# REGIONAL MODEL PREDICTIONS OF 21$^{ST}$ CENTURY MEDITERRANEAN SEA LEVEL

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**Abstract**
Sea level projections for the Mediterranean Sea derived from the temperature and salinity fields of a high resolution regional model are presented. The projections are based on the differences between the periods 1961-1990 and 2070-2099 as simulated by the model on the basis of the SRES (Special Report on Emission Scenarios) A2 scenarios.
*Keywords : Sea Level, Models.*

Climate models suggest that sea level rise is expected to increase during the 21$^{st}$ century mainly due to continuing thermal expansion of the oceanic water mass but with an additional contribution by melting ice sheets [1]. Spatially the various global models are inconsistent, indicating differences in the atmospheric and/or oceanographic models used. Thus, downscaling and the development of regional models have become a necessary tool for policy making and planning for climate change impacts.

The Mediterranean Sea is a semi-enclosed deep sea with its own, locally forced thermohaline cell separated from the Atlantic Ocean with a very dynamic hydraulically controlled regime. As a result past sea level changes in the Mediterranean did not always match those at the Atlantic Ocean. Sea level trends for the three longest tide-gauge stations in the Mediterranean are presently in the range 1.1-1.3 mm/yr, thus lower than the estimated global value for sea level rise [2].

An Atmosphere-Ocean Regional Climate Model coupled over the Mediterranean basin and forced by river runoff and influxes from the Atlantic Ocean and the Black Sea is used to obtain estimates of sea level rise in the region during the 21$^{st}$ century. Sea level rise in the Mediterranean over the next century is expected to be at most 25 cm, plus any sea level rise due to mass addition from ice sheet. The mean sea level rise value predicted is around 13 cm with lower values in the Eastern Mediterranean and higher values at the western Mediterranean. Warming and salinification of the intermediate waters are expected to occur simultaneously, thus partly compensating each other. These are driven by intermediate water formation in the Adriatic Sea rather than the presently dominant Levantine Intermediate Water. Atmospheric pressure over the basin is also expected to increase by up to 2 mbars, thus also compensating some of the thermal expansion. There is no seasonal bias in the sea level rise indicating that the seasonal cycles will remain unaffected.

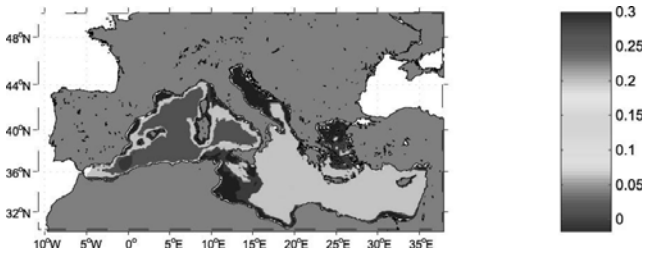


Fig. 1. Steric sea level rise estimated as the difference of the mean sea levels between 2070-2099 against the reference period 1961-1990

The most important missing contributor from the model is expected to be the water mass addition from melted ice. This is expected to dominate sea level rise in the second part of the century [1]. About 30% of the total sea level rise will be caused by this factor. In the worst case scenario that is about 27 cm of sea level rise. This needs to be added to the model predictions together with the atmospheric pressure effects. Clearly near the coasts this will correspond to most of the expected sea level rise.

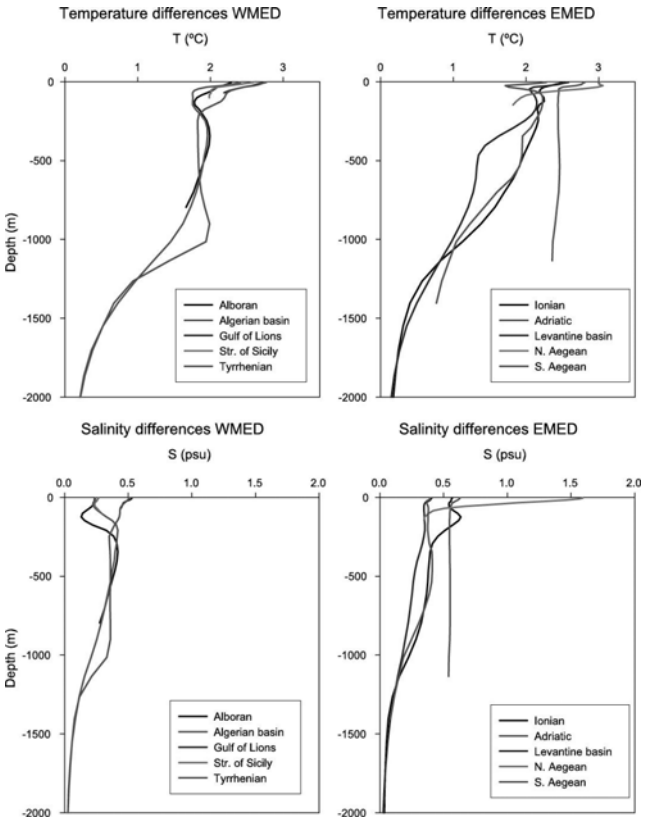


Fig. 2. Differences of temperature and salinity profiles between the two periods

Acknowledgements
The work has taken place when M. Marcos was visiting the National Centre for Oceanography, Southampton under a post-doc fellowship funded by the Spanish Ministry of Education and Science. This work is partly supported by the Spanish project VANIMEDAT (CTM2005-05694-C03-270/01/MAR).

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