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Avoiding Sea Level Rise and Sea Ice Changes in an Aggressive Mitigation Scenario: a Model Study

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Based on the goal of avoiding "dangerous anthropogenic interference with the climate system" (United Nations, 1992), policy makers have agreed on a limiting global mean warming to 2 K compared to the pre-industrial era, for example most recently in the Copenhagen Accord. However, since the spatial pattern of a global mean warming of 2 K will be regionally heterogeneous, impacts of the warming will also have regionally different impacts.
In this study the effect of mitigation on two of the most prominent features of a warming climate is investigated: sea level rise due to thermal expansion and the change towards more seasonal sea ice due to the amplification of the warming at, especially Northern Hemispheric, high latitudes.
Analysis is based on simulations with the coupled atmosphere-ocean general circulation model EGMAM for two different scenarios for the 21st century. Results from the well documented SRES A1B scenario without any mitigation measures are compared to results from the aggressive mitigation scenario E1. The main focus is on steric sea level rise and on seasonality of changes in sea ice in both in extension as well as in volume.
Due to the slow response of the ocean to the radiative forcing the effect of mitigation on sea level rise is expected to be weaker than for instance on surface air temperature. Nevertheless, in our simulations 20% of sea level rise could be avoided by mitigation. Results of the two scenarios on Northern Hemispheric sea ice changes reveal structural differences between the seasons. While for the winter E1 shows less reduction at the sea ice border - thus less of a polewardsshift of sea ice - differences are largest at highest latitudes.
Comparison with other models from the European Commission's 6th Framework Programme Integrated Project ENSEMBLES will be discussed.