

Morphology of Mariana forearc serpentinite seamounts

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Serpentinite seamounts which consist mostly of serpentinites and serpentine mud distribute from 20 to 13 degrees north of the Mariana forearc. They are named from north to south, as Conical, Pacman, Celestial, Big Blue, Blue Moon and so on. The spacing of the serpentinites seamounts is small compared with that of volcanoes. As is the case of the Izu-Bonin serpentinites seamounts, the spacing of them is about half of that of the active volcanoes. The distance from the trench axis is 40 to 90 km. The morphology of the serpentinite seamounts is basically conical shape and the size of them is larger than the Mt. Fuji. Three morphological types of serpentinite seamounts, were identified; Conical, Hanging Bell, and Straight, respectively. These three types have close relationship with their origin. The materials forming the serpentinite Seamounts are matrix and pebbles. The matrix consists of serpentine mud of crysotile and antigorite and the pebbles consist of the serpentinitized peridotite, mostly harzburgite, including orthopyroxenes. Serpentine muds include much water like clay minerals and sometimes flow structure of serpentine muds are seen everywhere. Serpentinite seamounts are accompanied by carbonate chimneys and chemosynthetic animal communities at South Chamorro SMT, Conical SMT and Pacman SMT. We have bathymetric survey around the serpentinites seamounts and their adjacent area. As the results we observed a huge slope failure along the Mariana forearc. The collapse of the slope reached not only in the serpentinites seamounts but as far as the outer arc area near Pagan volcanic island. The Mariana outer Arc consisting of Guam, Saipan and other islands but to the north of Pagan Island there are neither island nor submarine seamount at the extension of the outer arc. Huge collapse diminished out of the extension part due to the huge slope failure. Bathymetry of this area represents a large horseshoe morphology which was caused by large collapse structure and all the materials existed there were transported down to the trench. It was also observed that some of the serpentinites seamount themselves show the sliding morphology along the slope surface resultant formation of a small depression behind the movement. We found the pebbles obtained during the cruise which has a complicated structure that is enclosed by serpentine matrix many times. It will conclude that serpentinites dominated forearc always collapse and cause the slope failure to transport the materials there to the trench bottom and the materials subducting to the deeper part then to have repeated recycling as serpentinites seamounts up to the surface of the forearc. The serpentine melange, kind of mixed rocks are thought to be formed through this process. Fujioka (1997) proposed serpentine dominated tectonics along Izu-Bonin, Mariana, Yap and Palau Margins. The idea is the same as stated above recycling process which includes material transportation, sedimentation, metamorphism and exhumation accompanying the large scale submarine sliding due to the serpentine dominated forearc. Great Earth scientist, Hess (1955) already stated this kind of processes conceptionally about half century before.