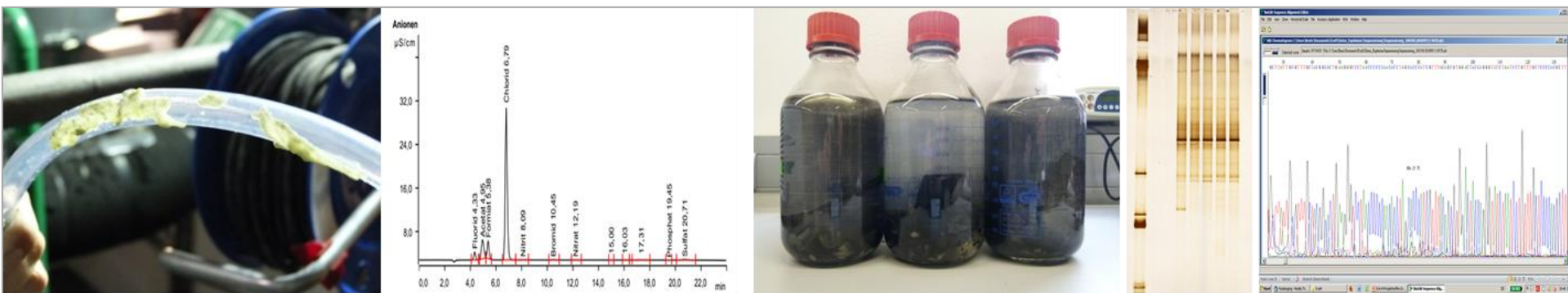


# Interactions between a calcium scaling inhibitor, geothermal fluids, and microorganisms – Results of in situ monitoring in the Molasse Basin and laboratory experiments



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EGU 2020 Abstract

# Overview

- Introduction – calcium scale inhibitor NC47.1B
- Laboratory experiments
- *In situ* monitoring at the geothermal plant Unterhaching
- Outlook – Experiments with a mobile bypass system



# Introduction

- Addition of the calcium scale inhibitor NC47.1B is tested at the geothermal plant Unterhaching in the Molasse Basin since August 2017
- The inhibitor is a polycarboxylate based copolymer with a highly biodegradable component (polysaccharide)
- Dosage at the plant is between 5 mg/L and 10 mg/L

Inhibitor injection



Sampling at the outflow  
of the heat exchanger



T = 60 °C -100 °C

# Laboratory experiments

- Incubation at different temperatures (40°C – 80°C)
- Fluids from the geothermal plant (96°C ) with 5 mg/L inhibitor
- Further addition of inhibitor between 100 mg/L and 1200 mg/L
- Frankendolomite as rock analogous (200g / 800ml Fluid)

Control



Experimental Series 1



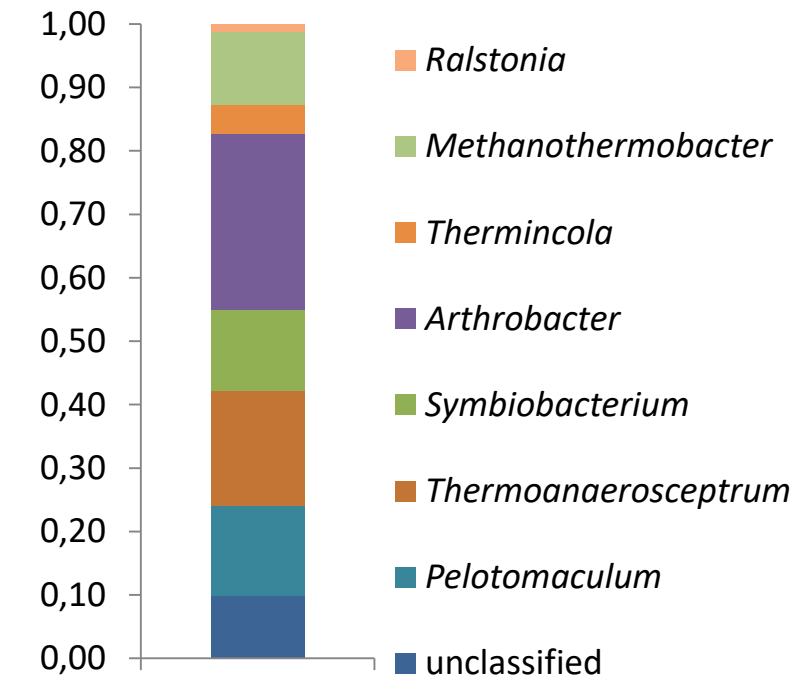
Experimental Series 2



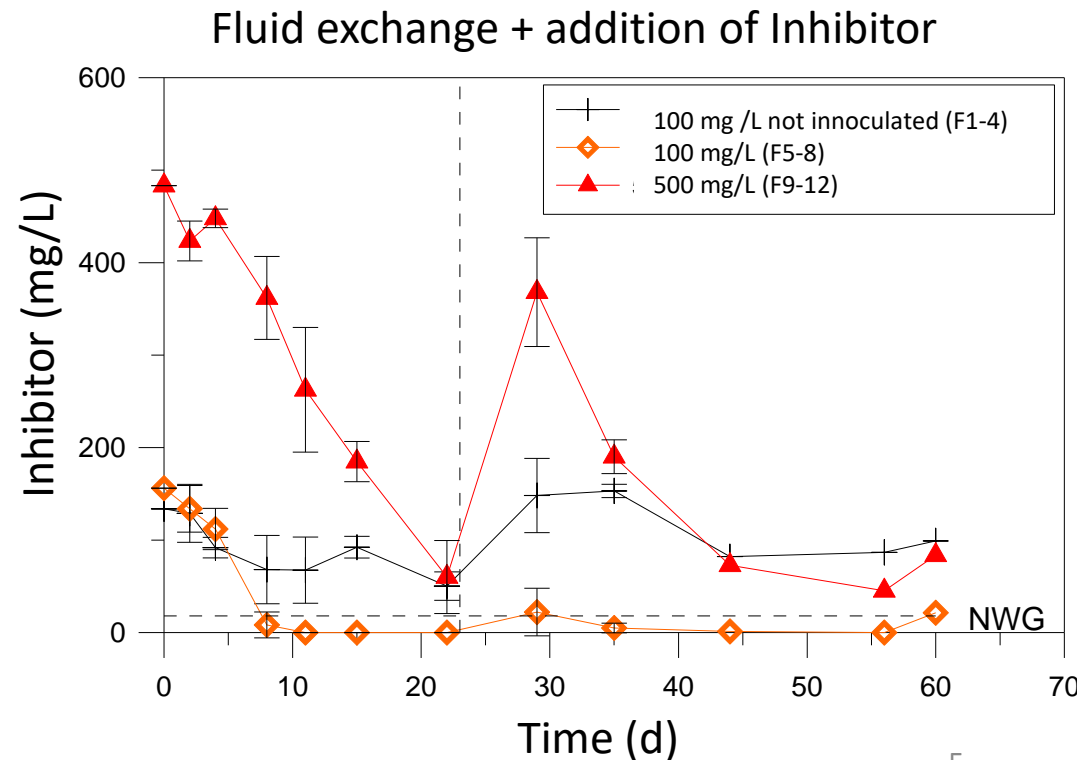
Inhibitor [mg/L]	-	-	600	120	600	1200	120	600	1200
Rock	-	+	-	+	+	+	+	+	+

# Degradation of the inhibitor in laboratory experiments

- Inhibitor is degraded under anaerobic conditions
- Indications for acetogenesis
- Activity of methanogenic *archaea* and sulfate-reducing *bacteria*



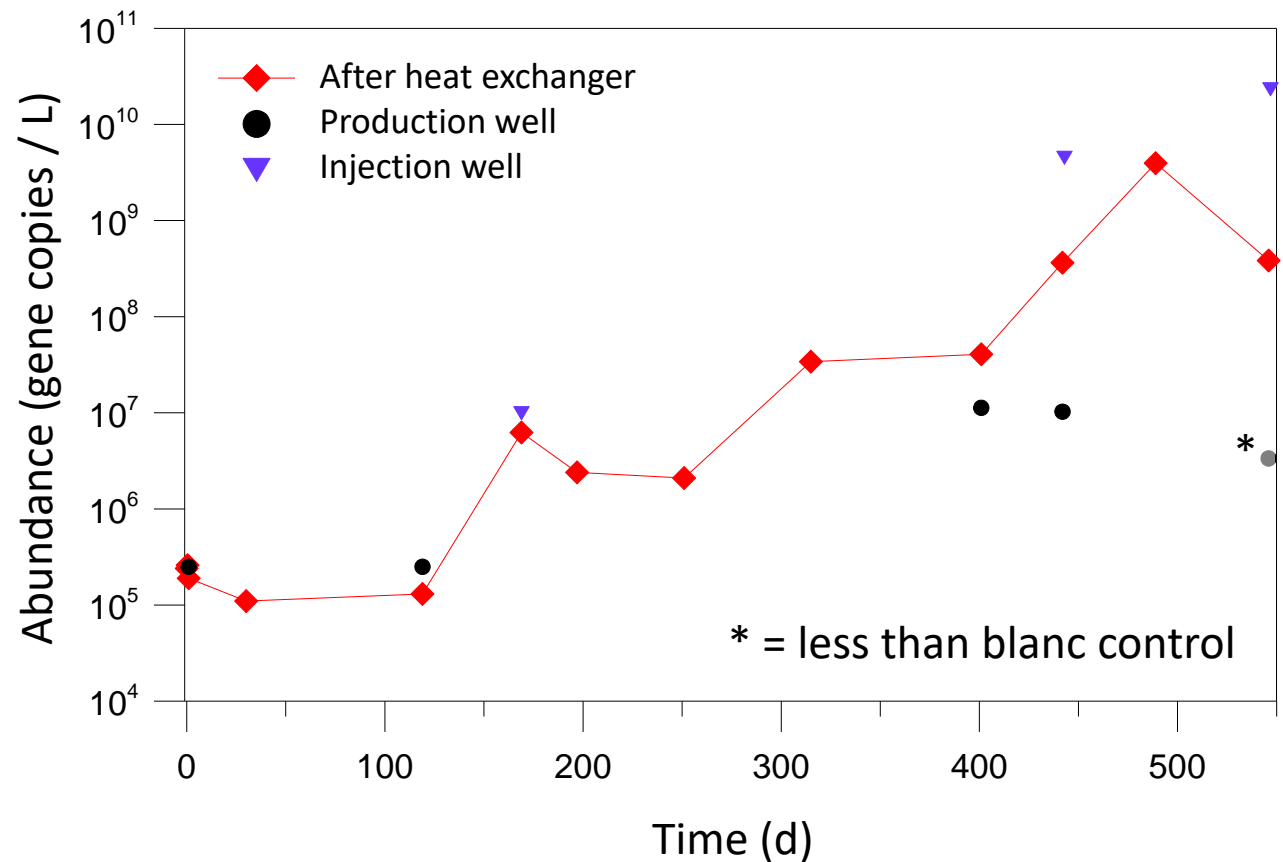
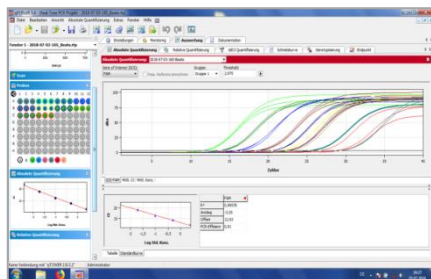
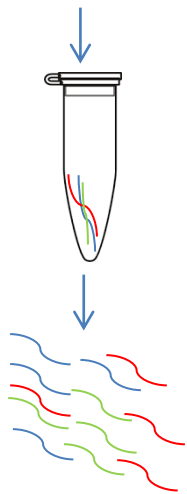
B4  
characterisation of the bacterial bioceonosis



Degradation of inhibitor over time

# *In situ* Monitoring at the geothermal plant Unterhaching

Abundance  
determined by qPCR



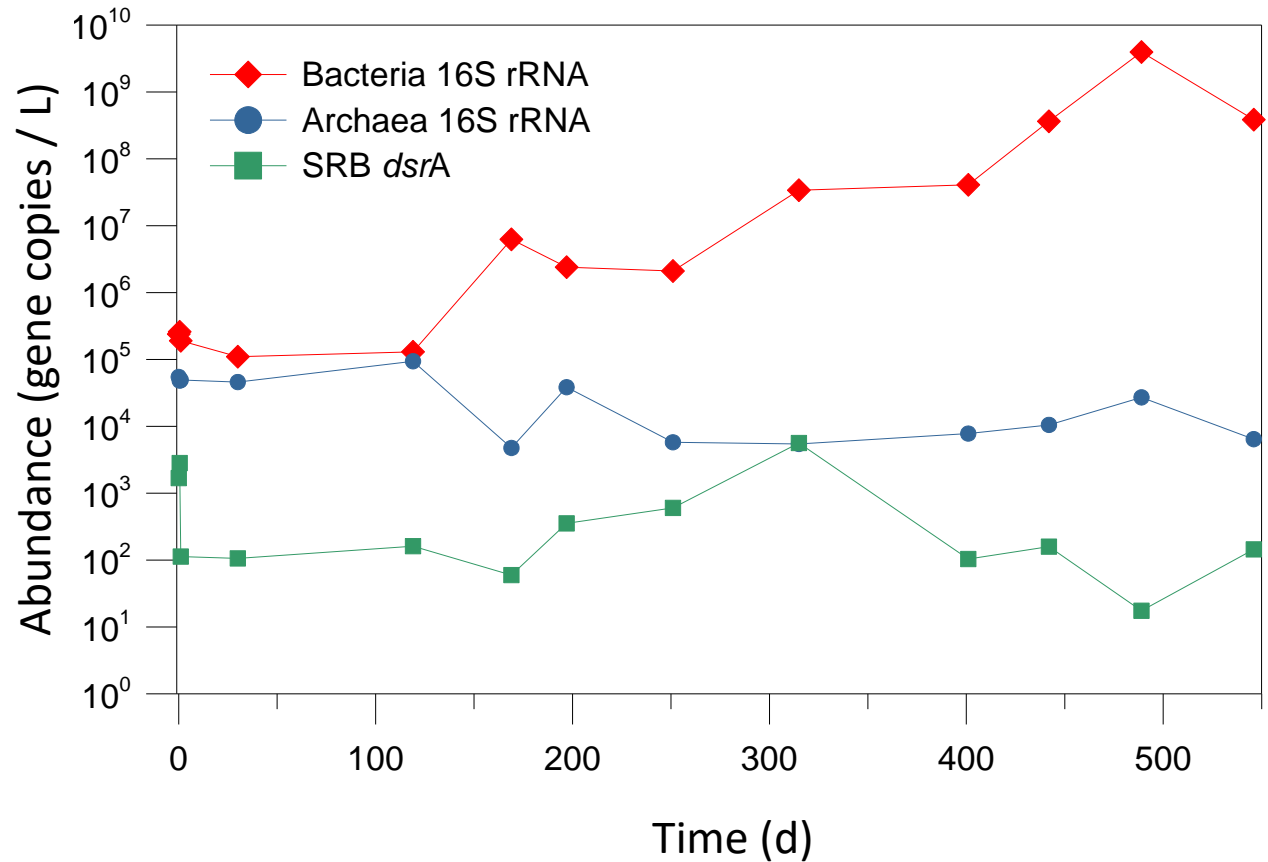
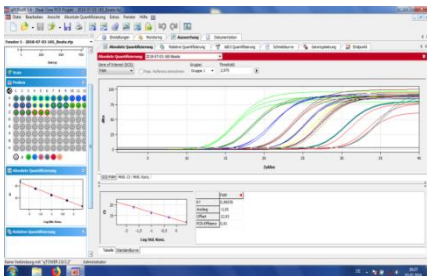
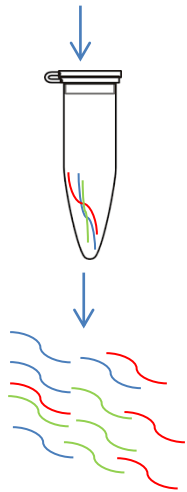
→ Abundance of *bacteria* increased over time since the inhibitor addition



# *In situ* Monitoring at the geothermal plant

## Underhaching

Abundance  
determined by qPCR



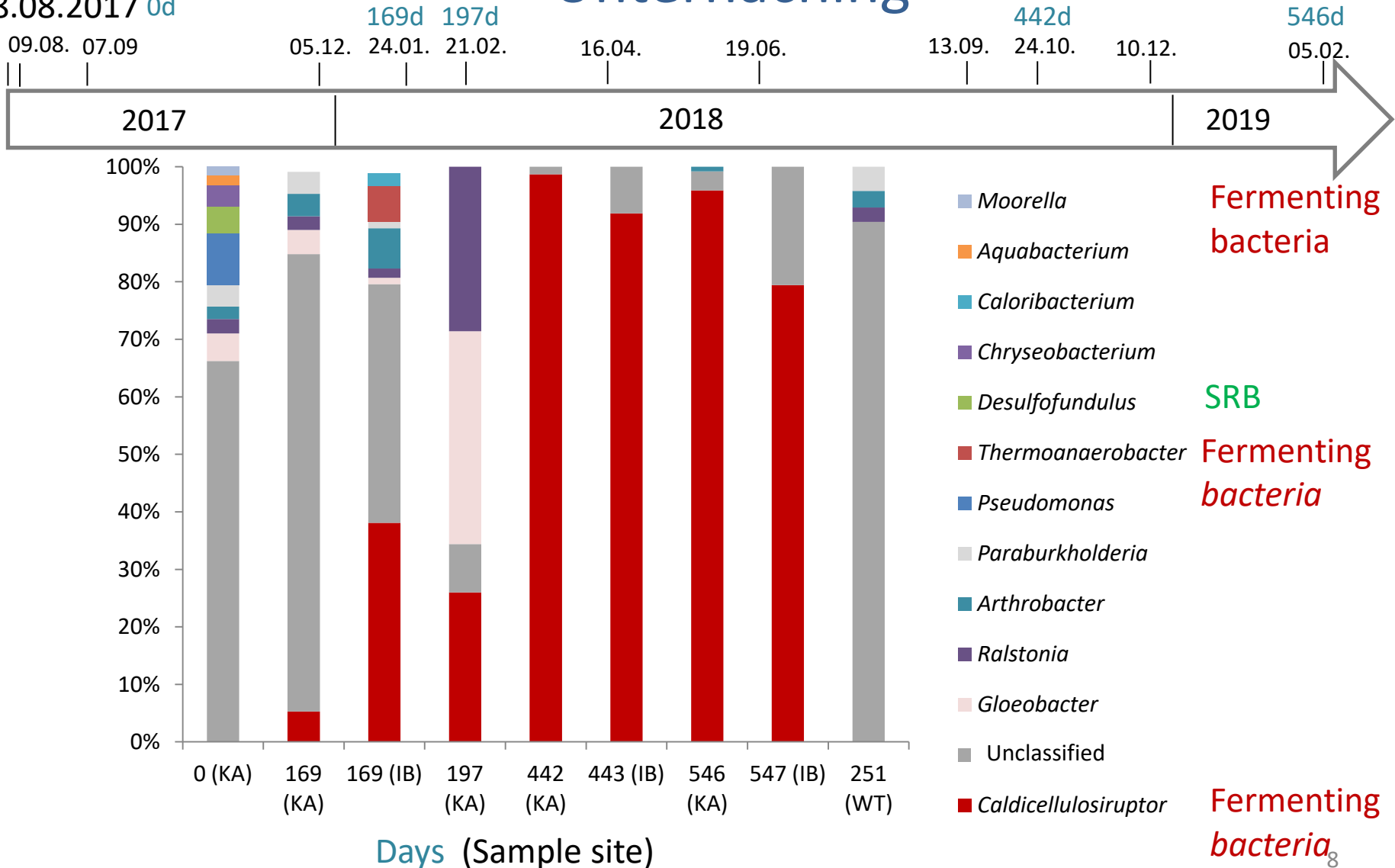
→ Abundance of *archaea* and sulfate-reducing *bacteria* (SRB) remained more or less constant

# *In situ* Monitoring at the geothermal plant

## Unterhaching

Inhibitor injection

08.08.2017 0d



KA = plant outflow, IB = injection well, WT = heat exchanger outflow



# *In situ* Monitoring at the geothermal plant Unterhaching

- Abundance of *archaea* and sulfate-reducing *bacteria* remained more or less constant
- Abundance of bacteria increased since the inhibitor addition
- Addition of the scaling inhibitor influenced the composition of biocoenosis of the fluids at the geothermal plant
- *Caldicellulosiruptor* (fermentative bacterium) increased over time and dominated the biocoenosis

# Outlook – Experiments with a mobile bypass-system

- Characterization of the changes in the microbial biocoenosis due to inhibitor addition *in situ*
- Degradation of the inhibitor *in situ* and monitoring of corrosion rates
- Minimum effective concentration of the inhibitor
- Comparison of results with and without inhibitor injection



Mobile bypass-system



Vessel for steel coupons