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Regional dynamic and steric sea level changes in an IPCC-A1B scenario simulation

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This poster analyzes regional sea level changes in the Intergovernmental Panel on Climate Change (IPCC) A1B climate change scenario using the Max Planck Institute for Meteorology coupled Atmosphere Ocean General Circulation Model ECHAM5/MPI-OM. Compared to the unperturbed control climate, global sea level rises 0.26 m by 2100, and 0.56 m by 2199 through steric expansion; eustatic changes are not included in this simulation. Sea level rise is strongest in the Arctic Ocean, and weakest in the Southern Ocean. In the North Atlantic (NA), a complex tripole sea level pattern across the subtropical to subpolar gyre front evolves, which is consistent with a northward shift of the NA current. On interannual to decadal timescales, the sea level difference between Bermuda and the Labrador Sea correlates highly with the combined baroclinic gyre transport in the NA, but only weakly with the meridional overturning circulation (MOC), and thus does not allow for estimates of the MOC on these timescales. The spatial distribution of the steric sea level changes is generally influenced as much by salinity variations as by changes in temperature, but the two often partly cancel each other and vary considerably by region. Maximum thermosteric expansion occurs in the subtropical North Atlantic, while negative halosteric anomalies in this region partly compensate the thermosteric sea level rise. Freshening of the Arctic Ocean leads to an additional halosteric sea level rise, reflecting the increased intensity of the hydrological cycle. Steric anomalies in the Pacific Ocean are largely positive, but of smaller magnitude. Furthermore, we find that the vertical distribution of steric anomalies is very different between ocean basins. In the North Atlantic, the anomalies reach to depths of the North Atlantic Deep Water, whereas anomalies in the Pacific Ocean occur mainly in the upper 500 m. In the Southern Ocean, anomalies occur throughout the entire water column.