EGU25-1025, updated on 26 Feb 2026
https://doi.org/10.5194/egusphere-egu25-1025
EGU General Assembly 2025

Plastic entrapment by riparian vegetation across ecological gradients in European rivers: First insights from the RIPARIANET Project

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Plastic litter accumulating in riverine riparian habitats is a global concern. Macrolitter items are highly visible (items > 0.5 cm) and threaten river and riparian biodiversity and ecosystem services. Although scientific interest in plastic entrapment along river corridors is growing, large-scale studies and predictive models assessing drivers and patterns in riverine plastic accumulation are still lacking. Given those gaps, this study investigates plastic entrapment by riparian vegetation at different spatial scales and ecological gradients across European rivers. We focused on six river basins across Europe, covering the biogeographic regions boreal (Sweden), continental (Germany), alpine (Trento, Italy), Mediterranean (Rome, Italy), and Atlantic (Northern Spain, Northern Portugal) climatic regions as part of the European Biodiversa+ RIPARIANET project. By surveying macrolitter across six European basins, we aim to unveil differences in riverine macrolitter accumulation in riparian areas across a large biogeographic and land-use gradient. We found that riparian vegetation acts as a sink for macrolitter across European rivers, with the highest trapping value in the Tiber catchment (Italy) and the lowest in the Sävar River basin (Sweden), following a clear latitudinal gradient. Among predictors, urbanization, land use, river discharge, sinuosity, and vegetation structure are crucial factors driving macroplastic accumulation. Our findings shed light on how macroplastics accumulate in riparian zones across Europe, with both ecological and societal consequences, and could guide management efforts for their active removal. Given the potential impacts on biodiversity and ecosystem resilience, our results may help prioritize monitoring and clean-up activities of plastics to protect and restore riparian ecosystems.