GEOLOGICAL EVENT ACROSS THE BOUNDARY OF THE LATEST PALEOCENE TO EARLIEST EOCENE IN TINGRI, SOUTHERN TIBET

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The marine early-middle Early Paleogene in the northern Tethys Himalayas was found in southern Tibet in mid 1980s (Hao and Wan, 1985), and the bio-, litho-, and chrono- stratigraphy were patterned by then (Hao and Wan, 1985; Willems et al., 1993, 1996). It seems that there is not an abrupt boundary between the Paleocene and Eocene (P/E) because they are composed of carbonate rocks. This similarity is widespread in the world. They are well examined in many ocean DSDP and ODP logs in similar continuous sediments. But in fact, it is sure that there is a geologic event between the Paleocene and Eocene around the world. Foraminifer extinction, stable isotope record, clay mineral changes, etc. verify the geologic event existence at the latest Paleocene. Unlike the K/T boundary, there is at present little direct or indirect evidence of such catastrophes coincident with the transition (Zachos et al., 1993). This work first shows that there could be also a geologic event across the boundary of latest Paleocene to earliest Eocene exposed on land, certainly in China territory.

The P/E transitional sediment is exposed and remeasured at Gongzha, northwestern flank of the Zhepure Shan Syncline, west to Tingri. Here the P/E transitional stratum is approximately equivalent to the upper Member IV and the entire Member V (Willems et al., 1993, 1996). The exact boundary between the Paleocene and Eocene, i.e. between the Unit 16 and Unit 17, is determined by benthic foraminiferal zonations. The fossil zone *Alveolina* beginning at Unit 17 is just above the boundary that is partly different from Willems et al (1993, 1996).

There is a clear replacement of the benthic foraminiferal community. The texture, composition, and diversity of the *Lockhartia* community ranging from the Unit 14 to 16 are extremely different from those of the *Alveolina* community in the Unit 17. Most of the species in the *Lockhartia* community disappear in the *Alveolina* community, and ca. 70% new species display in the later community. The Last Appearance of species in the *Lockhartia* community, the species First Appearance in the *Alveolina* community, and the replacement of the two communities indicate that there could be bio-extinction and following bio-recovery events happened at the latest Paleocene to earliest Eocene in the southern Tibetan Tethys Himalayas.

An obvious sedimentary response can be observed at the boundary of the P/E. The latest Paleocene Unit 14 ~ 16 is dominated by nodular limestone (or named floatstone) less than 15 cm in single layer. Nodule is consisted of wackestone, in which foram fossils are less than 20%. There are more than 20% fossils in marlstone surrounding the nodules. Above the boundary, the earliest Eocene Unit 17 ~ 19 is composed of blocky wackestone and packstone, in which fossils are often more than 20%. It is stressed that the thickness of a single layer in Units 17 ~ 19 is more than 2 m, and over 10 m in the Unit 19. This rock differentiation shows that there could be a distinct environment change at the turnover of the P/E.

Some organic geochemical data also provide clues for analysis of the P/E event. Parameters

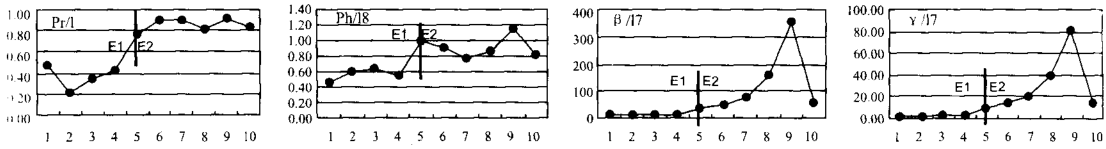

Fig.1 Profile of some parameters of biomarkers at the boundary of the P(E1)/E(E2)

of biomarkers from 10 samples extensively support the idea. For example, Pr/17 (pristane n-C_{17}), Ph/18 (phytane n-C_{18}), β/17 (β-carotane n-C_{17}), γ/17 (γ-carotane n-C_{17}) altogether increase largely from Units 14～16 to Units 17～19 (Fig 1). The steep increase of the parameters to great degree is the result of redox condition changes. It is evident that an aerobic environment at the latest Paleocene could become a quasi-, anaerobic environment at the earliest Eocene. Organic elements N, C, N/H, N/O are also distinctly different beneath and above the boundary of the P/E although we can not explain the causes.

There are several suggestions on the geologic event at the turnover of the P/E transition. However, lots of geologists think it was caused by transient climate (Zachos et al., 1993; Dickens et al., 1997), or by ocean circulation (Gibson et al., 1993; Kennett and Stott, 1991). From the response of bio-succession, sediment, and biomarker in Tingri, southern Tibet, here we suppose that it could be dominative of ocean circulation that leaded to the geologic event at the turnover of the P/E in the Tibetan Tethys Himalayas. This is consistent with the processing closure of the Neotethys Ocean. In another word, the remnant sea in southern Tibet was basically separated form the Neotethys Ocean at the P/E boundary time (58 Ma), which had caused the quasi-, anaerobic environment in the earliest Eocene southern Tibet sea.

Key words: geological event; Paleocene; Eocene; Tingri; Southern Tibet

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