Optimize sampling for micropollutants in urban drainage systems with pump stations – a conceptual hydraulic model

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ABSTRACT

To date it is unknown how pumps in sewer systems influence micropollutant loads at the scale of minutes to hours. This is important to design sampling campaigns: i) collecting representative composite samples, ii) experimentally determining peak loads or iii) dynamically evaluating wastewater treatment plant performance. Hydrodynamic models which could simulate pollutographs become available for an increasing number of catchments. However, computationally it remains demanding to run simulations at high temporal resolution for a large number of conduits. Furthermore, also in complex models pumps are typically only modelled as one conceptual node, i.e. no spatial differentiation only volume. Furthermore, particularly for micropollutants, long measured input time series at sufficiently high temporal resolution are missing. In this paper we present a conceptual model to assess any combination of sub-catchments and lift stations. In gravity systems the number of wastewater packets containing the substance of interest generated at the source - i.e. toilets and other household appliances - determines the variability of the pollutograph. However, in the effluent of sub-catchments with pumps, the variability is independent of the number of generated wastewater packets but heavily depending on the properties and operation of the lift station.

KEYWORDS

High temporal resolution, micropollutants, modular model, pumps, sampling design