Jorrit Mesman

Interview, August 2025

Dr. Jorrit Mesman is one of the authors of the paper "Timing of spring events changes under modelled future climate scenarios in a mesotrophic lake". In this interview, the author shares insights with the SITES Community about the project and experience using SITES open data.

Why is it important to investigate spring events changes in lakes?

Spring is an ecologically important period, in lakes and elsewhere: the food web is starting up and many interdependent processes activate that can have effects for the remainder of the growing season. In lakes, examples would be the phytoplankton spring peak, the spring clear water phase, or the spawning period of many fish species. The interdependency is especially interesting, as the fish need zooplankton to feed upon, whereas the zooplankton needs to graze upon edible phytoplankton, which again needs available light and nutrients, which are dependent on, amongst others, stratification, spring discharge, and ice-off. Changes, due to climate or human influence, that directly affect one or two of these processes, are therefore likely to affect the whole chain of events.

Most climate change studies do not look at the timing of these seasonal processes (this topic is sometimes called “phenology”) and if they do, it is usually on one or two isolated processes, whereas especially the relative changes in timing can be important! Therefore, we used SITES data from Erken to set up and validate a one-dimensional lake model coupled to a watershed model, to investigate the relative timing of four spring processes and make climate projections. The four investigated processes were 1) peak (snowmelt) spring discharge, 2) ice-off, 3) phytoplankton spring peak, and 4) onset of stratification. By using one model for all processes, the interdependency would be included in the simulation.

What are the main findings of your project?

Since there are not many studies on how the timing of spring processes changes with climate warming, one main goal was to simply make individual climate projections of each individual processes. In line with the existing literature, these showed a general trend towards occurrence earlier in the year, and years without ice cover become more frequent. However, the most interesting result was that these rates were not the same for each process. Results slightly differed depending on the climate scenario, but overall, the phytoplankton peak followed the date of ice-off, yet the stratification onset lagged behind. Therefore, the time period between the phytoplankton spring peak and onset of stratification widened. Likewise, the timing of the spring peak changed relative to the other three processes. These relative changes in timing will likely have impacts on the ecological dynamics in the lake and some species may benefit whereas

others will be negatively affected. This highlights that effects from climate change are more pervasive than changes in temperature alone.

How can the results be applied in society and be utilized by different stakeholders?

The changing timing of (spring) events will have repercussions on the food web, including species that have direct relevance for humans, such as toxic cyanobacteria or fish that are popular with anglers. Accurate predictions are difficult, and effects will differ between lakes, but the spring and autumn seasons may see more changes than previous expected. Drinking water providers and other water managers should monitor changes especially in these seasons.

Has a collaboration with other researchers, research groups, stakeholders and companies taken place?

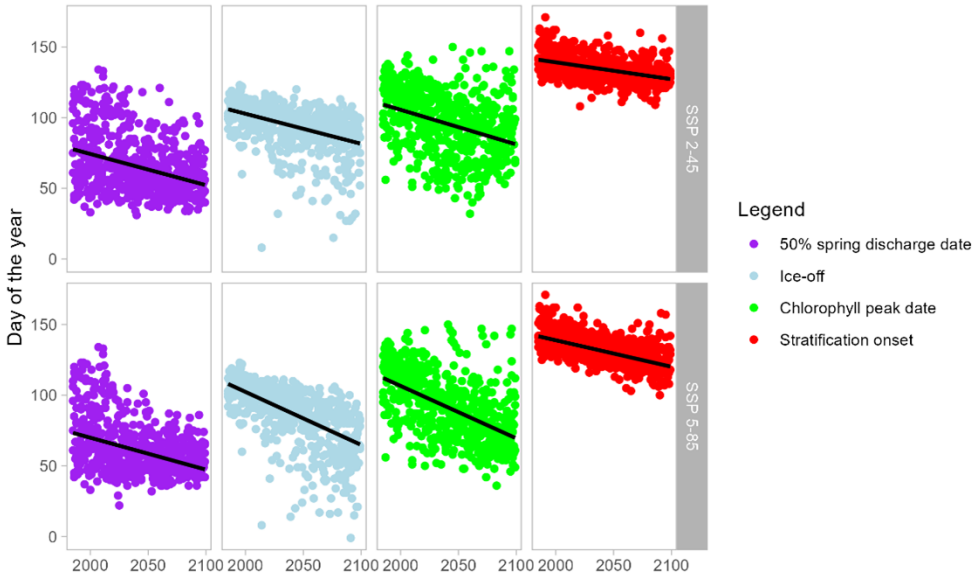
This research was done together with researchers from Murcia (Spain) and the WaterITech company (Denmark). It was part of the EU Horizon 2020 "SMARTLAGOON" project, in which Erken was used as a test site for buoy and camera monitoring and for modelling.

A panoramic view of the lake Erken (photo: Pia Larsson)

What data collected SITES Erken Station did you use?

The work used the long-term monitoring at Erken (water temperature, stream discharge, oxygen, nutrients, and chlorophyll). These long-term data are essential to both get an accurate model fit and to study long-term change. Of additional importance in this specific study were the high-frequency data during spring. These were necessary to estimate observed timing of events so that the model could be

compared to them. This is a difficult period for data collection, as monitoring buoys are not put out during ice cover and the uncertain ice conditions around ice-off may prohibit manual sampling. However, the study could be performed despite these difficult conditions. This makes Erken one of the few sites in the world where these processes can be studied.



Spring events were predicted to occur earlier in the year both under a moderate (SSP 2-4.5) and severe (SSP 5-8.5) climate scenario. However, these rates differed between the type of events. For example, the gap between the chlorophyll peak and stratification onset became larger. Such changes are likely to have ecological repercussions. Each dot in the graph is from one year (multiple climate models were used, so each year was simulated multiple times) and the black line is a linear statistical trend that was fitted to the data.