



Contribution of wave setup to projected coastal sea level changes

Angelique Melet (1), Rafael Almar (2), Mark Hemer (3), Goneri Le Cozannet (4), and Benoit Meyssignac (2)

(1) MERCATOR OCEAN, Scientific Direction, Ramonville St Agne, France (angelique.melet@mercator-ocean.fr), (2) LEGOS, Université de Toulouse, CNES, CNRS, IRD, UPS, Toulouse, France, (3) CSIRO, Oceans and Atmosphere, Hobart, Australia, (4) BRGM/French Geological Survey, Orléans, France

Along open coasts, ocean wind-waves are a key driver of coastal changes and can be major contributors to coastal hazards. Wind-wave characteristics are projected to change in response to climate change, notably due to changes in atmospheric circulation patterns and the associated surface winds. Here, a first-order estimate of projected 20-yr mean wave setup changes is provided along most of the world coastline over the middle and end of the 21st century, based on an ensemble of wave model projections under the representative concentration pathways (RCP) 8.5, and on an empirical formulation of wave setup. Projected wave setup changes are compared to other contributors currently accounted for in regional sea-level projections to extend existing projections of 21st century coastal sea level changes.

Projected wave setup changes exhibit a strong spatial heterogeneity with regional-scale consistency, and mostly average out at global scale. At regional scale, wave setup changes are a small yet sizeable contributor to total coastal sea level 20-yr mean changes (including global mean sea level rise-GMSLR) over the middle and end of the 21st century. Importantly, wave setup is a substantial contributor to regional departures of coastal sea level changes from GMSLR. Wave setup changes can therefore substantially either enhance or reduce coastal sea level changes due to other contributors such as steric effects, and should be included in regional patterns of coastal sea level changes. The sizeable reported long-term changes in wave setup also advocate for the inclusion of non-stationary wave contributions to projected regional patterns of coastal sea level changes, including for extreme events.