

OBLIQUE CONVERGENCE BETWEEN TRENCH-ARC SYSTEM AND CONTINENT—IMPLICATIONS FOR THE FORMATION OF THE SUBMARINE PHYSIOGRAPHY OFF SOUTHERN TAIWAN

HO-SHING YU¹ and GWO-SHYH SONG¹

ABSTRACT

The northern Manila Trench-Luzon Arc system and the juxtaposed Asian continental margin were successively deformed by collision which began at about 5 Ma ago and has been propagating southward at a rate of about 9 cm/year. As a consequence, folding, thrusting and orogenic sedimentation related to the east-west compressive stress have deformed the Asian continental margin and the trench-arc system into the mountain range (Taiwan) which plunges southward into the sea. Off southern Taiwan the sea floor features several prominent alternating N-S trending linear ridges and troughs.

Beginning about 5 Ma, the northern tip of the Manila Trench has been progressively filled, closed and uplifted from north to south and compressed into the deformation front buried west of Taiwan. The northern portion of the Manila accretionary prism together with the Asian continental margin were deformed into the Central Range and its southern extension of the submarine Hengchun Ridge which ends at about 21°N. The northern segment of the forearc basin of the North Luzon Trough was deformed into the Longitudinal Valley, serving as the boundary between the Eurasian and Philippine Sea plates. The southern extension of the Longitudinal valley is represented by the Southern Longitudinal Trough, Huatung Ridge and Taitung Trough which merge together as the North Luzon Trough south of 21°N. During the last 3 Ma, the volcanic islands north of Lutaio-Lanhsu Ridge then collided with the accreted Asian continental margin, resulting in the formation of the Coastal Range, and the Lichi melange accreted into eastern Taiwan.

INTRODUCTION

Taiwan is an island located among the island arcs along the rim of the Western Pacific. It is situated near the junction between the Ryukuu Arc to the northeast and the Luzon Arc to the south (Fig. 1). The Philippine Sea plate is moving relative to the Eurasian plate at a rate of 7 cm/year (Seno, 1977), resulting in an oblique convergence between the Asian continent and the Philippine Sea plate. The Manila Trench-Luzon Arc system and Asian continental margin were successively deformed by collision which began probably at about 5 Ma ago and has been propagating southward at a rate of about 9 cm/year (Suppe, 1981). For the past two decades, the arc-continent collision model has been successfully applied to the tectonic evolution of the island of Taiwan and especially the Coastal Range in eastern Taiwan, which has been well documented to be the product of the collision between the northern extension of the Luzon volcanic islands and the Asian continental margin (Biq, 1972; Chai, 1972; Bowin *et al.*, 1978; Chi *et al.*, 1981; Page and Suppe, 1981; Ho, 1982, 1986; Suppe, 1981, 1984; Stephan *et al.*, 1986; Chen *et al.*, 1990; Teng, 1990; Huang *et al.*, 1992).

1. Institute of Oceanography, National Taiwan University, Taipei, Taiwan, Republic of China.