TTÜ GEOLOOGIA INSTITUUDI TEADUS- JA ARENDUSTEGEVUSE AASTAARUANNE 2011

1. Instituudi struktuur

TTÜ Geoloogia Instituut, Institute of Geology at Tallinn University of Technology, direktor Atko Heinsalu

- Administratsioon ja haldustalitus, Administration, Atko Heinsalu
- Füüsikalise geoloogia õppetool, Chair of Physical Geology, Alvar Soesoo
- Isotoop-paleoklimatoloogia osakond, Department of Isotope-paleoclimatology, Rein Vaikmäe
- Litosfääriuuringute osakond, Department of Lithosphere Studies, Alvar Soesoo
- Paleontoloogia ja stratigraafia osakond, Department of Paleontology and Stratigraphy, Olle Hints
- Pärastjääaja geoloogia osakond, Department of Post-glacial Geology, Siim Veski
- Teaduskogude osakond, Department of Collections, Ursula Toom

2. Instituudi teadus- ja arendustegevuse (edaspidi T&A) iseloomustus

(NB! punktid 2.1- 2.6 täidab struktuuriüksus)

2.1 struktuuriüksuse koosseisu kuuluvate uurimisgruppide teadustöö kirjeldus ja aruandeaastal saadud tähtsamad uurimistulemused *(inglise keeles*); **2.2** Uurimisgrupi kuni 5 olulisemat publikatsiooni läinud aastal.

Department of Isotope-paleoclimatology

The main research area is using isotopic and geochemical indicators of climate and environmental changes on four integrated directions in this field: 1) study of new ice core records in order to link climate records from different polar areas; 2) impact of Quaternary ice sheets on groundwater flow systems 3) Late Pleistocene glacial chronology of Estonia and adjacent regions (development of dating methods); 4) estimation of capacity and safety of Baltic sedimentary basin for CO_2 geological storage. Densities and stable oxygen isotope ratios measured in three shallow firn cores from Vestfonna ice cap (Svalbard) have been jointly analyzed in the light of measured and modelled surface air temperature data. The Vestfonna $\delta^{18}O$ record captures the recently discovered autumnal warming local maximum and is confirmed as a good proxy for local air temperatures. There is a strong correlation between amplitude of isotopic cycles and downscaled wind field. The Vestfonna isotopic records show a warming trend as seen in instrumental records from Svalbard and thus could be used to reconstruct long-term trends of past atmospheric parameters driving the isotopic composition of local precipitation. The counting of isotope cycles and the dating of the common "cold winter horizon" led to an acceptable dating of the cores. It was established that the composition of the dissolved inorganic carbon in Cambrian-Vendian groundwater is influenced by complex reactions and isotope exchange processes between water, organic matter and rock matrix. The $\delta^{13}C$ composition of dissolved inorganic carbon in Cambrian-Vendian water indicates also a bacterial modification of the isotope system. Results of the latest interdisciplinary study of the Voka reference section, southeastern coast of the Gulf of Finland showed that the accumulation of the enclosing sediments in the range between 96 to 75 ka (MIS 5b–5a) occurred in the conditions of stable interglacial climate. It was concluded that in Estonian–Latvian capture–transport–sink scenario of industrial CO_2 emissions the avoidance costs per tonne of CO_2, estimated by Decision Support System using GeoCapacity GIS are 37.4 €.

Alexanderson, H., Landvik, J.Y., **Molodkov**, A., Murray, A.S. (2011). A multi-method approach to dating middle and late Quaternary high relative sea-level events on NW Svalbard – a case study. Quaternary Geochronology 6, 326-340.

Bitinas, A., Damušytė, A., **Molodkov**, A. (2011). Geological structure of the Quaternary sedimentary sequence in the Klaipėda Strait, southeastern Baltic. Harff, J., Björck, S., Hoth, P. (Eds.). The Baltic Sea Basin. Springer Verlag, Berlin, 133-146.

Divine, D., Isaksson, E., **Martma**, T., Meijer, H.A.J., Moore, J., Pohjola, V., van de Wal, R.S.W., Godtliebsen, F. (2011). Thousand years of winter surface air temperature variations in Svalbard and northern Norway reconstructed from ice core data. Polar Research 30, 1-12.

Kaljo, D., Hints, L., Hints, O., Männik, P., **Martma**, T., Nõlvak, J. (2011). Katian prelude to the Hirnantian (Late Ordovician) mass extinction: a Baltic perspective. Geological Journal 46, 464-477.

Shogenova, A., **Shogenov**, K., Pomeranceva, R., Nulle, I., Neele, F., Hendriks, C. (2011). Economic modelling of the capture–transport–sink scenario of industrial CO_2 emissions: the Estonian–Latvian cross-border case study. Energy Procedia 4, 2385-2392.

Department of Lithosphere Studies

The research is focused on genesis and geochronology of Precambrian rocks of the Fennoscandian Shield, correlation based on metabentonites of Ordovician and Silurian, carbonate mineralogy and environmental geochemistry. The results of numerical model of magma transport allow quantification of magma geochemistry. The use of high-resolution geochemical methods on Silurian bentonites allowed distinction of several magmatic events during Telychian and correlation over the paleocontinent. Close to Aeronian-Telychian boundary a specific volcanic layer rich in P and Sr was found, which can be used as a marker. Directions of O-S paleocurrents in the Baltic basin have been established. Research on phosphorus distribution in Ordovician paleobasin allows better understanding of oil shale formation. Environmental geochemistry provides evidence for the distribution of heavy and other element in industrial soils and groundwater of town and power plant environments. Metal-rich black shale origin has been studied. In 2011 Kristjan Urtson defended his PhD Thesis (University of Tartu) and Kairi Ehrlich defended her MSc Thesis.

Brasiera, A.T., Fallick, A.E., Praveb, A.R., Melezhikc, V.A., **Lepland**, A., FAR-DEEP Scientists (2011). Coastal sabkha dolomites and calcitised sulphates preserving the Lomagundi-Jatuli carbon isotope signal. Precambrian Research 189, 193-211.

Kiipli, T., **Kallaste**, T., Nestor, V., **Siir**, S., Perens, H., Einasto, R. (2011). Geochemistry and correlation of volcanic ash beds from Rootsiküla Stage (Wenlock-Ludlow) in the eastern Baltic. Estonian Journal of Earth Sciences 60, 207-219.

Kump, L.R., Junium, C., Arthur, M.A., Brasier, A., Fallick, A., Melezhik, V., **Lepland**, A., Črne, A.E., Luo, G. (2011). Isotopic evidence for massive oxidation of organic matter following the great oxidation event. Science 334, 1694-1696.

Lepland, A.; Van Zuilen, M.A.; Philippot, P. (2011). Fluid-deposited graphite and its geobiological implications in early Archean gneiss from Akilia, Greenland. Geobiology 9, 2-9.

Reinik, J., Heinmaa, I., Kirso, U., **Kallaste**, T., Ritamäki, J., Boström, D., Pongracz, E., Huutanen, M., Larsson, W., Keiski, R., Kordas, K., Mikkola, J.-P. (2011). Alkaline modified oil shale fly ash: Optimal synthesis conditions and preliminary tests on CO_2 adsorption. Journal of Hazardous Materials 196, 180-186.

Department of Paleontology and Stratigraphy

The research is focused on Early Paleozoic paleontology, environments and stratigraphy. The department's target financing project ”Ordovician and Silurian biodiversity in Baltica: evolution and impact of the changing environment“ involves taxonomical and phylogenetical studies, palaeoecology and palaeobiogeography, sedimentology, and integrated bio- and chemostratigraphy. The main results in 2011 include the following. A quantitative stratigraphical approach on Ordovician chitinozoans produced hitherto the most detailed biodiversity curve, showing links with sedimentary sequences and primary production. Paleobiodiversty of conodonts also correlates with

large-scale depositional cycles, diversification is connected with transgressive phases and sequence boundaries coincide with impoverished faunas. Comparison of different groups of latest Ordovician organisms showed a longer prelude to the Hirnantian extinction, and varied response to the changing environment. Discovery of oldest cryptospores (deriving from early land plants) and coral endosymbionts were reported. New data on Darriwilian conodonts enabled reconstruction of evolutionary lineages of biostratigraphically important species. Biostratigraphy of Silurian chitinozoans was also advanced with elaboration of zonation in the Pridoli and review of the entire Baltic Silurian chitinozoan biozonal scheme. New integrated bio- and chemostratigraphical data showed that the global boundary of the Ludlow Series should be drawn lower that previously thought. 12 ISI papers were published, and a PhD (Adrian Popp, Ordovician trilobites) and a MSc (Laur Kõiv, areal variation of carbon isotopes) were defended in 2011.

Cramer, B. D., Brett, C. E., Melchin, M. J., **Männik, P.,** Kleffner, M. A., Mclaughlin, P. I., Loydell, D. K., Munnecke, A., Jeppsson, L., Corradini, C., Brunton, F. R., Saltzman, M. R. 2011. Revised correlation of Silurian Provincial Series of North America with global and regional chronostratigraphic units and $d^{13}C$carb chemostratigraphy. Lethaia 44, 185-202.

Kaljo, D., Hints, L., Hints, O., Männik, P., Martma, T., **Nõlvak, J.** 2011. Katian prelude to the Hirnantian (Late Ordovician) mass extinction: a Baltic perspective. Geological Journal 46, 464-477.

Männik, P., Loydell, D., Lubeseder, S. 2011. Sheinwoodian (Silurian) conodonts and graptolites from NE Anti-Atlas, Morocco. Lethaia 44, 410-416.

Nestor, V. 2011. Chitinozoan biostratigraphy of the Pridoli Series of the East Baltic. Estonian Academy Publishers, Tallinn. Estonian Journal of Earth Sciences 60, 191-206.

Vecoli, M., Delabroye, A., Spina, A., **Hints, O.** 2011. Cryptospore assemblages from Upper Ordovician (Katian-Hirnantian) strata of Anticosti Island, Québec, Canada, and Estonia: palaeophytogeographic and palaeoclimatic implications. Review of Palaeobotany and Palynology 166, 76-93.

Department of Post-glacial Geology

The department's target financing on the topic „Postglacial natural and human induced environmental and climate change recorded in lake and bog sediments" ended in 2011. The research aimed at reconstruction of climate change and environmental dynamics, both natural and man-made, at high temporal resolution in Estonia and neighbouring areas during the late-glacial and post-glacial time through a multidisciplinary and multiproxy study of lake and bog sediments. Main results in the current year involve connecting long palaeo proxy series from lake sediments to climatic events, investigations on the methodology of pollen productivity estimates, palynological richness and relevant source area of pollen, which define the grounds of the research on past anthropogenic land cover change via pollen-based reconstruction. New results, applying novel methods of corroded pollen combined with macrofossil data on complete and unambiguous vegetation record since the Bølling warming from the Baltic area since 14,550 cal yr BP show regional and local vegetation responses to the late-glacial climate. 12 ISI papers were published (ten 1.1 and two 1.3), Leeli Amon and Vivika Meltsov defended their PhD Thesis and Johanna Sepmann MSc Thesis.

Amon, L., **Veski**, S., **Heinsalu**, A., **Saarse**, L. (2011). Timing of Lateglacial vegetation dynamics and respective palaeoenvironmental conditions in southern Estonia: evidence from the Lake Nakri sediment record. Journal of Quaternary Science (published online 07.09.2011; DOI: 10.1002/jqs.1530).

Meltsov, V., **Poska**, A., Odgaard, B.V., Sammul, M., Kull, T. (2011). Palynological richness and pollen sample evenness in relation to local floristic diversity in southern Estonia. Review of Palaeobotany and Palynology 166, 344-351.

Poska, A., Meltsov, V., Sugita, S., **Vassiljev**, J. (2011). Relative pollen productivity estimates of major anemophilous taxa and relevant source area of pollen in a cultural landscape of the hemi-boreal forest zone (Estonia). Review of Palaeobotany and Palynology 167, 30-39.

Reitalu, T., Purschke, O., Johansson, L.J., Hall, K., Sykes, M.T., Prentice, H.C. (2011). Responses of grassland species richness to local and landscape factors depend on spatial scale and habitat specialization. Journal of Vegetation Science (published online 17.08.2011; DOI: 10.1111/j.1654-1103.2011.01334.x).

Rose, N.L., Morley, D., Appleby, P.G., Battarbee, R.W., **Alliksaar**, T., Guilizzoni, P., Jeppesen, E., Korhola, A., Punning J.-M. (2011). Sediment accumulation rates in European lakes since AD 1850: trends, reference conditions and exceedence. Journal of Paleolimnology 45, 447-468.

Department of Collections

Geological collections are essential part of many branches of geosciences and the Institute holds the largest geocollection in Estonia. The Department of Collections ensures preservation and accessibility of physical collections (fossils, rock samples, drill cores etc), as well as the archives and electronic information system (accessible online at http://geokogud.info/git). The latter has been developed in the Institute, but is now used also by other geocollection holders in Estonia. The department has close collaboration with other natural history collections in Estonia and since 2011, the institute is a partner in the national research infrastructure roadmap object "Natural history archives and information network". Further projects to integrate collections, databases and research data are underway.

Chair of Physical Geology

The Chair is providing teaching in geological subjects at BSc (commencing in 2010/2011), MSc and PhD levels. Three MSc (Johanna Sepmann, Laur Kõiv and Kairi Ehrlich) and two PhD theses (Adrian Popp and Leeli Amon) were defended in 2011.

2.3 Loetelu struktuuriüksuse töötajate rahvusvahelistest tunnustustest.

European Science Foundation (ESF) personaalne uurimistoetus Micro-DICE Tübingeni Ülikoolis, Alvar Soesoo

2.4 Loetelu struktuuriüksuse töötajatest, kes on välisakadeemiate või muude oluliste T&A-ga seotud välisorganisatsioonide liikmed.

Tiiu Alliksaar, 2007 - ..., Rahvusvahelise Paleolimnoloogia Assotsiatsiooni liige;

Olle Hints, 2009 - …, IUGSi Rahvusvahelise Stratigraafia Komisjoni Ordoviitsiumi alamkomisjoni liige;

Dimitri Kaljo, 2006 - …, Rahvusvahelise Paleontoloogia Assotsiatsiooni graptoliitide töögrupi liige; Londoni Geoloogia Seltsi auliige;
Enn Kaup, 2008 - ..., Saksa polaaruurijate ühingu teadusnõukogu liige; 1992 - ... Rahvusvahelise teoreetilise ja rakendusliku limnoloogiaühingu liige;
Tarmo Kiipli, Rahvusvahelise Geoanalüütikute Assotsiatsiooni liige;
Elga Kurik, Rahvusvahelise Geoloogiateaduste Liidu Stratigraafia Komisjoni Devoni alamkomisjoni kirjavahetajaliige;
Peep Männik, 2008 - …, IUGSi Rahvusvahelise Stratigraafia Komisjoni Siluri alamkomisjoni aseesimees;

Tiiu Märss, 2007 - ..., IUGS'i Geoteaduste Programmi teadusnõukogu liige; 1997 - ..., Rahvusvahelise Selgroogsete Morfoloogia Uurimise Ühingu liige; 1995 - ..., Rahvusvahelise Paleontoloogia Ühingu liige;

Tõnu Martma, 2006 - ... Rahvusvahelise Glatsioloogiaühingu (IGS) liige; 1996 - ..., Euroopa Isotoopuuringute Ühingu (ESIR) liige;

Anatoli Molodkov, 1989 - ..., Rahvusvahelise EPR-Ühingu tegevliige;

Viiu Nestor, Paleosoikumi Mikrofloora Rahvusvahelise Komisjoni (CIMP) koosseisu kuuluva Kitinosoade Alamkomisjoni liige;

Anneli Poska, 2009 - ..., NordForsk LANDCLIM võrgustiku nõuandva kogu liige; 1999 - ..., INQUA PMP (Pollen Monitoring Program) asutaja ja tegevliige;

Anto Raukas, Rahvusvahelise Geomorfoloogide Assotsiatsiooni Eesti rahvuslik esindaja; Rahvusvahelise Geoloogiateaduste Liidu keskkonnaplaneeringute komisjoni (GOGEOENVIRONMENT) korrespondentliige ja Eesti rahvuslik esindaja; USA Rahvusliku Geograafia Seltsi liige; New Yorgi Teaduste Akadeemia liige; Poola teadusühingu Societas Scientiarum Gedanensis välisliige; Soome Geoloogia Seltsi korrespondentliige; Soome Maa Füüsika Seltsi liige; Ülemaailmse Teadlaste Föderatsiooni liige;

Alla Šogenova, 2004 - ..., Geoenergia Uurimise Euroopa võrgu (ENeRG) Eesti esindaja;

Alvar Soesoo, Ameerika Geokeemia Seltsi liige; Euroopa Geotermaalenergia Nõukogu (European Geothermal Association) grupiliige;

Rein Vaikmäe, 2009 - ..., Euroopa Strateegilise Teadusinfrastruktuuri Foorumi keskkonna töörühma liige; 2008 - ..., INQUA Maismaaprotsesside Komisjon - paleopõhjavete grupp, koordineeriva grupi liige; 2008 - ..., Jääpuursüdamike Teadusuuringute Rahvusvahelise Partnerluse (IPICS) juhtkomitee liige; 2006 - ..., COST Programmi Maa Süsteemi Teaduste ja Keskkonnakorralduse Valdkonna Komitee liige; 2001 - ..., ESF Euroopa Polaarnõukogu liige; 2003 - ..., Academia Europaea liige; 2003 - …, Ameerika Geofüüsika Ühingu (AGU) liige; 2001 - …, Euroopa Geoteaduste Ühingu (EGU) liige; Euroopa Isotoopuuringute Ühingu (ESIR) nõukogu liige;

2.5 Aruandeaasta tähtsamad T&A finantseerimise allikad.

Sihtfinantseeritavad teemad, ETF grandid, välis- ja siselepingud.

2.6 Soovi korral lisada aruandeaastal saadud T&A-ga seotud tunnustusi (va punktis 2.3 toodud tunnustused), ülevaate teaduskorralduslikust tegevusest, teadlasmobiilsusest ning anda hinnang oma teadustulemustele.

2.7 Instituudi teadus- ja arendustegevuse teemade ja projektide nimetused *(Eesti Teadusinfosüsteemi, edaspidi ETIS, andmetel)*

- Haridus- ja Teadusministeerium

sihtfinantseeritavad teemad [**4**]:

- SF0140020s08, Ordoviitsiumi ja Siluri elustiku mitmekesisus Baltika paleokontinendil: evolutsiooni ning muutuva keskkonna mõjud, Olle Hints

- SF0320080s07, Isotoop- ja geokeemiliste indikaatorite kasutamine globaalsete kliima- ja keskkonnamuutuste uurimisel, Rein Vaikmäe
- SF0332710s06, Pärastjääaegsetes soo- ja järvevetes talletunud keskkonnatingimuste ja kliima muutused ning nende modelleerimise võimalused, Siim Veski
- SF0140016s09, Fennoskandia ja Baltika litosfääri evolutsioon: geokeemia, geokronoloogia, paleokeskkond ja mineraalsed ressursid, Alvar Soesoo

baasfinantseerimise toetusfondist rahastatud projektid (sh TTÜ tippkeskused) [**1**]:

- ÜPTK03A, Kliima- ja keskkonnamuutuste uurimiskeskus, Rein Vaikmäe

teaduskollektsioonide finantseerimine:

- TTÜ Geoloogia Instituudi geoloogilised kollektsioonid, Ursula Toom

riiklikud programmid:

- Teiste ministeeriumide poolt rahastatavad riiklikud programmid [**5**]:

- BALTICDIVERSITY (INTERREG IVA), Towards transboundary access of nature observation data, Sigrid Hade
- COBWEB (INTERREG IVA), Communicating the Baltic, Alvar Soesoo
- GEO.POWER (INTERREG IVC), Geothermal energy to address energy performance strategies in residential and industrial buildings Alvar Soesoo
- Riikliku seireprogrammi suurjärvede rannikute seire, Anto Raukas
- Riikliku polaar- ja kliimauuringute programmi ettevalmistamine, Enn Kaup

- SA Eesti Teadusfond

grandid [**12**]:

- ETF6995, Mineviku maakasutus, selle mõju maismaa- ja veekeskkonnale, Anneli Poska
- ETF7315, Eesti kristalliinse aluskorra post- ja anorogeensete kivimite isotoop-vanuste ja haruldaste muldmetallide geokeemia, Evelin Verš
- ETF7605, Vulkanismi areng Baltika laami äärealadel ja sellel tuginev Ordoviitsiumi ja Siluri kemostratigraafia Baltoskandia regioonis, Tarmo Kiipli
- ETF7640, Ordoviitsiumi - Siluri piir Balti piirkonnas, Jaak Nõlvak
- ETF7674, Darriwili (Kesk-Ordoviitsium) konodondid, kitiinikud ja skolekodondid Balti regioonis: taksonoomia, mitmekesisus ja biostratigraafia, Olle Hints
- ETF8054, Ordoviitsiumi trilobiitide tunnuste muutlikkus paleokeskkonna ja -ökoloogia muutumise taustal, Helje Pärnaste
- ETF8182, Ordoviitsiumi ja Siluri kliima peamised tsüklid, mis on tõendatud süsiniku ja hapniku isotoopide, faatsieste ning stratigraafilistele uuringutega Baltikumis, Tõnu Martma
- ETF8425, Pleistotseeni viimase jäävaheaja loodusolude arengulugu Põhja-Eestis 5. merelise isotoopstaadiumi kestel (~130 000 – 70 000 aastat tagasi), Anatoli Molodkov
- ETF8552, Hilisjääaja keskkonnatingimused viimase jäätumise kagusektoris: paleoökoloogiline uurimus, Siim Veski
- ETF8907, Muutused Telychi ja alam-Sheinwoodi konodondifaunas kui basseini arenguloo indikaatorid Baltikumi põhjaosas, Peep Männik
- ETF8948, Mandrijäätumise mõju Balti kilbi lõunanõlva põhjavee kujunemisele: vee isotoop-geokeemiliste trasserite, lahustunud tahkise ja gaaside ning põhjavee integreeritud modelleerimise kompleksuuring, Rein Vaikmäe
- ETF8963, Maakooretekkega magma evolutsiooni analoog- ja numbriline modelleerimine ja geokeemilised uuringud, Alvar Soesoo

ühisgrandid välisriigiga [**1**]:

- GREUTF, Sensitivity of Svalbard glaciers to climate change (SvalGlac), Rein Vaikmäe

järeldoktorite grandid (SA ETF ja Mobilitas) [**4**]:

- MJD17, Geochemical evolution of groundwater in Cambrian-Vendian aquifer system in Estonia, Andres Marandi
- MJD51, Sette poorivee fluorestsentsiindeksi rakendamisvõimalused madala suurjärve paleolimnoloogilistes uuringutes, Anu Kisand
- MJD57, Kas vesikirbuliste jäänused järve settes näitavad kliima- ja keskkonnamuutust? Jaana Salujõe
- MJD4, Unraveling the history of plant diversity patterns by means of pollen analyses: an interdisciplinary approach, Triin Reitalu

- SA Archimedesega sõlmitud lepingud

infrastruktuur (nn „mini-infra“, „asutuse infra“) [**3**]:

- AP020, Ordoviitsiumi ja Siluri elustiku mitmekesisus Baltika paleokontinendil: evolutsiooni ning muutuva keskkonna mõjud, Olle Hints
- AP080, Isotoop- ja geokeemiliste indikaatorite kasutamine globaalsete kliima- ja keskkonnamuutuste uurimisel, Rein Vaikmäe
- AP710, Pärastjääaegsetes soo- ja järvevetes talletunud keskkonnatingimuste ja kliima muutused ning nende modelleerimise võimalused, Siim Veski

Muud T&A lepingud:

- SA Keskkonnainvesteeringute Keskusega sõlmitud lepingud [**6**]:

- Geoteaduslike täiend- ja valikõppeprogrammide väljatöötamine ning käivitamine (I etapp), 2011-2012, Alvar Soesoo
- Laiale lugejaskonnale mõeldud raamatu "Populaarselt Eestimaa geoloogiast" koostamine (Eesti geoloogilisest ehitusest ja Maa-teadustest), 2011-2012, Alvar Soesoo
- Geoloogilised õppekollektsioonid (I etapp), Kristjan Urtson
- INTERREG IVC projekti GEO.POWER kaasfinantseerimine, Alvar Soesoo
- Laialdasemat maasoojusenergia rakendamist stimuleerivate majanduslike meetodite analüüs teiste riikide näitel ning saasteennetuslikku tegevust toetava tegevusstrateegia väljatöötamine Eestis, Alvar Soesoo

- Siseriiklikud lepingud [**4**]:

- L10-116, Jordaania Attarat Um Ghudran põlevkivimaardla uuringud, Alvar Soesoo
- L11-123, Maroko Errachidia ja Aghbala alade põlevkivi uuringud, Alvar Soesoo
- L11-138, Õppematerjalid Pärnu Loodus- ja Tehnikamajale, Ursula Toom
- L11-144, Geokogude infosüsteemi struktuuri arendus ja Europeana liidese loomine Eesti Loodusmuuseumile, Olle Hints

- EL Raamprogrammi projektid [**1**]:

- L11-135, Pan-European coordination action on CO_2 Geological Storage (CGS Europe), Alla Šogenova

- Välisriiklikud lepingud [**4**]:

- L10-115, Analyses and interpretation of chemical elements isotopes and composition of groundwater in frame of the European Social Fund project Establishment of interdisciplinary scientist group and modeling system for groundwater research, Rein Vaikmäe
- L08-58, Sustainable groundwater monitoring system of East-Viru county, Estonia, Norra finantsmehhanismi project 52/2006-EE0010, Liidia Bitjukova
- L10-99, Soil sampling and geochemical analysis for metals in the Exploration License area, Ruhaama County, Ntungamo District, Uganda. Raremet (U) Ltd., Alvar Soesoo
- L11-126, Oil shale geological studies (KATAG-119-21), Jordan Oil Shale Energy Company, Alvar Soesoo

2.8 Struktuuriüksuse töötajate poolt avaldatud sihtfinantseeritava teadusteema taotlemisel arvestatavad eelretsenseeritavad teaduspublikatsioonid *(ETIS klassifikaatori alusel 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2, 3.3, 4.1 ja 5.1).*

1.1 [42 publikatsiooni]

Alexanderson, H., Landvik, J.Y., **Molodkov**, A., Murray, A.S. (2011). A multi-method approach to dating middle and late Quaternary high relative sea-level events on NW Svalbard – a case study. Quaternary Geochronology 6, 326-340.

Amon, L., **Veski**, S., **Heinsalu**, A., **Saarse**, L. (2011). Timing of Lateglacial vegetation dynamics and respective palaeoenvironmental conditions in southern Estonia: evidence from the Lake Nakri sediment record. Journal of Quaternary Science (published online 07.09.2011; DOI: 10.1002/jqs.1530).

Beaudon, E., Arppe, L., Jonsell, U., **Martma**, T., Möller, M., Pohjola, V.A., Scherer, D., Moore, J.C (2011). Spatial and temporal variability of net accumulation from shallow cores from Vestfonna ice cap (Nordaustlandet, Svalbard). Geografiska Annaler Series A-Physical Geography 93, 287-299.

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5.1 [1 publikatsioon]

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2.9 Struktuuriüksuses kaitstud doktoriväitekirjade loetelu *(NB! struktuuriüksus lisab struktuuriüksuse töötaja juhendamisel mujal kaitstud doktoriväitekirjade loetelu)*

Adrian Popp, TTÜ Geoloogia Instituut
Teema: *Ordovician Proetid Trilobites of Baltoscandia and Germany* (Baltoskandia ja Saksamaa Ordoviitsiumi proetiidsed trilobiidid)
Juhendaja: vanemteadur Helje Pärnaste
Kaitses: 13.06.2011
Omistatud kraad: filosoofiadoktor (Maa-teadused)

Leeli Amon, TTÜ Geoloogia Instituut
Teema: *Palaeoecological Reconstruction of Late-Glacial Vegetation Dynamics in Eastern Baltic Area: A View Based on Plant Macrofossil Analysis* (Hilisjääaegsed taimkattemuutused Ida-Baltikumis taimsete makrojäänuste analüüsi põhjal)

Juhendaja: vanemteadur Siim Veski
Kaasjuhendaja: vanemteadur Anneli Poska
Kaitses: 21.10.2011
Omistatud kraad: filosoofiadoktor (Maa-teadused)

Kristjan Urtson, TTÜ Geoloogia Instituut, kaitsmine toimus Tartu Ülikoolis
Teema: *Stepwise melt transport and accumulation: analogue and numerical modeling approach* (Astmeline magma transport ja akumulatsioon: analoog- ja numbriline modelleerimine)
Juhendaja: professor Alvar Soesoo
Juhendaja: professor Kalle Kirsimäe (Tartu Ülikool)
Kaitses: 21.06.2011
Omistatud kraad: filosoofiadoktor (geoloogia)

Viivika Meltsov, EMÜ Põllumajandus- ja keskkonnainstituut
Teema: *Inferring floristic diversity from modern sedimentary pollen records* (Taimestiku mitmekesisuse peegeldumine kaasaegsete järvesetete õietolmus)
Juhendaja: vanemteadur Anneli Poska (TTÜ Geoloogia Instituut)
Juhendaja: professor Tiiu Kull (Maaülikool)
Kaitses: 21.12.2011
Omistatud kraad: filosoofiadoktor (botaanika)

2.10 Struktuuriüksuses järeldoktorina T&A-s osalenud isikute loetelu *(ETIS-e kaudu esitatud taotluste alusel)*

MJD17, Geochemical evolution of groundwater in Cambrian-Vendian aquifer system in Estonia, Andres Marandi
MJD51, Sette poorivee fluorestsentsiindeksi rakendamisvõimalused madala suurjärve paleolimnoloogilistes uuringutes, Anu Kisand
MJD57, Kas vesikirbuliste jäänused järve settes näitavad kliima- ja keskkonnamuutust? Jaana Salujõe
MJD4, Unraveling the history of plant diversity patterns by means of pollen analyses: an interdisciplinary approach, Triin Reitalu

2.11 Struktuuriüksuses loodud tööstusomandi loetelu

3. Struktuuriüksuse infrastruktuuri uuendamise loetelu

Seadmed	Hind, €
Leica M205 A stereomikroskoop	23,967
Leica M165 C stereomikroskoop	11,185
Järvesetete kolbpuurseadmed	21,744
Kivimite hoidmise kapp	2,070