

Transport and Retention of Radionuclides in Argillaceous and Fractured Media

Last Updated Monday, 24 May 2010

30th November - 7th December 2010, Würenlingen, St Ursanne and Meiringen Switzerland

A 6 day course, in collaboration with PSI, Swisstopo, Nagra and the IAEA Network of Centres of Excellence, with lab and field visits, held in Switzerland. Register on-line using the registration form.

Course Programme

This six-day course is presented by the ITC in collaboration with PSI (Paul Scherrer Institute), Swisstopo and Nagra. The course is designed for anyone with an interest in contaminant retardation in a waste repository host rock and, although focussed primarily on diffusive-transport dominated argillaceous rocks, also looks at advective-transport dominated fractured hard rocks.

Course participants will stay in the Schloss Boettstein Hotel

This is a novel course looking at all aspects of the definition of contaminant retardation in a repository host rock and begins with the basic definition of clays and works through various features of PSI laboratory and modelling investigation of contaminant retardation properties (<http://les.web.psi.ch/groups/index.html>). The course includes demonstration of various laboratory procedures and visits to two Underground Research Laboratories (URL): Mont Terri (www.mont-terri.ch), in St Ursanne in northern Switzerland and the Grimsel Test Site (www.grimsel.com) just below the Grimsel Pass in southern Switzerland.

The 6-day programme for 2010 consists of;

- Lectures on topics ranging from basic characterisation methods, through the theoretical and practical aspects of contaminant sorption processes to modelling of retardation processes. Sufficient time will be allocated for questions and discussions in each presentation module.
- Time in the laboratories of PSI where various practical aspects of the ongoing studies of contaminant retardation will be presented.
- A full day visit to Swisstopos Mont Terri URL will enable participants to go underground into the tunnels and learn directly about experiments to demonstrate the feasibility and safety of geological disposal. Focus here is on long-term experiments to study contaminant retardation in a diffusive-transport dominated host rock.
- Two days at a second Swiss URL, Nagra's Grimsel Test Site, where the focus will be on contaminant retardation in an advective-transport dominated (fractured) host rock. The visit will also include time in the underground research tunnels used for field testing of deep geological disposal methods and technologies.

While the course is ideal for those involved in any component of a national waste disposal programme, the main focus is on those researchers and modellers working on contaminant retardation and transport. The course should be attended by participants from a wide range of stakeholders in sectors such as national/provincial level decision-making authorities, implementing and regulating organisations, research organisations and universities, including both member and non-member organisations of the ITC-School. Sufficient time will be allocated for questions and discussions in each presentation module and afterwards, over coffee, lunch and dinner.

In addition to formal teaching, each course participant is required to prepare a pre-assignment related to the course. The purpose of the assignment is that the participants devise a specific contaminant retardation-related topic to focus on during the course (see details and application form below).

Course Location

The course will take place at the Paul Scherrer Institute, at Würenlingen/Villigen in northeast Switzerland along with the Mont Terri URL at St Ursanne in northwest Switzerland and the Grimsel Test Site in south-central Switzerland.

A view of St. Ursanne village

Other activities

On Saturday, 4th December, the course participants will have the day free to enjoy the scenery of the Jura Mountains in northern Switzerland or, if they prefer, the cities of Basel or Berne are within easy reach by train. On Sunday, 5th, the participants will travel to the Meiringen area in the Bernese Alps, where there will be additional possibilities for sightseeing en route.

Getting to PSI

The course participants will be accommodated in the Hotel Schloss Böttstein (www.schlossboettstein.ch) in the charming small village of Böttstein, near the Paul Scherrer Institute. The nearest airport is Zürich, but there are also excellent connections from Basel and Geneva airports.

By train, from Zürich airport, there are some 7 trains an hour from the station within the airport to the nearby town of Brugg (<http://www.brugg.ch/>) and the journey takes between 37 and 53 minutes. From Basel airport, it is necessary to take the airport shuttle bus (bus stop is well signposted in the airport) to Basel main station. From here, there are 5 trains an hour which take between 39 and 86 minutes to Brugg. From Geneva airport, there are 2 trains an hour which take between 167 and 172 minutes. For all trains, please see the Swiss Federal Railways website (www.sbb.ch/en/index.htm) for full details of times, reservations and costs.

A bus can be taken from Brugg railway station (north side of the station, well signposted throughout) to across the street from the hotel (see http://www.boettstein.ch/Ortsplan_boettstein.htm for a plan of the village with bus stops). There are two buses an hour (once again, see www.sbb.ch/en/index.htm for full details) and the journey takes 25 minutes. Please note that the bus's final destination (on the front of the bus) is Döttingen, not Böttstein.

By car, the easiest option is to use Google Maps to calculate your route to the hotel (enter "Hotel Schloss Böttstein, Böttstein, Switzerland" in the Search Maps field). It takes about 45-60 minutes to drive there from Zürich airport, about 60 minutes from Basel airport and around 3 hours from Geneva airport.

Travel from the hotel to the various meeting rooms and laboratories during the course is the responsibility of the ITC and you will be informed of the details during the course.

If you have any problems with your travel planning, please contact Gabi Vonlanthen at the ITC. Otherwise, the course director, Russell Alexander, will be available on 076 531 3607 on the Monday afternoon in case you get lost on the way to the hotel!

Course Organiser

The course is organised by the ITC-School in collaboration with the Paul Scherrer Institute, Swisstopo and Nagra.

Teaching

The course will be held in an informal, workshop atmosphere and participants will be encouraged to interact and question at all times. Each course topic will be taught by highly qualified and internationally recognised specialists from around the world. They will provide the most up to date and comprehensive information and discussions. Course materials will be provided for each topic. Modules will generally be taught throughout the day, with an extended lunch break. In addition, the course tutors will be present at dinner and afterwards in the hotel for free discussion and information exchange. The course language is English and course materials are printed in English.

Hotel Du Sauvage in Meiringen with the Sherlock Holmes museum to the right

Participants profile: is this course for you ?

The course is ideal for those involved in any component of a national waste programme and who have a desire to learn about all aspects of working on contaminant retardation in waste disposal. While some background in either radioactive

or chemo-toxic waste is useful, the modules have been so designed as to ensure that any participant who currently only has a rough idea of the role of contaminant retardation in waste disposal, will profit from this course. A basic grasp of chemistry is required, but more important is a genuine interest in being involved in contaminant retardation-related issues in waste disposal. If you are unsure if this course is for you, please feel free to contact the Director of Courses, Russell Alexander (russell.alexander@itc-school.org), for an informal chat.

To help you to get the most out of this course, we would like you to produce a short pre-course assignment. But don't worry, we are not asking you for much effort, just a little thought in advance of attending the course which will focus your thinking and give us an insight into your requirements. And don't worry if you cannot express yourself fluently, this is not a test, rather it is simply intended to help us get to know you a bit in advance. In return, you will be given the course tutors CVs when you start the course.

The Course Assignment can be found at the bottom of the application form and should be returned by 30th October, 2010.

Participants from IAEA Technical Co-operation Project

The IAEA will finalise arrangements for the INT 9.173 Technical Co-operation Project "Training in Radioactive Waste Disposal Technologies in Underground Research Facilities", of which this course is a part. A draft prospectus will be circulated by IAEA to target countries in the scheme which explains the application procedure and the support arrangements. Participants from the countries within the IAEA training scheme (Argentina, Armenia, Brazil, Bulgaria, Chile, the Peoples Republic of China, Croatia, the Czech Republic, India, Lithuania, Kazakstan, Mexico, Pakistan, Philippines, Republic of Korea, Romania, Republic of South Africa, Romania, Russian Federation, Slovakia, Slovenia, Ukraine) should contact responsible officers at the Agency as below.

Mr. Mykola Kurylchyk, Department of Technical Co-operation, e-mail M.Kurylchyk@iaea.org

Dr Paul Degnan, Division of Nuclear Fuel Cycle and Waste, email P.Degnan@iaea.org.

Course Fees

The course fees cover tuition, accommodation, breakfast, lunch, dinner and morning and afternoon refreshments for the course days (arriving Monday 29th November, departing Wednesday 8th December), plus a course dinner and a welcome reception. Course notes and other materials are also covered by the fee, as are transport during the course to field sites, labs etc.

CHF 6600 - ITC Members

CHF 7300 - non-members

Final deadline for registration is 22nd October, 2010. The course fee is due within four weeks of your registration and registration is not guaranteed until we have received the course fee. If you have to withdraw from the course after paying your fee, it will be refunded in full up to 25th October, 2010. After this date, it is not refundable.

Application form

You can register on-line using the registration form. The number of places is limited, so we would advise you to register early.

Insurance

Please note that participants on this course, or their employing organisations, are responsible for their own personal insurance.

Course Programme

Tuesday, 30th November

NOTE

Monday, 29th November, dinner in the hotel Schloss Böttstein at 19:00, welcome drink at 18:30

0900 – 0930

ZWILAG

Introduction and welcome

Participants briefly introduce themselves

Aims and structure of the course (Parts I and II)

Course I: Argillaceous Media

Module I: Clays and clay minerals

0930 – 1030

Introduction to clays and clay minerals

1030 - 1045

Coffee

1045 - 1145

Physico-chemical characterisation of clays

1145 - 1200

Coffee

Module II: Interaction of radionuclides with clays

1200 - 1300

Sorption of radionuclides on clays: theoretical aspects

1300 - 1400

Lunch

1400 - 1500

Sorption of radionuclides on clays: experimental aspects

1500 - 1515

Coffee

1515 - 1615

Modelling of sorption processes

1615 - 1630

Coffee

1630 - 1730
Sorption Databases

1745 – 1945
Tour of the ZWILAG facilities

Wednesday, 1st December

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Module III: Porewater characterisation

0900 - 1000
Introduction to pore water chemistry in argillaceous materials

1000 - 1015
Coffee

1015 – 1115
Experimental procedures for pore water characterisation

1115 – 1130
Coffee

1130 – 1230
Modelling of pore water chemistry

1230 - 1400
Lunch

PSI

Module IV: Practical exercises

1400 - 1700
Various aspects of laboratory study of transport in argillaceous media will be examined

1730 – 1830
Tour of the Beznau NPP

Thursday, 2nd December

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Module V: Transport of Radionuclides in Argillaceous Media

0900 - 1000
Transport processes

1000 - 1015
Coffee

1015 - 1115
Diffusion of radionuclides in clays: theoretical aspects

1115 – 1130
Coffee

1130 – 1230
Diffusion of radionuclides in clays: experimental aspects

1230 - 1400
Lunch

1400 - 1500
Coupling of transport and chemistry

1500 – 1515
Coffee

Module VI: Application in Performance Assessment

1515 - 1615
Integrated approach for the development of geochemical databases used for performance assessment

1615 – 1630
Coffee

Module VII: Upscaling

1630 - 1730
Upscaling from dispersed to compacted systems

Friday, 3rd December

Module VIII: Mont Terri URL – radionuclide retardation in the field

0700

Departure from hotel

0900 – 1000

Introduction to the Mont Terri URL programme

1000 – 1015

Coffee

1015 – 1115

Upscaling from lab to field part I: Field experiments

1115 – 1130

Coffee

1130 – 1230

Upscaling from lab to field part II: natural tracer profiles

1230 – 1315

Lunch

1315 – 1700

Visit to the URL, examination of the field experiments

1700 - 1730

Wrap-up

Participants overnight in St Ursanne, free day on Saturday, transfer to Meiringen on Sunday by train (directly from St Ursanne)

Saturday, 4th December

Free day: participants can travel to Berne or Basel for sightseeing or remain in the St Ursanne area and enjoy the Medieval character of the village and the wonderful surrounding countryside

Participants will be given advice and suggestions, but left to organise their own travel and visits

Sunday, 5th December

Travel to Meiringen by train from St Ursanne. Hotel Alpin Sherpa is a 5 minute walk from the station

The journey can be broken in Berne or Interlaken for a few hours sightseeing

Dinner in the Hotel at 19:00, welcome drink at 18:30

Monday, 6th December

Course II: Fractured media

Module I: Radionuclide migration processes in fractured media – the background

0830 – 0900

Travel to the GTS

0900 - 1000

Radionuclide migration processes in fractured host rocks (sorption, precipitation, matrix diffusion, colloids etc) and the link between R_d and K_d

1000 – 1015

Coffee

1015 - 1115

Treatment of radionuclide migration in PA: what are the data requirements?

1115 – 1130

Coffee

1130 - 1230

Gathering data for radionuclide migration use in PA from field site characterisation

1230 – 1330

Lunch

1330 – 1430

Supporting laboratory experiments – how do the data and techniques support field experiments and what are the limitations?

1430 - 1445

Coffee

1445 – 1545

Water-conductive features in fractured rocks: characterisation, abstraction of information for PA

1545 - 1600
Coffee

1600 – 1700
Historical overview of large-scale in situ radionuclide tracer testing experiments (surface and URL based) and their findings

1700 - 1730
Return to Meiringen

Tuesday, 7th December

Module II: The Grimsel Test Site (GTS)

0830 – 0900
Travel to the GTS

0900 – 1000
Understanding porewater processes in crystalline rock: experimental and modelling view

1000 – 1015
Coffee

1015 – 1115
Introduction to the GTS URL programme

1115 - 1130
Coffee

1130 - 1230
Upscaling in situ tracer tests to the repository – integration of lab, in situ & natural analogue data: example of the HPF experiment

1230 – 1330
Lunch

Module III: Going underground

1330 - 1630
GTS tour and visit to ongoing experiments

1630 - 1700
Wrap-up (with coffee) and end of course

1700 – 1730
Return to Meiringen

And finally.

Course Assignment please email to Gabi Vonlanthen (gabi.vonlanthen@itc-school.org) by 6th April, 2010 with Contaminant retardation in the subject line.

- why have you chosen this course?
- what are your learning objectives for the course?
- what other objectives do you have for the course?
- tell us a little (a couple of sentences) about your educational and professional background
- tell us a little about your current job and about any relevant projects you are currently working on or have recently completed. How do these relate to contaminant retardation in waste disposal?