Geochemical characterization of modern black mud by Independent Component Analysis

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Black shales are enriched in some kinds of redox sensitive metals as well as organic carbon and sulfides, and have been formed through the Earth history with the emergence of oxygen-depleted environment. The concentration of these metals has been attributed to an adsorption by organic matter, incorporation to or formation of sulfide minerals, or a precipitation as insoluble compounds such as oxyhydroxides.
In the modern ocean, black mud that is enriched in organic carbon and/or sulfides deposits in certain sea areas associated with an oxygen-depleted water mass, such as a silled basin or an upwelling area. These black muds likely constitute comparable counterparts of the ancient black shales. Therefore, to characterize the geochemical features of these black muds may provide a new insight into the past oceanic environmental changes.
In this study, we determined contents of major and trace elements, total organic carbon (TOC), and total sulfur (TS) of black mud and shale samples collected from a variety of geographic conditions and redox states in the water mass. In order to characterize the geochemistry of black mud and shale, we also applied Independent Component Analysis to the multi-elemental data set. We will present the analytical result and discuss its implications for the oceanic environmental changes.

Keywords: redox sensitive metals, black mud, black shale, Independent Component Analysis

