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MODELING FUTURE ARCTIC MARINE ECOSYSTEMS

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Projecting the likely state of ecosystems in the distant future has been and still is a challenging exercise. Because ecosystems are complex, adaptive, and non-linear systems, ecosystem models that are built to project future states are highly sensitive to approximations, simplifications and underlying assumptions. In the Arctic Ocean, this situation is exacerbated by the lack of appropriate levels of field observations and associated description of basic ecosystem dynamics. Model based predictions of the responses of arctic ecosystems to climate and anthropogenic variations are therefore most questionable and this is even more so when climate and anthropogenic forcings lie beyond previously experienced situations.
In this contribution, we present a numerical modeling approach that is particularly suited for the simulation of complex dynamical systems for which little information is available. This modeling framework acknowledges the complexity, adaptability and non-linearity of ecosystems without trying to explicitly model the underlying complex processes. Rather than modeling from the ‘inside', i.e. by representing the intricate processes within the ecosystem, one can model from the ‘outside' by focusing on the constraints that limit the system dynamics. In this modeling approach, complex processes and their interactions are simulated with stochastic (i.e. random) processes whilst the system dynamics is constrained by simple rules.
We show an application of this approach for the Barents Sea food web. Simulations from this simple model displays many features of more complex foodweb models and can serve as a reference to study the resilience of Barents Sea food-web. We illustrate how the impact of warming on marine foodweb dynamics can be investigated with such approach.