the mantle changed from an enriched one to a depleted one. The change of magma source most likely resulted from an asthenospheric upwelling and a large scale lithospheric delamination[3]. Coincidence of the age of the magmatism and uplift indicate that the uplift during 96-65Ma were induced by large scale crust extension and lithospheric thinning.

The transtensional characteristic of NE-trending boundary faults between the salients and sags, and lateral migration of sand body along NE-trending boundary fault in the sag suggest that the development of the salients and sags are controlled by dextral strike-slip along Tanlu fault. Therefore, the development and uplift of the salients can be ascribed to the dextral strike-slip along Tanlu fault and lithospheric thinning during the Cenozoic.

Key words: Jiyang depression, salient, Apatite T-t path, Uplift

References

Fig. 1. T-t path of the representative sample in Qudi-Renfeng salient
Pooled age: 40±2Ma, Length of track: 11.4±1.7um; Times of multi-stage uplift: 75-65Ma,55.3-50.4Ma, 46.13-42.12 Ma, 2Ma

Fig. 2. uplifting time of the salient