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Dissolved heavy metal fluxes at sediment-water interface in polluted sediments of the Adriatic Sea

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To evaluate the anthropogenic impact in surface sediments of the Northern and Central Adriatic Sea, dissolved fluxes at the sediment water interface of heavy metals and nutrients on the sea bottom in front of the Po River mouths and along the western side of the Northern and Central Adriatic Sea have been determined. The fluxes have been measured by benthic chamber deployments and calculated by pore water modelling. Pore waters composition have been used also to understand the early diagenesis processes generating the benthic fluxes.

Benthic chamber deployments and sediment core collection for pore water extraction have been carried out in three cruises in spring and autumn 2013 and autumn 2014.

The study stations have been chosen on the base of previous research results indicating a decreasing heavy metal and organic matter surface content leaving from the Po River mouths (Pérez-Albaladejo et al., 2016). The data obtained have been compared with previous studies carried in the Adriatic Sea (Spagnoli et al. 2010).

Results of the 2013 and 2014 cruises and of previous investigations indicate a consistent and rapid dissolved benthic flux decreasing going away from the Po River mouths both southward, eastward and northward.

The decreasing regards the final electron acceptors and the organic matter degradation products and some heavy metals.

On the whole, different early diagenesis environments have been recognized in the Northern and Central Adriatic Sea: they embrace two end members: from the Po River Prodelta to the Mid Adriatic Depression (MAD) (Spagnoli et al., 2014). In front of the Po River sediments are characterized by high sedimentation rate and by high inputs of fresh marine organic matter, continental organic matter and Fe-oxyhydroxides. These inputs produce high concentrations of organic matter degradation products, strong anoxic environment in the pore waters and high

dissolved benthic fluxes. In the MAD the diagenetic environments are characterized by low sedimentation rate and low inputs of reactive organic matter that produce low concentrations of pore-water organic matter degradation products with oxic conditions near the surface and weak benthic fluxes.

As regard the two major metals involved in the early diagenesis processes (Fe and Mn), they too show dissolved benthic fluxes decreases from the Po River mouths. Also in this case, this trend is attributed to the high Po River dissolved and particulate, anthropogenic and natural, metal inputs that deposit in the surface sediments of the Po Prodelta (Spagnoli and Bergamini, 1997).

The dissolved benthic fluxes of trace heavy metals (Co, Ni, Zn, Cu, Cd, Pb) indicate that some elements, such as Co and Pb, are clearly adsorbed by the sediment that act, for these two elements as sink. Other elements, such as Cu, don't show a clear north–south trend s, while other elements, such as Cd, indicate a southward decreasing trend suggesting a behavior affected by the Po River inputs and Fe-Mn-oxyhydroxide cycle.