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Strike-slip faults offshore southern Taiwan: implications for the oblique arc–continent collision processes

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Abstract

Taiwan is the site of present-day oblique arc–continent collision between the Luzon arc of the Philippine Sea plate and the Chinese continental margin. The major structural pattern revealed from marine geophysical studies in the area offshore southern Taiwan is that of a doubly-vergent orogenic belt, bounded by significant zones of thrusting on the west and east of the submarine accretionary wedge. Due to the oblique collision process, strike-slip faults could play an important role in this convergent domain. Topographic lineaments revealed from new digital bathymetry data and seismic reflection profiles confirm the existence of three sets of strike-slip faults in the collision–subduction zone offshore southern Taiwan: the N–S-trending left-lateral strike-slip faults within the Luzon volcanic arc, the NE–SW-trending right-lateral strike-slip faults across the accretionary wedge, and the NNE–SSW-trending left-lateral strike-slip faults lie in the frontal portion of the accretionary wedge. These strike-slip faults overprint pre-existing folds and thrusts and may convert into oblique thrusts or thrusts as the forearc blocks accrete to the mountain belt. A bookshelf rotation model is used to explain the observed geometrical relationships of these strike-slip fault systems. Based on this model, the counter-clockwise rotation of the forearc blocks in the area offshore southern Taiwan could have caused extrusion of the accretionary wedge material into the forearc basin. The originally continuous forearc basin is thus deformed into several closed and separate proto-collisional basins such as the Southern Longitudinal Trough and Taitung Trough. A tectonic evolution model which emphasizes on the development of various structures at different stages of the oblique arc–continent collision for the Taiwan mountain belt is proposed.

Keywords: Strike-slip faults; Oblique collision; Bookshelf rotation

1. Introduction

Taiwan is the site of present-day arc–continent collision (Biq, 1973; Bowin et al., 1978; Ho, 1986; Teng, 1990). This collision is oblique because the N–S-trending Luzon arc is colliding with the N60°E-trending Chinese continental margin (Fig. 1). Due to this oblique convergence, the arc–continent collision is propagating southward (Suppe, 1984). The area off southern Taiwan is a transitional zone where the Luzon subduction system extending northward from the Luzon island gradually turns into an

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