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日本海溝における沈み込み堆積物の力学的・水理学的特性と沈み込み帯弱面の発達過程
Mechanical and hydrological properties of incoming sediments at the Japan Trench and the weak-decollement evolution

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2011 Tohoku earthquake caused the large tsunami induced by the large fault slip along the subduction plate boundary. Incoming sediments, a part of which changes into weak fault zones or décollement, could control the earthquake behavior of subduction zones. However, what actually controls the formation of a weak fault plane from the non-deformed incoming sediments at a subduction plate boundary is still debated.

There is a high possibility that vertical variations of shear strength and velocity dependence of friction among the incoming sediment contribute to the development of a weak plate boundary fault zone. Permeability is the other important factor to affect the vertical variations of the strength as it controls the generation of excess pore pressure due to dehydration and pore compaction during the subduction.

In the previous reports, the hydrological and mineralogical data about the core of the toe of the wedge have been obtained on the Japan Trench Fast Drilling Project (JFAST), Integrated Ocean Drilling Program (IODP) Expedition 343 (Tanikawa et al., 2013; Kameda et al., 2015). The frictional properties are also revealed (Ikari et al., 2015). On the other hand, there are only a very few frictional and hydrological properties for the input materials at DSDP Hole 436 (Sawai et al., 2014).

Therefore, in this study we measured the frictional strength and fluid transport properties of the core samples retrieved from the input site of the Japan Trench (DSDP Hole 436), and estimated the depth distribution of the strength and permeability.

The core samples we tested were recovered from Hole 436, which is located at the outer rise of the Japan Trench. Tested samples were selected to cover the whole cored depth. We conducted two types of measurements of frictional strength on each sample: normal-stress dependent test and velocity dependent test, by a rotary shear friction apparatus at Kochi Core Center (Shimamoto and Tsutsumi 1994; Hirose and Shimamoto 2005). In addition, we measured fluid transport property by Steady State Flow Method using water as a pore fluid.

Based on the laboratory results, we discuss the possible process to develop the weak fault zone during the subduction. We also compare the data with those of the preceding studies about JFAST samples.

Keywords: Japan Trench, subduction zone, frictional property, hydrological property