

Public abstract

The goal of this project is to develop a high-resolution regional Earth System Model (ESM), to downscale global climate simulations from the Coupled Model Intercomparison Project 6 (CMIP6) for the Baltic Sea region. Currently, the model consists of the Modular Ocean Model 5 (MOM5) for the ocean and the COSMO model in CLimate Mode (CCLM) for the atmosphere. This model allows to study regional climate phenomena and to produce climate data appropriate for end users and policy makers. Technically, the model is driven by the atmospheric boundary conditions that are a priori generated from a Global Climate Model (GCM) simulation. The bi-directional ocean-atmosphere coupling allows for a realistic air-sea feedback which clearly outperforms the traditional approach of using uncoupled standalone models as typically pursued with the EURO-Cordex protocol. The model components used for the ESM are highly scaleable and used at many HPC Centers world-wide. In order to address marine environmental problems (e.g. eutrophication and oxygen depletion), the ocean model encompasses a marine biogeochemistry model setup for the Baltic Sea. The model is driven by reasonable Shared Socioeconomic Pathways (SSPs) including different assumptions for nutrient load scenarios. Beside these applications of high societal relevance, the ESM can be used for various scientific questions such as climate sensitivity experiments, reconstruction of ocean dynamics, study of past climates and natural variability as well as investigation of ocean-atmosphere interactions. Hence, it can serve for better understanding of natural processes via attribution experiments that relate observed changes to mechanistic causes.