# Distribution of abnormal fluid pressure ratio in Hyuga-Nada combining the laboratory experiments with the velocity from seismic profiles.

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Pore fluid pressure is an important parameter in the mechanical strength and earthquake behaviors along plate boundary faults. In Hyuga-nada, seamount subduction is observed, and slow earthquakes occur around the seamounts, which is a place where the relationship between topography and slow earthquakes is clearly identified. It has also been pointed out that slow earthquakes are related to high pore fluid pressure. Therefore, the purpose of this study is to calculate the pore fluid pressure from the velocity structure inferred from the seismic reflection profiles and to obtain the distribution of the abnormal fluid pressure ratio.
The Kyushu-Palau Ridge (KPR) is a non-seismic paleo-island arc separated from the Izu-Ogasawara-Mariana Island Arc at the opening of the Shikoku Basin at 27-15 Ma. The West Philippine Basin (40-50 Ma) is located to the west of the KPR.
This study focuses on the HYU02, HYU18, and HYU22 seismic profiles. HYU18 and HYU22 are perpendicular to the trench and landward of the subducting seamount, with HYU18 located to the east and HYU22 to the west of the seamount. HYU02 is oriented parallel to the direction of relative motion of the Philippine Sea Plate and is located on the western flank of the subducting seamount. The length of the profile is approximately 153.0 km for HYU02, 43.6 km for HYU18 and 84.6 km for HYU22.
The conversion is performed using the velocity-porosity-effective pressure relationship obtained from the laboratory experimental data of Hashimoto and Yamaguchi (2014) for the input sites of Nankai Trough off the Kii Peninsula. First, the velocity obtained from the seismic profiles is converted to porosity using the velocity-porosity relationship. The porosity is then converted to effective pressure using the porosity-effective pressure relation on the normal consolidation curve, which is assumed to be under hydrostatic pressure. Next, the lithostatic pressure is calculated using the depth below seafloor and the density (2g/cm3), and the pore fluid pressure is calculated by subtracting the effective pressure from the lithostatic pressure. Then, the anomalous pore pressure ratio (lambda star) is calculated from the difference between pore fluid pressure and hydrostatic pressure normalized by the difference between lithostatic pressure and hydrostatic pressure.
For HYU02, some high lambda star was found near the surface on the land side as seen in the porosity diagram. For HYU18, the thickness of the small lambda star near the seafloor is consistent with the sedimentary basin, but the thickness is thinner on the seaward side. In addition, there is an area where the lambda star is elevated near the surface on the seaward side. For HYU22, some high values are found in the middle.
The physical properties of the sediments used in this study were obtained from the IODP NanTroSEIZE transect, input sites in the Nankai Trough off Kumano, and it is questionable whether these properties can be directly applied to the sediments of the Hyuga-Nada. The Hyuga-Nada can contain a large amount of

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volcanic ash due to active volcanism in Kyushu, and it is desirable to adapt the physical properties of sediments with this characteristic. If possible, it would be ideal to obtain physical properties over a wider range of porosity with lower porosity that are exposed on land. Even in the current situation, where these problems can be pointed out, porosity is obtained in a sensible range, and some relative distribution may be reasonable to be discussed.
The velocity distributions are obtained from the analysis depending on the reflection structure, and may be strongly affected by strongly reflecting surfaces such as BSR. It will be necessary to study the resolution accuracy of the velocity distribution in conjunction with the velocity and density simulations.

Keywords: Subduction zone, Seamount subduction, Slow Earthquakes, Hyuga-Nada

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