PAHS IN SUPERFICIAL SEDIMENTS AFFECTED BY RAW SEWAGE IN A MOROCCAN MEDITERRANEAN COASTAL AREA (AL HOCEÏMA)

Amato E. *, Ausili A., Romano E., Gabellini M., Celia Magno M., Alcaro L.

ICRAM. Istituto Centrale per la Ricerca scientifica e tecnologica Applicata al Mare, Roma, Italy. - *eziamato@tin.it

Abstract

In the framework of an EC Avicenne initiative co-funded project, the authors investigated the distribution of some organic pollutants in superficial sediments subjected to urban raw sewage pollutant inputs in Al Hoceïma (Morocco, Western Mediterranean Sea). The sampling design has foreseen collecting samples of superficial (0-20 cm) sediments by means of box-corer, gravity corer and grab. 27 stations were sampled to characterize sediment texture and to quantify the PAHs concentration. Results show that these pollutants are dispersed in a wide area by strong long-shore currents.

Key words: coastal systems, PAHs, sewage pollution, Western Mediterranean

Introduction

In the framework of an EC Avicenne initiative co-funded project, the distribution of polycyclic aromatic hydrocarbons (PAHs) in superficial sediments subjected to urban raw sewage pollutant inputs in Al Hoceïma (Morocco, Western Mediterranean Sea) was investigated.

The area was chosen along the Moroccan coast in the Alboran Sea basin (Western Mediterranean Sea) near Sabadia and Al Hoceïma Bay; Al Hoceïma Bay is located on the extension of lower valley of Nekkor (Middle Rif's belt). Sedimentation is mainly terrigenous in the central area of the bay while, on the external sides is mainly bioclastic sedimentation (1); the morphological features of the continental shelf in the area indicate, on the outer side, some sectors with variable slope of the sea floor.

Methods and Materials

15 superficial sediment samples coming from the marine area in front of Sabadia al Hoceïma and 2 samples (SM3 e SM5) in front of the sewage output were collected. In the Al Hoceïma Bay, instead, in the eastern zone of investigated area, 8 superficial samples and 2 cores (Fig. 1) were collected to understand about vertical contaminant distribution. The first 6 cm length of each core was sub-sampled into 1 cm-thick layers while the remaining part was sub-sampled into 2 cm-thick layers. All the samples were then homogenised and frozen at -20°C prior to the analyses.

Grain size and PAHs analyses were performed according to Romano et al.(2).

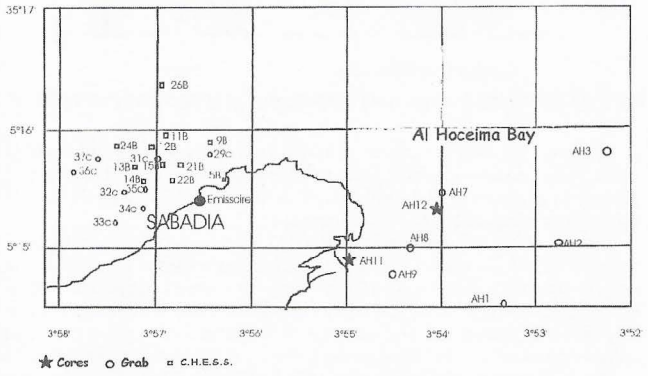

Figure 1. The investigated area and sampling points

Results and Discussion

In the western zone of the area, grain size results show only sandy sediments with an high biodetritic fraction (3%-4.6 %). It was coarse and frequently were found much organogenic detritus probably worked by the transport and long-shore current; the fine fraction is absent in almost all the samples, except for the MM 24B sample (13.8%), localized at the end of the first slope (50 – 60 m).

In the eastern zone (Al Hoceïma Bay), instead, superficial sediment is mainly terrigenous with a low sand fraction (3%-17%), and no biodetritic fraction. Only AH 9 and AH 11C samples have respectively 31% and 21.8% of sand. In both areas sediment distribution don't seems to be related to the bathymetry.

PAHs concentration levels measured in the western area are generally low in all the samples with the only exception of station 25B (549 ng/g) that is was located on the outer side of the area. In the eastern zone the levels are below the detection limit (<1 ng/g).

The vertical trend of the core AH 11C shows a decrease of the sandy fraction until 14 cm from the top while in the last two levels the sandy and gravelly fractions increase.

In the core AH 12C, instead, the sandy fraction increases with depth and, at the same time, there is a decrease in the clay fraction. There is only one exception in the (4-5 cm) level with a high value of clay content (62%).

In both cores the PAHs concentrations decrease with depth with the higher values in superficial layers of AH 12C; in particular, in this core is observed the same trend in the fine fraction (Fig. 2).

In conclusion, our results identify two areas with different sedimentological characteristics in which sedimentation is strictly conditioned by continental shelf morphology and the coastal hydrodynamic regime. The western area has a coarse and biodetric sediment deposition and the eastern area, Al Hoceïma Bay has a terrigenous sedimentation. PAHs contamination is low and strictly correlated with the fine fraction.

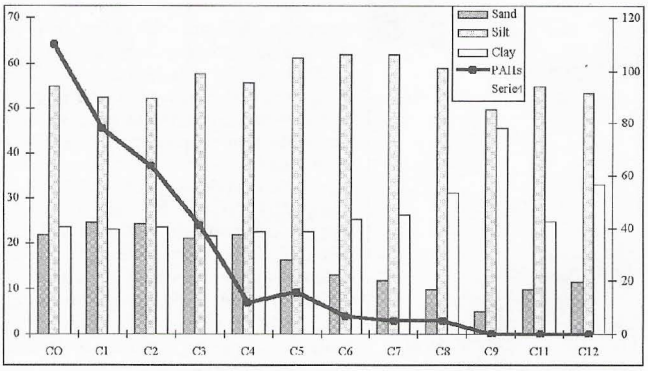

Figure 2. Grain size (%) and PAHs trend (ng/g) in AH11C core.

References:

1. Gensous B. and Tesson M., 1979. Morphologie et sédiments de la Baie d'Al-Hoceïma. *Mines, Géologie et Energie, Rabat,* n. 46, 127-134.

2. Romano E., Gabellini M., Pellegrini D., Ausili A., Mellara F., 1998. Caratterizzazione di sedimenti provenienti da differenti aree marine costiere per la definizione di criteri di gestione ambientale. *In:* Atti 12° Congresso AIOL, Ass. Ital. Ocean. e Limn., Isola di Vulcano, 18-21 Settembre 1996: vol. II, 473-486.