Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MIS32-17 Room:304 Time:May 24 14:45-15:00

Assessment of In-Situ Stress from Deep Borehole in the Middle Coastal Plain and Its Implications for Taiwan CCS Project

YEH, En-chao[1*] ; LI, Wei-cheng[1] ; CHIANG, Tung-chin[1] ; WU, Feng-yi[1] ; CHENG, Chuan-li[1] ; LIN, Weiren[2] ; WANG, Tai-tien[3] ; YU, Chi-wen[4] ; CHIAO, Chung-hui[5] ; YANG, Ming-wei[6]

[1]Department of Earth Sciences, National Taiwan Normal University, Taipei, Taiwan, ROC, [2]Kochi Institute for Core Sample Research, Japan Agency Marine-Earth Science and Technology, Japan, [3]Institute of Mineral Resources Engineering, National Taipei University of Technology, Taipei, Taiwan, [4]Sinotech Engineering Consultants, Inc., Taipei 114, Taiwan, ROC, [5]Taiwan Power Company, Taipei 100, Taiwan, ROC, [6]Taiwan Power Research Institute, Taipei 238, Taiwan, ROC

Global warming have been becoming an important issues around the world. One of efficient ways to reduce the global warming and decrease CO2 in the atmosphere is to sequestrate the supercritical CO2 into the underground structures or formations. To evaluate the risk of CO2 leakage, the knowledge of in-situ stress state and integrity and rock strength of cover formation is essential. Besides, the assessment of in-situ stress state is significant for drilling-casing plan. Furthermore, understanding the relationship between fracture and in-situ stress is one of key information to evaluate the potential of fracture seal/conduit and fracture reactivity for such underground projects.

Formations under the Coastal Plain in Taiwan have been evaluated as saline-water formations with gently east-dipping and no distinct fractures endured by regional tectonics of obliquely arc-continental collision with N35W compression. The formation is characterized as a suitable place for carbon sequestration. In this study, we will integrate the comprehensive results of different in-situ stress determinations such as anelastic strain recovery (ASR), diameter core deformation analysis (DCDA), borehore breakout, hydraulic fracturing from a 3000m borehole of carbon sequestration testing site and further evaluate the seal feasibility in terms of rock mechanics and tectonic implication in the context of stress state.

Results of 30 ASR experiments between the depth of 1500m and 3000m showed the consistent normal faulting stress regime. Stress gradient of vertical stress, horizontal maximum stress and horizontal minimum stress with depth is estimated as 22, 20, and 18MPa/km, respectively. The distribution of borehole breakout is not completely throughout all of interval in 1500-3000m. The mean orientation of breakout is about 175deg and mean width of breakout is 84 deg. Based on rock mechanic data, maximum injection pressure of carbon sequestration can be estimated. Furthermore, although it is normal faulting stress regime consistent with core observations and borehole image logging, the horizontal maximum stress of 85deg inferred from breakout suggested that this place has been affected by the compression of oblique collision. The comparison of stress magnitudes estimated from ASR, DCDA, breakout and hydraulic fracturing cab further verified current results.

Keywords: In-Situ Stress, CCS, Taiwan, ASR, Breakout, Hydraulic Fracturing