Geophysical Research Abstracts
Vol. 17, EGU2015-3925-4, 2015
EGU General Assembly 2015

Postglacial uplift of the eastern Gulf of Finland-Lake Ladoga region: models and observations

Aleksey Amantov (1), Willy Fjeldskaar (2), and Marina Amantova (1)
(1) VSEGEI, St.Petersburg, Russia, (2) Tectonor, Stavanger, Norway (wf@tectonor.com)

The eastern Gulf of Finland – Lake Ladoga region - is at the peripheral part of the Fennoscandian post-glacial uplift. We compared different modeling results for this region with observations, including our revision of geomorphological traces of paleo shorelevel.

As in many parts of the general Baltic-White Sea bedrock lowland at the margin of the Fennoscandian Shield, the bedrock landscape was modified by glaciers, but it was also the major controlling factor for the history of glacial grows and decays. First-order landforms of this segment are: Lake Ladoga-Lake Ilmen lowland, Lembolovo High of the Karelic Isthmus and Neva-Gulf of Finland lowland. The range of the bedrock topography is close to 350 m. The landforms reflect different glacial behavior during stadials, with fast movement and strong erosion in northern Ladoga, but passive motion and accumulation around Lembolovo High. The differences influenced the ice sheet and deglaciation history.

The shore level displacements in this area are slightly different than westwards in the Baltic area; the shoreline tilts are usually lower in southern-central part of the eastern Gulf of Finland-lake Ladoga region. For example, the shoreline tilts at 11 600 BP in the Baltic Ice Lake in the south-east range from 0.55 to 0.31 m/km. The slope of the Ancylus shoreline varies from 0.12 to 0.18 m/km, increasing to almost the double in the north-western area. Similarly, the Littorina shore level is tilted only 0.08 m/km, rising to 0.14 m/km in the north-west.

We have used this data in our high resolution modeling involving glacial isostasy, hydro isostasy, sediment isostasy, and gravity field changes. The mopdeling is based on Earth rheology model with a low-viscosity asthenosphere of thickness less than 150 km and viscosity less than 7.0x10**19 Pa s above a mantle of viscosity 10**21 Pa s, and an effective elastic lithosphere thickness of 30-40 km (flexural rigidity 10**24 Nm).

The specific uplift features in the area are probably caused by combination of factors, with hydro-isostasy as the most significant, due to water load changes of the Baltic and Lake Ladoga. Another factor that could contributed to the regional tilt changes is Younger Dryas re-advance of the ice sheet, marked by Salpausselkä terminal moraine ridge system in Southern Finland. It caused local transgression (i. e. in northernmost Ladoga).

It is also important to mention that the central part of the Karelic peninsula has been deglaciated $\sim$1000 years earlier than neighboring lowlands. The best fit ice model is relatively thin for this area, possibly reasonable because of specific ice base conditions on soft sedimentary cover.