

Abstract

Kareem M Tonbol

Sea-level change and projection for future flooding along the Egyptian Mediterranean coast

Future sea-level changes along the Mediterranean Egyptian coast (southern Levantine sub-basin) are projected using satellite altimetry data and model simulations. Twenty-one years (1993—2013) of satellite altimetry data, represented by dynamic topography (DT), are examined in light of tide-gauge observations. Current DT changes are examined with respect to five atmospheric/oceanic factors. The qualities of three realizations of the Geophysical Fluid Dynamics Laboratory (GFDL) model are examined by comparing these with DT. Finally, the simulations best describing the present DT are used to describe projected sea-level changes in the study area. The results indicate that DT can be used to study coastal and deep-water sea-level changes in the study area. The southern Levantine sub-basin sea level has recently risen by an average of 3.1 cm decade⁻¹ and exhibits significant annual sea-level variation of 17 cm to 8 cm. The sealevel variation is significantly affected by several factors: sea-level variation west of the Gibraltar Strait, steric sea level, and sea-surface temperature. The GFDL simulations best describing the recent sea level over the study area, i.e., GFDL-CM3 and GFDL-ESM2M, are used to calculate the two-model ensemble mean (GFDL-2ENM), which indicates that Egypt's Mediterranean coast will experience substantial sea-level rise (SLR) this century. The estimated uncertainty over the study area was 4—22 cm by 2100, with the emission assumptions dominating the three sources of uncertainty sources. Comparing the projected SLRs with digital elevation data indicates that Egypt's Mediterranean coast will only be safe from flooding by 2100 if effective adaptation methods are applied