Karlsruhe Institute of Technology

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LANDES FORSCHUNGS ZENTRUM GEOTHERMIE

Natural analogue investigation for CCS in the Southern Caucasus CauCasCCS

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Overview

- Project coordinator and partners
- Project summary
- Main objectives
- Expected outcomes and impacts
- State of the art so far





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Project Coordinator and Partners

- **Co-ordinator:**
- Dr. Birgit Müller, Landesforschungszentrum Geothermie, Karlsruhe, Germany
- **Project Partners**
- Prof. Heinz Stosch, Prof. Thomas Neumann, KIT Campus Süd, Adenauerring 20b, Karlsruhe, Germany
- Dr. George Melikadze, Dr. Nino Tsereteli, Institute of Geophysics, Ivane Javakhishvili Tbilisi State University (TSU), 1 Aleksidze Street, Tbilisi, 0171, Georgia
- Dr. Arkadi Karakhanyan, Institute of Geological Sciences (IGS)-Geotectonics, Seismology, Baghramyan ave. 24a, Yerevan, 0019, Armenia




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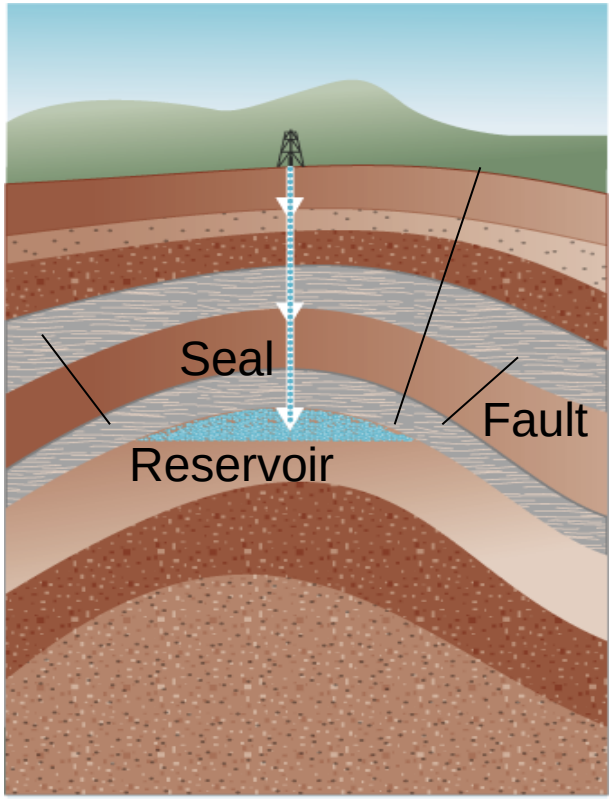
Project Summary

- In the project, greenhouse gas emissions in the different natural springs will be analysed qualitatively and quantitatively.
- Rocks at these springs are natural analogues of sealing cap and reservoir rocks for CO2 sequestration



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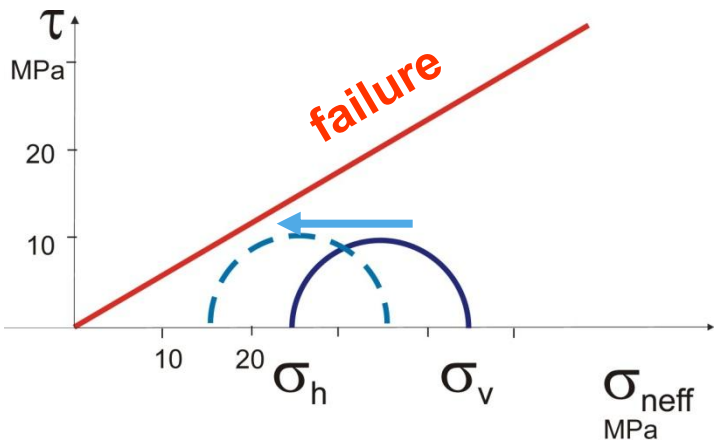
Main Project Components

- A: Green House Gas Budget, Hydrogeology, Geology and Mineralogy
- B: Rock Alteration Investigation
- C: Geomechanics: Identification of critically stressed faults
- D: Seismology and Monitoring






Main Objectives

- Study of the Southern Caucasus aquifer systems and reservoirs → base for the identification of potential storage sites
- Investigation of potential hazards for these sites, such as fault systems to ensure their long-term stability.
- Develop the principles of adequate monitoring systems for geological CO_2 storage
- Competence building for understanding geoprocesses for safe geological storage of CO_2 in the BS-ERA.NET area.

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Expected Outcomes

Fill important gaps in the current knowledge of CO_2 sequestration because only few studies exist on the effects of alteration

- cross-country compilation and characterization of gases from natural springs to obtain natural emissions
- Seismic monitoring concept for CO2 sequestration sites
- Compilation of the alteration of cap rocks and reservoir rocks in the Southern Caucasus under CO2-influence





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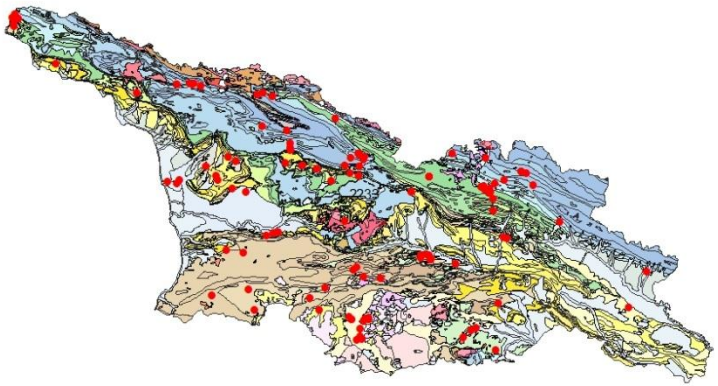
Expected impacts

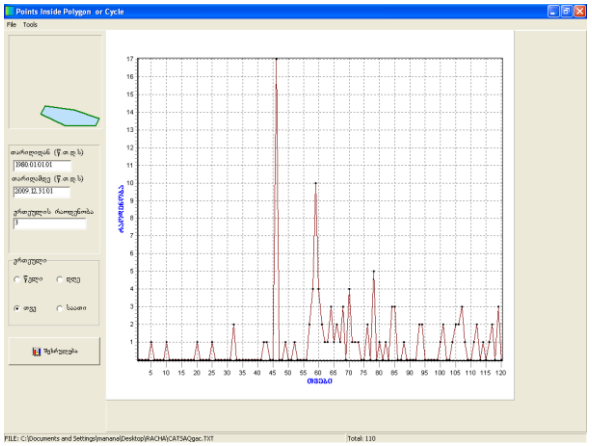
- Contribution to global climate protection in the Southern Causasus, an area which is of ecological importance
- Coherence in national research in the field of greenhouse gas reduction.
- Economic Impact → potential future cap and trade market
- Science for population living in vicinity of storage sites

First Results of the Georgian Team

- Gas Composition of Underground Waters
- Compilation of regional seismicity in areas of potential CO2 storage sites (Racha region and Javakheti region)



Map of CO2 springs in Georgia



Seismic rate (Number of earthquake per 3 months) for Racha from 1980 till 2009

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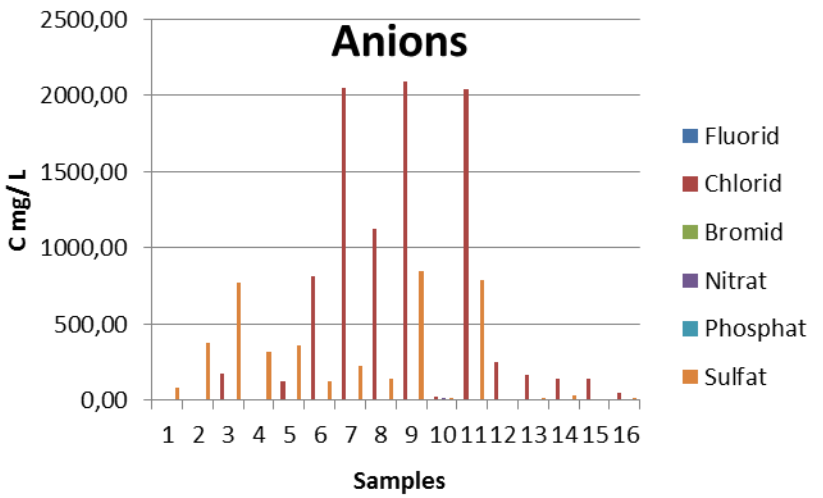
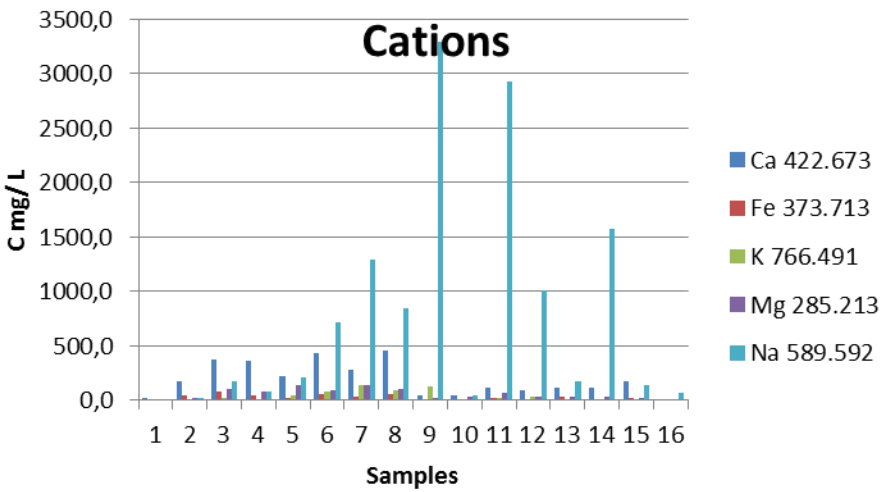
First Field Trip to Armenia and Georgia in September 2012

Site selection for future data sampling but also first

- Sampling of natural CO_2 springs in Armenia and Georgia for mineral water analysis
- Sampling of rocks at the spring sites

First Results of Water Analysis





Results of anions and cations from samples 1 – 16.

In 2013

- Further data sampling
- Diffractometry and x-ray fluorescence (XRF) experiments
- Mineralogical, geological, geochemical analyses

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Thank you for your attention!

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Origin of fluids (magmatic/ biogenic)

Host/Cap Rock (Unstable minerals)

Host/Cap Rock (Stable minerals)

If the initial state of a system can be constrained, stable isotopes of natural analogues can be used to monitor the intensity of alteration due to fluid influx!

Jurassic Entrada Sandstone, Green River, Utah (Foto by B. Dubacq)