S-N secular ocean tide: explanation of observably coastal velocities of increase of a global mean sea level and mean sea levels in northern and southern hemispheres and prediction of erroneous altimetry velocities

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The phenomenon of contrast secular changes of sea levels in the southern and northern hemispheres, predicted on the basis of geodynamic model about the forced relative oscillations and displacements of the Earth shells, has obtained a theoretical explanation. In northern hemisphere the mean sea level of ocean increases with velocity about **2.45±0.32** mm/yr, and in a southern hemisphere the mean sea level increases with velocity about **0.67±0.30** mm/yr. Theoretical values of velocity of increase of global mean sea level of ocean has been estimated in **1.61±0.36** mm/yr.

1 Introduction. The secular drift of the centre of mass of the Earth in the direction of North Pole with velocity about **12-20** mm/yr has been predicted by author in 1995 [**1**], [**2**], and now has confirmed with methods of space geodesy. For example the DORIS data in period 1999-2008 let us to estimate velocity of polar drift in **5.24±0.29** mm/yr [**3**]. To explain this fundamental planetary phenomenon it is possible only, having admitted, that similar northern drift tests the centre of mass of the liquid core relatively to the centre of mass of viscous-elastic and thermodynamically changeable mantle with velocity about **2-3** cm/yr in present [**4**]. The polar drift of the Earth core with huge superfluous mass results in slow increase of a gravity in northern hemisphere with a mean velocity about **1.4** μGal and to its decrease approximately with the same mean velocity in southern hemisphere [**5**]. This conclusion-prediction has obtained already a number of confirmations in precision gravimetric observations fulfilled in last decade around the world [**6**]. Naturally, a drift of the core is accompanied by the global changes (deformations) of all layers of the mantle and the core, by inversion changes of their tension states when in one hemisphere the tension increases and opposite on the contrary - decreases. Also it is possible that thermodynamical mechanism actively works with inversion properties of molting and solidification of materials at core-mantle boundary in opposite (northern – southern) hemispheres [7].

2 Atmospheric and oceanic inversion tides. The gravitational attraction of superfluous mass of the drifting to the North core (in 17 masses of the Moon) causes a planetary inversion tide of air masses of the Earth and its oceanic masses, from the southern hemisphere – to the northern hemisphere [**8**]. On our theoretical estimations the mean atmospheric pressure in the northern hemisphere accrues with velocity about **0.17** mbar/yr and with similar negative velocity in southern hemisphere. Although mentioned estimations are draft the predicted phenomenon of a slow redistribution of air masses from the southern hemisphere in northern partially has already obtained confirmation according to the meteorological observations in period 1.4. 2002 - 1.4. 2005 [**9**]: **0.17-0.22** mbar/yr (northern hemisphere) and **-0.18** mbar/yr (southern hemisphere). On the basis of modern data of satellite altimetry for 1993-2007 years we for the first time appreciate velocities of secular variations of the mean sea level in northern and southern hemispheres of the Earth which, as well as was supposed, appeared various [**10**]. In the report the mechanisms of the revealed phenomena, their dynamic interrelation are discussed and an possible interpretation to the data of observations is given.

3 Contrast changes of mean sea levels in northern and southern hemispheres. The air masses slowly are transported from a southern hemisphere in northern. They form an original inversion secular atmospheric tide which existence proves to be true by the modern data of observations [**9-11**]. The gravitational attraction of the core which is displaced along a polar axis causes the similar tide of oceanic masses [**5**]. The barometric effect of influence of atmospheric tide will result in reduction of expected secular oceanic tide. Really, an increase of

mean atmospheric pressure in the northern hemisphere results in replacement of oceanic masses in the southern hemisphere. Only for this reason (on our model) the mean sea level in the northern hemisphere decreases with secular velocity **-1.98** mm/yr. In turn a decrease of atmospheric pressure in the southern hemisphere results in an increase of the mean sea level in this hemisphere with velocity **1.43** mm/yr. Preliminary estimations have shown, that a oceanic inversion tide, caused by a gravitational attraction of the drifting core, gives the basic contribution to the phenomenon of secular variation of the mean sea level in N and S hemispheres (in northern hemisphere the mean sea level increases with velocity **3.01±0.17** mm/yr and in the southern hemisphere it decreases with velocity **-2.18±0.12** mm/yr).

On the sea level the slow deformation changes of a bottom of the ocean render the essential influence. This tectonic phenomenon is connected with global (planetary) changes of shapes of hemispheres of the Earth. The last have been predicted and described on the basis of developed geodynamic model of the core mantle forced oscillations and drift [**5**] and revealed by methods of space geodesy [**11**]. On the basis of these results the estimation of velocity of increase of the mean sea level because of deformations of ocean bottom in **0.55±0.26** mm/yr has been obtained. An analysis has shown that thermal factors play big role in secular change of sea level. Here we will accept conclusions of the last years that due to a heating of ocean layers and their expansion and due to melting of glaciers and other contributions of water masses in ocean its mean sea level rises with velocity about **0.83** mm/yr [**12**]. Summarizing now all considered factors of increase of the sea level, we come to the important conclusion. In northern hemisphere the mean sea level of ocean increases with velocity about **2.45±0.32** mm/yr, and in a southern hemisphere the mean sea level increases with velocity about **0.67±0.30** mm/yr. This result give clear confirmation of existance in present epoch of the secular S-N oceanic tide. Observations on the coastal guage stations confirm these predicted theoretical velocities [**13**]. Theoretical values of velocity of increase of global mean sea level of ocean thus has been estimated in **1.61±0.36** mm/yr that is close to value observed by coastal methods.

4 Prediction of erroneous altimetry determinations. An altimetry mehod can not give obtained above values of velocities of increasing of mean sea levels in northern and in southern hemispheres and of course and real value for global change. The reason consists that altimetry determinations include additional effect, we shall name it is fictitious, which is caused by secular drift of the centre of mass of the Earth to the North with velocity **5.24±0.29** mm/yr. It is uneasy to show, that only one effect of drift of the centre of mass results in fictitious effect of decreasing of mean sea level in northern hemisphere with velocity **-2.37±0.13** mm/yr and to increasing of the mean sea level in a southern hemisphere with velocity **2.66±0.15** mm/yr, and also to effect of increase of mean global sea level with velocity **0.54±0.03** mm/yr. And the specified effects would take a place in observations even if the real sea level would not vary at all. But we shall add real values of velocities obtained above to fictitious and we shall obtain, accordingly, the values of velocities which can be obtained by altimetry method at scope by observations of all latitudes of ocean areas: **0.08** mm/yr for northern hemisphere; **3.33±0.30** mm/yr for southern hemisphere and **2.15±0.39** mm/yr for a global level of ocean. But they have not any relation to real characteristics of change of sea levels in northern and southern hemispheres of the Earth and to its global secular change. Real values of velocities of increase of mean sea levels in northern hemisphere, in a southern hemisphere and all ocean make: **2.45±0.32** mm/yr, **0.67±0.30** mm/yr and **1.61±0.36** mm/yr.

The mentioned values of velocities of change of mean sea levels have been obtained at set of simplifying assumptions concerning of a direction of drift of the centre of mass of the Earth and character of redistribution of atmospheric and oceanic masses and, naturally, in future will be specified. The work was accepted by grants of RFBR: N 07-05-00939.

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