Geochemical and geomagnetic properties of drill core sediments from the Youngjong Island: New evidences of sea level change during the late Pleistocene to Holocene

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The whole sections of two drill core sediments (YJ-1 and YJ-2) sampled around the Youngjong Island were analyzed for the distribution of trace metal concentrations after both partial and total extraction, in order to investigate the paleodepositional environments in the area. The vertical variations of the pH, organic matter content (LOI and TOC), particle size distribution, mineralogy, and geomagnetic properties were also measured and compared with the trace metal data.

All of the data sets examined vary systematically with depth and show a distinct change around a specific depth: 14-15 meters below the sea floor (mbsf) in the core YJ-1, and 10-11 mbsf for the core YJ-2. The variation patterns are also well correlated between the two cores. These changes are interpreted to indicate the an abrupt change of the sediment accumulation and composition, likely due to a dramatic environmental change in the Yellow Sea during the last glacial cycle in the late Pleistocene to Holocene.

The layer just below the specific horizons (YJ-1, 15.01 mbsf; YJ-2, 11.55 mbsf) shows the higher magnetic susceptibility (MS) due to the existence of magnetite (as indicated by the IRM data), the higher contents of the sand fraction and organic matter, and the lower pH. On the other hand, the layer just above the depths (YJ-1, 14.18-14.48 mbsf; YJ-2, 10.6 mbsf) shows the higher contents of the metals (esp., Fe, Mn and other heavy metals) and clay fraction. The Fe- and Mn-hydroxides are the possible scavenger of heavy metals in the layer. The clay mineralogy also varies with the increasing contents of kaolinite and chlorite with the decreasing illite content.

The formation of a metal-rich horizon is considered as the result of the following mechanism: during the Pleistocene/Holocene transition the sedimentary environments in the area were changed from more, sand-rich and oxic environment (possibly, beneath-terrestrial during the Last Glaciation) toward more, clay-rich and anoxic (as indicated by the restricted occurrence of peat fragments) environment; the transition toward more anoxic sedimentary environment resulted in aqueous dissolution of redox-sensitive elements such as Fe, Mn, and other metals from the lower sandy layer materials; the dissolved metals diffused upward through sandy layer and concomitantly precipitated with clay; the scavenging of heavy metals occurred by the coprecipitation with and/or adsorption onto the re-precipitated Fe- and Mn-hydroxides in the upper clay-rich layer. This scenario is also supported by the variation of the ratio between total metal concentration and partial metal concentration, as well as by the variation of Al-normalized heavy metal concentration data.

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