

Formation processes and human impact for sediments in Majuro Atoll

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In Majuro Atoll, Marshall Islands, people have lived for more than 2000 years, even though atolls are vulnerable to natural disasters and climate change. The sediments are originally composed of coral gravel and foraminifera. However, they are easily affected by human activities such as cultivation of crops. We focus on the changes of physico-chemical conditions of sediments that could be affected by human activities to evaluate anthropogenic impacts depending on the depth of the sediments in Majuro Atoll.

X-ray fluorescence (XRF) and Inductively-coupled plasma mass spectrometry (ICP-MS) analyses were used to measure concentration of major and trace elements, respectively. X-ray absorption fine structure (XAFS) analysis was conducted to examine their detailed chemical form. Accelerator Mass Spectrometry (AMS) was applied for ¹⁴C dating using foraminifera.

The concentrations of toxic elements such as Zn, Cu, and Pb increased sharply in upper layer, which were correlated with that of total organic carbon (TOC) in Laura and Calalen islands, whereas Mg increased as the increase of the depth. Speciation of the elements suggested that the former elements are of anthropogenic origin, whereas the latter is by the release of Mg from magnesian calcite due to the acidification of the surface sediment.