

Asian Paleocene-Early Eocene Chronology and biotic events

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Biostratigraphic, chemostratigraphic, and magnetostratigraphic studies of the Paleocene and early Eocene strata in the Nanxiong Basin of Guangdong, Chijiang Basin of Jiangxi, Qianshan Basin of Anhui, Hengyang Basin of Hunan, and Erlian Basin of Inner Mongolia, China, in last ten years provide the first well-resolved geochronological constraints on stratigraphic framework for the early Paleogene of Asia.

Asian Paleocene and early Eocene strata are subdivided into four biochronological units based on the fossil mammals (Land Mammal Ages). From oldest to youngest, they are the Shanghuan, the Nongshanian, the Gashatan, and the Bumbanian Asian Land Mammal Ages (ALMA). Recent paleomagnetic data from the Nanxiong Basin indicate that the base of the Shanghuan lies about 2/3 the way up Chron C29r. Nanxiong data and recent paleomagnetic and isotopic results from the Chijiang Basin show that the Shanghuan-Nongshanian ALMA boundary lies between the upper part of Chron C27n and the lower part of Chron C26r, close to the Chron C27n-C26r reversal. This record favors a correlation of Shanghuan-Nongshanian ALMA boundary to the Torrejonian-Tiffanian North American Land Mammal Age (NALMA) boundary and to the Danian-Selandian stage boundary in the marine record. The paleomagnetic and isotopic results from the Erlian Basin show that typical Gashatan faunas persist into Chron C24r and may range into Chron C25r and possibly C26n, and the records from the Nanxiong Basin indicate that both Nongshan and Guchengcun formations may correlate to the upper part of Chron C26r. These results would imply that the Nongshanian-Gashatan ALMA boundary may correlate within the Tiffanian NALMA. The paleomagnetic and isotopic evidences from the Hengyang Basin indicates that the transient carbon isotope excursion that marks the Paleocene-Eocene boundary is present between the Limuping and Lingcha formations, and the boundary is placed at the uppermost reversed polarity interval correlated to Chron C24r and to the Thanetian/Ypresian stage boundary in the marine record. The Bumbanian Lingcha fauna seems to correlate with the Wasatchian-0 faunal zone of North America to within $\sim 10^4$ yr.

Both Shanghuan and Nongshanian faunas are mainly composed of Asian endemic taxa. The coincidence of faunal turnover at the Shanghuan-Nongshanian boundary with the Torrejonian-Tiffanian boundary and Danian-Selandian stage boundary in far separated ecosystems may indicate independent ecologic and/or evolutionary response to climatic changes. The Gashatan fauna shows less endemism and has taxa shared with those of the Clarkforkian NALMA in North America at the generic level. The Bumbanian fauna is cosmopolitan. A sudden appearance of modern mammalian orders at the Gashatan-Bumbanian boundary is the same pattern as observed in North America and Europe, indicating the faunal turnover is related to the transient global warming event at the Paleocene-Eocene boundary known as the Paleocene-Eocene Thermal Maximum (PETM).