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The evolution of the Ailaoshan Ocean: recorded by detrital zircons from Permo-Triassic strata

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Southeast Asia was formed during Phanerozoic time as a result of a series of complex assembly (collision or accretion) by several allochthonous continental blocks including the South China (including the Yangtze and Cathaysia), Simao-Indochina, Sibumasu blocks and several microcontinents [1-2]. Among these blocks, the Yangtze and Simao blocks (which is generally considered as the northern part of Indochina Block) were separated by a branch of Paleotethys Ocean, commonly referred as the Ailaoshan Ocean. Uncertainty remains on this ocean regarding the polarity of the ocean subduction (to present day east beneath the Yangtze Block [3] or to present day west beneath the Simao-Indochina Block [3]) and closure time (early Carboniferous [2], late Permian-early Triassic [4] or mid-late Triassic [1, 5]). In order to test these models, we have carried out a combined detrital zircon U-Pb dating, Hf isotope analyses on the Permo-Triassic strata exposed in the both sides of the Yangtze-Simao suture. Our results indicate that (1) 70-90% detrital zircons from the Permian Longtan formation in the west of the suture yield a marked wide 250-290Ma age peak and some minor peaks with older ages (380-430, 600-700, 900-100 and ~1850 Ma), both positive and negative $\epsilon(\text{Hf})_t$ value were recorded for those 250-280 Ma zircons. We interpret these strata as having been sourced from an Andes-type arc system on the side of Simao-Indochina Block; (2) those strata also mapped as the Permian Longtan formation in the east of the suture display a totally different detrital zircon U-Pb age pattern which is characterized by a ~245Ma single sharp peak almost without Precambrian zircons, implying that these rocks were deposited no earlier than middle Triassic in a fore-arc basin. If our explanation are correct, the Ailaoshan ocean should have been subducted to the east (present day direction) beneath the Yangtze Block and to the west (present day direction) beneath the Simao-Indochina block ; and (3) early to middle Triassic strata, mainly exposed in the east of the suture, contain only ~245Ma detrital zircons while late Triassic strata, both in the Simao and Yangtze sides, contains a lot of Precambrian detrital zircons with age information from both the Simao-Indochina and Yangtze blocks, indicating a remarkable provenance change from middle Triassic to late Triassic and the Ailaoshan ocean was closed at only late Triassic.

References:

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