

Research Advances

Initial Rifting Age of the Nearly N–S Rifts in Southern Tibetan Plateau: New Evidence from the Age limit of the Early Sediments

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Objective

The nearly parallel N–S-trending rifts in southern Tibet represent the E–W extension of the Tibet Plateau. Most data which constrained the age of the extensional deformation come from isotopic dating of the dikes probably related to the activity of the nearly N–S faulting and micas from hydrothermal activity and the low-temperature thermochronology of plateau uplift. Previous research shows that there are at least three different ideas about the age of the rifts: (1) older than 16–12 Ma, (2) 14–10 Ma, and (3) 8–4 Ma (Fig. 1a). For the old sedimentary strata represented the beginning of the rifting, the dating of the sediments helps to better define the initial rifting age.

Methods

We took detailed geological profiling survey about the lacustrine sediments in the Pagri–Duoqing Co Basin (Fig. 1b) which was the southern part of the Yadong–Gulu rift and Qiongdoujiang Basin (Fig. 1c) which belonged to the central part of Cuona–Oiga rift. We collected 233 samples for paleomagnetic chronology measurements and six samples of ESR dating. Then we obtained the sedimentary age of the lacustrine deposits preliminarily.

Results

The oldest outcrop is a set of lacustrine and fluvial sediments with the thickness of 120 meters in the western Pagri–Duoqing Co Basin (Fig. 1b). The lower part of the strata consists of clay, fine sand and silt, and the upper is mostly conglomerates (Fig. 1d), which is all with semi-consolidated calcareous cementation. The age of the strata is about 8 Ma by the analysis of thermal demagnetization of paleomagnetic chronology (Fig. 1d), which shows that the activity of the fault was older than 8 Ma. The lacustrine strata distributes in the central part of Qiongdoujiang Basin, which belongs to the central

segment of Cuona–Oiga rift (Fig. 1a), with the thickness about 100 m. The lower part of strata mainly consists of clay with some conglomerates and fine sand locally; the central part mostly includes conglomerates with the diameter <5 cm and some of clay layers and weathering crust, and the upper part mainly consists of fine sands, which is unconformably covered by fluvial conglomerates (Fig. 1e). We collected six samples from the strata and the results showed that the age of the upper part was 2.48–2.77 Ma, and the lower part was 4.61–4.91 Ma (Fig. 1e), which indicated the initial rifting happened before 5 Ma.

Conclusions

The chronological results of sediments in the Pagri–Duoqing Co and Qiongdoujiang basin show that the initial rifting of the southern Tibet rifts happened before 5–8 Ma. This is similar to the magneostratigraphy result of the lacustrine strata contained happarion fossils in the Gyirong Basin and is also close to the result that the initial faulting occurred at 11 Ma of Thakkhola Basin. However, this conclusion is clearly different from the result from apatite (U–Th)/He thermochronology (ca. 4 Ma), which indicates that the normal faulting may be multiphase in the southern Tibet rifts, and the latter result (ca. 4Ma) may reflect the latest normal faulting, not the initial. We also infer that the rifts formed at the same time which may be 11–8 Ma or older based on the analysis of the sedimentary strata and the chronological evidence now. If so, the conclusion indicates that the translation process from N–S shortening and thickening to W–E extension and reduction of the crust under the Tibet Plateau occurred at late Middle Miocene before 8 Ma and after 14 Ma.

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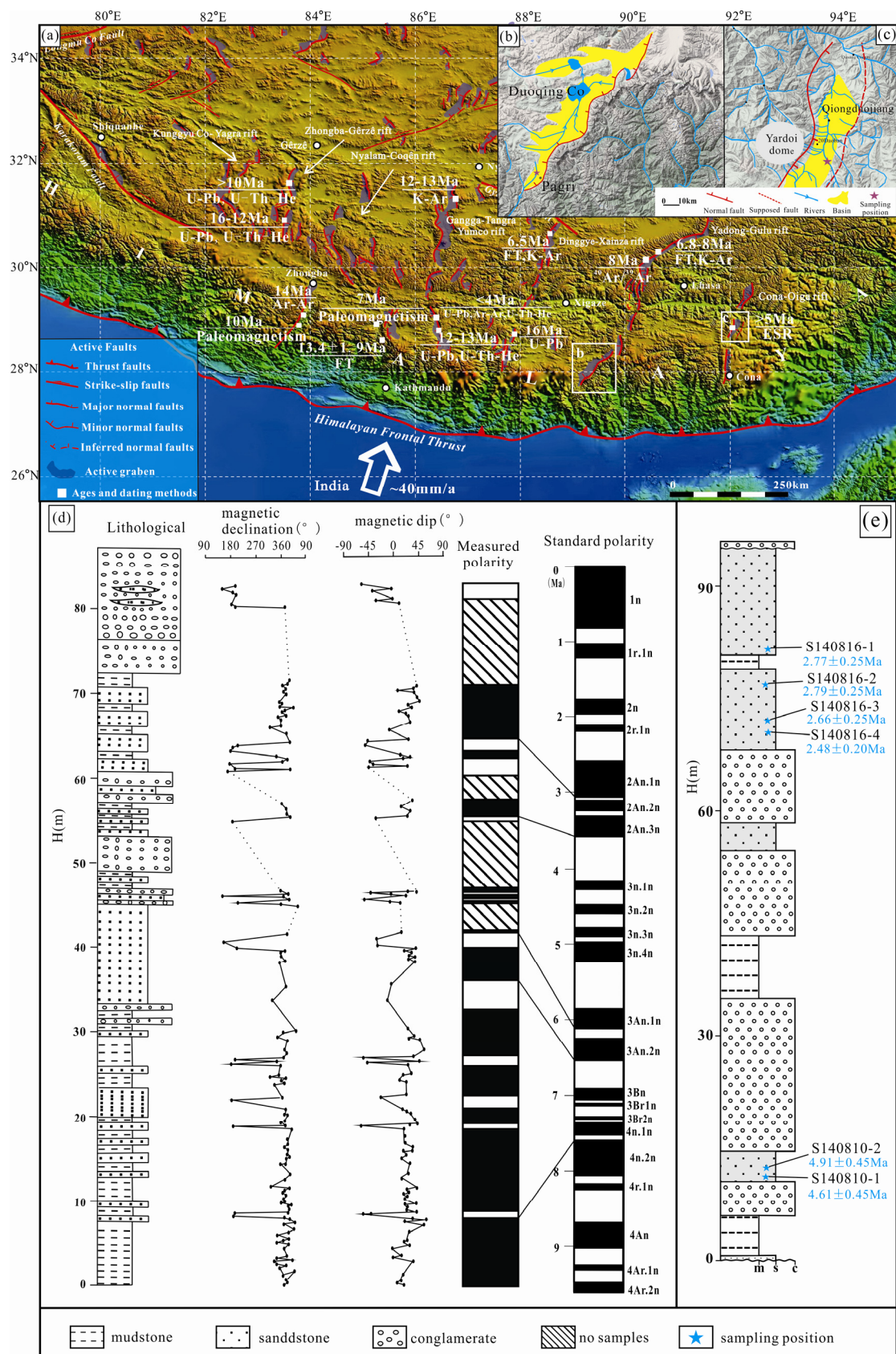


Fig. 1. (a), Tectonic map of the southern Tibet rifts. Part of ages of the rifts are also shown in the picture; (b-c), Diagram of topography and river distribution about Pagri-Duoqing Co Basin and Qiongdoujiang Basin; (d), Paleomagnetic results and sedimentary section in the Pagri-Duoqing Co Basin; (e), Sedimentary section and ages dated by ESR of the Qiongdoujiang Basin.