Geophysical Research Abstracts
Vol. 14, EGU2012-3617, 2012
EGU General Assembly 2012

Reconstructing the groundwater flow in the Baltic Basin during the Last glaciation

T. Saks (1), J. Senņikovs (2), A. Timuhins (3), and A. Kalvāns (4)

(1) Faculty of Geography and Earth Sciences, University of Latvia, Latvia (tomas.saks@lu.lv), (2) Faculty of Physics and Mathematics, University of Latvia, Latvia (jsenniko@latnet.lv), (3) Faculty of Physics and Mathematics, University of Latvia, Latvia (tim@modlab.lv), (4) Faculty of Geography and Earth Sciences, University of Latvia, Latvia (andis.kalvans@lu.lv)

In last decades it has been discussed that most large ice sheets tend to reside on warm beds even in harsh clima tic conditions and subglacial melting occurs due to geothermal heat flow and deformation heat of the ice flow. However the subglacial groundwater recharge and flow conditions have been addressed in only few studies.
The aim of this study is to establish the groundwater flow pattern in the Baltic Basin below the Scandinavian ice sheet during the Late Weichselian glaciation. The calculation results are compared to the known distribution of the groundwater body of the glacial origin found in Cambrian – Vendian (Cm-V) aquifer in the Northern Estonia which is believed to have originated as a result of subglacial meltwater infiltration during the reoccurring glaciations.
Steady state regional groundwater flow model of the Baltic Basin was used to simulate the groundwater flow beneath the ice sheet with its geometry adjusted to reflect the subglacial topography. Ice thickness modelling data (Argus&Peltier, 2010) was used for the setup of the boundary conditions: the meltwater pressure at the ice bed was assumed equal to the overlying ice mass.
The modelling results suggest two main recharge areas of the Cm-V aquifer system, and reversed groundwater flow that persisted for at least 14 thousand years. Model results show that the groundwater flow velocities in the Cm-V aquifer in the recharge area in N-Estonia beneath the ice sheet exceeded the present velocities by a factor of 10 on average. The calculated meltwater volume recharged into the Cm-V aquifer system during the Late Weichselian corresponds roughly to the estimated, however, considering the fact, that the study area has been glaciated at least 4 times this is an overestimation. The modeling results attest the hypothesis of light dO18 groundwater glacial origin in the Cm-V aquifer system, however the volumes, timing and processes involved in the meltwater intrusion are yet to be explored.
This study was financed by the European Social fund Nr. 2009/0212/1DP/1.1.1.2.0/09/APIA/VIAA/060

References

Argus D.F., Peltier R.W. 2010. Constraining models of postglacial rebound using space geodesy: a detailed assessment of model ICE-5G (VM2) and its relatives. Geophysical Journal International. 181, 697–723.