Second Training Course:

Impact of THMC Processes on Performance Assessment

TIMODAZ

Introduction to tomorrow's group exercise

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ONDRAF

Exercise devised by T. Vietor, P. Blaser and X. Sillen

Introduction

- Training course structure:
  - 13/01 PM - geological disposal and the assessment of its performance (PA) and safety (SA), the Regulator and the Implementer approaches.
  - 14/01 AM - research and development on THM(C) behaviour of clays, also known as "Science" or "Pheno(menology)"
  - 14/01 PM - group exercise: how do we bring these two worlds together? (2 or 3 groups)
  - 15/01 AM – discussion of the exercise results & how a real implementer does it.
- Tight integration between "science" and "PA" is essential to end up with a system that is safe AND adequately understood (so that it can be licensed and implemented)

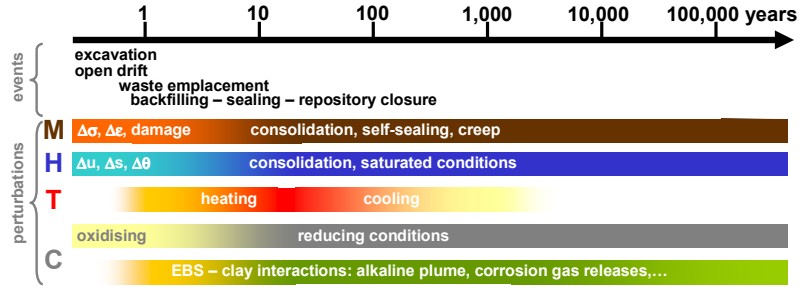
The “PA” & “Science” recipe

(P. Zuidema, 1st TIMODAZ end-users meeting, Paris 2007)

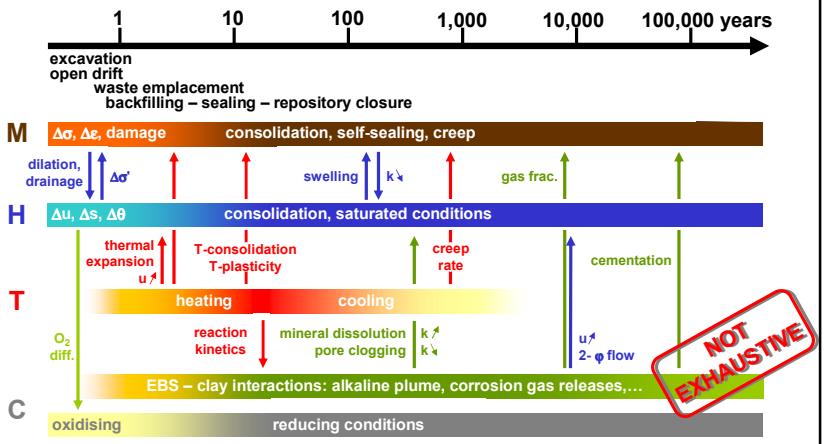
- For a convincing safety case, Science has to
  - provide process understanding (incl. quantification on relevant scales)
  - characterise uncertainties (alternative concepts & interpretations, data uncertainty, variability)
  - review the assumptions / simplifications (as proposed by PA) present in assessment models & data for consistency
  - accept that limitations in understanding need to (and can) be "bounded" by pessimistic or conservative assumptions
  - ensure that conservative assumptions are justified and explicit
- ... and Performance Assessment has to
  - be open minded for the input provided by science
  - ensure that best use is made of the available scientific understanding
  - acknowledge in the synthesis the limitations of the analysis (no exact prediction but a sufficiently reliable illustration of safety)

Repository induced perturbations of a clay host

- Clay as host rock because of favourable barrier properties
  - low permeability, solute diffusion, sorption, anionic excl., swelling, creep
  - in the long term, mechanically and chemically stable environment
- However, THMC perturbations of this barrier are unavoidable



Of course, perturbations interact…



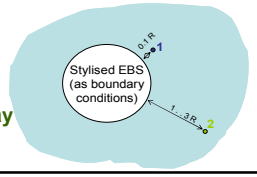
So, how do we make sense of all this ?
(and integrate "science" with "PA" ?)

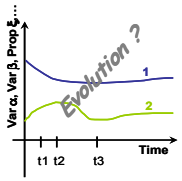
- **Part 1. Identify TIMODAZ results (lab tests, in situ tests & modelling) that are significant to a safety case**
  - *fate of favourable clay properties?*
  - *under which conditions will the future properties of the host clay differ from the currently observed properties?*
  - *impact on safety functions?*
  - *uncertainties?*
- **Part 2. Construct a storyboard of the likely evolution of the disturbed/damaged zones around a repository**
  - *"Tell the story"*

Exercise outputs:

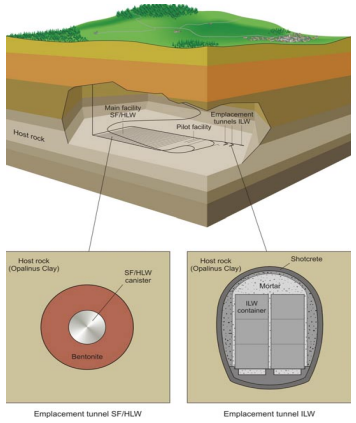
- Part 1. Identifying TIMODAZ results (lab tests, in situ tests & modelling) that are significant to a safety case
  - Improved understanding of THM characteristics of host clays
  - Safety-relevant aspects of THM perturbation and evolution
  - Predictive capability of modelling
  - Identified uncertainties
- Part 2. Constructing a storyboard for the likely evolution of the dZ/DZ around a repository

Boom Clay
or
Opalinus Clay





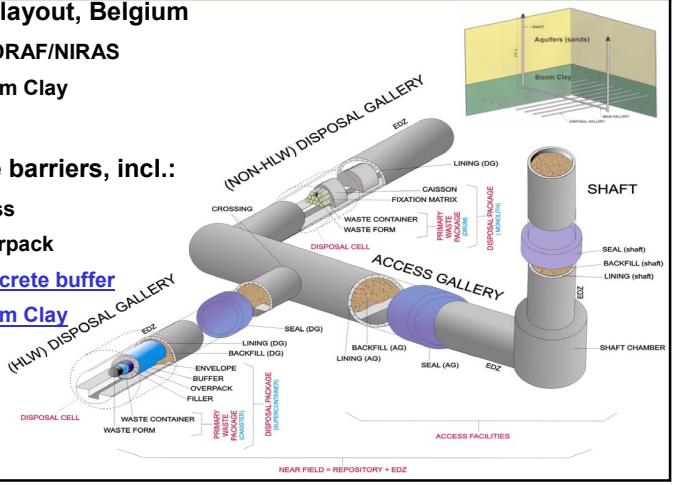
Repositories in clay



- Typical layout, Switzerland
  - SF/HLW and ILW
  - from Opalinus Clay project (NAGRA NTB 02-05, 2002)
- Multiple barriers, incl.:
  - Canister,
  - Bentonite,
  - Opalinus Clay,
  - ...

Repositories in clay

- Typical layout, Belgium
  - ONDRAF/NIRAS
  - Boom Clay
- Multiple barriers, incl.:
  - Glass
  - Overpack
  - Concrete buffer
  - Boom Clay



Groups for the exercise

Lucie H. (CTU)	Marketa L. (CTU)	Li Yu (SCK)
Sandra R. (UPC)	Mareva P. (Padua)	Ramon B. (UPC)
Miro H. (SCK)	J.-S. Kim (KAERI)	Ferdinando M. (3S)
Oliver C. (GRS)	Manuel C. (ONDRAF)	Loris L. (Padua)
P.Y. Hong (ENPC)		X.-P. Nguyen (ENPC)

Groups for the exercise (alternative)

Lucie H. (CTU)	Oliver C. (GRS)	Ramon B. (UPC)
Sandra R. (UPC)	J.-S. Kim (KAERI)	Ferdinando M. (3S)
Marketa L. (CTU)	Miro H. (SCK)	X.-P. Nguyen (ENPC)
Mareva P. (Padova)	P.Y. Hong (ENPC)	Manuel C. (ONDRAF)
Li Yu (SCK)	Loris L. (Padova)	