Glacial-interglacial cycles and sedimentary organic matters of the Pleistocene core in the Choshi area, central Japan

Satoko Ishikawa[1], # Akiko Omura[2], Koichi Hoyanagi[3], Moamen M.I. El-Masry[4], Saneatsu Saito[5], Asahiko Taira[6]

[1] Geology Sci.,Shinshu Univ, [2] Shinshu Univ., [3] Geology, Shinshu Univ., [4] ORI, U-Tokyo, [5] JAMSTEC, [6] Ocean Research Institute, Univ. of Tokyo

Many paleoceanographic and paleoenvironmental studies regard sedimentary organic matter preserved in the deep-sea sediments as primary productivity in the sea-surface. However,terrigenous organic matter intermix with marine organic matter in the shallow marine sediments. We examined the compositional changes of sedimentary organic matter and correlate them with glacial-interglacial cycles with the Pleistocene core from the Choshi area. The Morito site in Choshi City was cored from 0 to 250 m depth by the Ocean Research Institute of the University of Tokyo.

The Choshi core is composed of the Pleistocene sediments of the Obama,Yokone, Kurahashi and Toyosato formations. The Obama and Yokone formations are mainly composed of mudstone,gradually changing to sandy mudstone in the upper part of the Yokone Formation. The Kurahashi and Toyosato formations are mainly composed of sandy mudstone. Mudstone and sandy mudstone are strongly bioturbated. The Obama to Toyosato formations were deposited under the shelf environment. The sandier-upward successions are interpreted shallowing-upward in the shelf environment.

One hundred twenty four samples of mudstone and sandy mudstone for grain size analysis and TOC measurement were taken from the Choshi core at intervals of 2m. TOC was measured by a YANACO CHN analyzer (MT-5). Grain size was measured with a laser-diffraction size analyzer (Coulter LS230). Forty-six samples for particulate organic matter analysis were taken from the Choshi core at intervals of 5m. We applied the fluorescent visual kerogen analysis (Sawada and Akiyama, 1994) to preparation and observation of particulate organic matter. Classification of particulate organic matter was followed by Sawada and Akiyama (1994) and Tissot and Welte (1984). Vitrinite,cutinite and sporinite are considered to be of higher plant debris,leaf and cuticle,pollen and spore in origin,respectively. Alginite is of algae and marine plankton origin. Amorphous organic matter is subdivided into NFA,FA WFA on the basis of their fluorescent character (Sawada and Akiyama, 1994). NFA, FA and WFA are considered to be of vitrinite or land plants, sporinite or cutinite, and marine plankton in origin, respectively (Sawada and Akiyama, 1994). Furthermore, Gorin et al. (2001) pointed out that amorphous organic matter is formed under the anoxic environments by a bacterial attack. Composition of organic matter was determinated by counting 300 points at each 100 micro meters interval under a reflected light fluorescence microscope.

Most samples contain TOC less than 1% and C/N ratio is approximately 6 to 10. High TOC contents are coincide with the high pikes of C/N ratio. These evidences indicate that TOC is controlled by not only primary productivity but also terrigenous organic matter supply. We correlate composition of particulate organic matter, TOC contents and grain size with delta 18O values. The results indicate that warm periods are characterized by high TOC contents, coarse grained sediments and high contents of vitrinite,cutinite and sporinite,while cold periods are characterized by low TOC contents,fine grained sediments and low contents of vitrinite,cutinite and sporinite. Furthermore,horizons of high pyrite contents are rich in amorphous organic matter. We correlated pyrite contents and amorphous organic matter contents with delta 18O value. Both amorphous organic matter and pyrite contents are high in warm period and are low in cold period. These evidences suggest that sea-floor environment is reductive condition in the warm period and is oxic condition in cold period.

The warm current is considered to have flowed into the Choshi area at the warm period from the examination of planktonic foraminifer assemblages (Igarashi, personal communication). It is concluded that a suboxic sea-floor environment on the shelf in the Choshi area was caused by a stratified water column with the warm water current inflow in the warm period.