Occurrence and distribution of selected heavy metals in the surface sediments of South Brittany coastal waters: An assessment using pollution indicators

Ong MC (1,2), Menier D (1), Noor Azhar MS (2), Dupont V (3), and Révillon S (4)

(1) Géosciences Marines et Géomorphologie du Littoral, Centre de Recherche Yves Coppens, Campus de Tohannic, Université de Bretagne-Sud, 56017 Vannes cedex, France (ong@umt.edu.my), (2) Department of Marine Science, Faculty of Maritime Studies and Marine Science, University Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu, Malaysia , (3) Laboratoire Ingénierie des Matériaux de Bretagne, Campus de Tohannic Université de Bretagne-Sud, 56017 Vannes cedex, France, (4) Domaines Océaniques, Institut Universitaire Européen de la Mer, Place Copernic, Université de Bretagne Occidentale 29280 Plouzané, France

In order to avoid the pollution of heavy metals in South Brittany water, it is necessary to establish the data and understand the mechanisms influencing the distribution of heavy metals of the area. One of the aims of this work was to assess heavy metals contamination in Gulf of Morbihan and Quiberon Bay. Another aim was to use interpolation surfaces per metals to assess the contamination separately per metal. A total of 196 bottom sediment samples were collected from the coastal waters in order to determine the spatial concentration of Cr, Mn, Co, Cu, Zn, Cd and Pb by Inductively Coupled Plasma Mass Spectrometry (ICPMS) after acid digestion. The average heavy metal concentrations are ranked as follows: Mn>Zn>Cr>Pb>Cu>Cu>Cd. In the gulf, metal enrichments observed compared to the bay environment may due river run-off from three major river (Auray, Le Marle and Novalo rivers) which carried municipal waste and maritime activities along the coastal area within the gulf. Beside those factors, the natural factors such as the sheltered basin morphology itself, fine sediment and low hydrodynamic regime which favour the in situ accumulation of pollutants. The level of pollution levels attributed to heavy metals was evaluated using several pollution indicators in order to determine anthropogenically derived sediment contamination. Comparison to sediment quality guidelines (SQGs), enrichment factors (EFs), index of geoaccumulation (Igeo) and contamination factors (CF) based on reference element and background value to compensate for the influence of the natural variability in sediment mineralogy and to assess whether the concentration observed in surface sediment represent background and contaminated levels and visualize using ArcGIS software. These analyses validated that the bottom sediment only enriched in Pb and the other metals in most sample are not due to artificial contamination. Overall, geochemistry of the samples show the effect of both natural and anthropogenic inputs to the catchment, however, natural processes are more dominant than anthropogenic inputs in concentrating metals in the sediment.