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Regional extent of the extrusion of Indochina: Late Cretaceous paleomagnetic results from northern Vietnam

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Paleomagnetic study was carried in order to examine the regional extent of the extrusion of Indochina. Samples were collected from the Upper Cretaceous Yen Chau Formation at the Yen Chau locality (21.0°N/104.4°E) and at the Lai Chau locality (22.3°N/103.4°E). These two localities are located within the Song Da terrane bounded by the southeastern segment of the Ailao Shan-Red River (ASRR) fault system to the north and by the Song Ma fault to the south.

Progressive thermal demagnetization revealed high temperature (600-690°C) components (HTCs) of remanent magnetizations. Primary nature of these HTCs is ascertained by positive fold tests and presence of normal and reversed polarities. The tectonic corrected mean direction of these primary magnetizations for the Yen Chau and Lai Chau localities is D= 3.2°, I= 26.7° with α_{95}= 12.9° (N= 8 sites) and D =12.2°, I= 40.1° with α95= 4.7° (N= 5 sites), respectively. Corresponding poles of primary magnetizations for the two localities are indistinguishable each other at 95 % confidence level, indicating that two localities were subjected to only little relative movement after the Late Cretaceous. The characteristic Late Cretaceous paleomagnetic pole for the Song Da terrane is evaluated as situated at 82.9°N/220.7°E (A_{95}= 6.9°) on the basis of 13 sites from both localities, which provieds a characteristic direction at the reference point in the Song Da terrane (21.7°N/103.9°E) as D= 6.4º, I= 32.0º with α_{95}= 8.5º.

Comparison with coeval paleomagnetic poles for the neighboring tectonic blocks indicates that no relative movement have occurred between the Son Da terrane and the South China Block, whereas the Shan-Thai Block and the southern part of the Indochina Block were subjected to a southward displacement of 10.5°±9.5º in latitude (1200±1000km) and a clockwise rotation by more than 22° with respect to the Song Da terrane. This suggests that the Song Da terrane behaved as a part of the SCB during the extrusion tectonics of the Shan-Thai and Indochina blocks. We conclude that the southeastern segment of the ASRR fault system to the east of the Dien Bien Phu fault is not a demarcation of the extruded Indochina Peninsula. Because the extrusion model for the Indochina Peninsula requires sinistral motion along a prominent strike-slip fault, we newly propose that the extrusion of Indochina occurred along some faults between the Song Da terrane and the Khorat Plateau, e.g. the Song Ma fault, Song Ca fault or Da Nang fault.