

Study of geochemical behaviour of pollutants in the Belgian coastal marine environment

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Belgian coastal area has been polluted for many years due to anthropogenic activities, leading to important changes in local marine ecosystems.

The project of NEWSTHEPS (Belspo project 2015-2019) aims to develop innovative approaches and novel tools and techniques that address the current fundamental scientific and methodological issues related to the implementation of Good Environmental Status (GES) of the Marine Strategy Framework Directive in national and European waters. In this framework, novel and integrated passive sampler techniques for metals (DGT technique) and for organic pollutants are developed for both chemical exposure and biological effect assessment. The novel and integrated approaches aim at (1) better measurement of contamination levels in the marine environment for metallic and organic pollutants, and (2) development of the DGT technique for organic pollutants, while it is now used for inorganic pollutants (BELSPO, 2014).

In total, three stations have been selected for a preliminary campaign in March 2016: OO3 in Oostende harbor, ZB1 in Zeebrugge harbor, and MOW1 about 5km from Zeebrugge coast in the North Sea. By combining the results of particulate metal analysis on suspended matter extracts, total dissolved metal analysis on filtered seawater extracts and labile metal fractions obtained on DGT resin extracts, it seems that OO3 (Oostende harbor station) is more contaminated by metals than ZB1 and MOW1. Particulate and total dissolved metal concentrations are higher at OO3 than at both other stations. Moreover, the labile and hence the bioavailable fraction of Mn, Co, Ni, Cu and Zn is also higher at station OO3. The preliminary results at ZB1 and MOW1 show more comparable and lower values, with the exception that the labile metal fractions of Pb, Cr, Fe and Cd measured at sea station (MOW1) are the highest of the 3 stations. These results, their time-evolution and final interpretation will have to be confirmed by a continuation of the study and the participation in new field campaigns in the coming years.

Preliminary results show that the suspended matter (SPM) amount at station MOW 1 is four times higher than at the two harbor stations, but SPM at ZB1 and OO3 contains higher levels of particulate organic carbon. Particulate nitrogen is only found at the three stations under organic form. Isotopic ratios for carbon show that the particulate carbon measured at OO3 and ZB1 should be from allochthonous sources, while particulate carbon measured at MOW 1 appears to be more from marine origin. Indeed, MOW1 presents less negative values for the isotopic ratio of particulate carbon compared to the isotopic ratios at ZB1 and OO3.

These results will further be used for the development and the validation of an integrated model to quantify the environmental status of the Belgian coastal zone. It will predict the accumulation, trophic transfer and effects of chemicals in this specific local ecosystem. Ultimately, our integrated approach will lead to the development of novel procedures for the monitoring of the contamination levels in the coastal areas.

Keywords: Belgian coastal area; total dissolved metal; labile fraction; DOC; DGT

Reference

- Belgian Science Policy Office (BELSPO). 2014. NewSTHEPS, New Strategies for monitoring and risk assessment of Hazardous chemicals in the marine Environment with Passive Samplers. Available on: https://www.belspo.be/belspo/brain-be/projects/NEWSTHEPS_en.pdf