Geophysical Research Abstracts
Vol. 21, EGU2019-18013, 2019
EGU General Assembly 2019

Modelling floating macro litter loads from rivers to the marine environment based on visual observations

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Riverine systems transport floating macro litter from inland to the coast. A relevant percentage of this floating litter is expected to be plastic waste, which can have direct impacts on animals in both the freshwater and the marine environment. Within the collaborative project RIMMEL (European Commission, Joint Research Centre), a Riverine Litter Observation Network (RILON) was set up for acquisition of field data providing the first-ever European database on floating macro litter inputs to the sea, including rivers in the four European marine shared basins (Mediterranean Sea, Black Sea, North East Atlantic Ocean and Baltic Sea). The monitoring method included visual observations for identification of litter items during short sessions, following a harmonized approach. Field data allowed calculating litter flux as items per hour in each river. Based on these monitoring data and river basin characteristics (catchment area, population and waste generation), a power-law model was developed to estimate annual loads of riverine litter discharge from coastal areas of the 23 EU members involved in the Marine Strategy Framework Directive, providing that 140 million floating macro litter items could be entering the marine environment annually, including a large share of plastics (up to 80 %). The model estimates that the top ten countries: Italy, Spain, United Kingdom, Greece, France, Netherlands, Croatia, Denmark, Sweden and Portugal, contribute with 81 % of the total annual load.