

Research on sediments from the deepest oceanic trench (DIOMAT project).

Our knowledge related to the ocean seabed concentrate mainly on the shelves areas located closest to the continental margins, where the broader economic activity and human activity is the most intense. Unfortunately, these areas, due to fluctuations in the sea level related to climate change in the geological past, do not preserve a constant record of environmental changes in their sediments. This record had a chance to be reflected in the sediments deposited in the deeper parts of the ocean. Exploration of abyssal areas, which are located below 4000 m from the surface of the water, led to the recognition of only 4% of those immersed in the darkness, under the huge pressure and cold areas of the seabed. It is a result of a great distance that divides these regions from the shore, the spatial size of those areas that constitute 75% of the ocean areas and also due to technical limitations of the equipment. Due to the above, the world of science still has limited knowledge about these regions, and every opportunity to analyze these extreme, but at the same time stable environments provides a huge portion of new information, including about species previously unknown to science.

The formation Mariana Trench, deepest known area of the seabed with a depth of nearly 11,000 m, located in the western part of the Pacific Ocean, is related to the subduction zone of the Pacific Plate for the Euro-Asian Plate.

The first scientific research of this place was carried out during the legendary expedition on board of the British vessel "Challenger" in 1875, which discovered Challenger Deep in the western Pacific Ocean and obtained sediment ooze samples on the seafloor of 4475 m water depth. One of the most recent expeditions into the area of Challenger Deep was the expedition of the Chinese Geological Survey in 2012 on board of research vessel Haiyang 6. Thanks to these efforts, three sediment samples from the water depth of approx. 6650 meters to approx. 7200 meter were collected. These sediment profiles are available as part of the submitted project for further analysis, based on the courtesy of the Guangzhou Marine Geological Survey, Guangzhou, China.

By obtaining this unique research material, it will be possible to test a special type of sediment, which was shown in the profile of collected sediments. These are the so-called diatom ooze, which is a special type of pelagic sediments made of biogenic silica. These sediments are typical of marine areas located particularly around Antarctica but are also known from other deep-sea areas of the Pacific Ocean or the Atlantic. In order to explain the nature of the formation of diatomaceous ooze, their spatial and temporal differentiation, a research project proposal was prepared. The main hypothesis being the assumption that the formation of this special type of sediment dominated by the species *Ethmodiscus rex* is associated with changes in the oceanographic regime in the area of the Mariana Trench, which affected changing the composition and concentration of nutrients in surface waters, in particular during climate oscillations in glacial-interglacial timescales. To verify this hypothesis, sediment cores with various diatomaceous layers collected from the Mariana Trench will be analyzed by micropaleontological and bio-geochemical methods. The project aims to: 1) identify the composition of diatomaceous assemblages, 2) explain the bio-stratigraphy of sediments, 3) create a geological age model of sediments, 4) create a model that summarizes the conditions for the formation of diatomaceous ooze.

The implementation of this project will contribute to a better understanding of the deep ocean areas and their response to environmental (climatic) changes. Research on the formation of these deep-sea sediment facies - their chronology and paleo-oceanographic conditions will highlight Polish achievements in research on deep sea areas, conducted so far, among others in the Clarion - Clipperton zone. Additionally, the presented project assumes research in cooperation with scientists from China, Germany and the United States, which will result in strengthening international cooperation, especially at the University of Szczecin, where most of the research will be carried out. Research on such extreme environments should also attract the attention of scientists and the public around the world, which will promote Polish scientific research.