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On the steric and mass variations influence in the annual sea level variations of the Mediterranean Sea

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Sea Level Variation (SLV) is the net sum of two major contributions: steric and mass-induced. The steric SLV is that resulting from the thermal and salinity changes in a given water column. It only involves volume change of the same amount of water, and hence has negligible gravitational change signature. The mass-induced SLV, on the other hand can be seen as the result of adding or subtracting water mass to or from the water column, for whatever the reasons. It has direct gravitational signature. The aim of our work is to estimate the share, or relative importance, of the two contributions in the SLV in the Mediterranean Sea as a function of time, by combining ocean altimetry data (from TOPEX/Poseidon, Jason-1, ERS and ENVISAT altimeters) to estimate the total SLV, temperature and salinity data (from ECCO project) to estimate steric SLV and time-variable gravity data (from GRACE mission, from April/May 2002 to July 2004) to estimate mass-induced SLV. All datasets have been averaged in the Mediterranean. Mass SLV has been independently estimated in an indirect way monitoring the differences between total SLV and steric SLV. The agreement between both mass SLV estimations is quite satisfactory, indicating a relatively important seasonal cycle which reaches the maximum value in mid-February, that is, 5 months after than the one of total SLV and steric SLV. This out-of-phase would indicate that when sea level is rising, it is loosing mass, and on the contrary, when sea level is dropping, it is gaining mass. Therefore annual SLV in the Mediterranean is mainly driven by steric changes. On the other hand, water mass variations in the Mediterranean basin are mainly produced by two mass fluxes, namely, net evaporative cycle (precipitation minus evaporation) across the sea surface and the net barotropic signal across the Strait of Gibraltar, and

then the later is estimated monitoring the former (from NCEP data) and the total water mass variation (from GRACE).