

Compte-Rendu de la réunion du 21 mai 2024

INTERREG FR CH (2024-2026) ALGA

Lake Geneva modelling

21 05 2024

Présents:

- INRAE : Orlane Anneville, Frédéric Soullignac, Jean-Philippe Jenny
- Ecole des Ponts Paris Tech : Brigitte Vinçon Leite
- Uppsala University: Jorrit Mesman
- WaterITech: Dennis Trolle
- UniGe : Bas Ibelings

Excusés:

- INRAE : Stéphan Jacquet, Laura Soares

Purpose of the meeting : To exchange on who will / is modeling what on Lake Geneva ?

Quaggas in Lake Geneva. WaterITech (Dennis Trolle / Tobias Andersen) will use GOTM-WET to model the consequences of quagga invasion and expansion in Lake Geneva. A specific `quagga module` will be implemented in WET. This concerns a new project funded by Velux foundation on a proposal written by Bas on lake benthification (and interactions with re-oligotrophication and climate change). PhD student is Salome Boudet (start 01 June 2024). In addition to modeling Salome will perform controlled experiments with quagga and zebra mussels and will do 2 more lake-wide surveys (2022, 2024, 2026). The new surveys are sponsored by CIPEL. Jorrit will help supervise the modeling by Salome.

Orlane: before quaggas zebra mussels in the lake already played a role in enhancing transparency – particularly in the littoral zone. Will this be included in the model? Dennis: set-up is modular, certainly possible to have a distinct quagga and a separate zebra mussel module, with different traits for the two species.

Bas: in Seewandel part II Eawag is preparing to model quaggas in Lake Constance (GLM-AED?). We could benefit from each other's efforts and compare outcomes.

Dispersion of algal blooms. INRAE (Frédéric and Orlane). This study will use MIT-GLM to model the dispersion / transport of algal blooms across the lake. Starting point are satellite images (Sentinel, PACE) that show spatial (surface) distribution of Chla or cyanobacteria. Then, using meteo forecasts show where the bloom will `travel`. Final aim is to forecast algal blooms. MIT was chosen over Delft 3D since for algal blooms and how they interfere with lake usage the shoreline is critically important. MIT behaves stronger at the land-lake interface.

Dennis: does algal forecasts include the effects of meteo (extremes) in the watershed? There is an existing SWAT model for the Lake Geneva watershed (UniGe, Anthony Lehmann).

Bas : published a cyanobacterial scum forecast (Ibelings et al, 2003 / doi/full/10.1890/01-5345, see pdf), where initial biomass distribution was modeled using DBS (Delwaq/Bloom/Switch) and then used the meteo forecast plus Fuzzy Logic to forecast timing, location and intensity of surface blooms. This so called EWACS model was further developed over a few years by Deltares. Mabe some useful lessons?

Objective-P for Lake Geneva. INRAE (Jean-Philippe, Laura Melo-Vieira-Soares). Modeling study using GLM-AED on behalf of CIPEL. For Léman hypoxia in deepest part is a growing concern. The model varied both IPCC warming scenarios as well as long term TP goals for the lake. Results of the study will be communicated by CIPEL in due course.

Algal blooms and succession in Lake Geneva (Brigitte, Orlane, Stéphan). Using Telemac-AED the development of algal blooms and the succession of phytoplankton in the lake will be modelled.

Overall all agree to share experiences and where possible data on boundary conditions, forcing data etc. We need a `space` to share things, e.g. a Google Drive. Try to avoid building duplicate databadses.

Also, all see value in Ensemble modeling approach (as done by Jorrit in his PhD on modeling short term extreme weather events).

A discussion ensued between the modelers on pros and cons of 1D vs 3D modeling. Given the computational weight of 3D, a 1D model allows for a longer period (years vs months) of time to spin-up the model, which for instance is relevant for the new to develop benthic module in WET. For dispersal studies as introduced by Orlane 3D may be necessary. Dennis has good experience with calibration at 1D level and later transfer to 3D. Orlane and Jorrit discuss if all parameters would transfer OK or not or whether unforeseen compensations between process in the model could muddle the picture.