Metals and microplastics, a multi-contamination in the environment: which planetary distribution?

Charlotte Catrouillet, Christian Le Carlier de Veslud, Julien Gigault

Metals and microplastics, a multi-contamination in the environment: which planetary distribution?

Charlotte CATROUILLET[1], Christian LE CARLIER DE VESLUD[1], Julien GIGAULT[2]

[1]Univ. Rennes, CNRS, Géosciences Rennes, UMR6118, F-35000 Rennes, France

[2]TAKUVIK CNRS/ULaval, UMI3376, Université Laval, Quebec City, Canada

Plastic debris are everywhere: soils, rivers, oceans, even at the top of the Everest. In marine environments, plastics accumulate in gigantic oceanic gyres, in which different sizes of plastic are found (macro-, micro- and nano-plastics)[1]. Then, due to the oceanic currents, numerous plastics are remobilized and finished on the beaches from all around the World. Problems are associated to plastics presence. For 30 years, in the public minds, the principal hazards related to macroplastics (i.e. plastics debris size >5mm) is their strangulation effects on the animals. However, a more insidious danger was poorly considered: plastics act as trojan horses for contaminants in the environment, including toxic metals. Metals can either originate from the plastic formulation (additives) or from external environment (sorption)[2]. Over time, both becomes bioavailable and could represent a danger for the biota[3]. These last 5 years, increasing studies measured metal concentrations in microplastics from various location over the Earth. In this study, we reviewed the literature data concerning the distribution of the metal concentrations according to the sampling area and location. First, we focused on the methods used to measure metal concentrations in order to perform valuable comparisons between studies. Then, we discussed the differences/similarities in the metal distribution according to the sampling zone. Indeed, some metals occur everywhere, due to their use as additives. In contrast, other metals present different distribution patterns, depending on the sampling zone. Thus, what is the source and final impact of the plastic debris? Behind these results, we provide an interactive online global map based on the database built from this review. The final aim is to provide a map and database that can be implemented by researchers in order to simplify future summarizing and comparisons of the available data.

[1]Ter Halle A. et al., *ES&T*, 2017, 51, 13689-13697

[2]Prunier J. et al., *Env. Poll.*, 2019, 245, 371-379

[3]Catrouillet C. et al., *Env. Sci. Proc. Impacts Lett.*, submitted