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Investigation into hydrology along Bending-induced faults by off-Tohoku Incoming Plate Sampling

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The magnitude and spatial distribution of hydration of the oceanic plate is a key to understand water-carbon circulation at subduction zone, and also trigger earthquakes and arc magmatism. Hydration of oceanic plate at the outer rise region due to bending and faulting before subduction has been conceptually proposed (e.g., Peacock, 2001 Geolgy) and has been recently supported by seismic observations (e.g., Ranero et al., 2003 Nature; Worzewski et al., 2010 Nature Geosci.). It is, however, not clear yet, how, how deep and how much water can infiltrate into the bending oceanic plate. Dredging and submersible studies cannot provide the deep and spatial information of oceanic plate. We are going to propose a drilling project to obtain the spatial information of altered oceanic plate along bending-induced faults in off-Tohoku incoming plate, which is an old and cold end member of the oceanic plate. Although trenchward-dipping seismic reflections have not been observed in the studied region, recent multbeam bathymetric analyses show horst and graben structures parallel to subparallel to the Japan trench axis, which are newly formed from plate bending induced faults (Nakanishi, 2011 in Accretionary Prisms and Convergent Margin Tectonics; Nakamura et al., 2013 Geophys. Res. Lett.). Epicenters of the earthquakes in this region show lineations parallel to trend of topographic lineations of these horst and graben structures (Obana et al., 2012, Geophys. Res. Lett.) Ocean bottom seismograph observations suggest that intraplate earthquakes after the 2011 Tohoku earthquake occurred in the oceanic crust and uppermost mantle at depths <40 km, and have normal-faulting focal mechanisms (Obana et al., 2012). Hydration along these bending-induced faults should cause serpetinization in the incoming plate prior to the subduction that has been linked to the existence of the lower part of the double Wadati-Benioff seismic zone in this region (e.g., Peacock, 2001; Reynard et al., 2010 Geophys. Res. Lett.; Nakajima et al., 2011 Geophys. Res. Lett.; Garth and Rietbrock, 2014 Geology). In the meeting, we will present drilling strategies to achieve the scientific objectives.

Keywords: Subducting Plate, Outerrise, Hydrology, Earthquake, Oceanic Drilling, Serpentinization