

A STUDY OF UPPER CRUSTAL STRUCTURES BENEATH NORTHEASTERN TAIWAN: POSSIBLE EVIDENCE OF THE WESTERN EXTENSION OF OKINAWA TROUGH

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ABSTRACT

Arrival times of compressional (P) and shear (S) waves from microearthquakes recorded by a temporary network are used to determine the three-dimensional velocity structures beneath northeastern Taiwan. The results reveal a prominent low-velocity zone beneath the area south of Kueishantao. This zone runs in an E-W direction and extends to the Ilan plain. The relocated hypocenters show that seismic activity is also centered in this area. A clear seismic zone dipping to the south about 50 degrees exists in depths shallower than 15 km. Six fault-plane solutions of normal fault mechanisms indicate an extensional structure with the minimum principal stress, σ_3 , in a N-S direction. These results suggest that a spreading basin exists between the Ilan plain and the south flank of Kueishantao. This basin may be interpreted as the western extension of the South Okinawa Trough. A cross-section of the velocity structure perpendicular to the Chuchih thrust fault shows that this fault is a low angle thrust fault dipping 45 degrees to the southeast and extending to about 16 km deep. The velocity perturbation on the southeastern side of the Chuchih fault is greater by up to 12% than that on the opposite side. This result implies that a compressional process is taking place north of the Ilan plain. The collision and back-arc opening model (Letouzey and Kimura, 1986) can be used to interpret this paired compression/extension in the vicinity of the Ilan plain and Kueishantao.

INTRODUCTION

The subduction of the Philippine Sea plate northeast of Taiwan beneath the Ryukyu arc dips about 45 degrees northward to a depth of nearly 150 km (Tsai,