



The contribution of thermal expansion to Mediterranean Sea level variability

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The steric expansion of the Mediterranean Sea and of its sub-basins is assessed on the basis of temperature and salinity from global and regional databases in 1955-2003 and oceanographic models in 1993-2004.

The agreement between the steric heights evaluated from the World Ocean Atlas 2001, Ishii and Medar/Medatlas datasets is good in the longer interval, with a root mean square difference of the basin averages below 0.9 centimeters. The basin average decadal variability of the steric heights shows an increase in 1950-1980, a decrease in 1980-1988 and a new increase in the last decade. Most of the inter-annual variability occurs at 100-300 meters depth. The root mean squares of the basin averages are below 1 cm, 2 cm and 2.2 cm for the thermo-steric, halo-steric and steric components respectively. The sub-basins with the highest steric variability are the Alboran, Northern Ionian and Levantine Basins, with an rms of 3.9, 4.2 and 5.0 cm.

The annual amplitude of the steric heights evaluated from both ECCO and MFSTEP models is smaller (4cm) than the amplitude from the WOA01 and the Medar/Medatlas climatologies (5 cm). It represent about 50-60% of the total sea level annual amplitude (8 cm).

Since 1993, sea level variations are accurately measured by Topex/Poseidon altimetry complemented for the recent years by Envisat and Jason-1. The 12-years data show different linear trends in the sub-basins that are related to the inter-annual variability. In 1993-2003 both the positive and negative linear trends (rise/fall) of sea level observed by altimetry in the eastern Mediterranean and in the Ionian Sea are well re-

produced by the steric Medar data, with correlation higher than 0.8. We conclude that the sea level rise/fall observed there is mainly due to change in the heat and/or salinity content. In 1955-2003 the best agreement between thermo-steric heights and sea level measured at the tide gauges is lower (0.7) and significant only at a few stations.