ELSEVIER

Tectonophysics 246 (1995) 129–146

TECTONOPHYSICS

Contractional, transcurrent, rotational and extensional tectonics: examples from Northern Taiwan

Chia-Yu Lu [a], Jacques Angelier [b], Hao-Tsu Chu [c], Jian-Cheng Lee [b]

[a] *Institute of Geology, National Taiwan University, Taipei, Taiwan*
[b] *Département de Géotectonique, Université P. et M. Curie, Paris, France*
[c] *Central Geological Survey, Taipei, Taiwan*

Received 6 December 1993; accepted in revised form 9 November 1994

Abstract

Contraction, transcurrent faulting, block rotation and even extension are four essential tectonic mechanisms involved in the progressive deformation of arcuate collision belts. The neotectonic evolution of the Taiwan mountain belt is mainly controlled by the oblique convergence between the Eurasian plate and the Philippine Sea plate as well as the corner shape of the plate boundary. Based on field observations and tectonic analysis, and taking geophysical data and experimental modelling into account, we interpret the curved belt of northern Taiwan in terms of contractional deformation (with compression, thrust-sheet stacking, folding and transcurrent faulting) combined with increasing block rotation, bookshelf-type strike-slip faulting and extension. As a consequence, the formation of the extensional Taipei Basin, the division of conjugate strike-slip faulted domains and the variable nature and distribution of paleostresses should not be interpreted in terms of distinct Plio-Quaternary episodes but should reflect a single, albeit complicated, regional pattern of deformation. Our study demonstrates that in Taiwan, contractional, extensional and transcurrent tectonics as well as rotations combine together and interact within a single complex framework. The crescent-shaped mountain belt develops in response to oblique indentation by an asymmetric wedge indenter. The distribution, nature and relative importance of these deformation modes are a function of the shape of the indenter and the average direction of convergence.

1. Introduction

When deformation of the upper crust occurs in a tectonic environment where oblique convergence and indentation tectonics play a major role, three major modes of deformation are common: contraction, transcurrent motion and block rotation (Freund, 1970; Biq, 1972; Fitch, 1972; Hossack, 1979; Garfunkel and Ron, 1985; Nur and Ron, 1987). Contractional deformation results in folding and thrusting which thicken the upper crust undergoing shortening, with development of large compressional belts and foreland basins (Hossack, 1979). Transcurrent deformation results in juxtaposition of previously unrelated sectors while localized compressional ranges and basins develop (Burchfiel and Stewart, 1966; Taira et al., 1983; Sylvester, 1988). Block rotation may produce lateral extrusion and facilitate basin formation (Freund, 1970; Christie-Blick and Biddle, 1985; Garfunkel and Ron, 1985; Burke and Sengör, 1986; Souriot and Brun, 1992).

SSDI 0040-1951(94)00252-5