Geophysical Research Abstracts
Vol. 17, EGU2015-2413, 2015
EGU General Assembly 2015

Modeling future high-resolution dynamic sea level change

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Different studies have shown that resolving ocean eddies and representing boundary currents are of major importance when simulating changes in dynamic sea level on regional scale. Therefore, we use the strongly eddying global model version of the Parallel Ocean Program to simulate high-resolution future (up to the year 2100) sea surface height variations (SSH) under the SRES-A1B atmospheric forcing scenario. Results show dynamic sea level changes in the Southern Ocean that are caused by the southward shift in the westerly winds. The warming ocean (global mean sea surface temperature rises by about 2°C over the period 2000-2100) leads to a strong reduction of the Atlantic Meridional Overturning Circulation (AMOC). The magnitude of this reduction is affected by a feedback involving the heat transport to the sub-polar gyre region and evaporation over the North Atlantic region. The ocean circulation changes cause regional deviations from global mean sea level change in the North Atlantic. At coastal regions of eastern North America, dynamic sea level change leads to a positive deviation from global mean sea level change in the order of several decimeters. In the sub-polar gyre region a negative deviation from global mean sea level occurs. In the western North Atlantic, not only mean regional sea level is changed but also its variability, caused by shifted eddy pathways. This leads to a change in the frequency distribution of SSH anomalies, which has important consequences for regional sea level extremes.