

# The impact hydroisostasy to vertical motion and stress-strain condition of Earth crust and mantle.

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Intuitively it seems unbelievable that sea level change for 100-130 meters, as it was happened in Glacial periods include Last Glacial, could gravely impact stress-strain condition of the Earth crust with thickness 5 – 30 km and mantle until lower layers.

By the way, analysis of altitude positions of ancient coastal lines at the some marine coasts of Russia, which related to “far-field” regions, demonstrate inexplicable developments of tectonic trends. The accounting influence of violation the isostatic balance, in this case – hydroisostasy phenomenon, allowed explain this contradiction.

According to the survey results, beginning from 90th of the last centuries, of age and altitude positions of Holocene traces at the coastal lines, even in closed water areas like Japan sea [M.Nakada et.al, 1990], South China sea [B.Horton, et al, 2005] and located in far-field regions revealed different height positions of coeval coastal lines.

As research areas for investigation the hydroisostasy phenomena influence to vertical motions of the Earth’s crust have been taken the Russian coasts located in far distance from Glacier cover centers of North America and Scandinavia and located in so called “far-field” areas, where no gravitation influence from Glaciers. That were Primorie coasts of Russian Far East, coasts of Sakhalin island and Okhotsk sea, arctic seas Lapteva and East-Siberian. Some of these seas investigated better some worse by palaeogeographic methods.

Big contribution to study influence to vertical motion Earth’s crust from Post Glaciation melting of Glacier cover and World ocean transgression was made due to recent progress of computing ability. In this research were used free access and open source softwares SELEN and ELMER.

Following results discussed in report:

- Sea level change for 120 meters at the time period 17-20ky may distinctly affect and, even, change the dominated trend in vertical tectonic motions in region.
- The rate of solid sea bottom, coast area and land vertical motion speed depend from the shelf width affected by load and unload by 100-120m water’s column at the distance hundreds kilometers from water areas.
- “Te” – effective thickness of lithosphere, in dependence of it’s rheological properties, which as usually lower than underlying mantle, affect inversely proportional to amplitude of vertical motions – the thicker lithosphere layer, the bigger vertical motion amplitude.
- The mantle deformation as result of relatively small values of pressure on the lithosphere’s surface by decreasing and increasing waters column as results of Interglacials sea levels changing with maximal pressure value 1200 kPa reaches to the lower mantle layers at the time period several thousands years.
- The distributions distance of deformation with opposite sign from place of impact by water load reaches hundreds and thousands kilometers.
- The vertical motions amplitude even noticeably differ at the adjacent capes and bays at the distance 100km and more.
- The subduction type has decisive influence to sea level evolutions for tectonic active regions.