

Variations in Late Cenozoic–Recent strike-slip and oblique-extensional geometries, within Indochina: The influence of pre-existing fabrics

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Abstract

From Yunnan to Northern Thailand, Late Cenozoic–Recent faults strike predominantly NNE–SSW, N–S to NNE–SSW and NE–SW to ENE–WSW. Associated sedimentary basins are aligned NE–SW to N–S. The regional fault patterns are commonly interpreted as strike-slip dominated deformation throughout the area. Releasing bend and en echelon stepping patterns on faults bounding sedimentary basins indicate sinistral displacement on NE–SW to ENE–WSW trending faults. Yet, in the escape tectonics model left lateral displacement on the NE–SW to ENE–WSW faults is thought to have occurred late in the Miocene, whilst earlier motion was dextral. However, in Yunnan the NE–SW S_{Hmax} direction required for dextral motion on the N–S Sagaing, Nanting and Gaoligong fault zones is consistent with sinistral motion on ENE–WSW striking faults, which is still their sense of motion today. In Northern Thailand the dextral–sinistral switch model during the Miocene is not tenable because the Fang basin is of Late Oligocene–Pliocene age, and requires similar age sinistral motion on the ENE–WSW Mae Chan fault in order to have opened. In an alternative model, Northern Thailand is interpreted to have evolved predominantly by oblique extension. The Golden Triangle area marks a transition from transtensional deformation in the north to oblique extension in the south. The activation of pre-existing fabrics strongly affects both strike-slip and extensional faults and has given rise to the similar extensional and strike-slip fault patterns. Multiple episodes of basin inversion in Northern Thailand during the Miocene require short-term changes in stress pattern. To produce the inferred changes in stress pattern it is suggested that stresses radiating out from the Himalayan syntaxis exert a strong influence, but were not the only important forces acting on the region.

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1. Introduction

The region of Asia from Yunnan through Laos, Thailand and Myanmar that is the focus of this study contains an abundance of Cenozoic sedimentary basins (Fig. 1). Some of these basins display a long-lived history of deposition, faulting and folding, and consequently have recorded the variations of stresses during the Cenozoic (e.g. Morley et al., 2000, 2001; Morley, 2001; Socquet and Pubellier, 2005). This study discusses evidence for a lateral transition zone between strike-slip dominated deformation in the northern part of the area

and extensional dominated deformation in the southern part. One of the main problems is the transitional extensional zone appears to display quite similar map view structural geometries to those typically assumed to be characteristic of strike-slip deformation. Hence, older interpretations have tended to class all the basins as pull-aparts associated with strike-slip or oblique slip faults (e.g. Tapponnier et al., 1986; Polachan et al., 1991; Lacassin et al., 1998). The patterns of basins and faults across the region are superficially similar, being dominated by N–S to ENE–WSW striking faults (Fig. 1). This paper discusses the considerable variety in the range of geometries and in the origin (i.e. strike-slip vs transtension, vs oblique extension) and structural evolution of the basins.

The Indochina area has been tectonically very active during the Cenozoic as a consequence of India–Eurasian collision,

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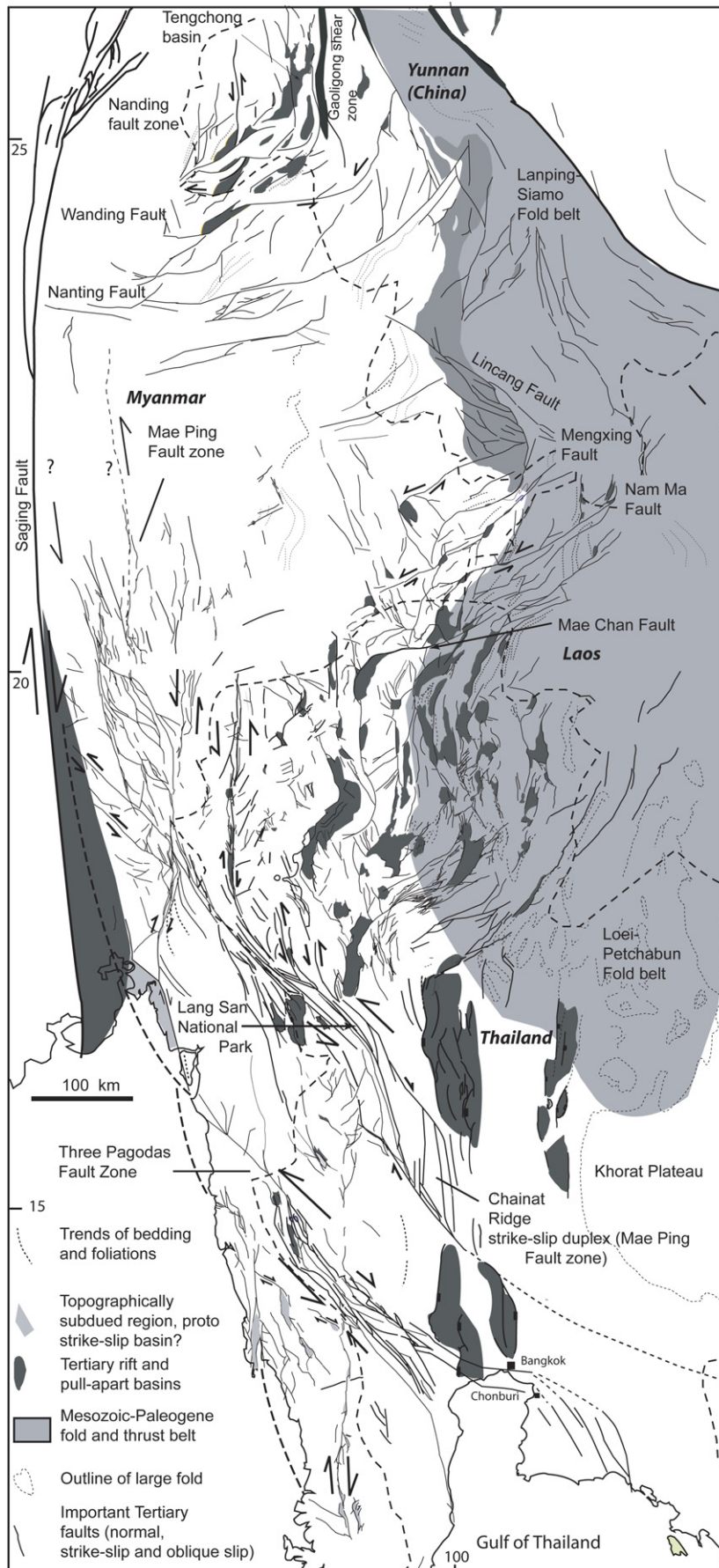


Fig. 1. Regional map of northern South East Asia. Fault pattern largely derived from satellite interpretation aided by geological maps.

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