Geophysical Research Abstracts
Vol. 20, EGU2018-12660, 2018
EGU General Assembly 2018

Comparing regional sea level changes simulated by climate models with observations from satellite altimetry over the period 1993-2015

Kristin Richter (1), Benoit Meyssignac (2), Aimée Slangen (3), Angelique Melet (4), John Church (5), Xavier Fettweis (6), Ben Marzeion (7), Cécile Agosta (6), Stefan Ligtenberg (8), Giorgio Spada (9), Matthew Palmer (10), Chris Roberts (10,11), and Nicolas Champollion (7)

(1) University of Innsbruck, Institute of Atmospheric and Cryospheric Sciences, Innsbruck, Austria (kristin.richter@uibk.ac.at), (2) LEGOS, Université de Toulouse, CNES, CNRS, IRD, UPS, Toulouse, France., (3) NIOZ Royal Netherlands Institute for Sea Research, Department of Estuarine & Delta Systems, and Utrecht University, The Netherlands, (4) Mercator Ocean, Ramonville, France, (5) Climate Change Research Centre, University of New South Wales, Australia, (6) University of Liège, Belgium, (7) Institute of Geography, University of Bremen, Germany, (8) Institute for Marine and Atmospheric research Utrecht, Utrecht University, Utrecht, The Netherlands , (9) University of Urbino, Italy, (10) Met Office Hadley Centre, United Kingdom, (11) European Centre for Medium Range Weather Forecasts, Shinfield, UK

The comparison of model-based sea level changes with observed changes is important for identifying uncertainties in models as well as observations. Meyssignac et al. (2017) and Slangen et al. (2017) used the output of 12 climate models from phase 5 of the Climate Model Intercomparison Project (CMIP5) to compare simulated total sea level changes to observed estimates from global sea level reconstructions and sparsely distributed individual tide gauges over the 20th century. Here, we complement these previous studies by comparing the same model-based estimates of total regional sea level change to that observed by satellite altimetry over the period 1993-2015. On these relatively short time scales, internal variability plays an important role and possibly governs the spatial patterns of sea level changes.

The ensemble means of the model-based sea level changes associated with dynamic sea level, atmospheric loading, glacier mass changes, and ice sheet surface mass balance contributions are summed with observations of groundwater depletion, reservoir storage, and dynamic ice sheet mass changes. The results are compared to the total observed change from the ESA-CCI dataset corrected for the GIA signal. To assess whether a forced signal is detectable in the model-based estimates of regional sea level change, the output is also compared to the strength of internal variability as derived from unforced control simulations. To further minimize the noise due to internal variability , zonal averages are produced. We find that, in all ocean basins, simulated zonally averaged sea level changes compare well with their observational counterparts, their differences lying mostly within the range of internal variability. We also find, that the simulated zonally averaged sea level rise over the period 1993-2015 is outside the range of internal variability revealing that the zonally averaged sea level changes observed since 1993 are dominated by the externally forced signal.

B. Meyssignac et al., 2017 , Evaluating Model Simulations of Twentieth-Century Sea-Level Rise. Part II: Regional Sea-Level Changes , Journal of Climate , 30 , 8565-8593 , DOI: 10.1175/JCLI-D-17-0112.1

Slangen, A.B.A. et al., 2017 , Evaluating Model Simulations of Twentieth-Century Sea Level Rise. Part I: Global Mean Sea Level Change , Journal of Climate , 30 , 8539-8563 , DOI: 10.1175/JCLI-D-17-0110.1