Po/So波から推定した海洋リソスフェアの地震学的構造
Seismological structure of oceanic lithosphere inferred from Po/So waves

*志藤 あずさ[1]、末次 大輔[2]、古村 孝志[3]
*Azusa Shito[1], Daisuke Suetsugu[2], Takashi Furumura[3]

1.九州大学 大学院理学研究院附属 地震火山観測研究センター、2.海洋研究開発機構　地球深部ダイナミクス研究分野、3.東京大学　地震研究所
1.Institute of Seismology and Volcanology, Kyushu University, 2.Department of Deep Earth Structure and Dynamics Research, Japan Agency for Marine-Earth Science and Technology, 3.Earthquake Research Institute, University of Tokyo

Oceanic lithosphere, comprising oceanic crust and upper mantle, plays an important role in plate tectonics. Knowledge of the detailed structure of oceanic lithosphere is key to understanding its origin.

The propagation of Po/So waves over large distances across oceanic lithosphere provides information about lithospheric structure. Po/So waves, characterized by a high frequency, large amplitude, and long duration, were identified as early as 1935 [Linehan, 1940]. Many previous studies have attempted to quantitatively explain the generation and propagation mode of Po/So phases. Although it is generally accepted that Po/So phases are guided waves traveling very efficiently throughout the oceanic lithosphere, the generation and propagation processes of Po/So phases remain unclear.

In the past two decades, there have been great technological advances in computer simulations of high-frequency seismic waves in heterogeneous structures and in broadband seismic observations on the seafloor. These gains motivated us to further investigate the processes relating to guided waves in oceanic lithosphere and the generation of Po/So waves, using broadband seismic data and the numerical Finite Difference Method (FDM) to simulate high-frequency seismic waves. In this presentation, we outline recent progress in the study of Po/So waves.

Shito et al. [2013] reported that Po/So waves are generated by multiple forward scattering of P- and S-waves due to small-scale heterogeneities in oceanic lithosphere. The laterally elongated heterogeneities are described by a von Karman distribution function with a correlation length of 10 km in the horizontal and 0.5 km in thickness, with a velocity perturbation of 2%.

Kennett and Furumura [2013; 2014] and Shito et al. [2015] found that the propagation efficiency of Po/So waves depends on the age of oceanic lithosphere, and that this relationship can be qualitatively explained by thickening of oceanic lithosphere that contains small-scale heterogeneities and a reduction in intrinsic attenuation. Recently, Kennett and Furumura [2015] proposed a new model that the amplitude of such heterogeneities increases with depth to the bottom of the lithosphere. These results suggest that small-scale heterogeneities may form continuously in oceanic lithosphere, from the time of its formation at a spreading ridge, via the solidification of melts in the asthenosphere.

The petrological and mineralogical processes that cause the small-scale heterogeneities remain poorly known. Future studies that combine seismological observations with petrological analyses will yield a greater understanding of the origin of oceanic lithosphere.

キーワード：Po/So波、海洋リソスフェア、小規模不均質
Keywords: Po/So waves, oceanic lithosphere, small-scale heterogeneities

