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Determination of Fracture Distribution on the Accretionary Prism off Southwest Taiwan Seismic Using Ocean Bottom Seismometers and shear-wave splitting analysis

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A multicomponent ocean-bottom seismometer (OBS) data set was collected by National Central University, Taiwan in the accreationary prism off southwestern Taiwan in 2013 and 2014, respectively. GI-gun shots located at 1 mile and 1.5 miles radius from the OBS, with spacing approximately 40 m along the sail line that were analysed as common receiver azimuthal gathers. The OBS recorded data at a sampling rate of 250 Hz and from a shot pattern that gave good azimuthal coverage around the OBS. Methods to obtain information about fractured sediments have been developed from these data since anisotropy, an effect of parallel fracture trains, generates birefringence of P-S converted waves. The multicomponent seismic method allows recording the complete wave field, including P-S converted waves. Based on P and P-S converted waves recorded between the direct and multiple arrivals, this experiment targeted the top few hundred meters of sediment in the study area. After preliminary processing, including a static correction, the data were optimally rotated to radial (R) and transverse (T) components. The principal technique used to detect the anisotropy was azimuthal stacking of the radial and transverse horizontal geophone components. The R component shows azimuthal variation of traveltime indicating variation of velocity with azimuth; the corresponding T component shows azimuthal variation of amplitude and phase. From the radial component azimuthal gather and mode-converted wave amplitude variation for the first few layers and determined corresponding anisotropy parameter and Vp/Vs values. Significant results were found, that might imply the presence of natural fracturing directions. We attribute the observed azimuthal anisotropy to the presence of microcracks and grain boundary orientation due to stress since fracture at this depth is not likely to occur. This result requires to be tested with complementary geological information.