

Existence of nonpoint source of perfluorinated compounds and their loads in the Tsurumi River, Japan

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In the last 50 years, perfluorinated compounds (PFCs) have been used as both industrial chemicals and components of consumer products. As a result, worldwide environmental pollution by PFCs has been reported. Although, industrial effluent and sewage treatment plant (STP) effluent which was discharged from industrial or domestic effluent were reported as the sources of PFC pollution in the aquatic environment, it was considered that other pollution factors exist. In this study, river water and STP effluent were sampled along the stretch of the Tsurumi River and also at a fixed station for monitoring the PFCs pollution in runoff event. Then, the STP effluent loads and runoff loads were compared. With an increase in river flow rate by runoff water inflowing, it was observed that the PFC concentrations in the river water at fixed station were remained the same or increased for PFOS (179.9 ± 34.4 to 179.6 ± 69.5 ng l⁻¹), PFHxA (5.5 ± 0.8 to 9.0 ± 2.6 ng l⁻¹), PFHpA (3.1 ± 0.3 to 4.4 ± 1.0 ng l⁻¹), and PFOA (15.9 ± 0.3 to 13.4 ± 2.5 ng l⁻¹). Meanwhile, PFNA (38.0 ± 3.3 to 15.4 ± 3.0 ng l⁻¹) and PFDA (3.9 ± 0.3 to 2.1 ± 0.3 ng l⁻¹) concentrations were decreased. The loads of PFOS, PFHxA, PFHpA, PFOA, PFNA and PFDA at elevated river flow rate were 5.5, 9.5, 7.4, 4.8, 2.3 and 3.0 times larger than those at ordinary water flow rate, respectively. The loads of PFOS, PFHxA, PFHpA, PFOA, PFNA and PFDA from runoff water were 2.2, 11.3, 3.6, 3.3, 1.5 and 2.0 times higher than that of STP effluents that are discharged into the river, respectively. These results indicate the existence of a PFC nonpoint source (NPS) and its impact to the total PFC load of river is significant.