



## **Interannual mass variation in the Mediterranean and Black Sea**

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We analyse interannual water mass transport and mass distribution in the Mediterranean and Black Sea in 2002-2007 using satellite based gravity, sea level and sea surface temperature data, hydrological and ocean models. The Mediterranean and Black Sea are characterized by a large annual steric component, which is out of phase with its mass counterpart. Furthermore due to its enclosed nature, the circulation in the basin is highly sensitive to mass fluxes. The multi-sensor analysis and integration with models promise a thorough investigation of those fluxes and provide a validation of both data and models.

In the Mediterranean Sea the trend of the total level variation is not significant, while a positive trend is observed in the water mass and a negative trend in the steric component of sea level. Temperature and salinity from both in-situ measurements and ocean models indicate that this behaviour is related to an increase of salinity and to a decrease in temperature, as well to the increase in the Mediterranean mass deficit (E-P).

The interannual variability of the Black Sea is even stronger and mainly due to the, highly unknown, water fluxes. The steric component is smaller and is known less accurately than that in the Mediterranean Sea. Due to the lack of suitable in-situ observations it can only be estimated from model simulated temperature profiles.

Errors in the estimates are propagated from different sources of information, taking into account the limitations implied by the dimension of the sea regions. The latest

Grace models and improved filtering methods increase the resolution and accuracy of our water mass estimates. Altimeter data assimilation into the ocean model increases the consistency of the complementary sources. In the Mediterranean Sea the GRACE data corrected for the leakage of land hydrology and the filtered steric-corrected altimetry are in good agreement (correlation of 0.8 and rms of 29 mm). In the Black Sea the agreement is not as good as in the Mediterranean Sea due to the larger amount of land hydrology leakage in the GRACE data, and to the inaccuracy of both the hydrological model and the steric component.