International Research School of Water Resources

International PhD Course in

ENVIRONMENTAL TRACERS IN THE HYDROLOGICAL CYCLE

April 3 – 7, 2005 (both days included)
Geocenter Copenhagen, Denmark

Guest lectures
Professor Kip Solomon, University of Utah
Dr. Roland Purtschert, University of Bern

Objectives

Bring together an international group of PhD students with relevant backgrounds for a short course on environmental tracers in the hydrological cycle with emphasis on groundwater and the unsaturated zone.

Course content

Advanced methods for use of environmental tracers in the hydrological cycle with emphasis on the unsaturated zone and groundwater in both porous and fractured media. The course will include theoretical aspects of the physics and chemistry of isotopes and other environmental tracers, methods for sampling and analysing isotopes and environmental tracers in water, ways of using of tracers for understanding physical and chemical processes in the subsurface, and modelling techniques for simulating tracer transport and groundwater age. Several case studies will be presented.

Course elements (Tentative)

- Environmental tracers and isotope hydrology (e.g. 3H/3He, 4He, CFCs, 85Kr, 81Kr, 39Ar, 14C, 36Cl etc.)
- Tracers and physical processes in porous and fractured media
- Tracer transport in unsaturated and saturated zones
- Tracers and models for evaluation of residence times/groundwater age
- Radioisotope dynamics
- Multi-tracer studies and mixed water types
- Techniques for groundwater sampling and isotope analysis
- Case studies

Course outline (Tentative)

- Lectures Sunday-Thursday.
- Exercises, e.g. hand-calculations (isotope chemistry), numerical and analytical modelling of transport and mixing (residence time, ages), small project based on case study (assign ages, find flow lines, interpret inter-aquifer mixing)
- Informal student presentations and discussions at end of day

Background of participants
The course should attract Ph.D. students with a background in;

- Geology/geochemistry/(geo)physics, but less experience in hydrogeology, groundwater flow, and modelling techniques
- Hydrogeology/groundwater hydrology/engineering/numerical modelling, but less experience in isotope and tracer chemistry and physics.

Time and place
April 3-7, 2005
Geocenter Copenhagen, Denmark

Organizers
Peter Engesgaard, University of Copenhagen, pe@geol.ku.dk
Klaus Hinsby, Geological Survey of Denmark and Greenland, khi@geus.dk

Work load and credit points
Approximately 100 hours in total including the lectures and exercises during the course and preparatory reading before and during the course. The workload corresponds to 4 ECTS.

Study material
Notes and copies of references papers will be provided during the course. Software and key papers can be made available ahead of time upon request.

Admission
Applicants are requested to submit the registration form no later than February 28, 2005. Information on admission to the course will be forwarded shortly after.

The total number of participants is limited to 20. PhD students are given first priority but depending on the number of registrants we also welcome post-graduate participants. The course is free for PhD students enrolled at universities. Post-graduate participants will be charged a course fee of DKK 4.000.

Accomodation and travel
For PhD students FIVA will arrange for accommodation residence facilities near the university free of charge and in addition the international students will receive support to daily allowances. International students from Europe and North America are requested to cover travel expenses from own funding. For international students from other countries a few stipends are available from DWF Research (http://www.danishwaterforum.dk) to cover travel expenses.

International students are requested to submit with the application form (1) a brief description of research interests and background, (2) a CV, and (3) a letter of recommendation from the research advisor.

Other participants and those who wish to stay in hotels are requested to make their own arrangements.

Further information
Please contact the course organizer or FIVA.