Log Data and Borehole Image Analysis of Hole-B, Taiwan Chelungpu-fault Drilling Project

En-Chao Yeh[1, 2], Philippe Gaillot[3], Kyaw Thu Moe[3], Weiren Lin[1], Yun-Hao Wu[4], Hisao Ito[3], Tetsuro Hirono[1], Wonn Soh[1], Masa Kinoshita[5], Chien-Ying Wang[4], Sheng-Rong Song[2], Jih-Hao Hung[4] and Kuo-Fong Ma[4]

1 Kochi Institute of Core Sample Research, Japan Agency for Marine-Earth Science and Technology, Japan; 2 Department of Geosciences, National Taiwan University, Taiwan; 3 Center for Deep Earth Exploration, Japan Agency for Marine-Earth Science and Technology, Japan; 4 Institute of Geophysics, National Central University, Taiwan; 5 Institute for Research on Earth Evolution, Japan Agency for Marine-Earth Science and Technology, Japan

Abstract

Log data and digital borehole images collected from Hole-B of the Taiwan Chelungpu-fault Drilling Project are analyzed to establish the relationships between deformation structures and in-situ stress, and to identify the rupture zone of the 7.6Mw 1999 Chi-Chi earthquake. Based on standard scalar logs, three log units and five subunits are recognized and are consistent with lithologic units defined from visual core description. Fracture analysis based on the borehole images shows two pairs of conjugated conductive fractures in the strike of N030° and N110°. Three major fault zones, FZB1133, FZB1191, and FZB1240, are recognized from visual borehole image inspection at wireline logging depth of 1133, 1191, and 1240m, respectively. FZB1133 shows the lowest electrical resistivity and relatively lower sonic velocity within the black fault gouge as well as a clear asymmetric resistivity pattern, and thus it is believed to be the more recently activated rupture zone related to

the Chi-Chi earthquake. The azimuth of the maximum horizontal stress (SHmax) inferred from drilling-induced fractures is regionally oriented in N130°, an orientation which is consistent with the direction of plate convergence. Local variations of SHmax correlate well with lithology changes. However, in a 20m depth interval around FZB1133, SHmax has an azimuth of N210° resulting from the stress perturbations of the Chi-Chi earthquake. The integration of in-situ stress, log data and deformation structures suggests that all fractures are conductive but might not have being activated by the Chi-Chi event.