

HISTORICAL RECONSTRUCTION OF HEAVY METAL CONCENTRATION IN THE GULF OF CARIACO, VENEZUELA

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INTRODUCTION

²¹⁰Pb activity is a useful technique in environmental investigation, to determine sediments accumulation rates, geochronology, and to study metals. Its activity decline exponentially with depth, and is inversely proportional to the sedimentation rate at non-impacted ecosystem. Dating of sediments, combined with chemical profile, allow the study of the impact events in coastal zones. In the present study, we have investigated the history of metals concentrations and sedimentation rates of recent sediments (100 years) in the Cariaco Gulf, Venezuela (Fig. 1), an important fishery area at the Caribbean Sea, with industrial, harbor, agricultural and urban activities (Fig. 2).

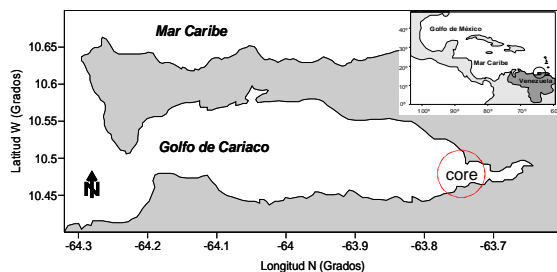


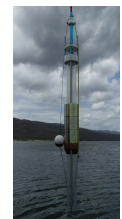
Figure 1. Cariaco Gulf, Venezuela



Figure 2. Cariaco Gulf, Venezuela Coastal Zone

METHOD

A sediment core was collected up to 30 m depth. Dating technique is based on decay of ²¹⁰Pb, which was measured from ²¹⁰Po by alpha spectrometry. Sedimentation rates were calculated from ²¹⁰Pb_{xs} profiles, and using the CRS model (constant rate supply). Metal concentration was obtained by FRX, and sediment grain size for laser diffractometer. Additionally analyses of organic carbon and total nitrogen were realised in an elementary analyzer.



RESULTS

Sedimentation rates and organic carbon obtained increases with time, which seems to be related to the changes in the land use. On the other hand the metals exhibit three different distributions: i) increase of the levels of the metal to middle 70's (Cu, Cr, Cs). ii) Decrease in in that same period (Hg). iii) elevation in the period 1975-1997 and diminution as of 1998 (Co, Mn, Ni, Si, V). Factorial analysis demonstrated the association of the majority metals with the sedimentation rate, and independence of grain size (90 % silt). Also, continental contribution were observed, represented by the relation Organic Carbon-P-Total Nitrogen.

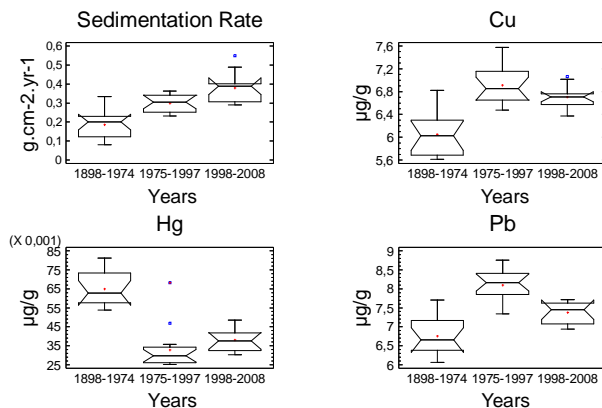


Figure 3. Sedimentation rate and heavy metal. Historical distribution in sediments of Cariaco Gulf, Venezuela

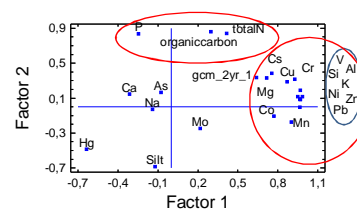


Figure 4. Factor analysis for metal, organic carbon, nutrients and sedimentation rate distribution in Cariaco Gulf, Venezuela.

CONCLUSIONS

Two processes were identified that have influence on the distribution of the studied variables: (i) natural input with terrestrial material of Al, Co, Cr, Mg, Mn, Si, Zn, V, and (ii) contribution of organic matter and nutrients, probably related to the agricultural activity of the zone. Important increases of both processes and sedimentation rate were observed in 1980's, due, probably, to changes in the economic activities of the area. A slight diminution of the concentrations of Pb was observed in 1998, due to restrictions in the gasoline commercialization with Pb.

Acknowledgements

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