Can subducting Kyushu-Palau Ridge weaken Hyuga-nada subduction interface, western Nankai Trough: A Proposal to IODP

*Rie Nakata[1], Masataka Kinoshita[1], Yoshitaka Hashimoto[2], Yusuke Yamashita[3]

1. University of Tokyo, 2. Kochi University, 3. Kyoto University

Hyuga-Nada is located at the southwestern end of the Nankai trough, and a transition zone to the Ryukyu trench. Here, Kyushu-Palau Ridge (KPR), an aseismic remnant arc of the Izu-Bonin-Mariana arc, obliquely subducts beneath the Amurian plate, and separates the newer Shikoku and older West Philippine basins. Comparing to the rest of the Nankai subduction zone, the plate interface at Hyuga-Nada is known to be weakly coupled, represented by frequent regular earthquakes of M7 or smaller and a lack of earthquakes of M8 or larger. Recursive swarms of very low-frequency earthquakes and tremors are observed near the trench, and clearly coincide with the seamount of KPR inferred from magnetic anomalies. Based on previous understanding in other subducted seamounts (e.g. Hikurangi), we hypothesize that the unique earthquake signatures are related to the KPR subduction and/or the transition of the two subduction systems. First, basic stress and frictional properties of the subducting interface is controlled by input sediments, topography and temperature of the incoming plate, of which the KPR, Shikoku and West Philippine Basins differ significantly. Second, the rough plate interface associated with KPR creates tectonic erosion, and modulates geomechanical and hydraulic conditions of the plate interface and the upper plate. This creates a favorable condition for slow earthquakes to occur (i.e., high pore-pressure). We propose to conduct scientific drilling and place observatories, in order to i) characterize age, lithologies, fluid properties of the incoming sediments, ii) estimate past and current deformation and stress conditions above and near KPR, and iii) monitor their evolution over earthquake cycles, as well as iv) explore slow earthquake events. We combine the results with modeling, seismic/structural, geodetic observations to validate, refine and deepen the understanding of the ridge subduction and the associated phenomena.

Keywords: IODP, slow earthquakes, ridge subduction

