

Current Status of Drilling-Related Plans to Study Consequences of Bend-Fault Serpentinization During Plate Bending offshore Nicaragua (Outcome from the June 2016 BFS/H-ODIN Workshop)

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During the last decade, multiple independent geophysical structure studies have revealed that plate bending-induced normal faults in outer rise regions around the world are associated with significant hydration. This bend-fault-linked hydration and Bend-Fault Serpentinization (BFS), with its associated physical and chemical changes, is one of the most significant geological discoveries of the last 15 years. It has the potential to reshape our understanding of Earth's deep water and carbon cycles, the ecology and evolution of species in deep-sea chemosynthetic environments, and even the fundamental mechanism by which slabs bend and unbend, thereby driving Plate Tectonics.

In-situ sampling of rocks and fluid tracers is a key tool to make further progress in our understanding of BFS, its implications for the hydrothermal system(s?) that can develop during plate bending, the extent of deep life within these systems, and the resulting chemical interactions between the downgoing plate and seawater. Offshore Nicaragua is a prime site for drilling-related study of this process because this is the place where ongoing BFS occurs in the the world's shallowest environment (2.9-3.4km water depth).

In June 2016 a group of interested scientists met at the IODP workshop "Bend-Fault Serpentinization, drilling proposals using the D/V *Chikyu*" to assess the best strategy for using scientific drilling to explore BFS at complementary sites at the Middle American Trench offshore Nicaragua and the Japan Trench. The drilling-oriented goals of the workshop were to refine scientific objectives, drill sites, and strategies for scientific drilling in the outer rise region in order to understand the nature of the bend-fault hydration in the incoming plate. We reached a provisional consensus on the best approaches to make the most rapid progress towards better understanding of this frontier area of Earth Science. The workshop discussed deep drilling plans, but it was felt that a staged approach is preferable for effective study of this system. A dual-mode drilling strategy was proposed: (Stage I), D/V JOIDES Resolution or D/V *Chikyu* drilling through the upper parts of the bend-fault system to better understand the chemistry and shallow fluids, fluid flow, and bend-fault-linked microbial ecosystems, and also assess and improve our current technologies and strategies for drilling through bend-faults, and (Stage II), a MoHole-type drilling strategy to sample an intact crustal and mantle section through 1km below the ~5.5km-deep crust-mantle boundary that has direct relevance to many M2M (MoHole) science objectives. This talk will briefly summarize the known constraints on BFS in this region, and then discuss the proposed strategy for future IODP investigation of this system. Any interested scientists are welcome to join the 'BFS Science Team' and help in the preparation of a full IODP proposal for Fall 2017.

Keywords: Bend-Fault Serpentinization, Outer Rise, Hydrothermal System, Scientific Drilling