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# Renewed geology of northern Vietnam: Miocene metamorphic domes extruded the older accretionary complexes

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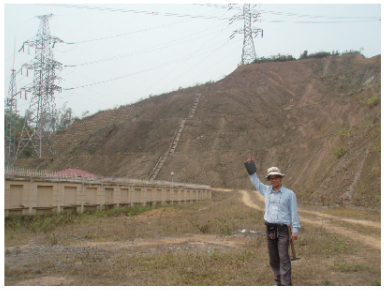
When we observe northern Vietnam geology handling Geological and Mineral Resources Map of Viet NAM 1: 200,000, published and copyright by Department of Geology and Minerals of Viet NAM, Hanoi, we notice so many NW-SE trending faults, part of which are strike-slip faults, and major, map-scale plunging-anticlines. Cores of the anticlines consist of metamorphic or granitic rocks, or partly early Paleozoic sedimentary rocks, and the other younger rocks, late Paleozoic and early Mesozoic normal sequences overlay the core complex in order of these ages surrounding the anticlinal core. We soon notice discrepancy. We could not observe clear strike-slip faults in outcrops, except for a part of the Red River and Song Chay faults. Strike-slip faulting may not play an important role for northern Vietnam structural development. The core complexes, dated and exhumed Tertiary, is overlain by the older coherent sequences, but the sequences are broken and seldom show anticlinal structure. Also for the cover sequences, these expected older Indosinian structures and younger overlapping dome structures are not distinguished. We found bedded chert, umber, and varicolored mudstone, at the first time from northern Vietnam, other than widely distributed and previously known limestone and basalt, which was previously interpreted shallow sea platform limestone and intra-continental rift products by Lepvrier et al. (2008). These rock suites constitute accretionary complex, and such cover rocks do not possess original sedimentary sequence. For example, pelitic and psammitic schist, mapped as the Devonian, is a matrix of accretionary melange, and the age of the schists may be incorrect and younger than presently considered.

As for the dome structure of the Red River shear zone, a focus of northern Vietnam geology, Leloup et al. (2001) considered the Dai Nui Con Voi dome a left-lateral ductile shear zone throughout the anticline with NW-SE axis (stretching and doming is contemporaneous in single transtensive condition), and they connected its movement with opening of the South China Sea (Tapponnier et al., 1982). Jolivet et al. (2001) follows that transtensive condition, but divided into the earlier ductile top to the NW shear and stretching restricted to the anticlinal core and the later brittle-ductile transition left-lateral shear restricted to the margins. They assume that the exhumation and doming is due to normal faulting of the Song Chay fault and scraping off the hanging wall rocks. Anczkiewicz et al. (2007) also considered left-lateral transtensive situation for doming, but shows both marginal faults have component of normal faulting, and such progressive deformations including mylonite shearing is undergone under relatively high temperature. The most recent study of Yeh et al. (2008) divided the deformations into earlier stretching phase with ductile northwestward shear and later transpressional doming phase. Brittle left-lateral faulting was followed in transtensive phase.

Our structural division is also earlier ductile and later brittle-ductile transition deformations, common to both core complexes as well as sedimentary covers extruded by core complexes. However, contrast to the all above studies, transpressional and dextral ductile shear is for the earlier deformtion, and later brittle normal faulting, following the ductile extrusion of metamorphic rocks, never major strike-slip faulting, plays an important role in northern Vietnam.

We describe the renewed geology of northern Vietnam, Miocene vertical extrusion of metamorphic core complexes into older accretionary complexes, which were further broken by the extrusion. Existence of major fault with major strike-slip component, which is a traditional Red River fault, is very doubtful, and most of such fault has normal fault sense movement.


Moetamorphic dome model



Miniture of metamophic dome

Anticlinal fold accompanies axial planar cleavages, dextral streaching lineationons, and parasitic folds

Keywords: Northern Vietnam, metamorphic dome, D1 trans pression, dextral, D2 Red River normal fault, accretionary prism origin