

Detection of anthropogenic materials in Beppu Bay sediments, a candidate for the Anthropocene GSSP, by osmium isotopes

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It is a well-known fact that human activities since the Industrial Revolution have altered the environment and ecosystems on a global scale, and it has been pointed out that this global environmental change has been one of the most significant in the long history of the Earth. This global-scale environmental change caused by human activities is called the Anthropocene geological era, and there is a movement to establish a global standard model site. The Beppu Bay sediments have been proposed as one of the candidates for a model site for the Anthropocene, and one of the aims of this study is to identify the age of the transition from the Holocene to the Anthropocene based on the temporal changes in the characteristics of the sediments, and to recognize Beppu Bay as a model site for the Anthropocene.

In this study, the isotopes of Os, one of the platinum group elements, were analyzed in the sediments of Beppu Bay. Osmium isotopes in sediments have been used to analyze the impact of meteorite impacts and large-scale igneous activity on the paleoenvironments such as mass extinction and oceanic anoxic events. It is also useful to investigate the influence of anthropogenic substances on coastal areas because the Os isotopic ratios of anthropogenic materials such as car exhaust, catalysts from factories, and medicines such as anticancer drugs are low, while the Os isotopic ratios of terrestrial components are high.

The ratio of ¹⁸⁷Os/¹⁸⁸Os in sediment cores from Beppu Bay was 0.7 to 0.8 before 1960. It started to decrease around 1960, reaching a minimum value of approximately 0.5 around 1995, and then rapidly recovered to 0.7-0.8 in 2000. This result may indicate that the rapid industrialization in the 1960s increased the discharge of anthropogenic substances into the coastal zone, and then the emission of anthropogenic Os decreased due to the effect of pollutant emission control around 1995.

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