Reconstruction of late Holocene flooding history by GDGT proxies in Beppu Bay sediments

MASANOBU YAMAMOTO[1*], MICHINOBU KUWAE[2], TOMOHISA IRINO[1], KEN IKEHARA[3], KEIJI TAKEMURA[4]

[1]Faculty of Environmental Earth Science, Hokkaido University (Correspondence: myama@ees.hokudai.ac.jp)
[2]Ehime University,
[3]AIST,
[4]Kyoto University

Reconstruction of flooding events is a recent issue of paleoclimatology. We developed the use of GDGT compositions to identify flooding sediments in marine cores and generated a 2900-year long record of flooding in Beppu Bay area, northern Kyushu, Japan by analysing 457 sediments (2-cm interval) of core BP09-3 retrieved in Beppu Bay basin. We also analysed 74 soils in the watershed areas of Oita and Ohno Rivers and 35 estuary sediments for comparison.

Branched GDGTs in soils have less methyl group (higher MBT) and less cyclic structures (higher CBT) than estuary and basin GDGTs. Soil and estuary sediments have more branched GDGTs (higher BIT) than basin sediments. GDGT compositions are, thus, useful to identify the provenance of sediments in Beppu Bay cores.

In core BP09-3, 18 thick and 55 thin event layers were recognized by visual, soft X ray and CT-scan descriptions, and the sediment ages were determined by 42 radiocarbon dates of molluscan shells (Kuwae et al., 2011). Most of major event layers showed higher BIT than hemipelagites. Some of them have high MBT and CBT values which correspond to those of soils. We interpret that they originated directly from the surface soils via Oita and Ohno Rivers, most likely by typhoon-induced flooding. Historical records support this interpretation.

U^{K}_{37}' in the study core showed decadal-scale variation in temperature (PDO). Two third of flooding events occurred when temperature was maximal (negative PDO). The flooding was also frequent in the periods showing century-long warming. These results provide proxy-based evidence of hypothesis mentioning that the regional warming of the northwestern Pacific enhances typhoon activity.