

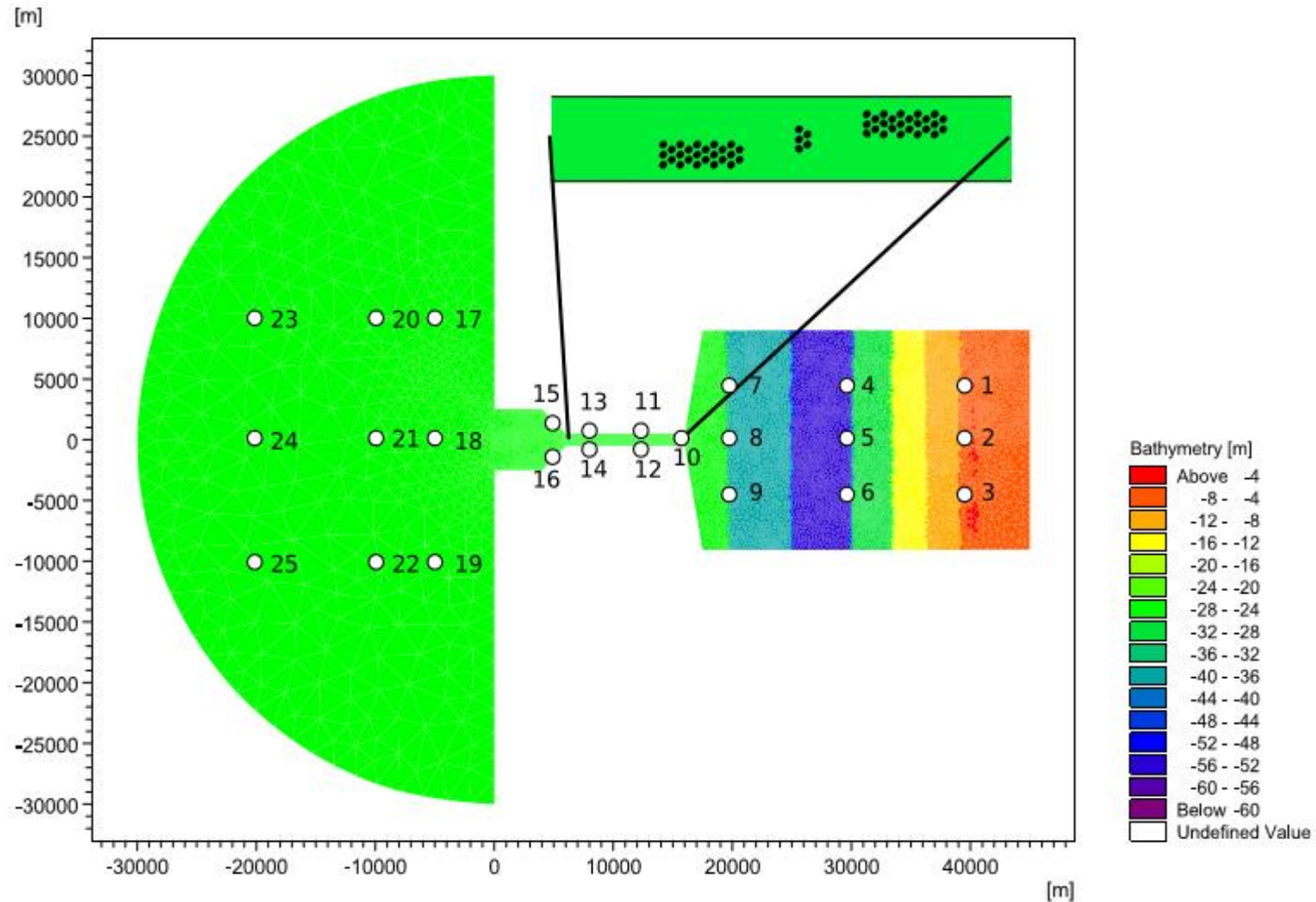
Potential local and regional effects of large tidal energy device arrays on phytoplankton dynamics

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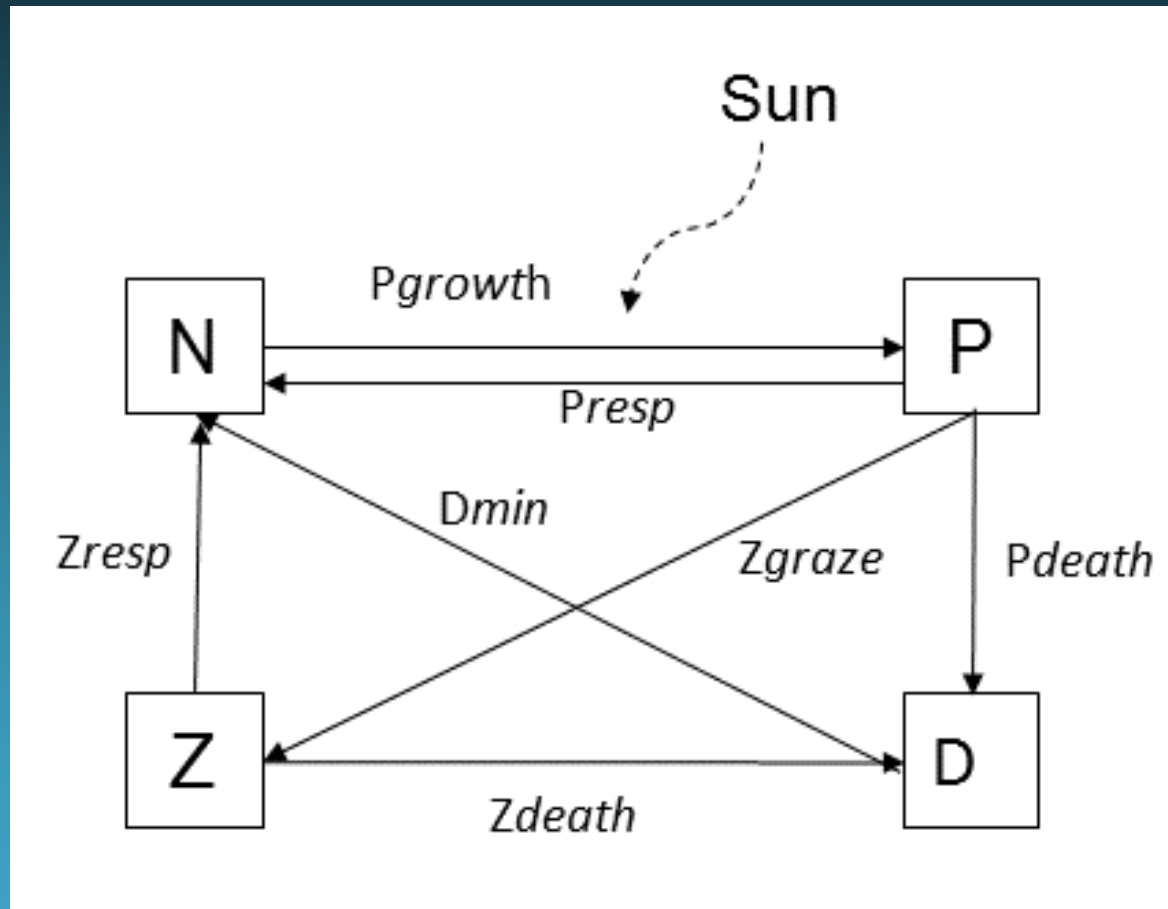
Introduction

- Exploring local, near-field and far-field impacts of large scale tidal arrays on phytoplankton dynamics
- Use 2-D coupled hydrodynamic and NPZD models
- Investigate the impacts of mussels settling on structures on phytoplankton

Hydrodynamic Model

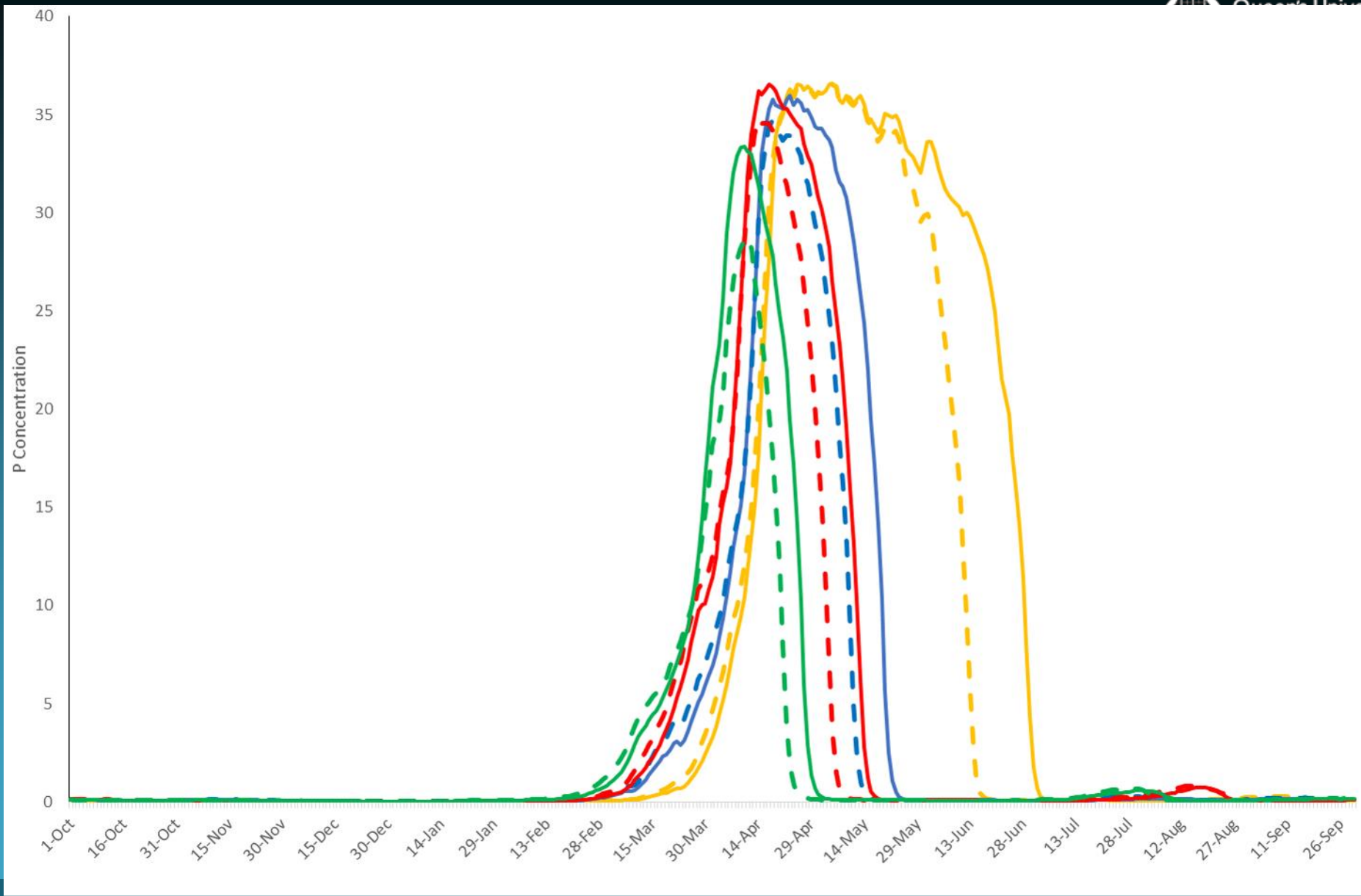


NPZD- Model



Simulations

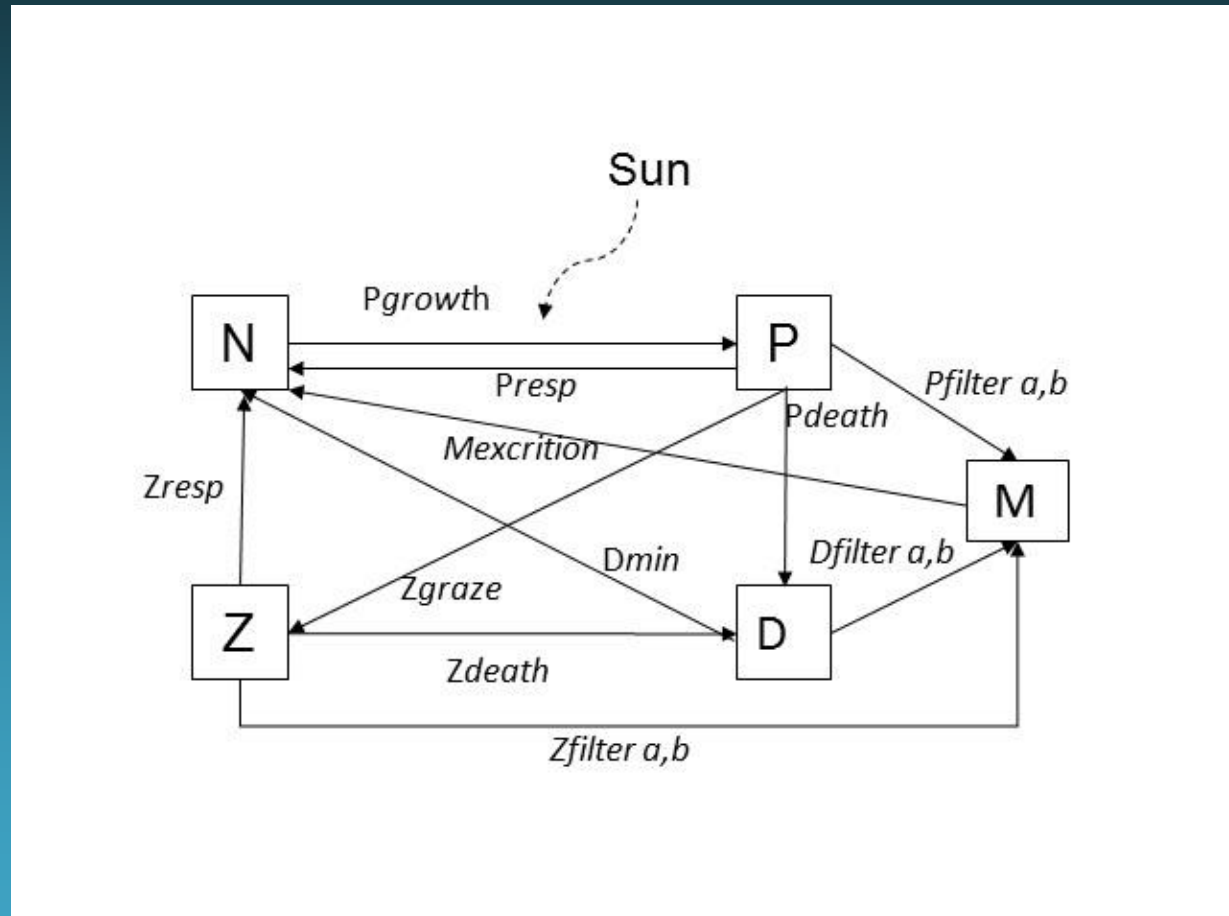
- 5- year start-up period
- Four radiation (PAR) scenarios (A-D)
- Each with and without an array of tidal turbines
- Recorded Phytoplankton concentrations at 25 points
- Calculated annual average and maximal concentrations as well as daily average concentrations



Mussels settling on structures



Extended NPZD Model



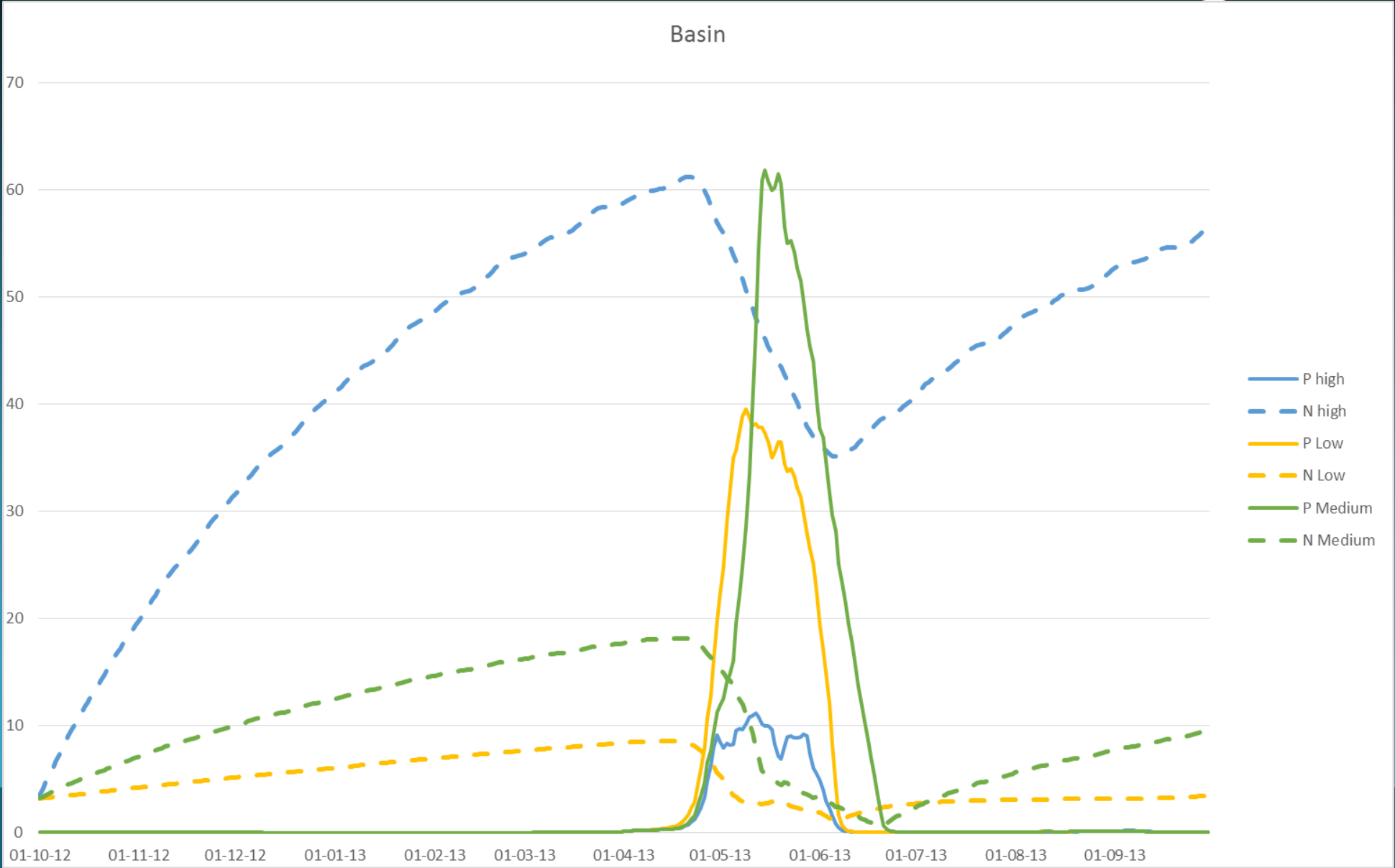
Simulations

- Only one PAR scenario
- Control: Only control cover of mussels in the basin
- Three scenarios with full bottom cover in the channel and control cover in the basin: Low, Medium and High (100,1000 and 5000 g/m²)

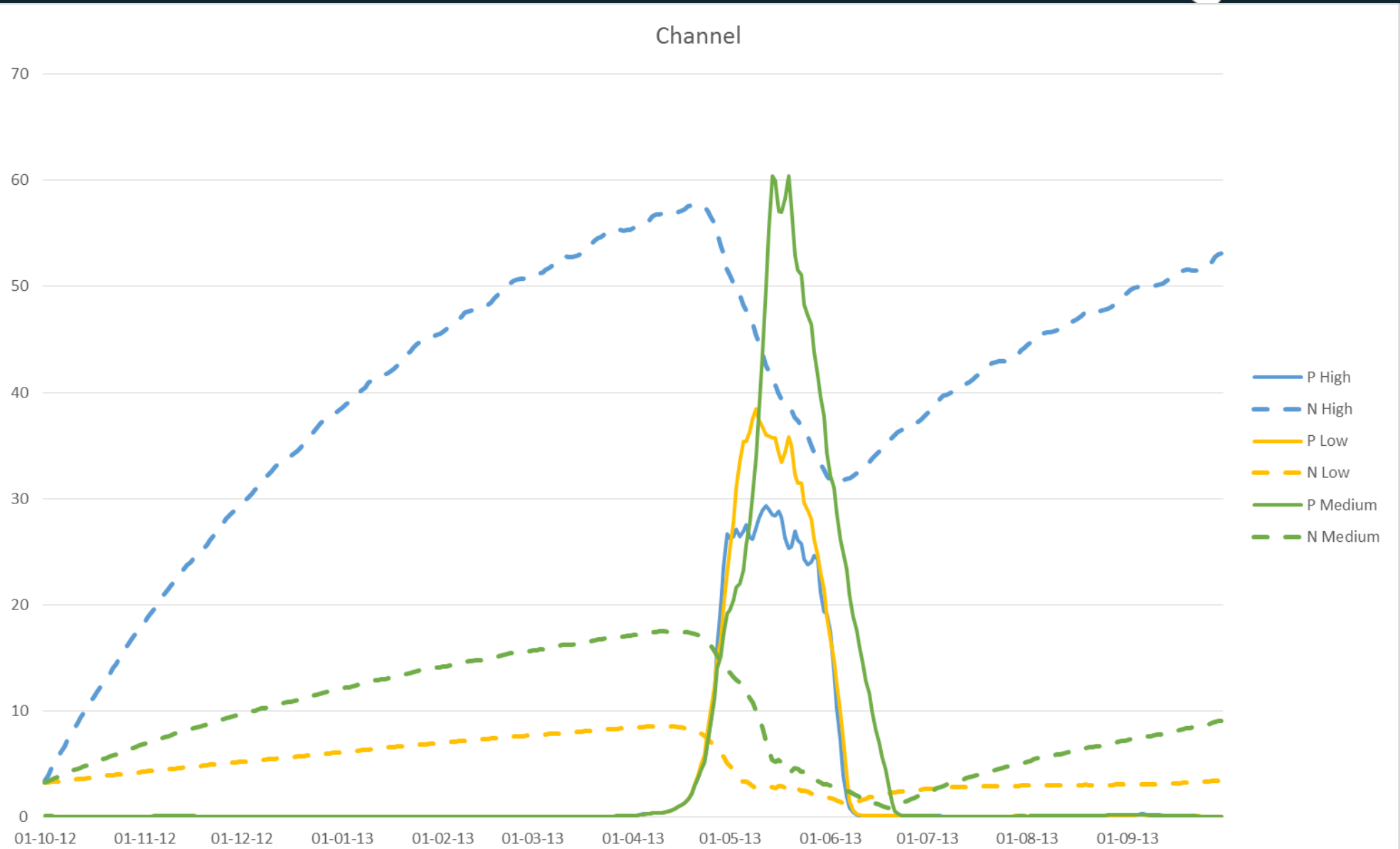
Three scenarios with full bottom cover in the basin: Low, Medium and High

Measured P and N concentrations in the basin and channel only

Results



Results



Conclusions

- Coupled Hydrodynamic- Biogeochemical models are a valuable method to explore possible effects of large scale tidal device arrays on the local ecosystem.
- Observed impacts on the phytoplankton dynamics are considerably lower than those of natural annual variation
- TED arrays increase the residence time in basins. The impact that this might have on phytoplankton production if there is elevated nutrient input into the basin from other sources will have to be investigated further.
- Effects of mussels settling on the structures are likely to be minimal due to the high flow speeds.

Thank you very much!