Geophysical Research Abstracts
Vol. 13, EGU2011-12202-1, 2011
EGU General Assembly 2011

Water mass variation in southern Europe: assessment of observations, models and relation to climate change

Luciana Fenoglio-Marc (1), Matthias Becker (1), Roelof Rietbroek (2), Juergen Kusche (2), Sebastian Grayek (3), Emil Stanev (3), Tim Aus der Beek (4), and Lucas Menzel (5)

(1) Technical University Darmstadt, Institute of Physical Geodesy, FB 13, Darmstadt, Germany (fenoglio@ipg.tu-darmstadt.de), (2) Institute of Geodesy and Geoinformation, Bonn University, Bonn, Germany, (3) Institut für Chemie und Biologie des Meeres, University Oldenburg, (4) Center of Environmental Systems Research, Kassel, Germany, (5) Department of Geography, University of Heidelberg, Germany

The Southern European region is very sensitive to climate change. The evolution in time of total sea level and of its steric and mass-induced components are related to change in climate and therefore are a key to understand the oceanic response to the climate changes.

The water mass variation in the Mediterranean Sea and Black Sea and mass exchange between the two basins in the last decade are derived using altimetry and GRACE measurements, oceanography and hydrology models. For the first time a dedicated release of the hydrology model WATERGAP tailored to this area is used to correct for the hydrology leakage. The water mass variation has a strong interannual component and is the main contributor to the total interannual sea level change.

With the GRACE standard release of GFZ filtered by an anisotropic filter, the water mass in the Mediterranean Sea increases with a rate of equivalent water height of about 7 +/- 2 mm/yr. This rate being compensated by the decrease of the steric sea level due to the halo-steric component, the total sea level variability is almost zero in the net effect.. The water mass in the Black sea has a stronger interannual variability, with increase between 2003 and 2005 and decrease in 2006-2008.

The mass exchange between the basins results in net inflows into the Mediterranean Sea from the Black Sea and from the Atlantic Ocean with annual amplitudes of 0.008 Sv and 0.06 Sv peaking in Spring and in Autumn. The long term trend of the water cycle parameters shows an evolution towards a dryer regime and an increase in the loss of freshwater over the Mediterranean Sea. Water mass changes estimated by GRACE and by sea level reconstruction over the last decades do not show a correspondent loss in mass in the basin and therefore indicate a significant increase in the net flow at Gibraltar.

Results depend slightly on the GRACE products, on the filtering methods applied and on the models used.