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Decadal sea level variations in the North Atlantic and Arctic Oceans

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Decadal and longer term variations in the North Atlantic and Arctic sea level reflect the global sea level changes as well as regional oceanic and atmospheric variations. In the light of future sea level rise, it is important to assess the magnitude and origin of the regional variations.
We investigate how the warming of the 1940s and of recent decades and the intervening cool period in the North Atlantic are reflected in observed sea level variations in the region. We have put together a sea level curve for the Norwegian and Russian coast based on available tide gauge measurements. It shows a distinct increase for the 1940s as well as a general increase in recent decades. These results are compared with observations from the dense network of tide gauges with long records from the North Sea and Baltic Sea, as well as the long record from New York. It is seen that the signal for the 1940s is distinct, whereas there is a high correlation between the Norwegian/Russian composit record and more southern stations for the sea level rise of recent decades.
These results are compared with model runs performed with the global coupled climate model EC-Earth. Two different experiments have been made, first a 600 year long control run with constant external forcing from greenhouse gases, tropospheric man-made aerosols, stratospheric aerosols from volcanic eruptions and variations in solar irradiance. This allows investigating low-frequency steric sea level natural variations generated by internal dynamics. Secondly, an ensemble of runs forced with historical external forcing from 1850 to present simulates steric sea level variations arising from changes in the radiative forcing during that period.
Based on observations and model results, we will discuss the importance of variations in the thermohaline overturning index for the North Atlantic relative to changes forced by external variability in shaping the North Atlantic sea level curve.