SCCER SoE

SWISS COMPETENCE CENTER for ENERGY RESEARCH
SUPPLY of ELECTRICITY

Task 1.1
Reservoir exploration, assessment & characterization:

Overview of Current Projects

Larryn Diamond
University of Bern
11.09.2015

In cooperation with the CTI

Energy funding programme
Swiss Competence Centers for Energy Research

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Commission for Technology and Innovation CTI

T1.1 Research goals for geothermal electricity production & CO_2-storage in Switzerland

- Characterize potential reservoirs
- Refine estimates of exploitation potential
- Provide science-based guidelines for exploration companies
- Develop geological models and geophysical exploration techniques to reduce risk of exploration failure

- Feed real, Swiss-specific reservoir data to Task 1.2 (Reservoir modelling)
- Feed acquired data to Task 4.3 (Swisstopo public archive)

T1.1 Research Partners

- Uni Bern
  - Rock-Water Interaction Group (Prof. Larryn Diamond)
  - Structural Geology Group (Prof. Marco Herwegh)
- Uni Geneva
  - Reservoir Geology & Basin Analysis Group (Prof. Andrea Moscariello)
- Uni Lausanne
  - Applied Geophysics Group (Prof. Klaus Holliger)
- ETH Zurich
  - Rock Deformation Laboratory (Prof. Jean-Pierre Burg)

T1.1 Capacity building

Uni Bern:

Capacity-building completed

– Profs.	L. Diamond, M. Herwegh, M. Mazurek
– Senior Researchers:	Dr P. Alt-Epping (funded by SCCER)
	Dr. A. Berger
	Dr. Ch. Wanner
– PostDoc:	D. Egli (funded by SNF-NRP70)
– PhD Candidates:	A. Adams (funded by Cantons Bern/Fribourg)
	L. Aschwanden (funded by SNF-NRP70)
– Master Candidates:	R. Caldas, I. Bosoppi, M. Bächli, T. Belgrano
	A. Eugster

T1.1 Capacity building

Uni Lausanne

Capacity-building completed

- Prof. K. Holliger
- Postdocs: Dr. J. Hunziker
  Dr. C. Mallet
- Senior Researchers: Dr. Eva Caspari (funded by SCCER)
  Dr. L. Baron
  Dr. B. Quintal
  Dr. L. Baron
- PhD Candidates: N. Barbosa (funded by SNF)
  T. Zahner (funded by SNF-NRP70)

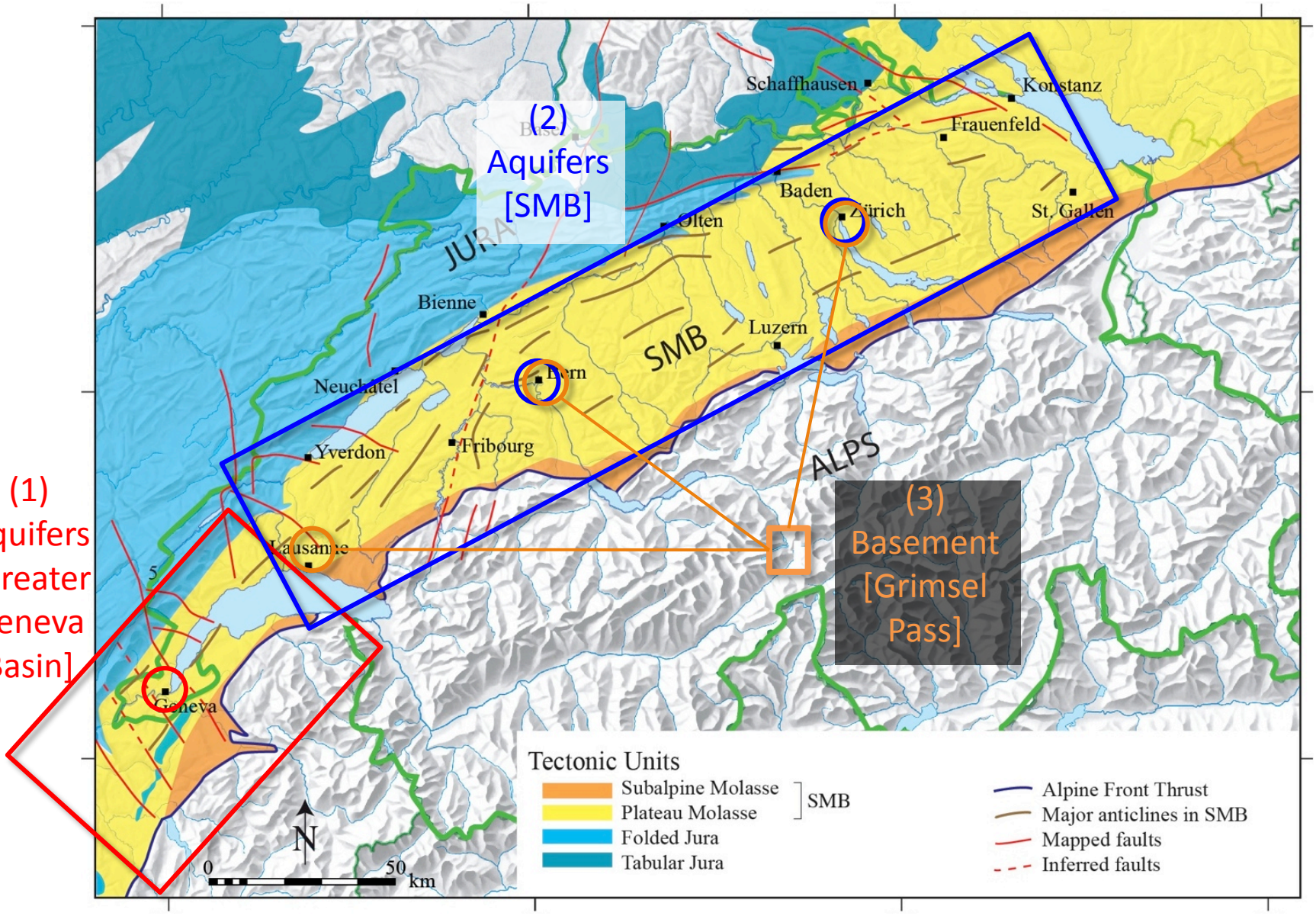
T1.1 Capacity building

ETH Zurich

Capacity-building completed

- Prof. J.P. Bürg
- Postdoc: Dr. C. Madonna (funded by SCCER)
- PhD Candidate: Q. Wenning (funded by NRP-70)

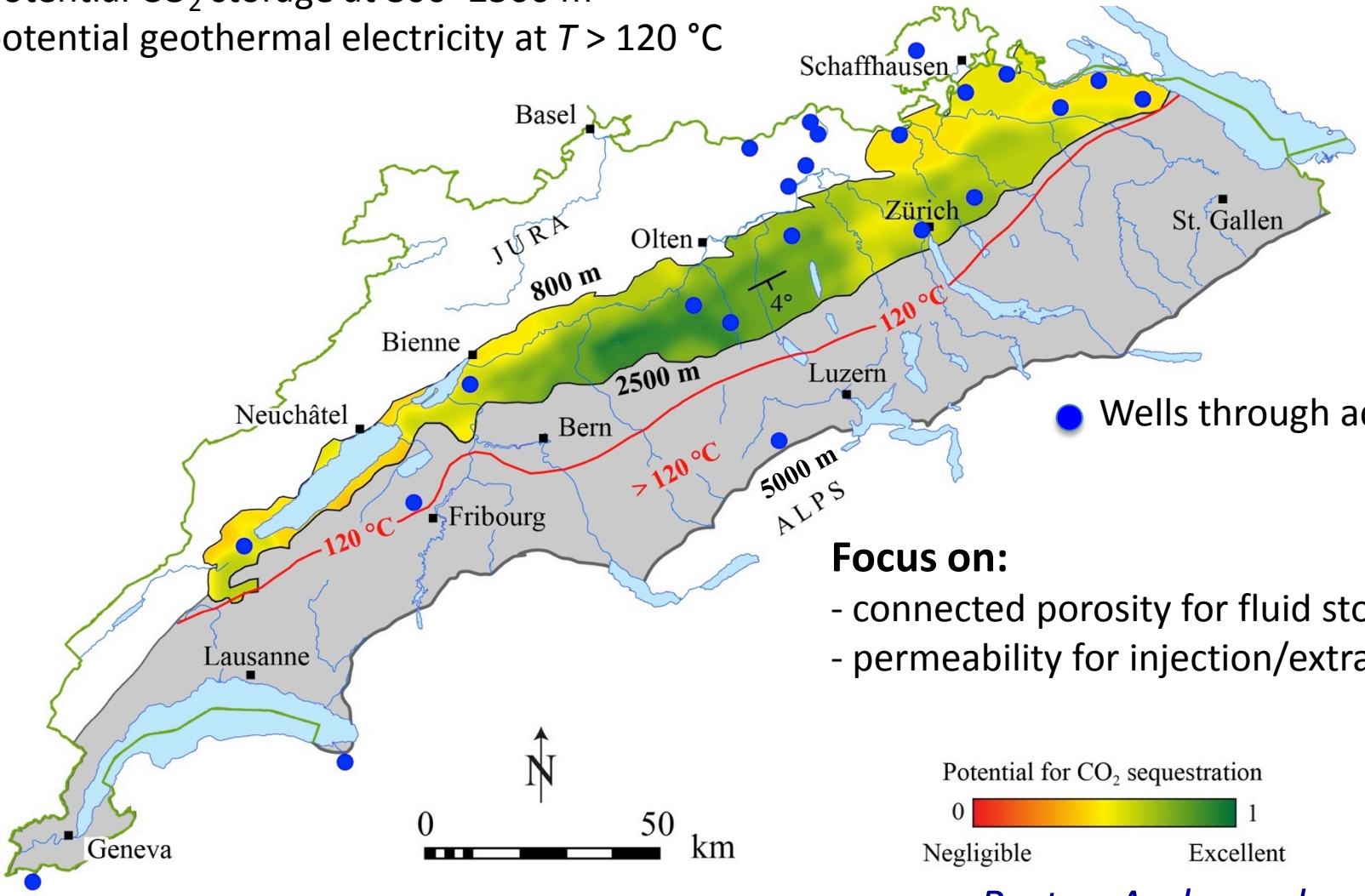
T1.1 Research projects



NRP70 Subproject "Aquifers"

Regional Upper Muchelkalk aquifer:

- low-permeability caprock
- potential CO_2 storage at 800–2500 m
- potential geothermal electricity at T > 120 °C



Focus on:

- connected porosity for fluid storage
- permeability for injection/extraction

Poster: Aschwanden et al.

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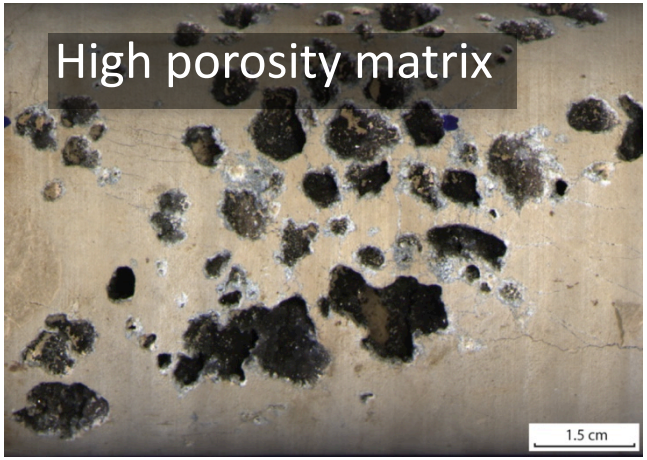
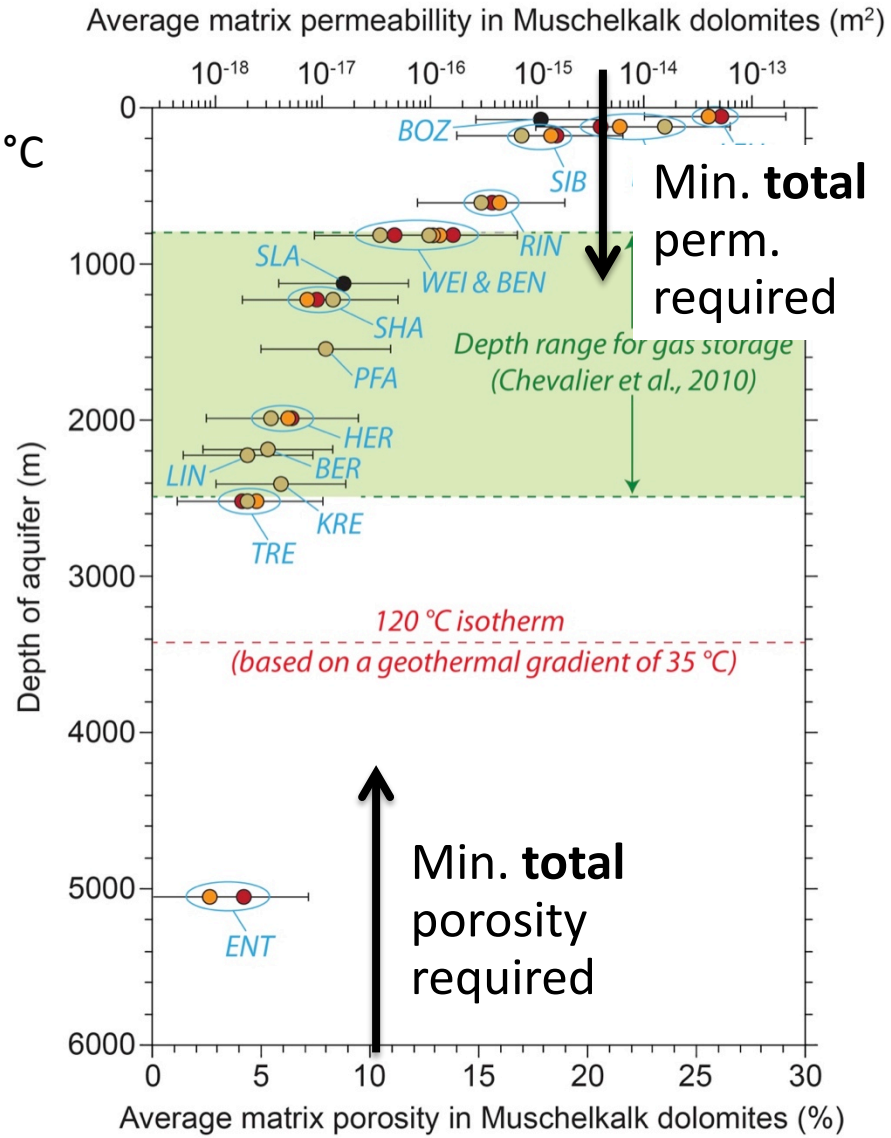
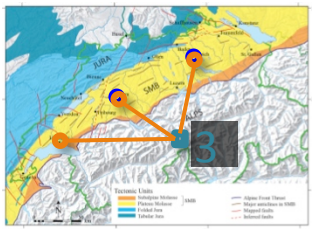




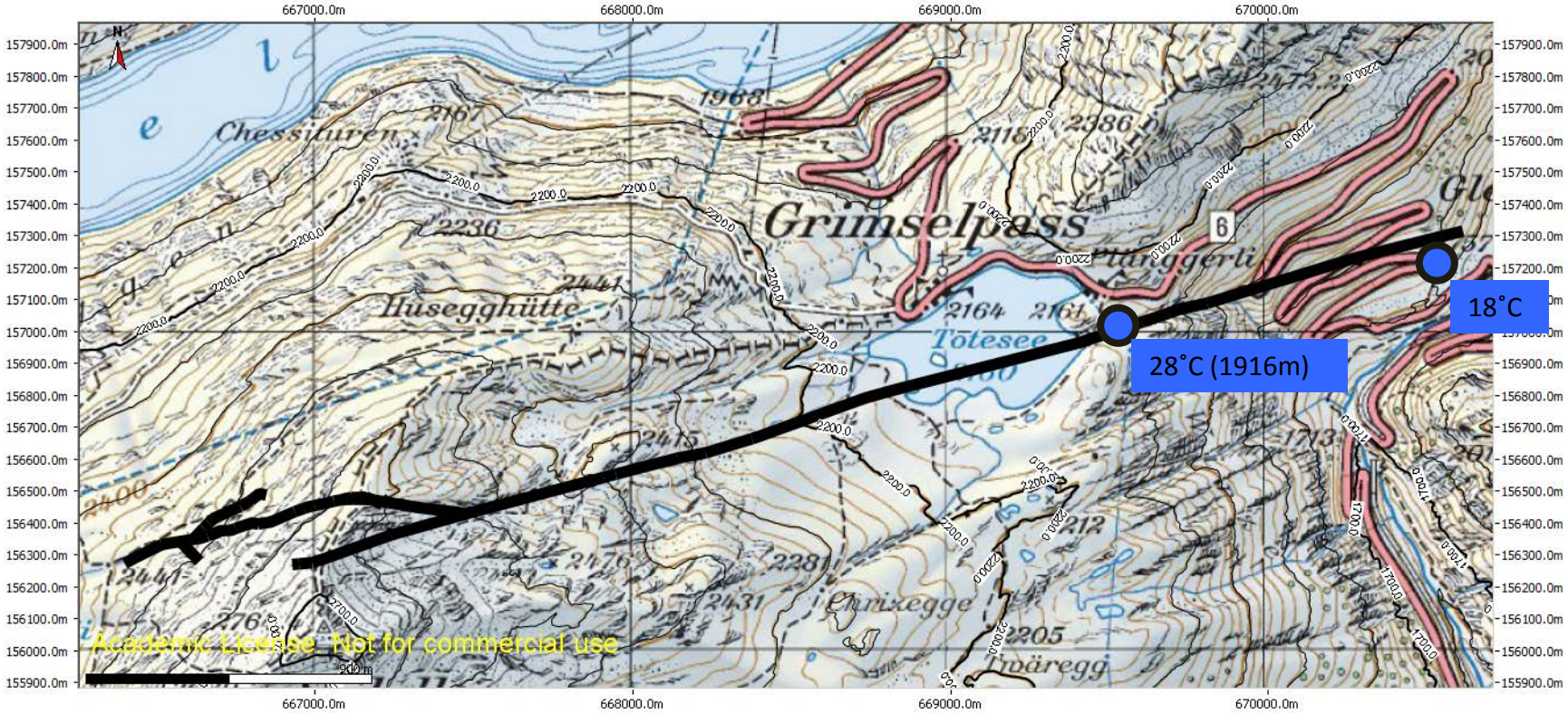
Poster: Aschwanden et al.

NRP70 Subproject "Basement"



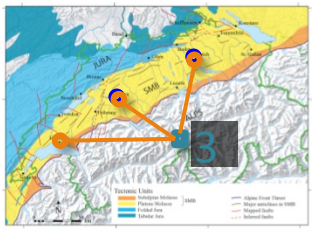
Hydrothermally active fault zone in crystalline basement:

- analogue of deep water-conducting structures beneath SMB
- example of Alpine fault-hosted geothermal systems



Poster: Belgrano et al.

NRP70 Subproject "Basement"



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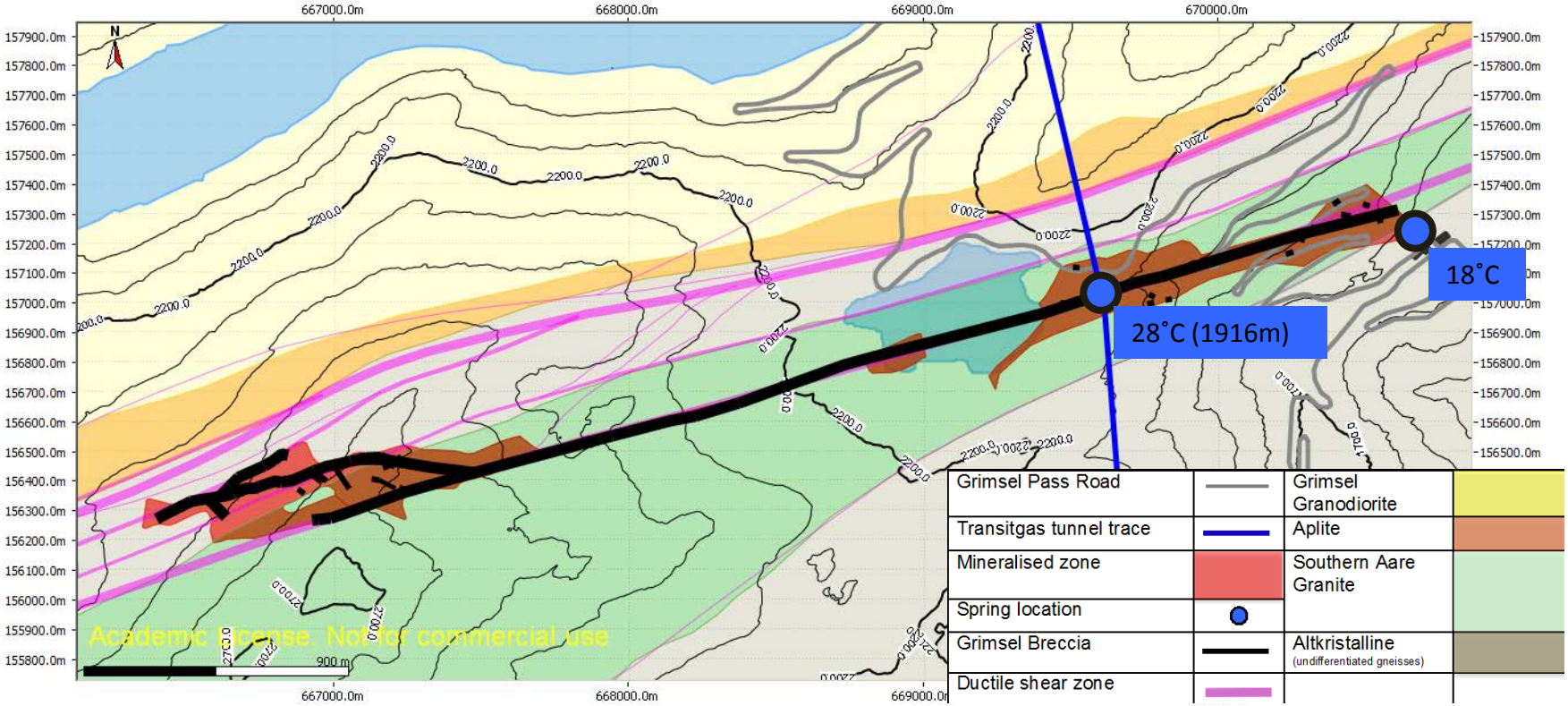

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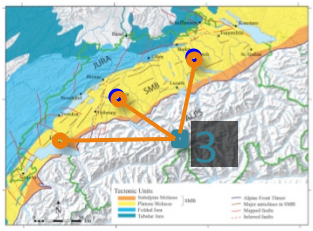

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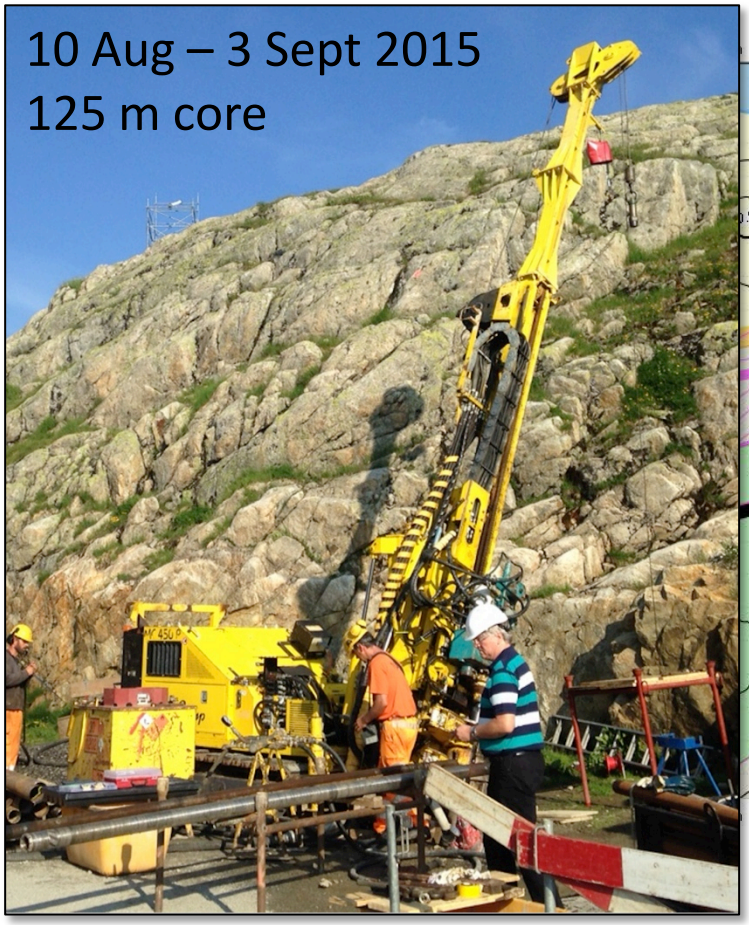

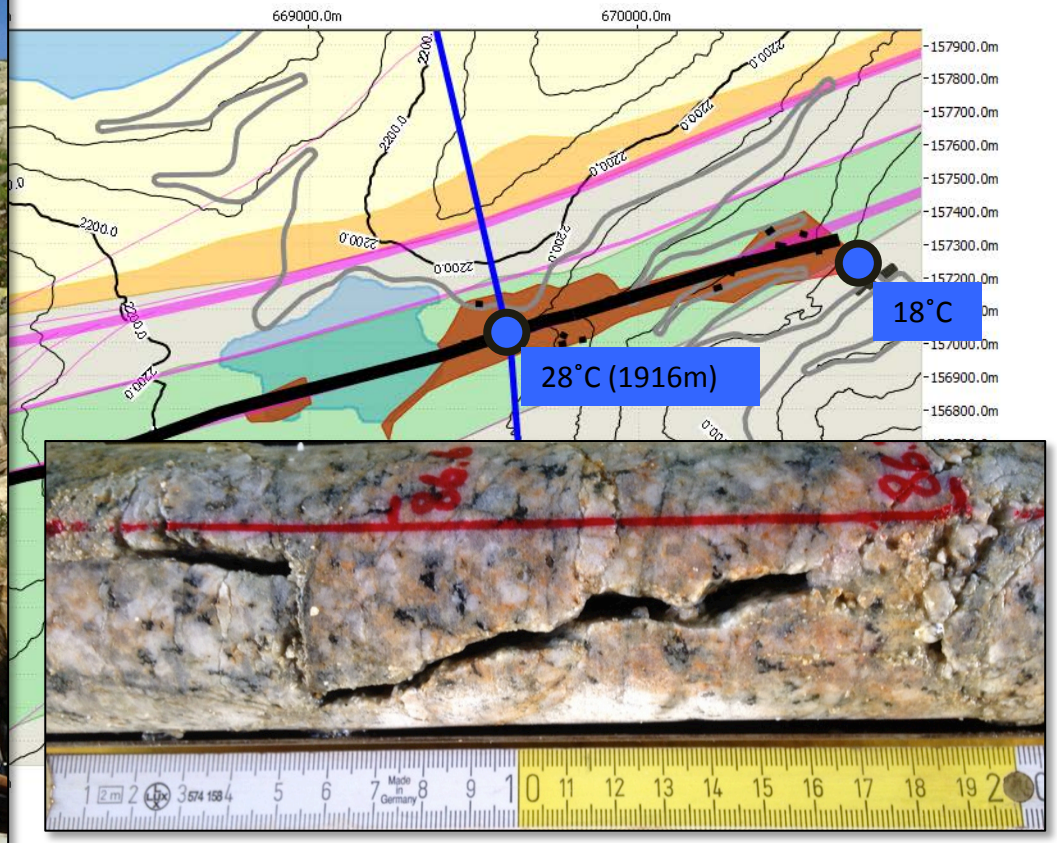

Poster: Egli et al.

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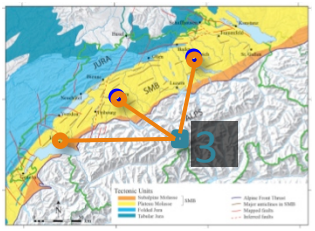

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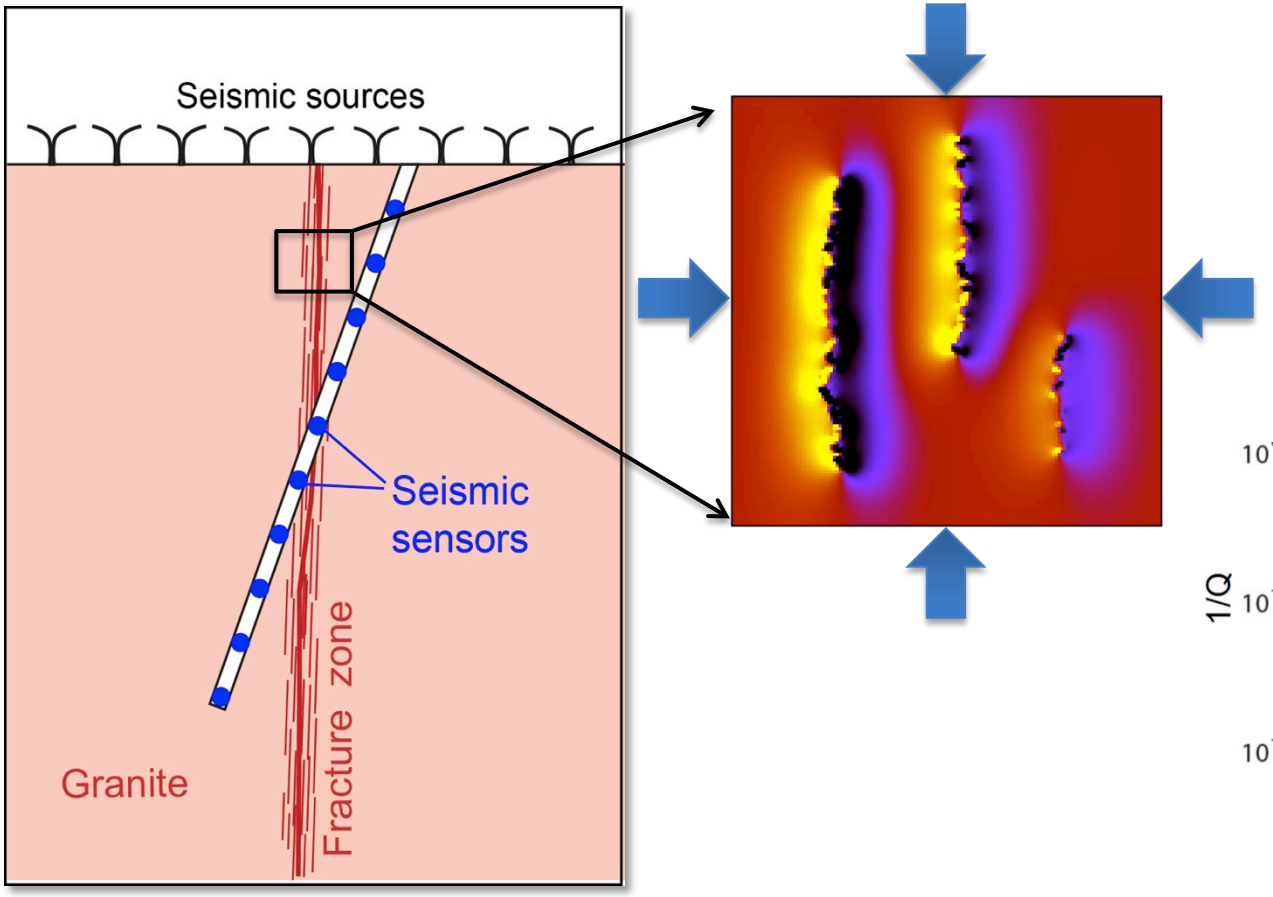
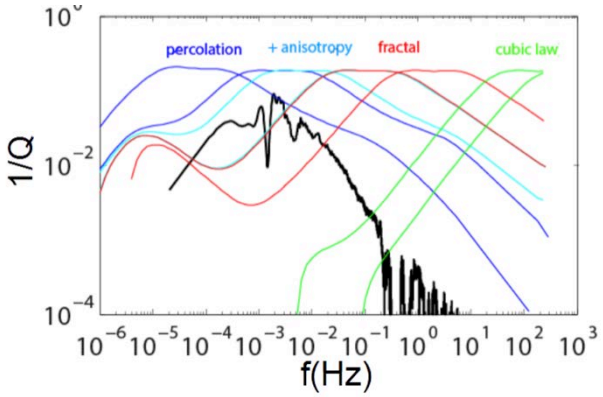


Detection of local rock permeability via seismic wave-induced fluid flow



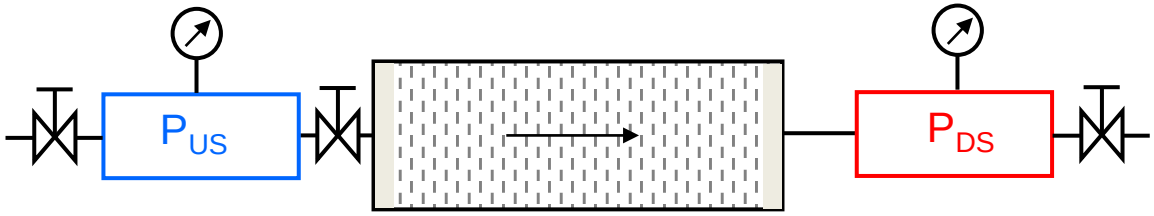
Poster: Mallet et al.

NRP70 Subproject "Petrophysics"

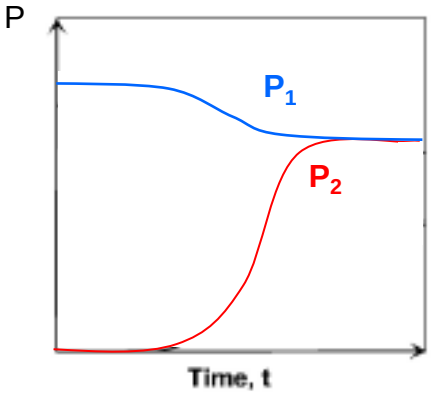
Relationships between permeability, seismic attenuation & electrical properties in fractured rocks?

New instrumental developments at ETHZ Rock Deformation Lab:

1) Permeability measurements



UPSTREAM RESERVOIR V_{US} | SAMPLE | DOWNSTREAM RESERVOIR V_{DS}



Transient step for low *k* samples

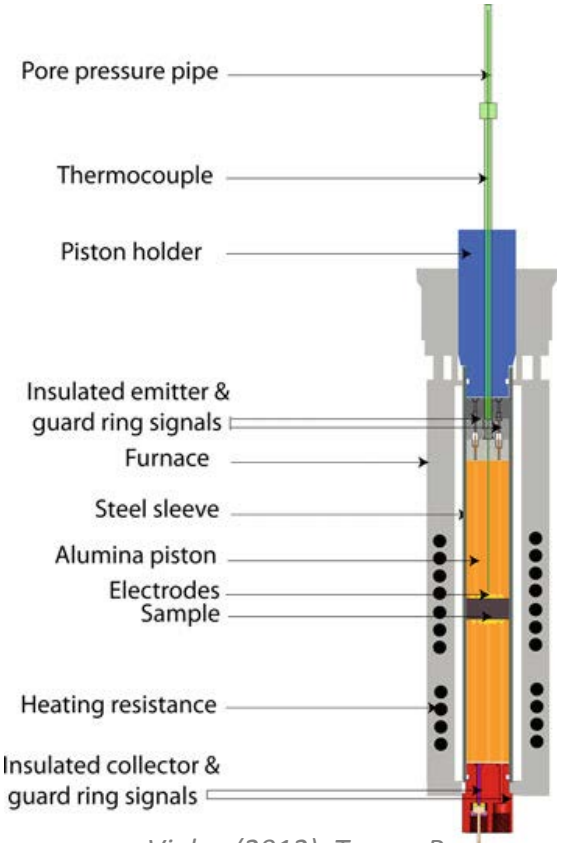
NRP70 Subproject "Petrophysics"

Relationships between permeability, seismic attenuation & electrical properties in fractured rocks?

New instrumental developments at ETHZ Rock Deformation Lab:

2) Measurement of **attenuation & elastic moduli** at seismic frequencies (1-100 Hz) at $P_{conf} \leq 100$ MPa, $T \leq 250$ °C with various saturating saline fluids.

3) Measurement of **electrical properties** with an impedance spectrometer over 10^{-1} – 10^{6} Hz range.



Madonna and Tisato (2012), Geophysical Prospecting

Violay (2012), Transp Porous