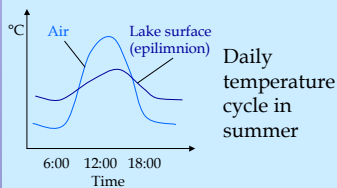


The main objective of my thesis is to analyse changes in lake physics and biology of Müggelsee (Berlin) and to relate these to long-term changes in the weather. Within the last 25 years Müggelsee has experienced considerable changes in lake catchment (nutrient loading) and climate. This study is part of the EU-project CLIME that provides strategic support for the Water Framework Directive and develops new tools for managing lakes and catchments in a warmer world.

Lake physics: Long-term change in daily lake surface temperature

State of the art



World-wide phenomenon:

Asymmetric long-term increase in daily air temperature extrema followed by a **decrease in daily temperature range (DTR)**

Impact of nocturnal warming on terrestrial biota already evidenced!

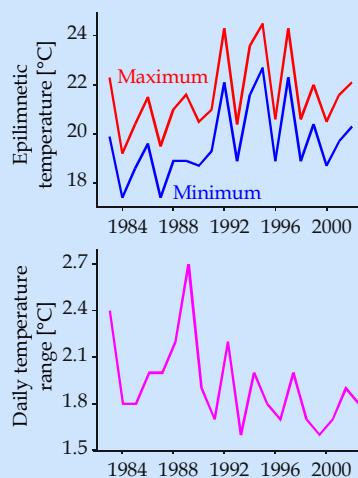
Change in epilimnetic daily temperature range?

Advantage at Müggelsee:



- 20 years of hourly data
- Automatic measuring station

Long-term data of Müggelsee



- 1) Increase in daily extrema
- 2) Significant rising trend only for minimum temperature

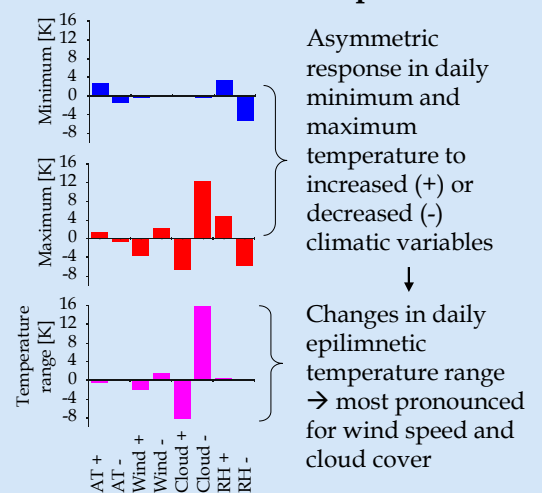
↓
Decrease in daily epilimnetic temperature range

Change in epilimnetic temperature range in response to an asymmetric warming in epilimnetic extrema!

Possible causes:

Change in meteorological variables; e.g. air temperature, wind speed, cloud cover and/or relative humidity

Sensitivity analysis of climatic variables on modelled lake temperature



Asymmetric response in daily minimum and maximum temperature to increased (+) or decreased (-) climatic variables

↓
Changes in daily epilimnetic temperature range → most pronounced for wind speed and cloud cover

Müggelsee 1983-2003 – observed changes:

Long-term increases (+) in air temperature, wind speed and cloud cover

→ These changes in climate promoted a **decrease in epilimnetic daily temperature range!**

Impact of nocturnal warming in lakes !?

Lake biology: Long-term change in the abundance of *Dreissena polymorpha* larvae

State of the art

Dreissena polymorpha (zebra mussel)
neozoon and pest species

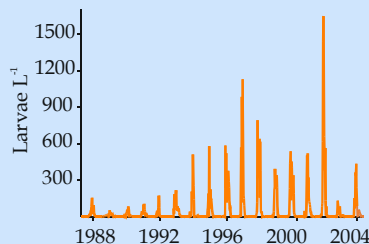


Main impacts of adult mussels on lakes:

Displacement of native benthic species and changes in pelagic and benthic species composition

Little is known about the influence of the pelagic larvae on lake ecosystems!

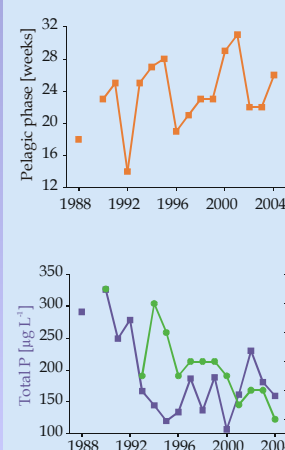
Long-term data of Müggelsee



Drastic increase in larval abundance beginning in the mid 90's

Possible causes:

- Increase in adult mussels or spawning
- Decrease in competitors or predators of larvae
- Change in habitat quality (climate, nutrients, prey)



Climate
Prolongation of larval pelagic phase in response to higher water temperatures

Increase in habitat quality supports larval survival

Nutrients
Increase in prey availability due to less eutrophic conditions