PAST AND FUTURE CHANGES OF SEA-LEVEL ALONG THE EAST COAST OF THE UNITED STATES OF AMERICA

Love R(1), Milne GA(1),(2), (3)Tarasov L

(1)Department of Physics, University of Ottawa; (2)Department of Earth Sciences, University of Ottawa; (3)Department of Physics and Physical Oceanography, Memorial University of Newfoundland and Labrador

Our goal is to quantify future changes of sea-level along the Eastern coast of North America with particular emphasis on heavily populated areas which may be susceptible to such changes. There are several processes that will contribute to the sea-level signal and each needs to be considered in order to produce accurate projections (Slangen et. al., 2011). The primary component signals are: changes in sea surface height due to ocean steric changes and the associated dynamic signal, changes in relative sea-level due to melting of land ice (ice caps, glaciers and ice sheets), and changes in relative sea-level due to glacial isostatic adjustment (GIA, here mainly associated with the melting of the now absent Laurentide ice sheet). This presentation focuses on the effects and uncertainties associated with each of these component signals.

The GIA response is evaluated by comparing a suite of over 360 spherically symmetric Earth models driven by a high variance sub-ensemble of glaciation histories from the analysis of Tarasov et. al. (2012). The output from these models is compared to paleo sea-level data from the study of Engelhart and Horton(2011), in which approximately 500 index points distributed between Maine and Southern Carolina were presented and assessed. Using various methods to determine the best fitting ice and Earth models, preliminary results indicate changes of the order of 14±2cm, 8±2cm and -2±1cm for the period 2000-2100 for the cities New York, Boston, and Portland, respectively. The thermosteric and ocean dynamic response is evaluated using datasets provided by the Coupled Model Intercomparison Project Phase 5 (CMIP5). The response is determined by examining the output of atmosphere-ocean general circulation models driven by implementations of the representative concentration pathways (RCPs) of the Intergovernmental Panel on Climate Change (IPCC). Considering a total of over 100 model runs, from 15 different atmosphere-ocean general circulation models, gives sea-level contributions for the 21st century ranging from -3cm-36cm, -2cm-38cm and -2cm-38cm (mean values for 2090-2100 as compared to 2000-2010), at New York, Boston and Portland. We are presently computing the contribution due to future land ice changes (glaciers, ice caps and ice sheets). For glaciers, we use the Randolf Glacier Inventory to define the spatial distribution of ice and the results from Marzieon et al. (2012) to define the volume changes for each region. Our presentation will compare the magnitude and geometry of the sea-level change associated with these different processes for the US east coast.