

Bottom sediment distribution of the off-Tokara Islands; a preliminary report of surveys on 2021.

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The Geological Survey of Japan (GSJ) implements the Marine Geological Map Project to produce a comprehensive 1:200,000 marine geological map of the seas surrounding Japan. As a part of this project, we have carried out sediment sampling surveys covering the entire ocean area to create a surface sediment map. This presentation will report the preliminary results of onboard observation and non-destructive analysis of sediment samples obtained during the geological survey cruises (GB21-1, GB21-2, and GB21-3) conducted by "Bousei Maru" of Tokai University in 2021.

We conducted surface sediment sampling using a K-grab sampler at 163 sites in a grid pattern spaced about 10 km apart in the study area. The K-grab is equipped with a safety device, a seafloor camera with laser scale, and a Niskin water sampler. These devices are linked to the underwater altimeter to improve the operation rate, acquire seafloor images for a detailed understanding of biota and sedimentary structures, and collect water directly above the seafloor. In addition, CTDs, azimuth inclinometers, and a sound velocity meter (at some sites) are also installed independently. With this equipment, it is possible to obtain a certain amount of sediment information even in hard bottom sediments where no sample can be obtained.

The collected sediment samples were photographed on board, described with the naked eye, and coarse-grained material larger than 5 mm is classified into biological remains and gravels. From sandy or muddy sediments, Arita-type subcores were obtained and used for soft X-ray imaging and three-dimensional structure imaging using medical CT.

Igneous gravels and sands predominate on islands and around topographic highs. In contrast, muddy sediments predominate at depths of about 1000 m, such as Tokara Valley and the bottom of the Okinawa Trough. The composition of coarse-grained materials varies depending on the site, especially pumice, and biological remains (mainly sponges, cnidarians, and mollusks) are widely distributed. Many outcrops and ripples were observed in the seafloor photographs around the islands, the Tane-Yaku Spur, and the geomorphic rises such as submarine volcano. Especially on sandy sediments, topography and structures influenced by currents were often observed, such as ripples, mega ripples, and sand waves, which can be recognized on seafloor photographs and topography data. At the sites where ripples were observed, we also observed that materials with similar densities and shapes, such as pteropod remains and sand particles with different mineral compositions, were concentrated and interbedded. The three-dimensional structure of the sandy and muddy sediments, obtained by naked-eye observation and CT images, indicates that they are subjected to a strong biological disturbance at many sites regardless of water depth.

In this area, major facies of fine-grained materials are distributed only in deep water, while those of coarse-grained materials tend to be distributed regardless of water depth.

The composition of the sediment particles basically reflects the supply from the nearby volcanic rock bodies and biological production. However, the sedimentary structure including ripples and the concentration of particles with specific density and shape can be attributed to the influence of the Kuroshio Current. Kuroshio Current meanders around the Tokara Islands and passes from the East China Sea to the Pacific Ocean, and could reach the bottom layer from the estimated direction and distribution

area.

The distribution of sediments around the off-Tokara Islands is complicated by the movement and redeposition of various volcanic debris and biological remains supplied by both land and sea, under the influence of currents such as the Kuroshio Current.

In FY2022, we will extend the longitude range in the same area and conduct undersea geological surveys in the northeastern part of the Okinawa Trough and the area around the Tane-Yaku Spur. We will perform quantitative analysis of the samples obtained during these surveys and existing samples, including particle size analysis and particle composition. We would prepare basic information for geological research in the form of Sedimentological Maps.

In addition to the surface sampling by K-grab, columnar samples were collected at seven sites (GB21-1 cruise on the Bousei Maru and KH-22-2 cruise on the Hakuho Maru). Using these samples, we also aim to elucidate the Spatio-temporal changes of typical sedimentation rates and sediment sources in the sea area.

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