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Velocity Structure of a Large-offset Seismic Profile Derived from tau-p Velocity Analysis Approach

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The tau-p velocity inversion method has been used extensively and successfully in deriving crustal velocity structures from expanding spread profile data and ocean bottom seismometer (OBS) data, but is seldom used on analyzing multichannel seismic profile data. In this study we use tau-p velocity analysis method to derive velocity structures from a large-offset (6 km) multichannel seismic data set collected during the 2009 TAIGER survey on the continental shelf area offshore southwestern Taiwan. The tau-p velocity analysis method transforms travel time data from time-offset (T-X) domain to the intercept time-ray parameter (tau-p) domain, and then calculates the relationship of velocity and depth by using tau-sum inversion method. This method has two advantages: 1. Tau-p velocity analysis method is more effective for calculation and it can get velocity information faster than high order velocity method (e.g. pre-stack depth migration); 2. Comparing to velocity spectrum method, which has to convert stacking velocity to interval velocity by Dix equation, the velocity information collected by using tau-p velocity method can highly represent strata velocity that produces refraction wave and the real strata velocity.

The area offshore southwest Taiwan is a collision zone where the active Luzon accretionary wedge province meets the passive china continental margin province. There are two types of continental margins. The northwest area belongs to the passive continental margin, and southeast area is active margin. In this study, we use tau-p velocity analysis to derive the velocity structures in both areas. Preliminary results show that lateral velocity change is small along the seismic profile while vertical velocity increases with depth. The velocity gradient between velocity and two-way travel time is about 1.83 km/s2. A comparison of shallow crustal velocity structures between passive continental margin and active continental margin will be discussed.