Morphological and Geophysical study of Seamounts in the Northwestern Pacific using underway surveys

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Many seamounts are distributed in the northwestern Pacific. However, most seamounts are unknown about the age and the mechanism of volcanic eruption. Large seamounts can be discovered in Etopo2 for example, but small seamounts are not. In this study, we analyze the seamount's characteristic using a detailed bathymetric map in northwestern Pacific (146˜160E, 35˜47N). The northwestern Pacific seafloor has information of tectonism and volcanism from formation to subduction because crustal age of this area is old. When a seamount is formed on an oceanic plate, the plate is bended by load of the seamount, and a moat is formed around the seamount. If a seamount is formed on a young plate, the flexure of the plate grows big, because the elastic thickness is thin. As the result, the moat becomes deep. In this way, the seamount moat and age of the oceanic plate is related. Therefore seamounts have various information. We examine classifications of seamounts that may be able to estimate of the age of formation and the mechanism of volcanic eruption.

We analyzed the morphology, the height, the moat, and the volume of seamounts from grid data with 0.05 minutes interval that compiled swath bathymetric data obtained with JAMSTEC cruises and made a detailed bathymetric map. As a result, we can evaluate each parameters of total of 68 seamounts. The classifications are possible by relationship of the seamount morphology and the volume-moat. The seamount's morphology is possible to classify in three types; cones, ovals and irregularities. The cone-type seamounts tend to have deep moats compared to the oval-type seamounts. Moreover, we can classify three groups in a volume-moat simple scatter diagram. Each seamount's heights, moats, volumes are various, and we cannot find clear characteristics by the distribution. Each parameter's ratios of most seamounts have similar value.

The three types may indicate difference in the condition of eruption or the change of the stress direction at time of formation. As for the volume-moat relationship classified in three groups, it is possible to consider that each seamount is formed in different condition. For example, seamounts that have shallow moat and large volume are formed when the elastic plate is thick. More detailed analysis is needed, because other effects must be considered, such as sedimentation, erosion, re-deposition and variation of crustal structure near fracture zones.