River Export of Plastic from Land to Sea: A Global Modeling Approach

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Plastic is increasingly considered a serious cause of water pollution. It is a threat to aquatic ecosystems, including rivers, coastal waters and oceans. Rivers transport considerable amounts of plastic from land to sea. The quantity and its main sources, however, are not well known. Assessing the amount of macro- and microplastic transport from river to sea is, therefore, important for understanding the dimension and the patterns of plastic pollution of aquatic ecosystems. In addition, it is crucial for assessing short- and long-term impacts caused by plastic pollution. Here we present a global modelling approach to quantify river export of plastic from land to sea. Our approach accounts for different types of plastic, including both macro- and micro-plastics. Moreover, we distinguish point sources and diffuse sources of plastic in rivers. Our modelling approach is inspired by global nutrient models, which include more than 6000 river basins. In this paper, we will present our modelling approach, as well as first model results for micro-plastic pollution in European rivers. Important sources of micro-plastics include personal care products, laundry, household dust and car tyre wear. We combine information on these sources with information on sewage management, and plastic retention during river transport for the largest European rivers. Our modelling approach may help to better understand and prevent water pollution by plastic , and at the same time serves as 'proof of concept' for future application on global scale.