High temporal resolution eutrophication modelling in regional hydrographic networks

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Full Abstract

To allow climate change impact assessment on river system water quality, the scientific community lacks efficient deterministic models able to simulate hydrological and biogeochemical processes in drainage networks at the regional scale, with a fine temporal resolution and with water temperature explicitly determined. The model QUALity-NETwork (QUAL-NET) was developed and tested on the Middle Loire River Corridor, a sub-catchment of the Loire River (France), prone to eutrophication. Hourly variations computed by the model helped disentangle the complex interactions existing between hydrological and biological processes across different timescales. Phytoplankton variations in the Loire River were governed by phosphorus availability, water transparency and transit time. Additionally, QUAL-NET showed that a large amount of phytoplankton cells growing in the upper part of the studied corridor was eventually recycled through the microbial loop, which enhanced phytoplankton growth, and explained why severe blooms still occur in the Loire River despite large point source reductions.