

# **Microcrack Fabric and Seismic Anisotropy of TCDP Sandstone Samples**

Tzu-Mo Natalie Chen<sup>1</sup>, Laurent Louis<sup>2</sup>, Teng-fong Wong<sup>1</sup>, Sheng-Rong Song<sup>3</sup>

1 Department of Geosciences, Stony Brook University, Stony Brook, NY 11794-2100, USA; 2 Département des Sciences de la Terre et de l'Environnement, Université de Cergy-Pontoise, CNRS UMR 7072, Bâtiment Neuville 3.1, Neuville-sur-Oise, F-95031 Cergy-Pontoise, France; 3 Department of Geosciences, National Taiwan University, P.O. Box 13-318, Taipei 106, Taiwan

## **Abstract**

A recent study on cm-sized samples retrieved from TCDP Hole A showed that significant anisotropy of magnetic susceptibility and P-wave velocity likely related to regional tectonics could be observed in both sandstone and siltstone. In the sandstone samples, strong P-wave anisotropy was suggested to originate from the presence of a set of parallel cracks with a normal vector oriented along the bedding strike. Comparison between velocity measurements performed in dry and water saturated samples showed a maximum decrease in elastic compliance parallel to the bedding strike after saturation, and preliminary microscopic observation in a single-thin section indicates a very strong preferred orientation of intragranular cracks along the maximum velocity eigenvector, which may account for the observed seismic anisotropy. A thorough study of cracks length and orientation in 3D was performed to farther explore this microstructural interpretation. Sandstone samples collected from Hole A at depths 851 m, 1365 m and 1394 m were used for preparing 3 thin sections along mutually orthogonal planes at each location. On each thin section, intragranular cracks were characterized in length and orientation. Overall, more than ninety thousand observable microcracks data were collected and the resulting crack tensor was found to agree very well with the orientation of the principal velocity axes at these depths. We are in the process of analyzing the effects of crack density on velocity anisotropy and the relation between the microcrack failure and tectonic stresses.