Had the Lhasa Terrane Ever Been Separated from the Ancient Indian Subcontinent?

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In general model of the Tibetan terrane evolution, the Qiangtang, Lhasa, and Himalaya terranes were sequently added to the Eurasia plate one by one, which were rifted and drifted from the northern ancient Indian subcontinent[1, 2]. For this model, Audley-Charles (1983, 1984)[3, 4] argued that the Lhasa Terrane is affinitive to the ancient Australian instead of Indian subcontinent, because he thought that the sudden change of coexisting warm and cold water biota on the Lhasa terrane could be caused by the mixing of the warmer Paleotethyan Ocean water but not by the quick change of paleoclimate. However, the thoughtful opposition was not accepted afterwards, and became the "Charles Puzzle" due to lack of evidences.

In this work, our tectonic paleomagnetic data plus recent other evidences published support the Audley-Charles's opposition, i.e., the Lhasa Terrane was separated from the ancient north Australian but not the north Indian subcontinent.

The magnetic data of our works show that the Lhasa terrane was located about latitude S25-35° in the Late Carboniferous (Pennsylvanian), at S45-50° in the Early-Middle Permian, and at S30-45° in the Late Permian, and it went northward and did not return again since then. The change of paleolatitude indicates a different movement way of the Lhasa terrane that does not harmonize with the general model of secular drifting northward. Recent lithochemistry evidences proposed that volcanic islands were lied in the southern edge of the Lhasa terrane in the Middle Permian[5], but it was of rift-type volcanic rocks in the northern Indian margin at the same time[5]. Provenance analyses indicate that the peak age of zircon U-Pb isotope is 1160 Ma[6], not the 950 Ma, which is similar with those from North Australia. The implication from the new data makes us resume the "Charles Puzzle".

Keywords: Lhasa terrane, Indian subcontinent; Australian subcontinent; Charles Puzzle

Main references

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