CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES
TRIP REPORT

SUBJECT: 7th DECOVALEX-2015 Workshop

DATE/PLACE: April 13–16, 2015

Brno, Czech Republic

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and
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PERSONS PRESENT: Randall Fedors (NRC) and Chandrika Manepally (CNWRA) participated in the 7th workshop of the DECOVALEX-2015 project.

BACKGROUND AND PURPOSE OF MEETING/TRIP: The workshop was held on April 13–16, 2015, in Brno, Czech Republic. The **De**velopment of **Co**upled Models and Their **Val**idation Against **Ex**periments (DECOVALEX) project is an international collaboration focused on modeling thermal-hydrological-mechanical-chemical (THMC) processes associated with the geologic disposal of high-level waste and spent nuclear fuel. The purpose of the workshop was for participants to interact to identify issues and learn from the variety of approaches taken by the different teams.

SUMMARY OF ACTIVITIES: The NRC and CNWRA staffs' participation in the 7th DECOVALEX-2015 workshop provided an opportunity to interact and discuss other organizations' approaches and progress in modeling field experiments encompassing near-field coupled THMC processes. The workshop agenda is included as an attachment. The activities at this workshop included (i) discussion on approaches and progress by each participant for the relevant portions of the five tasks, (ii) informal interactions between presentations and group discussions, and (iii) field trips. Discussions of research progress for DECOVALEX-2015 tasks provided a better understanding of the technical difficulties in understanding near-field conditions and the advantages and disadvantages of several alternative approaches.

Involvement with DECOVALEX will allow the staff to leverage expertise from waste disposal programs from many countries in understanding complex near-field processes and issues in a variety of geologic environments. Leveraging international experience will help the NRC and CNWRA staffs understand important technical and performance issues that may influence planning and preparation for future regulatory developments as the U.S. national waste policy and program evolve.

The continued development of modeling tools validated against large underground experiments will, in subsequent years, enable staff to provide insights on the importance of coupled processes on repository performance for geologic disposal. The NRC and CNWRA staffs will continue to develop the modeling tools needed to analyze coupled processes in the near field of repositories in the saturated zone.

Use of these data could guide and constrain scenario modeling of coupled THMC near-field processes. In addition to the continued development of modeling tools and identification of required constitutive relations for near-field processes, the NRC and CNWRA staffs will continue to use information leveraged from international interactions to refine near-field abstraction approaches and data for performance assessments.

Trip Details

Five tasks were agreed upon at the 1st DECOVALEX-2015 workshop in April 2012, called A, B1, B2, C1, and C2. The NRC staff will continue to participate in Tasks A, B1, and C1. CNWRA has been tasked to support NRC with Task B1. All staff will continue to follow discussions for Tasks B2 and C2 to gain insights from the efforts and approaches of other DECOVALEX participants. Because of the open and collaborative environment in DECOVALEX, the staff is able to gain insights from the discussions pertaining to the other tasks. Four of the tasks involve modeling of experiments at underground facilities and the fifth task involves modeling of a complex laboratory experiment.

The following tables provide information related to the task description, participants, discussion points, future work, and action items specific to NRC/CNWRA for each task. The acronyms used in the tables for each task are as follows:

BGR	Federal Institute for Geosciences and Natural Resources, Germany
CAS	Chinese Academy of Sciences
CEA	Commissariat à l'Energie Atomique, France
CIMNE	Centre International de Métodes Numèrics en Enginyeria, Barcelona, Spain
CNSC	Canadian Nuclear Safety Commission, Canada
DOE	Department of Energy, USA
ENSI	Swiss Federal Nuclear Safety Inspectorate, Switzerland
IC	Imperial College of London, UK
IRSN	Institut de Radioprotection et de Sûreté Nucléaire, France
JAEA	Japan Atomic Energy Agency
KAERI	Korea Atomic Energy Research Institute, Korea
KINS	Korea Institute of Nuclear Safety
KRMC	Korea Radioactive Waste Management Corporation
KIGAM	Korea Institute of Geoscience and Mineral Resources
KTH	Royal Institute of Technology, Sweden
LBNL	Lawrence Berkeley National Laboratory, USA
NAGRA	Nationale Genossenschaft für die Lagerung radioaktiver Abfälle, Switzerland
RAWRA	Radioactive Waste Repository Authority, Czech Republic (SÚRAO)
RWM	Radioactive Waste Management, UK (formerly NDA)
SNL	Sandia National Laboratories, USA
SNU	Seoul National University
TUL	Technical University of Liberec, Czech Republic
UFZ	Helmholtz Centre for Environmental Research, Germany
UPC	Universitat Politècnica de Catalunya, Spain
UGN	Institute of Geonics, Science Academy of Czech Republic
UoE	University of Edinburgh, UK
Quintessa	Quintessa Ltd., UK

Task A	
Brief Description of the Overall Task	SEALEX experiment at Tournemire underground research facility in France, developed by IRSN. The task focus is on hydromechanical performance of bentonite seals for horizontal emplacement boreholes.
Brief Description of the Current Steps, Task A (Completed Steps Are Included. Last Item Listed is the Current Step)	STEP 0—Modeling of bentonite-sand mixture hydromechanical behavior and parameters identification from various laboratory tests such as (i) water retention curves, (ii) infiltration test under constant volume condition, and (iii) swelling and compression tests under suction control condition. STEP 1—Blind prediction of laboratory 1/10th mock-up test using parameters obtained from Step 0. Simplifications used for the mock-up test are the elimination of bentonite-host rock interaction and axisymmetric geometry. The initial gap is employed at start of test. STEP 2—Modeling the hydrological response of the host rock around water injected under a pressure head into a borehole section isolated with a stainless steel packer. STEP 3—Modeling of one of the SEALEX tests, PT-A1. Field scale test of bentonite/sand seal with asymmetrical technological gap and injected water to enhance resaturation rate.
Participant/Funding Organization	Software Used for Step 2
RAWRA/UGN	COMSOL
Quintessa/RWM	OpenGeoSys and QPAC
NRC	xFLO-FLAC
CNSC/IRSN	COMSOL
IRSN	CODE-BRIGHT
Main Conclusions and Issues	1. Step 0—HM modeling of lab tests for the bentonite/sand mixture. Compression tests reproduced by all teams, but infiltration test still causes some difficulties; problems with matching the entire suite of curves, which probably illustrates the importance of free swelling and of hydromechanical coupling in general. Curiously, hydrologic-only calibrations fit just as well as the hydromechanical-coupled fits. Mixing of retention curves in the other parts of Step 0 may have caused some problems; mixing of 1.67 and 1.97 g/cm^3 materials. 2. Step 1—HM modeling of the 1/10th mockup lab test. The gap and change in boundary condition for the mock-up test are challenging aspects to this problem. Continuous change in properties from initial dry density material (1.97 g/cm^3) to a material comparable to 1.67 g/cm^3 (dry density) as the gap is filled suggests possible approach is to make hydromechanical properties a function of void ratio. A couple issues in results are: • Behavior at 0 (low) suction, gel formation, flooding of gap, and spatial imbibition into sample • Over-prediction of Phase 1 water injected • Difficulty with transition between Phase 2a and 2b

Task A	
	3. Step 2—Modeling the host rock during the WT-1 in situ flooding test. Teams addressed important aspects discussed by teams at the previous workshop: • Location (borehole wall or gallery wall) for the atmospheric boundary condition, and the need to incorporate steady or seasonal fluctuation of temperature and relative humidity at that boundary condition. *Updated modeling suggests that the most appropriate approach uses the gallery wall for the pressure condition and accounts for seasonal fluctuations.* • Importance of incorporating borehole and/or gallery excavation damage zone in models, and should the properties evolve as rewetting occurs? *Updated pressure modeling suggests that the EDZ heals after resaturation (permeability drops by almost a factor of 5 over a year).* 4. Step 3—Modeling the PT-A1 test, which features a 60-cm diameter horizontal drift with cylindrical bentonite disks initially compacted to 1.97 Mg/m^3 resting on the bottom of the drift, sealed with water-tight packers, and flooded with water, ultimately yielding a saturated bentonite density of 1.67 Mg/m^3. IRSN provided an updated assessment of the initial water injection to reconcile the initial 80 kg of injected water, which was previously thought at the 6th workshop to be explained by the technological void space (space between bentonite plug and host rock). It was also noted that there was a gap between the downstream lid and the rock, and other minor gaps within the bentonite plug. Teams presented modeling results for the PT-N2 and PT-A1 tests using 2D axisymmetric and 3D (isotropic) HM models in the 6th workshop. Some of the sensors in the bentonite responded asymmetrically, suggesting rapid saturation. Participants speculated that perhaps a seam between bentonite disks was a flow pathway. The 7th workshop focused on developing 3D models using anisotropic properties. However, two teams (Quintessa and BGR) presented their 2D model results. The teams described the numerical approach to represent the bentonite and the gap (technological void). The task leader identified modeling bentonite at different dry densities and modeling the gap between the rock and bentonite as one of challenges faced by the teams. Most of the teams underpredicted the injected water mass and overpredicted RH in the bentonite. Only one of the teams (UGN) was able to represent the difference in observed RH at the two sensor locations in its numerical model. The teams were less successful in estimating the radial pressures at the three monitoring locations. Inadequate representation of HM processes in the gap could be one of reasons for the mismatch of the radial pressures.
Future Work	1. Team members should provide input to the final report and journal papers. 2. Improve all numerical models for all steps if necessary.
Action Items for NRC Staff	Staff progress in 2014 and 2015 was limited by Yucca Mountain responsibilities. As staff time affords, NRC staff expects to return to Steps 0 and 1 to implement models for infiltration portion of those steps not previously completed, before considering model development for Step 3 (PT-A1 test).

Task B1	
Brief Description of the Overall Task	HE-E experiment run by a consortium of European Union countries at Mont Terri underground research laboratory in Switzerland; focuses on thermal-hydrologic-mechanical performance of two types of bentonite buffers surrounding a horizontally-emplaced analog waste package heated up to 140 °C in a low permeability argillaceous host rock.
Brief Description of the Current Task (Completed Steps Are Included. Last Item Listed is the Current Step)	STEP 1a—Opalinus Clay study: Numerical modeling of the thermal-hydrological-mechanical behavior in Opalinus Clay host rock at a heater test in the Mont Terri tunnel system (i.e., the HE-D test). STEP 1b—Buffer material study: Numerical modeling of CIEMAT column cells with focus on processes understanding and parameter determination. The objective of this step is to calibrate the constitutive relationships for the bentonite pellet mixture based on back analysis of the column tests and literature study. The main parameters are associated with moisture retention curve, dependencies of thermal conductivity and water permeability on degree of saturation, and mechanical constitutive relationships. STEP 2—HE-E predictive modeling: Numerical modeling of the thermal-hydrological-mechanical behavior in the swelling bentonite buffer and Opalinus Clay host rock at the HE-E heater test in the Mont Terri tunnel system.
Participant/Funding Organization	Software Used
UFZ /BGR	OpenGeoSys
CAS	Elasto-Plastic Cellular Automaton (EPCA) 3D
LBNL/DOE	TOUGH-FLAC
ENSI	OpenGeoSys
CNSC/IRSN	COMSOL
JAEA	THAMES
KAERI	FLAC
CNWRA/NRC	xFlo-FLAC
Summary of Discussion	1. All teams except JAEA presented their results for the HE-E test. Some teams revisited the column cell test, reporting improved model behavior regarding the THM processes in the column cell material. Most of the teams (except LBNL and CNWRA) used a 3D model to model the HE-E test. LBNL and CNWRA used multiphase flow, whereas other teams used the Richards Equation approximation (single phase flow). 2. Though some teams modeled the sand-bentonite and granular bentonite sections, the focus of discussion was on the granular bentonite section.

Task B1	
	3. The temperature, RH and pore pressure measurements in the granular bentonite, bentonite blocks, and Opalinus Clay were compared to the model estimates for two cases. The first case related to model input parameters that were not calibrated but were based on the column test (for granular bentonite), HE-D test (Opalinus Clay), and previously published reports (for bentonite blocks). The second case related to calibrated input properties. Only a few groups reported results for the second case. 4. The predicted temperatures matched the observations in general. However, the relative humidity observations in the bentonite blocks were lower than most of the model predictions. 5. Long-term prediction: It was proposed that rewetting of the buffer could be evaluated for two scenarios: (i) heating will continue indefinitely while maintaining a temperature of 140 °C at the heater and (ii) the heating will be stopped at a specific time in the future. For both scenarios, evaluate the time required for the buffer to be saturated. A metric to define the buffer saturation needs to be determined.
Future Work	1. Last computation results from the HE-E experiment due on June 5th, 2015. 2. HE-D paper: teams must give feedback to Son in May through August 2015. 3. Column tests paper: teams must give feedback to Bastian in May through August 2015. 4. HE-E paper: teams must give feedback to Benoit in May through August 2015. 5. Final Report: Teams must provide input and feedback in May-June 2015. The final report will be finalized after the 8th workshop in Japan in October 2015.
Action Items for NRC/CNWRA staff	1. Continue work on HE-E test modeling and provide calibrated model results by 6/8/2015. 2. Provide input to the HE-D, Column Test, and HE-E journal papers. 3. Provide input to the Final Report.

Task B2	
Brief Description of the Overall Task	"EBS" experiment planned at Horonobe underground facility in Japan. The experiment focuses on THMC processes in a bentonite buffer surrounding a vertically-emplaced analog waste package heated to 100 °C in an argillaceous host rock of moderate permeability. Salt accumulation is the chemical process of interest.
Brief Description of the Current Task	Step 0—Preparation phase. Literature review and analyses of laboratory test data, especially for backfill. Step 1—Code comparison analysis. Set up input data for two analyses; one analysis to support sensor layout, and one analysis to predict long-term behavior.

Task B2	
	Step 2—Prediction analysis. Run model analyses, comparing with selected sensor data from the field experiment. Step 3—Sequence of the Horonobe EBS test which includes (i) excavation of the experimental gallery, (ii) opening of the test pit, (iii) emplacement of the buffer and backfill material, (iv) plugging, (v) stopping the pump (used to remove seepage), and (vi) initiate heating, The temperature was monitored at top, middle and bottom of the simulated waste container. The pore pressure was monitored at the center of the bottom of the test pit in the sand layer.
Participant/Funding Organization	Software Used
JAEA	Couplys and PHREEQC
BGR	OpenGeoSys coupling with PHREEQC, ChemApp, GEMIPM2K
CAS	Elasto-Plastic Cellular Automaton (EPCA) and TOUGH2
LBNL/DOE	TOUGH-FLAC and ROCMASS (complementary software for confidence building)
KAERI	TOUGH2-FLAC3D
Summary of Discussion	1. Limited data are available for comparison (heating started in January 2015). Data provided to the Task B2 participants covered only 3 months (i.e., through March 2015). 2. Models are mostly 3D, and most models are quite consistent with each other for temperature, to a lesser extent for pressure and stress, and less so for saturation. 3. There was some discussion related to availability of limited data.
Future Work	1. Complete report of Step 1 by August 2015. 2. Complete data distribution, analysis and discussion related to EBS test by July 2015 and have a draft of the final report ready by August 2015.
Action Items for NRC/CNWRA staff	None. NRC is not a participant in this task.

Task C1	
Brief Description of the Overall Task	Investigate and mathematically model coupled THMC processes using data from laboratory experiments on single fractures through a novaculite (dense microcrystalline quartz rock) and a granitic rock. The experiments are described in Yasuhara, et al. (2006, 2011).
Brief Description of the Current Steps	Step 0—Basic benchmarking for novaculite: • Use profilometer data as a representation of the topology of fracture surfaces to guide grid generation or estimation of statistical parameters of aperture distribution. • Use the aperture distribution data from Yasuhara, et al. (2006) to reproduce the observed flow rate at the start of the experiment only (stop at 1,292 hours, before flow reversal). • Geochemistry Benchmark Test: Represent stylized batch experiment of silicate (Si) dissolution in deionized water under no-low conditions in a 10-μm aperture fracture and no mechanical coupling at temperatures of 20-, 60-, and 120 °C. Step 1—Continue modeling of Yasuhara, et al. (2006) experiment: • Include the flow reversal, stop at ~1,500 hours. Step 2—Continue to end of Yasuhara, et al. (2006) experiment: • Includes nonisothermal portion of experiment. Step 3—Yasuhara, et al. (2011) granite experiment: develop geochemical model for granite Step 4—Simulate isothermal part of Yasuhara, et al. (2011) granite experiment Step 5—Simulate nonisothermal part of Yasuhara, et al. (2011) granite experiment Step 6—Reporting phase
Participant/Funding Organization	Software Used
RWM/Quintessa/ICL/UoE	QPAC and OpenGeoSys
UFZ /BGR	OpenGeoSys
CAS	Elasto-Plastic Cellular Automaton (EPCA) and TOUGHREACT
NRC	(1) Compartmental approach, modified from that in Yasuhara papers (2) HBGC123D+Aperture Module (stress incorporated only in the Aperture Module) (3) Geochemist's Workbench
RAWRA/TUL	Geochemist's Workbench, Semchem software, Transport, Flow123D, FEFLOW

Task C1	
Summary of Discussion	Most of the teams have completed modeling Steps 1 and 2. The teams, in general, were able to match the evolution of hydraulic aperture and Si concentration observed in the experiment. Observations made based on the analysis of the numerical modeling results include: (i) there is uncertainty about what is causing the shutdown in the mechanical evolution (experimental artefact or a real process) required for models with good fits at the end of Step 1; (ii) factors that could cause enhanced free face dissolution include channelization, reduction in dissolution area because of enhanced diffusion, or smoothing of surfaces. Analysis by Neretnieks' model shows matrix diffusion is important at high temperatures (almost 2 orders of magnitude). For Step 3, it was recommended that the statistical approach used by ICL and UoE to analyze fracture topography data be considered by all teams. A comparison of evolution of the Si concentration indicated a large variation in rates at 25 °C and a closer trend at 90 °C. The approach to implement Si dissolution (rate equations) differed among teams. For Steps 4 and 5, the teams, in general, were able to represent the aperture closure. The geochemical results were very different. Characterization of uncertainty and process model insights has been very useful.
Future Work	1. Finalize modeling and analyze the reasons for differences in modeling results 2. Provide input to the final task report by June 2015. 3. Provide input to the journal articles. Draft versions to be ready before the next workshop.
Action Items for NRC staff	Staff progress in 2014 and 2015 was limited by Yucca Mountain responsibilities. As NRC staff time affords, a model will be developed for the granite experiment using Geochemist's Workbench and staff will consider how to delineate the relative importance of the difference processes.

References:
Yasuhara, H., A. Polak, Y. Mitani, A. Grader, P. Halleck, and D. Elsworth. "Evolution of Fracture Permeability Through Fluid–Rock Reaction Under Hydrothermal Conditions." *Earth and Planetary Science*. Letters 244. pp. 186–200. 2006.

Yasuhara, H. and D. Elsworth. "Compaction of a Rock Fracture Moderated by Competing Roles of Stress Corrosion and Pressure Solution." *Pure and Applied Geophysics*. Vol 165. pp. 1,289–1,306. 2008.

Yasuhara, H., N. Kinoshita, H. Ohfuji, D.S. Lee, S. Nakashima, and K. Kishida. "Temporal Alteration of Fracture Permeability in Granite Under Hydrothermal Conditions and Its Interpretation by Coupled Chemo-Mechanical Model." *Applied Geochemistry*. Vol. 26. pp. 2,074–2,088. 2011.

Task C2	
Brief Description of the Overall Task	Regional flow and transport in saturated fracture network above the Bedrichov tunnel, Czech Republic, using measured data for conservative and nonconservative tracers. Constraints on flow and transport to be enhanced by utilization of natural tracers for water age from natural tracers and rock mineral dissolution to incorporate water chemical compositions.
Brief Description of the Current Task	Update steady-state hydraulics and pulse tracer and perform introductory transient hydraulics. The task involves development of the numerical models using a 2D/3D segment of the tunnel 1. Hydrological processes: (i) fit the water inflow (hydraulics), (ii) fit the lumped parameter models of tracers, and (iii) fit a batch reaction experiment (crushed granite leaching). 2. Coupled processes/cross-validation: (i) develop 1D reactive transport using field chemical data, (ii) fit the isotope tracers with 2D/3D numerical transport (including hydraulics), and (iii) compare 2D/3D numerical advection with lumped parameter (fictitious tracer). 3. Refined modeling tasks: (i) refine the water inflow conceptual model and data, (ii) calculate 2D/3D transport with simplified chemistry, (iii) combine/calibrate all together, (iv) consider transient hydraulics and (v) inverse method (data fitting by optimization methods) and uncertainty analyses.
Participant/Funding Organization	Software Used
TUL/RAWRA	Flow123D
SNL/DOE	PFIoTran and DAKOTA
BGR	RockFlow, OGS
Summary of Discussion	The workshop focused on meshing, calibration, and analysis of the tracer data using 4 modeling cases (M1-M4) focusing on processes in fractures, shallow rocks, and deep rocks for steady-state and transient regimes to better understand mean residence times and mixing of waters from different regimes and temporal input times. The results for the cases were compared among the teams. The issue of grid sensitivity was examined for the M2, M3, and M4 cases. The $^{18}O/^{16}O$ isotope data were used to compare the models for the M2 case and differences in modeling results among the teams were attributed to different infiltration boundary conditions.
Future Work	1. Teams will complete the modeling the cases and analyzing the results. 2. Teams will provide input to the journal articles (May) and final team report (June-September).
Action Items for NRC/CNWRA staff	None. NRC is not a participant in this task.

Technical Site Visit

As each of the participating teams hosts a workshop, the host generally arranges for a site visit to their underground facility, relevant laboratory, or waste facility. At this workshop, the technical site visit was arranged to the underground research facility (URF) at Bukov by Správa Úložišť Radioaktivních Odpadu (SÚRAO)[1].

This facility is located at a depth of 600 m and is a part of an operating uranium mine. The construction of this facility was initiated in August 2013 and expected to be completed in 2015. The URF is located in a crystalline rock (gneisses and migmatites with local granite pegmatites) and some fracture and fault zones. The facility consists of an access gallery, a 70 m-long spilt research gallery, and 2 research chambers 20 m long. SÚRAO has also initiated geological, geotechnical, hydrological, and geochemical characterization studies at the site.

[1] http://www.surao.cz/eng

WORKSHOP AGENDA

SÚRAO | SPRÁVA ÚLOŽIŠŤ RADIOAKTIVNÍCH ODPADŮ

DECOVALEX 2015

7th Workshop & Steering Committee Meeting

Best Western Premier Hotel International Brno, 13th – 16th April 2015

Organized by Radioactive Waste Repository Authority

Day 1 (13th April 2015)

10:00 – 11:00	On-site registration with coffee/tea
11:00 – 11:10	Welcoming address (Jiří Slovák, SÚRAO)
11:10 – 11:20	Opening of the workshop (John Hudson, UK)
11:20 – 11:40	Current statue (Jiří Slovák, SÚRAO)
11:40 – 12:40	Lunch
Session 1. Task A – The SEALEX In-situ experiment	**(Chaired by Alain Millard)**
12:40 – 12:50	Briefing for problem or step of Task A(A.Millard, France)
12:50 – 13:10	Presentation of IRSN team (IRSN, France)
13:10 – 13:30	Presentation of CNSC team (CNSC, Canada)
13:30 – 14:10	Presentation of RWM team (Quintessa/RWM, UK)
14:10 – 14:30	Presentation of RAWRA team (UNG, Czech Rep.)
14:30 – 14:50	Coffee/tea break
14:50 – 15:20	General discussions on Task A (Led by A.Millard)
15:20 – 16:20	Task Force Meeting for Task A (Led by A.Millard)
17:00 – 18:30	Visit Špilberk Castle

Day 2 (14th April 2015)

Session 2. Task B1 – Heater test, Mont Terri	**(Chaired by Benoite Garitte)**
08:00 – 08:10	Briefing for problem or step of Task B1(B.Garitte, Switzerland)
08:10 – 08:30	Presentation of BGR/UFZ team (BGR/UFZ, Germany)
08:30 – 08:50	Presentation of CAS team (CAS, China)
08:50 – 09:10	Presentation of DOE team (LBNL, USA)
09:10 – 09:30	Presentation of ENSI team (ENSI, Switzerland)
09:30 – 10:00	Coffee/tea break

10:00 – 10:20	Presentation of IRSN team (IRSN, CNSC, Canda)
10:20 – 10:40	Presentation of JAEA team (JAEA, Japan)
10:40 – 11:00	Presentation of KAERI team (KAERI, Korea)
11:00 – 11:20	Presentation of NRC team (CNWRA/SWRI, USA)
11:20 – 11:40	General discussions on Task B1(Led by B. Garitte)
11:40 – 12:40	Task Force Meeting for Task B1
12:40 – 13:40	Lunch
Session 3: Task B2 – EBS Experiment	**(Chaired by Yutaka Sueita)**
13:40 – 13:50	Briefing for problem or step of Task B2 (Y.Sugita, Japan)
13:50 – 14:10	Presentation of BGR team (BGR, Germany)
14:10 – 14:30	Presentations of CAS team (CAS, China)
14:30 – 14:50	Presentation of DOE team (LBNL, USA)
14:50 – 15:10	Coffee/tea break
15:10 – 15:30	Presentation of JAEA team (JAEA, Japan)
15:30 – 15:50	Presentation of KAERI team (Inha University, Korea)
15:50 – 16:10	General discussions on Task B2 (Led by Y.Sugita)
16:10 - 17:10	Task Force Meeting for Task B2
17:10 – 18:10	Task Force Meeting for Task C1, C2 – paralell sessions
19:00 – 21:00	Dinner

Day 3 (15th April 2015)

Session 4: Task C1 – THMC of single fractures	**(Chaired by Alex Bond)**
08:00 – 08:10	Briefing for problem or step of Task C1 (A.Bond, UK)
08:10 – 08:30	Presentation of CAS team (CAS, China)
08:30 – 08:50	Presentation of RWM team (Quintessa/RWM, UK)
08:50 – 09:10	Presentation of RWM team (Imperial College, UK)
09:10 – 09:30	Presentation of RAWRA team (TUL, Czech Republic)
09:30 – 09:50	Presentation of SNL team (SNL, USA)
09:50 – 10:10	Presentation of KTH team (KTH, Sweden)
10:10 – 10:30	General discussion on Task C1 (Led by A. Bond)

10:30 – 10:50	Coffee/Tea Break
Session 5: Task C2 – Bedrichov Tunnel Test Case	**(Chaired by Milan Hokr)**
10:50 – 11:00	Briefing for problem for step of Task C1 (Chaired by M.Hokr)
11:00 – 11:20	Presentation of DOE team (SNL, USA)
11:20 – 11:50	Presentation of RAWRA team (TUL, Czech Republic)
11:50 – 12:10	Presentation of BGR team (BGR, Germany)
12:10 – 12:30	General discussion on Task C2 (Led by M. Hokr)
12:30 – 13:30	Lunch
Session 6: Planning and Steering Committee	**(Led by Jens Birkholzer)**
13:30 – 16:30	Planning for DECOVALEX 2019
16:30 – 16:50	Coffee/Tea Break
17:00 – 19:00	Steering Committee meeting

Day 4 (16th April 2015)

Technical visit – URF Bukov

08:00	Departure from the hotel