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Differences in acquisition of environmental data in strongly impacted marine sediments using gravity and vibro corers: the case-study of Augusta Harbor (Eastern Sicily, Italy)

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Abstract

Sediment cores are used to reconstruct the chronological evolution of contamination in impacted areas while deep core levels may be considered as reference conditions for the assessment of environmental status. For this purpose, the collection of undisturbed cores is essential. Vibro and gravity corers are the most used devices for environmental research. In this study, chemical (Ba, Hg and PCBs) and grain size data obtained by means of gravity (SW-104) and vibro (Rossfelder[®]) corer from 3 stations of the heavily contaminated Augusta harbor (Sicily, Italy) were considered. Their vertical profiles were compared considering the different technical characteristics of corers, in order to highlight differences in data acquisition. Results showed that, for areas characterized by high sedimentation rates, the vibrocorer is the best choice for the higher penetration capacity. No significant differences were recognized for sediment compaction and potential downward drag of the contaminants.

Keywords:

Marine sediments; Contaminated areas; Gravity corer; Vibrocorer; Environmental data.

1. Introduction

The environmental characterization of marine coastal areas, especially if impacted by human activity, requires a careful sampling strategy of the sediments. The chemical and textural characteristics of sediments from superficial and deep levels are very important parameters to be considered in the evaluation of potential anthropogenic impact on marine coastal systems, because they preserve the record of sedimentary and chemical input. Sediment core is the best choice for this kind of studies because it preserves the record of sedimentary and chemical input, due both to natural and anthropogenic factors. Deep core levels reflect environmental conditions before the impact and, consequently, they may be used as reference conditions for the assessment of the environmental status (Guo and Yang, 2016). Due to these features, sediment cores are also the best choice for determining the background concentrations of metals and trace elements in marine sediments (Romano et al., 2015). In this context, the sampling method is of basic importance to acquire reliable data, because the collected samples should be virtually undisturbed, while any devices could be the cause of some disturbance during penetration into the sea bottom.

Two replicate cores from three stations (AU3, AU9 and AU10 at 10.2m, 12.3m and 10.1m, respectively) of the coastal area of the Augusta harbor, sampled during a comprehensive environmental characterization finalized to identify extent and chronology of contamination, were considered for this study (Fig. 1).

Aim of this study is to highlight advantages and disadvantages of both gravity and vibro corer for data acquisition finalized to the historical reconstruction of contamination patterns. This goal is achieved taking into account different technical characteristics and different physical principles used for sediment

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