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Some Structural Implications of the High-Angle Reverse Faults, Offshore Western Taiwan

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ABSTRACT

Reactivation of preexisting fault planes generally follows the frictional failure criterion, $\tau > \tau_{fract} = \sigma'_n\mu = (\sigma_n - P_f)\mu$. In the offshore western Taiwan area, the coefficient of internal friction is about 0.55, as calculated from the stereographic projections of a number of fault planes detected by seismic survey. For the observed high-angle reverse faults in this area, the possible cause of reactivation must be due to the presence of high fluid pressure occurring only in shallow crustal level.

INTRODUCTION

There are several high-angle reverse faults in the western offshore Taiwan area. There reverse faults have been proven by both seismic survey and drilling activity (Fig. 1). The dip angles of the fault planes range from 54 to 62 degrees, most of them show listric character. The formations across the faults may have different thicknesses, those in the hanging wall blocks being thicker than those in the foot wall blocks. Besides, according to Anderson's (1951) standard state of stress distribution at the point in question (Fig. 2), the typical reverse fault should have a dip angle of about 30 degrees, and the typical normal fault would have a dip angle of 60 degrees.

All the evidence may suggest an extensional structure be transformed into a compressional structure and reverse the sense of displacement along the fault planes. This is the so called "inversion tectonics" of Pegrum (1984).

This study uses Anderson's dynamic stress model and assumes that the failure of the faults follows the Coulomb-Mohr criteria, which can be used to calculate the coefficient of internal friction and the reactivation angle of the faults.

REACTIVATION OF FAULTS

A triaxial stress state is considered with principal compressional stresses $\sigma_1 > \sigma_2 > \sigma_3$ containing a cohesionless fault plane lying at an angle, α, to σ_1, with its normal contained in the $\sigma_1\sigma_3$ plane (Fig. 2). If a formation fluid pressure, P_f, is present, the effective principal stresses are