Geophysical Research Abstracts
Vol. 12, EGU2010-6275-1, 2010
EGU General Assembly 2010

Geodynamics of the Earth according to the altimeter measurements

Igor Uchytel (1), Victor Jaroshenko (1), Vadim Mituchenko (1), Borys Kapochkin (2), and Nataliya Kucherenko (2)

(1) Odessa State Academy of Civil Engineering and Architecture, Odessa, Ukraine (tsb1@mail.ru), (2) Odessa State Environmental University , Odessa, Ukraine (tsb1@mail.ru)

We performed a comprehensive analysis of observations of the Black Sea level variations by different methods. The first method is a coastal monitoring by sea-level tide gauges which measures sea level changes relative to a moving reference frame - the state geodetic network. The second one is the satellite altimetry which results are performed in the fixed global reference frame.
At the first stage we studied the mean monthly data smoothed over three points for the period 1993-2009. We found that during years 1994-1995, 1999-2001, and 2006, changes of the sea level registered by two different methods were almost identical. Hence both methods have high accuracy. Difference between results of the two methods is an indicator of errors. Changes in the shape of the geoid result in the satellite data errors. Systematic errors of this method have period of 10.3 months. Errors in the coastal sea level measurements are associated with vertical movements of the gauge instruments. Systematic errors of this method has 14.6 months period which coincides with the Chandler one. We performed cross-spectral analysis of the errors caused by global changes of the geoid shape and regional geodeformations in the Black Sea region. We found that results of the sea level measurements by two different methods are the same during short periods of phase overlapping of these incoherent cyclic errors.
At the second stage we studied the sea level changes averaged over 24 hours for the period May - July 2009. We concluded that the Earth' geomagnetic field variations during 10-15 May generated changes of the geoid. Main ruptures of the high-pressure gas pipe-lines which occurred at 9, 10, 16, 28 May could be related to corresponding geodeformations. We found that rapid changes of the distance from the satellite to the sea surface during May 2009 were preceded by geodeformations.
During July 2009 we registered maximal geodeformations caused by increase of the amplitude of the solid Earth tides. In July, the sea level rose up to 12 cm during 20 days. In this period measurement errors associated with vertical movements of the tide gauges reached 21 cm. Their period is 7 days. Recorded ruptures of the gas pipeline networks during July occurred almost every 7 days also. The phase shift between periodic component of the vertical movements and ruptures of the gas pipelines was 180 degrees.