

Micro-earthquakes Observations in 7-level seismometers array in TCDP Borehole, Taiwan

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Abstract

Taiwan Chelungpu-fault drilling project (TCDP) drilled two holes to retrieve the fresh slip zone associated with the 1999 Chi-Chi earthquake. The TCDP hole-A is 2km deep, and a slip zone at depth of 1111m was identified. A 7-level borehole seismometer (TCDP borehole seismometers, TCDP BHS, Figure 1) was installed in hole-A in July, 2006 through the depth of 946m to 1274m with 50m to 60m interval in depth. For this layout, three seismometers were placed in the hanging wall and footwall, respectively. The forth one is located at the depth of 1110.28m, close to the slip zone. For the state-of-the-art TCDP BHS, several earthquakes with the possible magnitudes to -0.5 were recorded with nice waveforms. These waveforms were calibrated to confirm the orientation with near-by permanent short period station TCU from the Central Weather Bureau Seismic Network (CWBSN). Micro-earthquakes, which were not recorded in the catalog of CWBSN, were well recorded at TCDP BHS with small S-P travel time. The shortest S-P travel time observed so far is 0.9 second. A temporary seismic array with 10 short period seismometers around the TCDP drill site was installed to incorporate with the TCDP BHS for the locations of the micro-earthquakes. In collaboration with Fluid Injection Test (FIT) in last Nov., and Jan., 2007, we would like to observe the possible seismicity changes associated with FIT from TCDP BHS and temporary array, and the observation of the possible triggering events (Figure 2). In additions, the source parameters of the events will be examined to understand the scaling relationship of the small to large earthquakes in stress drop and the corner frequency

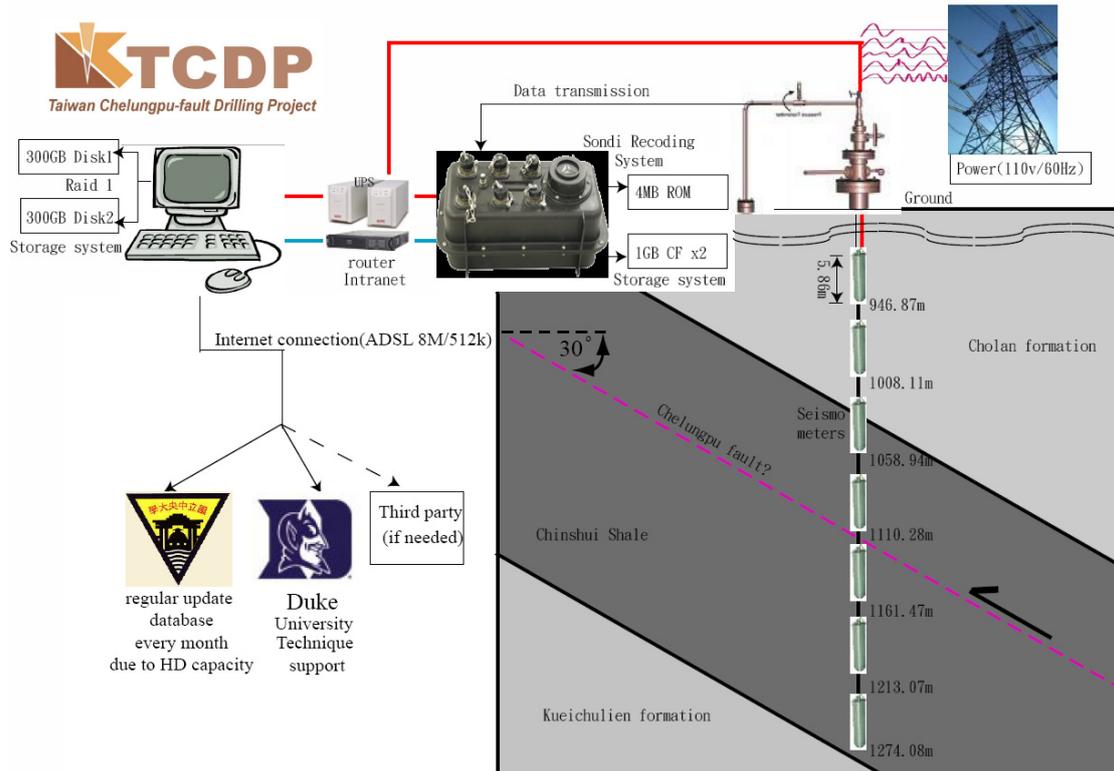


Fig 1. TCDP Borehole seismometers array deployed at drill site in Taichung.

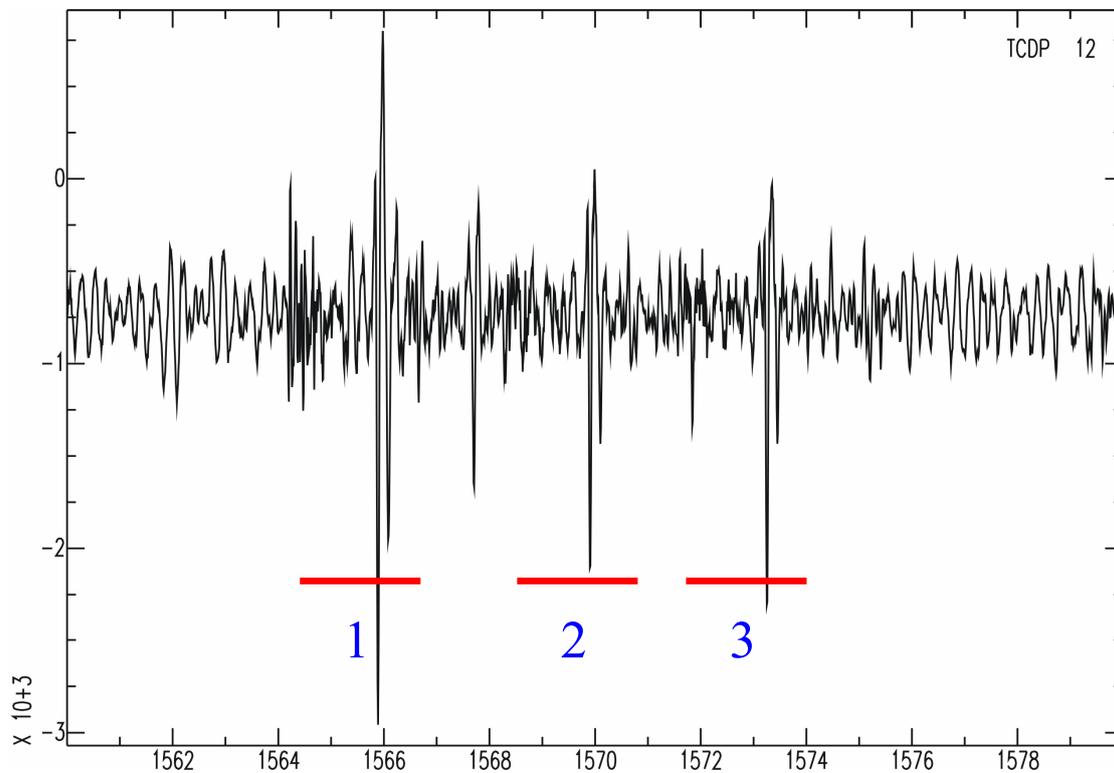


Fig 2. Repeating earthquakes recorded in Nov. 12, 2006. Red lines identify 3 events. There is 1.64sec of T_s-T_p in event 1, 1.55sec in event 2, 1.38sec in event 3.