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Reactivation of a collisional suture by Miocene transpressional domes associated with the Red River and Song Chay detachment faults, northern Vietnam

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ABSTRACT

Elongate Miocene gneissose and granitic domes in northern Vietnam formed in a dextral-transpressional ductile shear regime, possibly associated with large-scale restraining step-overs along dextral faults. Initial anticlinal D1 doming involved folding of both basement and hanging wall rocks with D1 secondary folds that verge toward the anticlinal axes. Such folds reflect dome-scale flexural slip folding. With continued shortening, D2 detachment faults developed on the flanks of the anticlines along the hanging wall-basement interface, so that the basement was extruded vertically into the overlying hanging wall rocks. The detachment faults were associated with D2 drag folds that verge away from the anticlinal axes. The hanging wall assemblage lacks a well-ordered stratigraphy, displaying primarily block-in-matrix fabric. We identified bedded cherts, associated with umbers and alkalic basaltic intrusions within these hanging wall rocks, a first report of such rocks from Vietnam. The association of cherts, umbers, and basaltic intrusions and extrusions with block-in-matrix units with clastic rocks strongly suggest that the hanging wall rocks comprise part of a subduction complex. Because the base of a subduction complex is a former subduction megathrust horizon, the hanging wall-basement interface represents a reactivated collisional suture. Such a suture was probably associated with the Indosinian orogeny, and the basement should be the Indochina continental block. This structure may have influenced the position of Miocene dextral faulting in addition to controlling the position of the dome detachments. The well-known Red River fault marks the boundary of one of the domes, but in this region it appears to be a detachment (normal) fault rather than a dextral strike-slip fault. However, the association with the dome evolution with large-scale restraining step-overs suggests that dextral faulting associated with dome development may lie further away from the dome axes than the detachment.

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1. Introduction

Northern Vietnamese geologic structure is a consequence of two episodes of continental collision, Triassic collision of Indochina and south China known as Indosinian orogeny, and Tertiary collision of India and Asia known as a part of Himalayan orogeny (Lepvrier et al., 2008). The Song Ma strike-slip fault is considered a suture of the Indosinian collision (Lepvrier et al., 2008), and the Red River strike-slip fault has been proposed to have resulted from indentation or lateral extrusion associated with the Indian collision (Tapponier et al., 1982).

Northern Vietnam geology shown on the Geological and Mineral Resources Map of Viet NAM 1: 200,000, published and copyright by Department of Geology and Minerals of Viet NAM, Hanoi, features many NW–SE trending faults, some of which are strike-slip, and major, map-scale plunging-anticlines. Cores of the anticlines consist of metamorphic or granitic rocks, or partly early Paleozoic sedimentary rocks. Younger, late Paleozoic to early Mesozoic normal stratigraphic sequences are depicted as overlying and concentrically surrounding the core complexes.

Our field observations (Fig. 1) differ from the structural-stratigraphic interpretations on the published geologic map. We did not observe any strike-slip faults in outcrop, except for a part of

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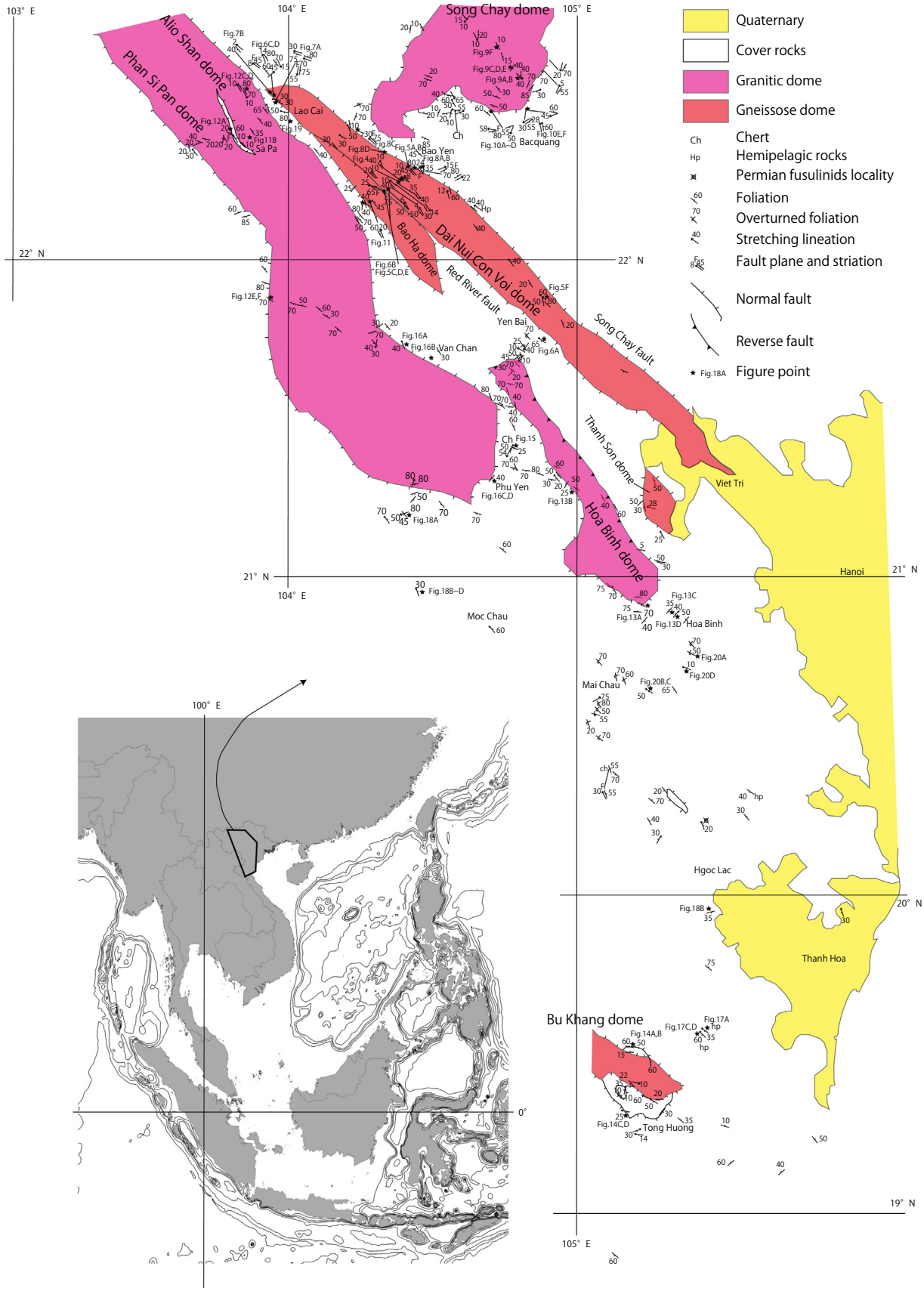

Fig. 1. Geological map of northern Vietnam.

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