Source of sediments and metal fractionation in the swamp of two Chinese estuaries

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The Changjiang estuary and the Jiulongjiang estuary are located in east and southeast China, which belong to the meso-tidal type and the liman type respectively. Sources of sediments are associated with the circumstance around estuaries, which affect the total contents and speciation of heavy metals.

The major elements and heavy metals were analyzed by ICP-AES and AAS. SiO_2, CaO, MgO are higher in sediments from the swamp of Changjiang estuary, and Al_2O_3, Fe_2O_3, OM are higher in sediments from the Jiulongjiang estuary. Heavy metals in sediments of the swamp of Jiulongjiang estuary are higher than in those of the Changjiang estuary. Sediments in the Changjiang estuary have higher soluble Cd and Pb, reducible Cr, oxidisable Cu and Zn, those in the Jiulongjiang estuary have higher soluble and reducible Zn, oxidisable Cu, Pb and Cr.

The primary component analysis of major elements and heavy metals shows that Pb is associated with CaO, Cu is associated with Fe_2O_3, MnO and organic matter, and Zn, Cr, Pb are associated with Al_2O_3 in sediments of the Changjiang estuary. Zn, Cd, Pb are associated with CaO, Cu is associated with Fe_2O_3, Zn is associated with MnO, Cu and Zn are associated with organic matter, Cr is associated with Al_2O_3in sediments of the Jiulongjiang estuary.

The sediments from the Jiulong swamp as a result of semi-closed bay mostly originate from the ambient soils with high contents of clay and organic matter, which can absorb the metal pollutants. But the Changjiang estuary is strongly affected by the riverine discharge, and sands from river deposit in sediments. The metal pollutants are diluted in the estuary swamp.

Mineralogical-geochemical peculiarities of sulfur-phosphate acidic weathering in arctic conditions

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For the last thirty years (1977-2007), black carbonaceous-argillaceous-siliceous shale hypergenesis processes in arctic conditions have been studied (Pai-Khoi, the Yugorsky Peninsula, Russia) and their comparative analysis with identical processes, developing in similar geological environments in arid climate conditions (Kazakhstan, Spain), has been carried out by us.

The main factor of hypergenic mineral formation is sulfur-phosphate acidic weathering. Freeze melt waters, infiltrated from loose covering deposits, influence on sulfide and phosphate containing black shales and are enriched by sulfuric, phosphoric and other acids, the concentration and activity of which increase sharply as a result of acid bath freezing in oxidizing rock outcrops. Fluid Si-Fe-Al-SO_3-P_2O_5 hydrosols, with the consistence from syrupy up to retinoid, are formed. They fall into two geochemical branches: aluminum and ferrous. Their coagulation leads to the formation of hard hydrogels and crystallization of Ca, Mg, Fe, Al, etc. sulfates. As a result of hydrogel salting-out under the influence of electrolytes, gypsum, jarosite, epsomite, and copiapite are crystallized, and also amorphous aluminophosphates are transformed into crystalline crandallite. The minerals of the system Si-Fe-Al-SO_3-P_2O_5 last evolution stage are wavellite, variscite, turquoise, etc.

The general mineral formation evolution consequence in the system of ageing colloids in Arctic is the same as in other regions, but evolution rows are much more complete because in arctic conditions, less stable short-lived phases, which in arid climate conditions immediately destroy, passing into more stable ones, are better preserved.