



Climate scenarios of the Gulf of Bothnia using a high-resolution regional ocean model (NEMO-SCOBI)

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How will the Gulf of Bothnia be impacted by future climate change? A changing climate will, in addition to warming, reduce the ice-season, change the salinity, sea level, and wave and current conditions. This will in turn have implications for eco systems, habitats, biodiversity, as well as human activities such as fishing, aquaculture, and wind parks. The SmartSea project aims to estimate the climate change impacts in this area. This study, which is part of the project SmartSea, assesses the changing physical and biogeochemical properties up to year 2059 using numerical experiments with forcing from two different Representative Concentration Pathways (RCP 4.5 and RCP 8.5) and four different global climate models. Here NEMO3.6 with LIM3 sea ice model is coupled to the biogeochemical model SCOBI. The model comprises the Gulf of Bothnia with a horizontal resolution of approximately one nautical mile.

The preliminary results comparing periods 1975-2005 and 2030-2059 and the pathway RCP4.5 and RCP8.5 show significant changes in sea ice conditions including a decrease of the ice season length, annual maximum ice volume, and extent of ice cover. In addition, the annual maximum ice volume is seen to arise earlier in the season. The temperature increases consistently, although the actual increase between the different simulations varies considerably. A general trend of decreasing salinity can also be seen. This is, however, less systematic than for ice conditions and temperature. The simulations indicate that the changes in both temperature and salinity are not spread evenly, but some areas will be affected more than others. The flow speed trends have been studied by comparing simulations for the period 1980-2005 and the pathway RCP4.5 and RCP8.5 for 2040-2059. The simulations indicate a rise in both local maximum flow speeds, as in average flow speeds, both in surface currents and depth averaged currents (barotropic currents).