



Naturally Forced Centennial-scale Sea Level Variability in Past-1000-Year Model Runs

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Models runs of the past 1000 years contain local sea level variability on centennial time scales in the Arctic and Southern Ocean regions. The earlier, coarser Millennium project model displayed centennial-scale sea level variability of up to 4 cm (standard deviation) or up to +/- 10 cm, regionally, in the Southern Ocean, and up to 3 cm in the Arctic. The relatively newer past1000 year run for MPI-ESM-P model displays a lower variability in the Southern Ocean, but a higher variability in the Arctic. This suggests that centennial-scale variability in the Southern Ocean could be sensitive to model resolution there, but that this low-frequency variability in the Arctic is a fairly robust feature in these models. Focusing on the Arctic variability, we break the Arctic sea level into steric components, and find that centennial-scale changes are halosteric in nature, similar to what has been previously reported for decadal changes in this region. Low-frequency changes in the export of freshwater out of the Arctic is lag-correlated with the halosteric variability in the basin. A full analysis of the freshwater forcing components and wind-forced currents on very low frequency time scales is provided to further explore the mechanisms behind these centennial changes in sea level. Comparisons to other model results for the past-1000 year experiments are also presented.