SOURCE OF SEDIMENTARY ORGANIC CARBON IN THE EASTERN YELLOW SEA (THE NORTHWESTERN PACIFIC)

Jung-Hyun Kim[1], Suk-Hee Yoon[2], Dong-Hun Lee[2], Hi-Il Yi[3], Kap-Sik Jeong[3], Masanobu Yamamoto[4], Jong-Ku Gal[2], Sujin Kang[2], Bohyung Choi[2], Kyung-Hoon Shin[2]

[1]Korea Polar Research Institute, South Korea
[2]Hanyang University, South Korea
[3]Korea Institute of Ocean Science and Technology, South Korea
[4]Hokkaido University, Japan

Introduction

River-dominated marginal seas are one of the most important sites of organic carbon (OC) burial in the marine environment. The Yellow Sea is a semi-enclosed, northwestern Pacific marginal sea. Two of the largest rivers in the world, the Huanghe River (Yellow River) and the Changjiang River (Yangtze River) and several smaller Korean rivers (e.g. Han, Geum, and Youngsan Rivers) are flowing into the Yellow Sea, supplying high amounts of terrigenous sediments. Previous bulk- and biomarker-based studies on the origin and distribution of sedimentary OC in the Yellow Sea have shown that the contribution of terrestrial OC is predominant along the coast while that of marine OC is in the central basin. However, most of the studies have thus far focused on the western Yellow Sea, and comparable studies have rarely been conducted in the eastern Yellow Sea. In this study, we aimed to provide qualitative and quantitative assessments of sedimentary OC source and composition in the eastern Yellow Sea. For this purpose, we used a multi-proxy approach on 9 riverbank sediments and 69 marine surface sediments, combining bulk (C/N and $\delta^{13}C_{TOC}$) and lipid biomarker (GDGTs and *n*-alkanes) parameters.

Results

The riverbank sediments have low C/N ratios (on average 4.8±0.5, n=9) and enriched $\delta^{13}C_{TOC}$ values (on average –21.5±0.6 ‰, n=9) while the BIT index is on average 0.27. The C/N ratio and $\delta^{13}C_{TOC}$ in the marine surface sediments (n=69) are on average 7.0±0.6 and –21.9±0.5 ‰, respectively, whereas the average BIT index is 0.00±0.01. The $\Delta^{14}C$ values of the marine surface sediments are depleted (on average –227±53 ‰, *n=8*). Molecular distributions of *n*-alkanes are overall dominated by odd-carbon-numbered high molecular weight *n*-C_{27}, *n*-C_{29}, and *n*-C_{31}. The $\delta^{13}C$ signatures of *n*-C_{27}, *n*-C_{29}, and *n*-C_{31} indicate a large contribution of C_3 gymnosperms as the main source of *n*-alkanes. However, the contribution of thermally matured petroleum-derived OC to the sedimentary OC pool is also evident, especially in the southern part of the study area. Notably, the even-carbon-numbered long-chain *n*-C_{28} and *n*-C_{30} in this area have higher $\delta^{13}C$ values (−26.2±1.5 ‰ and −26.5±1.9 ‰, respectively) than the odd-carbon-numbered long-chain *n*-C_{29} and *n*-C_{31} (−28.4±2.7 ‰ and −28.4±2.4 ‰, respectively).

Conclusions

The sedimentary OC in the muddy deposits in the eastern Yellow Sea appears to have a predominantly marine origin with minor contribution of continental (i.e. soil- and lake/river-derived) OC. Fossil OC, potentially derived from waste discharges from rivers and oil spills due to shipping activities, is also being contributed to the sedimentary OC pool in the eastern Yellow Sea. Hence, our results highlight a possible influence of petroleum-induced OC on benthic food webs in this ecosystem.