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Preliminary Strategy of Determination of Current Three-dimensional Rock Stress in Nankai Ultra-deep Drilling Well

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A qualitative modal of in-situ rock stress states at various depths in ultra-deep drilling well was schematically shown in Fig.1. The well will be drilled to a depth of about 6 km below the seafloor with about 2000m water depth, and go though splay fault and decollement. This figure shows all the orientations of the three principal stresses at deeper depths may be not same as the well axis. Thus, it can be considered that the three-dimensional stress measurements are desirable. Based on the investigation of various existent stress measurement methods, it was preliminarily concluded that there is not a perfect method by which the magnitudes and orientations of the three-dimensional in-situ stress can be reliably measured at great depth. We suggest that combinational applications of borehole methods and core-based methods, considered being possible and practical approach for ocean deep drilling projects, should be employed. With respect on the borehole method, hydraulic fracturing test or extended leak-off test (also be called micro-hydraulic fracturing test) will be suitable to obtain magnitudes of the maximum horizontal principal stress or/and the minimum horizontal principal stress, if the conceivable failure of borehole wall dose not result in that the operation of the tests become impracticable. In addition, the observation of borehole breakout, drilling induced tensile wall fracture can also provide important information. On the other hand, core-based methods such as anelastic strain recovery (ASR), differential strain curve analysis (DSCA), core discing etc. are possible methods to estimate the three-dimensional orientations and the ratios of three principal stress deviations or the ratios of three principal stresses.

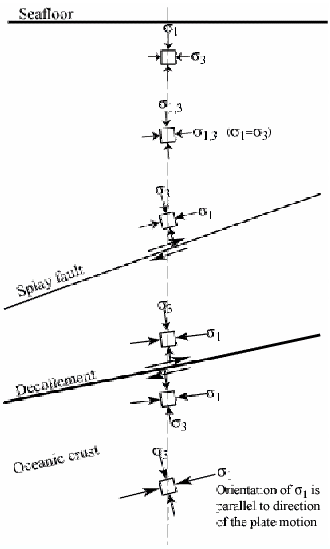

Fig.1 Predicted Stress states at various depths in coming Nankai trough deep drilling well.

Keywords: Three-dimensional stress; deep drilling; stress measurement strategy.