ELSEVIER

Tectonophysics 333 (2001) 323–345

TECTONOPHYSICS

www.elsevier.com/locate/tecto

Structural, geodetic and seismological evidence for tectonic escape in SW Taiwan

O. Lacombe*, F. Mouthereau, J. Angelier, B. Deffontaines

Tectonique ESA 7072, Université P. et M. Curie, T26-25, E1, Boîte 129, 4 pl. Jussieu, 75252 Paris Cedex 05, France

Abstract

Recent structural, geodetic and seismological data in SW Taiwan are analysed and discussed in terms of present-day tectonic escape occurring in response to the active N100° collisional shortening. The escaping area corresponds to the onland extension of the Manila accretionary wedge; this region comprises a rheologically weak, thick muddy cover which is decoupled from the underlying basement by a décollement and which deforms mainly by aseismic creep. It is separated from the northern actual collisional area by a major WNW- to NW-trending structural and kinematic transition zone oblique to the structural grain of the belt, the Chishan Transfer Fault Zone. Geodetic data are further used to define several poorly deforming blocks undergoing nearly uniform displacement velocities and bounded by kinematic discontinuities that fit the major faults, and to determine the present-day across-strike and along-strike motions on these major faults. Although direct onland structural evidence of tectonic escape is poor, reconstruction of Quaternary paleostress patterns demonstrate that this escape probably began during the late Pleistocene, later than in northeastern Taiwan as a result of the southward migration of the collision through time. Offshore structural data help to constrain the geometry and the southern extension of the escaping blocks. Finally, a tentative model of lateral extrusion in SW Taiwan is proposed.

Keywords: Taiwan; GPS; tectonic escape; transfer fault zone

1. Introduction

The Taiwan mountain belt is an active orogen that results from the late Cenozoic oblique collision between the Luzon arc belonging to the Philippine Sea plate and the Chinese passive margin of the Eurasia plate (e.g. Suppe, 1984; Ho, 1986; Barrier and Angelier, 1986; Tsai, 1986; Teng, 1990). This collision segment connects the Ryukyu subduction zone, where the Philippine Sea plate is subducting beneath the Eurasian plate, and the Manila subduction zone, where the Philippine Sea plate is overriding the crust of the South China Sea (Fig. 1).

Because of the oblique (N054°W-directed) convergence of the Philippine Sea Plate toward the N060–070°E trending Chinese passive margin (Seno et al., 1993; Yu et al., 1997), and the consequent southward migration of the arc–continent collision through time, the Taiwan region exhibits from south to north all the stages of the collision process (Fig. 1): subduction in the Manila trench, incipient collision south of Taiwan, active collision in south-central Taiwan, past collision in the northern part (Lallemand and Tsien, 1997). Taiwan thus constitutes a natural laboratory to study the entire life of the collision by simply moving from SW to NE along the convergent Philippine–Eurasia plate boundary (Fig. 1).

Many geological studies have been devoted to the analysis of structures and deformation related to the

* Corresponding author.
E-mail address: lacombe@lgs.jussieu.fr (O. Lacombe).

0040-1951/01/$ - see front matter
PII: S0040-1951(00)00281-X