



The drop in European time-mean sea level caused by the Mediterranean inflow

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To understand how coastal sea level will respond on centennial time scales, we need to understand what determines spatial patterns of coastal time-mean dynamic topography - an issue which is still poorly understood. A suite of model experiments shows that one of the biggest causes of inter-model variability along the eastern boundary of the Atlantic relates to a sea level step at the entrance to the Mediterranean Sea. Combining these models with a set of dedicated twin experiments, we show that the exchange flow between the Mediterranean and the North Atlantic leads to a drop in time-mean European coastal sea level along the Atlantic coast north of Gibraltar. The drop is about 7 cm along the Portuguese coast, and remains apparent (though reduced) as far north as the Norwegian coast. We also show that Mediterranean time- and spatial-mean sea level is about 9 cm lower than it would be without the exchange flow (but assuming a small supply from the Atlantic to balance evaporation). Each of these relationships makes possible an estimate of the magnitude of the exchange flow based on sea level measurements, and estimates of 0.8 and 0.91 sverdrups are made, consistent with previous determinations based mainly on current measurements in the Strait of Gibraltar.