UNIVERSITY of OULU

Laboratory of Water Resources and Environmental Engineering

Prof. Björn Klöve

Laboratory of Water Resources and Environmental Engineering

- Professors: 2
- Emeritus prof.: 1
- Chief engineer, docent: 1
- Assistants: 3 (2)
- Senior assistant: 1
- Laboratory manager: 1
- Technical staff: 5
- PhD researchers (activ): 10-15
- MSc students: 15-20

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Head of groups in esearch 2006

-Water supply, WW treatment and purification processes

- Prof. Esko Lakso, Dr. Jarmo Sallanko: Water supply & WW treatment
- Dr. Jaakko Rämö: Water chemistry, Chemical treatment processes

- **Water Resources Research:**
  - Prof. Björn Klöve: Applied surface and groundwater hydrology and hydraulics

- **Environmental Geotcechnology**
  - Dos. Kauko Kujala: Environmental geotechnics

Teaching cources (2005)

Common to all students of Environmental engineering

- Basics in Environmental Geotechnics *K. Kujala*
- Environmental Engineering, basic course *E. Lakso*

Cources for Water Resources and Environmental Engineering students:

First module

- Field Measurements in Environmental Engineering, *J. Rämö*
- Introduction to Urban Planning,
- Industrial Water and Wastewater Engineering, *M. Sillanpää*
- Chemical Process in Water and Wastewater Treatment, *M. Sillanpää*
- Environmental Legislation, *M. Hepola*
- Water Supply Networks, *E. Lakso*
- Groundwater Engineering *B. Klöve*
- Hydrology ja Hydraulics *B. Klöve*
- Environemental Engineering in Industry
- Remediation of Contaminated Soils *K. Kujala*
- Water and Wastewater Treatment, *E. Lakso*
- Waste Management for Industry and Communities, *E. Lakso*

Second module

- Seminar in Water Resources and Environmental Engineering, *M. Sillanpää, J. Rämö, B. Klöve, E. Lakso, K. Kujala*
- Advanced Cource in Environmental Geotechnics, *K. Kujala*
- Modelling Contaminat Transport of Point Source Pollutants in Watercources: *B. Klöve*
- Diffuse and Scattered Pollution Sources and Environmental Assessment *B.Klöve & E. Lakso*
- Water Resources and Environmental Engineering for Lake and River Restoration *B.Klöve*

Laboratory resources

- Soil and geoenvironmental laboratory
- Hydraulic laboratory
- Water quality laboratory



Examples of research in 2006

- Restoration of eutrophic lakes
- Phosphorus transport in forest soils and wastewater treatment filter media (EU)
- Wastewater retention in constructed wetlands/peatlands (EU)
- Material studies for environmental applications (e.g. by-products, composting)
- Use of tracer and isotopes in environmental engineering
- Use of peat in environmental applications
- Environmental effects of peat harvesting (SS transport, tretament methods)
- Tailings and containment systems in mining industry
- Landfill environmental technology
- Processes in sewer pipe lines
- Removal of COD from pulp and paper industry wastewaters
- Water treament by hydrogenperoxide (groundwaters)
- Sewage water treatment in non-urban areas
- Esker hydrology and sustainable use of groundwater
- Flocculation of wastewater
- Removal of organic material by catalysis
- Stream restoration
- Environmental effects of land drainage: water management
- Soil hydraulic properties
- Peatland research

Recent publications

- Sarpola, A., Hietapelto, V., Jalonen, J., Jokela, J., Rämö, J. 2006. Comparison of the hydrolysis products of AlCl3.6H2O in different concentrations by electrospray ionization time of flying mass spectrometer, *International Journal of Environmental Analytical Chemistry* (in press).
- Sallanko Jarmo, Lakso Esko, Lehmikangas Marko. 2005. The effect of ozonation on the size fraction of manganese. *Ozone Science & Engineering*, 27 (2), 147 - 151.
- Kværner, J. and Kløve. B. 2006. Tracing sources of summer streamflow in boreal headwaters using isotopic signatures and water geochemical components. *Journal of Hydrology*, accepted, in press (on elsevier www site).
- A.K. Søvik, J. Augustin, K. Heikkinen, J.T.Huttunen, J.M. Necki, S.M. Karjalainen, B. Kløve, A. Liikanen, Ü. Mander, M. Puustinen, S. Teiter, P. Wachniew. 2006. Emission of the Greenhouse Gases N2O and CH4 from Constructed Wetlands in Europe. *Journal of Environmental Quality.* Accepted.
- Grønlund, A. Sveistrup, T. Søvik, A.K. Rasse, D. Kløve, B. 2006. Degradation of cultivated peat soils in Northern Norway based on field scale CO2, N2O and CH4 emission measurements. *Archives of Agronomy And Soil Science* (in press).


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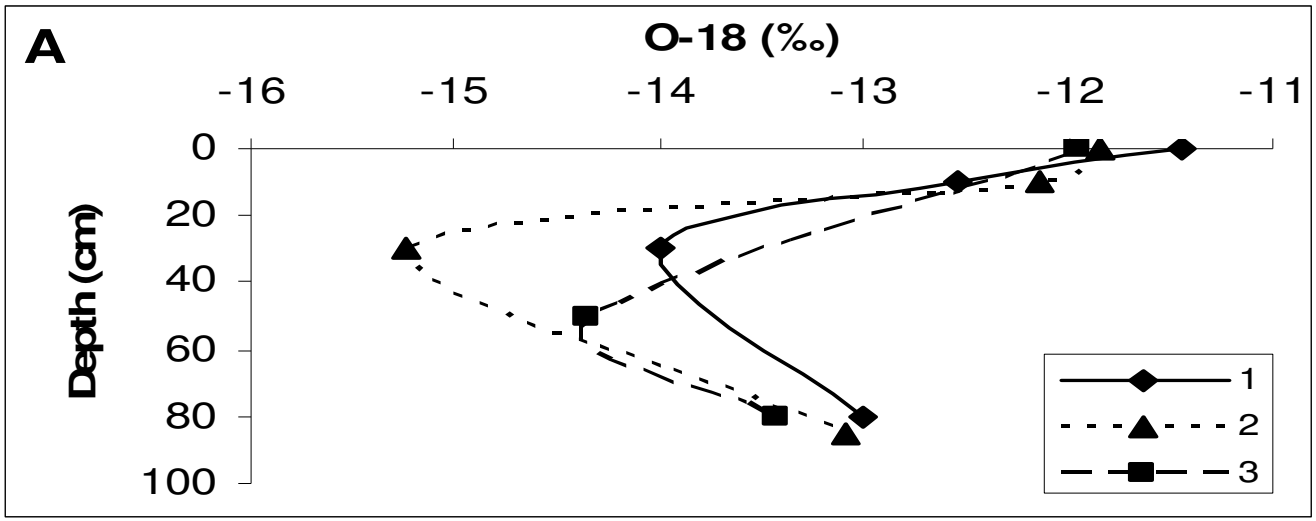
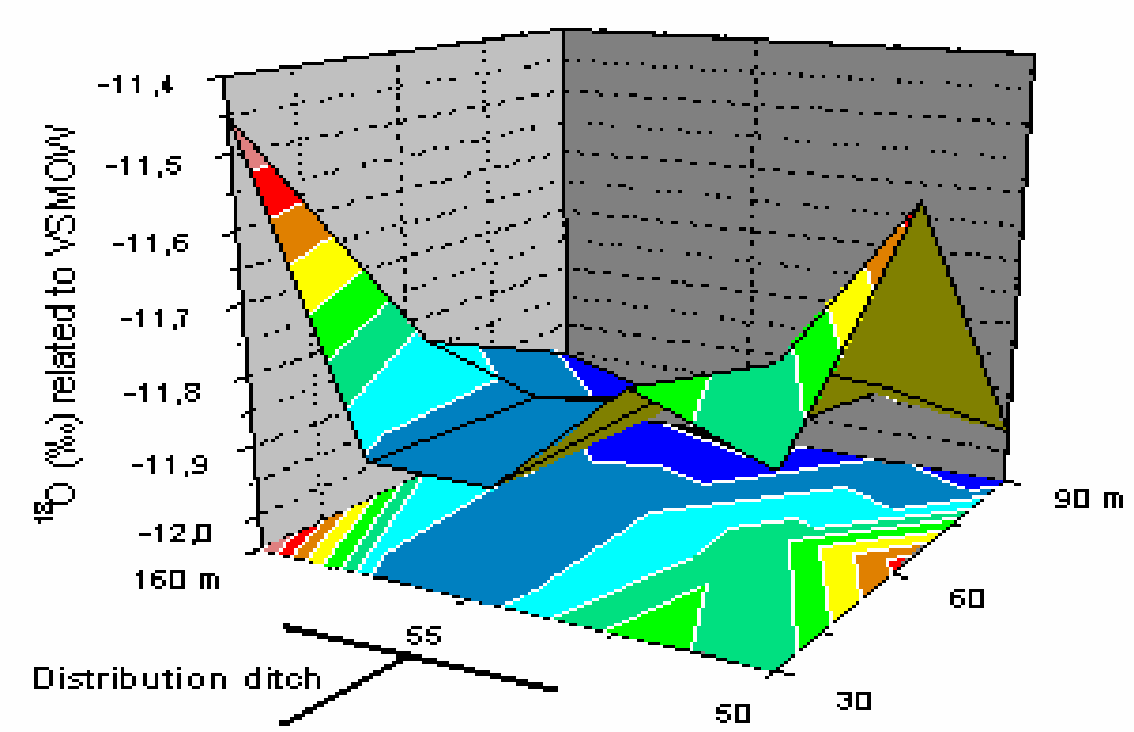
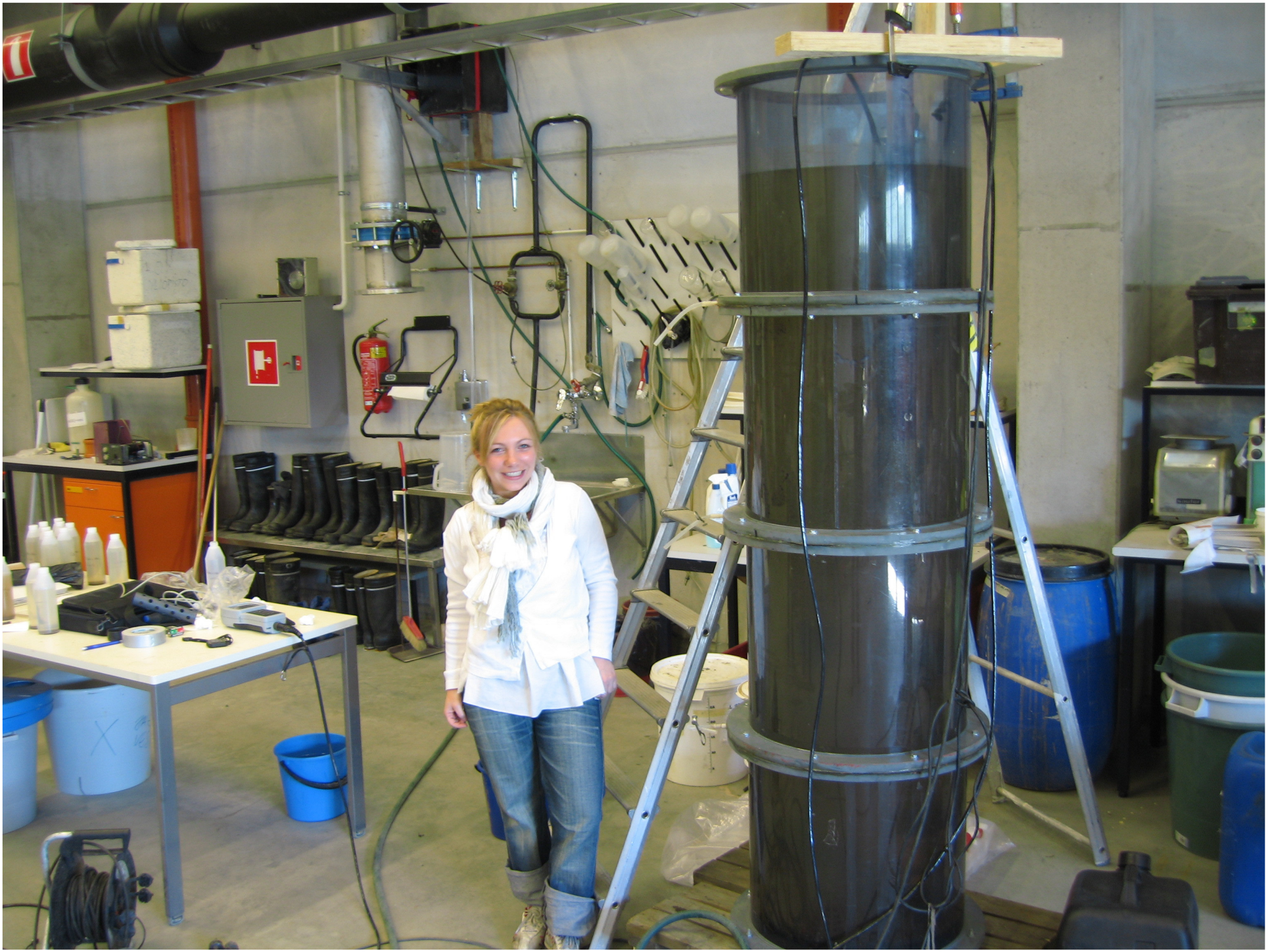
INFRASTRUCTURE AND COLD CLIMATE
RESEARCH PROJECTS
Stabilisation of peaty soils
Development of regional frost dimensioning
Freeze-thaw durability of hydraulically bound material
Peat in infrastructure
Frost heave and thaw weakening of road structure
Frost durability of stabilized excavated soil materials
GEO-ENVIRONMENT AND INDUSTRY
RESEARCH PROJECTS
Geotechnical use of slags
Utilisation of industrial by-products in earth structures
Development of mine waste deposits
Design systems for deposits of sulfidic mine tailings
Recycling of rockwool in earth structures
Peat in municipal construction
Remediation of contaminated soil
Landfill covers in cold climate
Geo-environmental modeling
Risk assessment
COLD CLIMATE AND NATURAL ENVIRONMENT
RESEARCH PROJECTS
Heat and mass transfer in forest soils
Impact of microclimate on soil temperature
Needle ice formation in forest soils
Thermal properties of palsa formation
Modeling of palsa formation
Moisture content of peaty soils


A
O-18 (‰)
-16
-15
-14
-13
-12
-11
0
20
40
60
80
100
Depth (cm)
1
2
3


-11,4
-11,5
-11,6
-11,7
-11,8
-11,9
-12,0
δ18O (‰) related to VSMOW
160 m
55
50
60
30
90 m
Distribution ditch

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Thank for your attention
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