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Concept for improving water quality models to account for mass accumulation in Mediterranean streams

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The hydrological response of catchments in semiarid regions is characterised by features not seen in perennial flow. These features require particular attention in the application of hydrological models. Compared to perennially flowing rivers in humid areas which are flowing all of the year in all of their main reaches, rivers in semi-arid basins are characterised by their great variability of flow in both time and space and ranging between two extremes. Periods of complete dry river beds are sometimes followed by torrential flood events. This changing water flow strongly influences pollutant dynamics.

Where high transmission losses lead to an entire cessation of discharge, river reaches are separated from each other and most of all from the receiving waters - the reach chain is broken. With the presence of point sources in truncated reaches the basis for an extensive mass accumulation is provided. Measurements at the Vène catchment on the French Mediterranean coast indicate a potential accumulation rate in the summer period for TN of about 40 kg per day downstream of the wastewater treatment plants.

A second mode of mass retention in semiarid catchments may be generated by a recurring sequence of events with different intensities. Many successive small events, which are too small to produce an in stream discharge, wash particulate substances into the river. These substances are then available for resuspension of a first flush caused by a major rainfall event.

The resuspension caused by the following flood events may generate high peaks in pollutant loads which the biology of downstream water bodies (e.g. lakes or lagoons)

may not be prepared for.

Common water quality models often work with constant release rates in terms of sediment bound materials and thus do not account for earlier accumulation. The model is reset if the river falls dry.

To improve water quality models for a more adequate application to temporary streams, the concept of a flow dependent generation of pools is introduced. In this study the 1-D kinematic wave model CASCADE, developed as a research model from CEH Wallingford is recoded in terms of transmission losses and the associated mass accumulation in pools.

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