RIVERBORNE HEAVY METALS AS INDICATORS OF PARTICLE DYNAMICS AND ANTHROPOGENIC PRESSURE IN THE GULF OF LIONS (NW MEDITERRANEAN)

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Abstract
Particle dynamics has been traced in the Gulf of Lions (NW Mediterranean) through the use of particulate heavy metals introduced by rivers. It allowed first to reconstruct the main trends of the hydro-sedimentary functioning of this non tidal environment and second to draw a global portrait of the distribution of the metallic contamination. Results evidenced the determinant role of the prodeltas - i.e. shallow sedimentary units off the river mouths - in the control of land-derived sediment and associated contaminant fluxes.
Keywords : Metals, Sediment Transport, Pollution, River Input, Gulf Of Lions.

The Gulf of Lions is one of the largest continental shelves of the Mediterranean Sea, receiving various sources of particulate materials delivered by far from rivers. Around 80 - 90 % of this terrestrial input originates from the Rhône River [1], the most important river of the western Mediterranean basin. In contrast, the other rivers (e.g. Têt, Aude, Orb and Hérault) are characterized by smaller watersheds and show a highly variable discharge regime governed by episodic flood events. The Gulf of Lions is, in this respect, a heterogeneous system, and hence represents an interesting worksite for the exploration of land-to-sea transfer of sediments. Another factor of interest is that this zone is bordered by numerous cultivated/industrialized watersheds, which release a large panel of contaminants such as trace metals that preferentially incorporate the particulate phase. These elements can therefore be used as tracers of the particle dynamics in an attempt to determine the ultimate fate of contaminated sediments, and hence their subsequent impact in the marine system. On this basis, the main trends of the hydro-sedimentary functioning of the Gulf of Lions have been pointed out: (i) the nearshore sedimentary units off the river mouths (i.e. the so-called prodeltas) are the first repository areas for riverborne particles owing to early sedimentation at the saline front. They act as sink but also as source of fine particles [2], depending on meteorological conditions, (ii) finest-grained sediments are advectively exported from direct continental sources and/or prodeltas towards the middle-shelf mudbank, and (iii) a homogeneous material is exported outside the continental shelf under the influence of the western general circulation, which is intensified during storms. Tightly bound to these sedimentary mechanisms, the distribution of the metallic contamination reveals that the most impacted areas concern the prodeltas. When going seaward, the persistence of the contamination likely depends on elemental behaviours, which makes that only conservative metals (i.e. fixed on particles) still depict anthropogenic enrichments [3] [4].

References

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