地震発生帯での応力推定とジオメカニクス：NanTroSEIZE Site C0002での例

Stress estimate and Geomechanics in seismogenic zone: Implications for NanTroSEIZE deep drilling at Site C0002

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Estimating regional stress state, especially horizontal stress orientation and magnitude, is essential process in the seismogenic zone drilling, since the estimate is important not only to understand regional stress regime and its change with depth for revealing tectonic situations beneath a drilling site but also to plan better drilling strategy (casing plan, mud weight design, wellbore stability analysis, etc.). Regional stress state and pore pressure should be estimated in the pre-drilling phase to investigate casing plan and mud weight design. In case of a typical sedimentary basin, preliminary stress state is simply estimated based on the poroelastic stress model. However, it is difficult to do for a drilling site where predominant horizontal tectonic stress is inferred as it is independently varied on overburden stress. In addition, method or tool for measuring in-situ stress at a depth (e.g., Leak-Off Test, LOT) is limited, and stress estimate during drilling requires the limited drilling conditions based on geomechanical approach (e.g., borehole breakout analysis). Therefore, update of the estimated stress state during a drilling operation is also one of critical issues.

In usual case, rock strength data (unconfined compressive strength, UCS) of drilled formation is required to estimate stress magnitude based on geomechanical approach. Therefore, it is also important to estimate or measure UCS before and during a drilling operation. In order to get better UCS data and its profile with depth beneath drilling site, conventional triaxial rock strength test and precise seismic velocity model are required at least.

For ultradeep drilling of the seismogenic zones (e.g., NanTroSEIZE), stress measurement and/or estimate is certainly important to establish feasible stress measurement and/or estimate in pre-and syn-drilling phases.

In this presentation, current status of stress estimate and results from our geomechanics study at Site C0002 will be presented based on stress estimate (e.g., LOT data) and borehole observations (e.g., borehole breakout) from the previous operations (e.g., Chang et al., 2016), borehole stability analysis deduced from stress/pore pressure profile models, UCS models estimated from our triaxial test results and the reprocessed 3D seismic velocity model (Shiraishi et al., 2018). Issues to drill ahead into the plate boundary fault will be discussed for those interested on upcoming IODP Expedition 358- Nankai Seismogenic/Slow Slip megathrust.

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