

# How could microbes make radioactive waste disposal safer?

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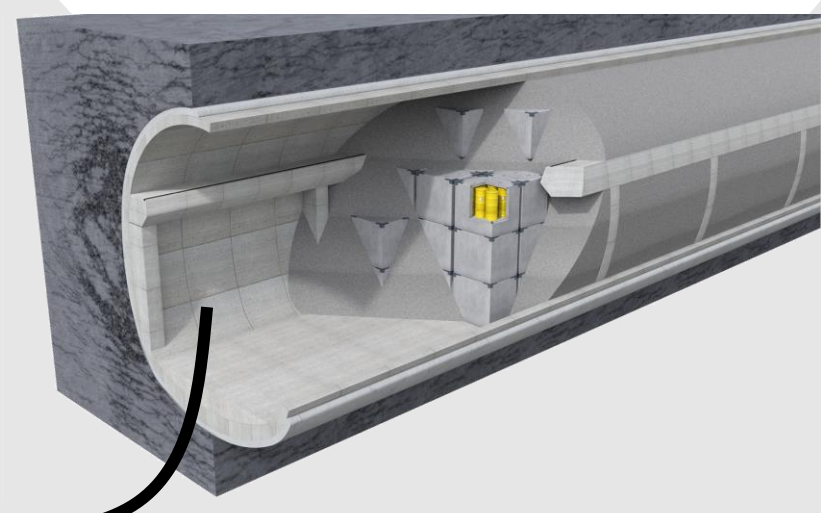
## Storage of radioactive waste in a deep geological repository

Low- and intermediate-level

Low- and intermediate-level waste safety confinement period is **100,000 years**

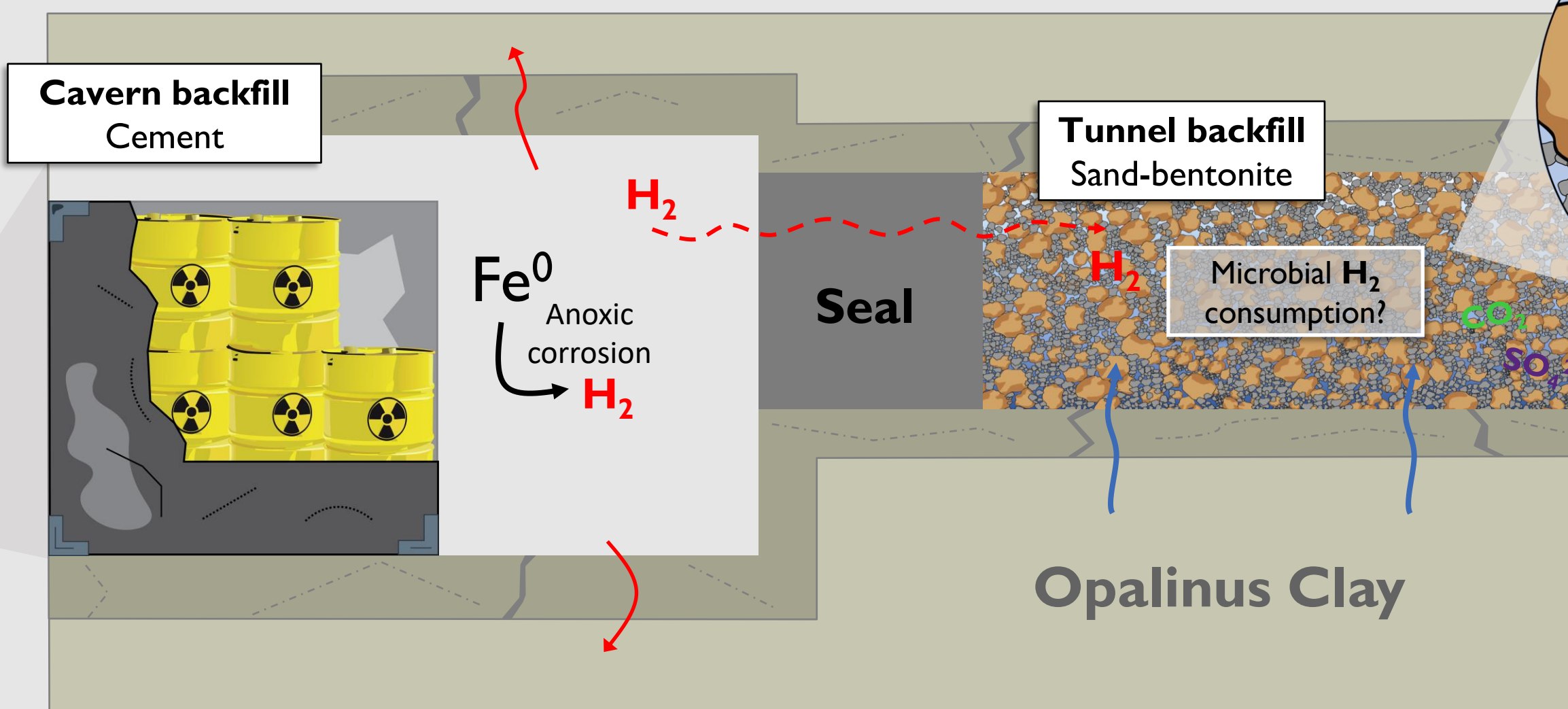


Steel canisters containing the waste will be emplaced in caverns backfilled with cement

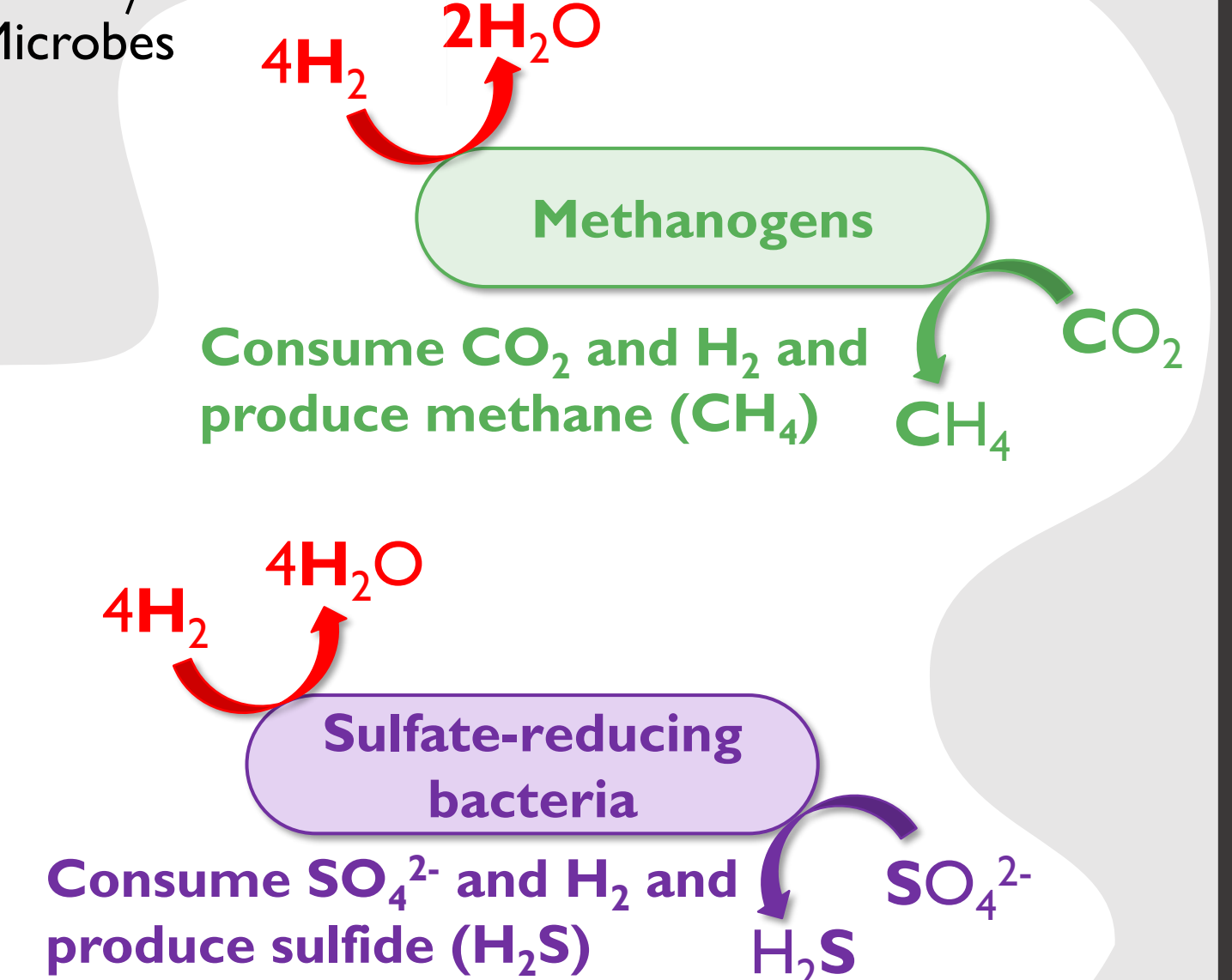
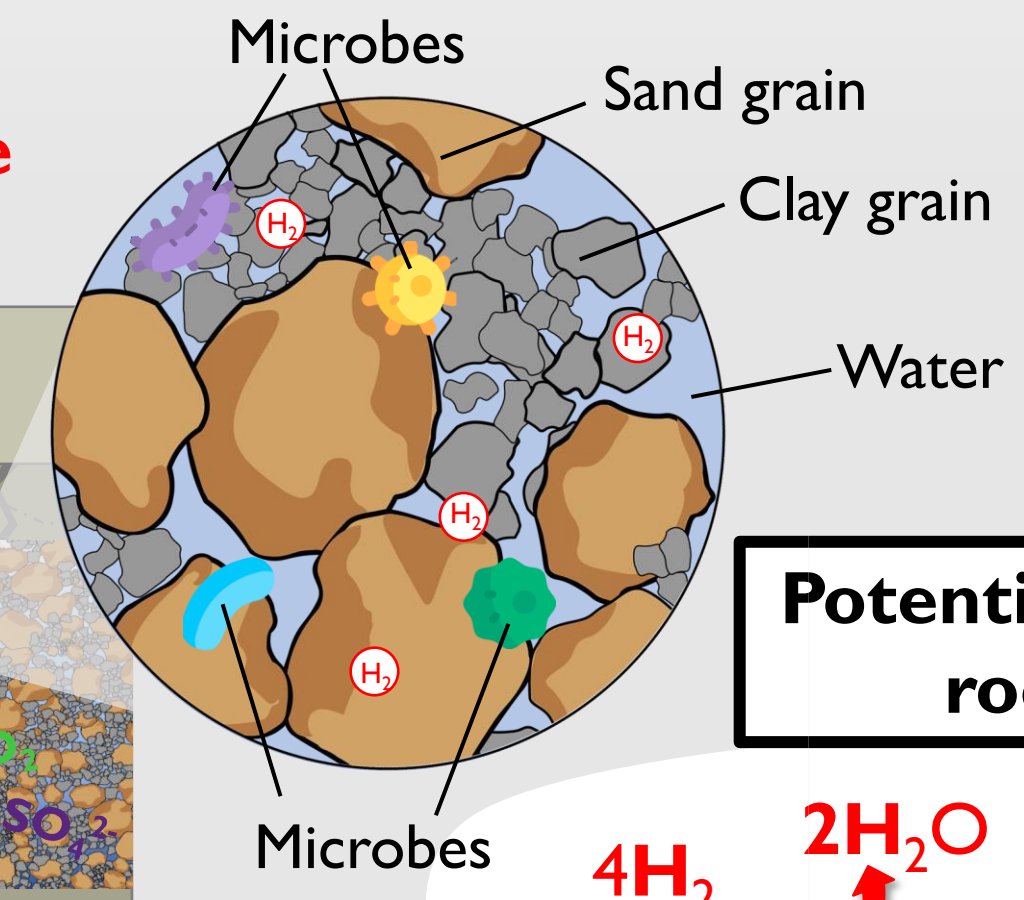


The caverns are drilled several hundreds of meters below ground in a deep geological repository

H<sub>2</sub> gas is produced by the chemical corrosion of iron in the absence of O<sub>2</sub> and can accumulate



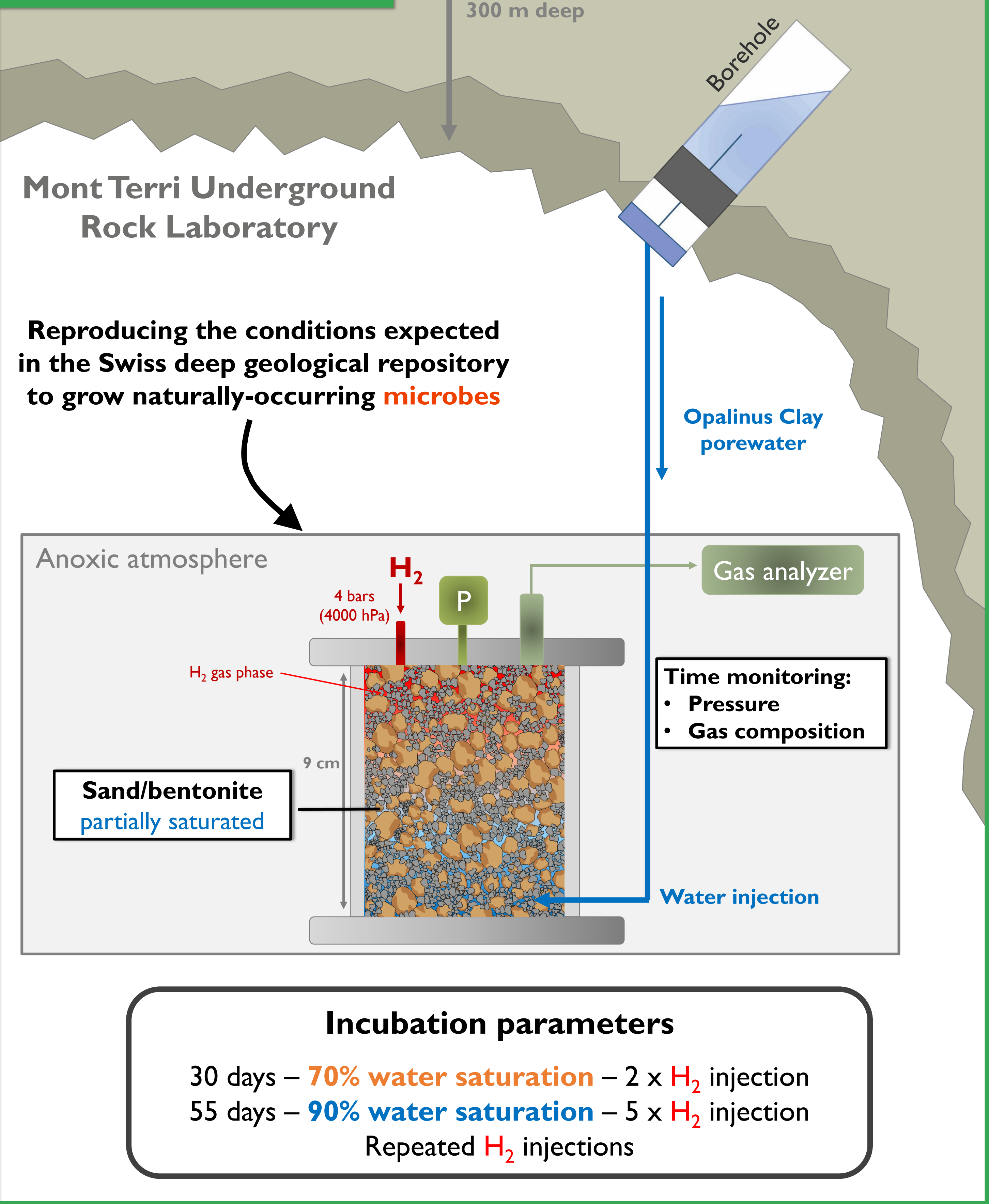
H<sub>2</sub> overpressure can threaten the integrity of the host rock



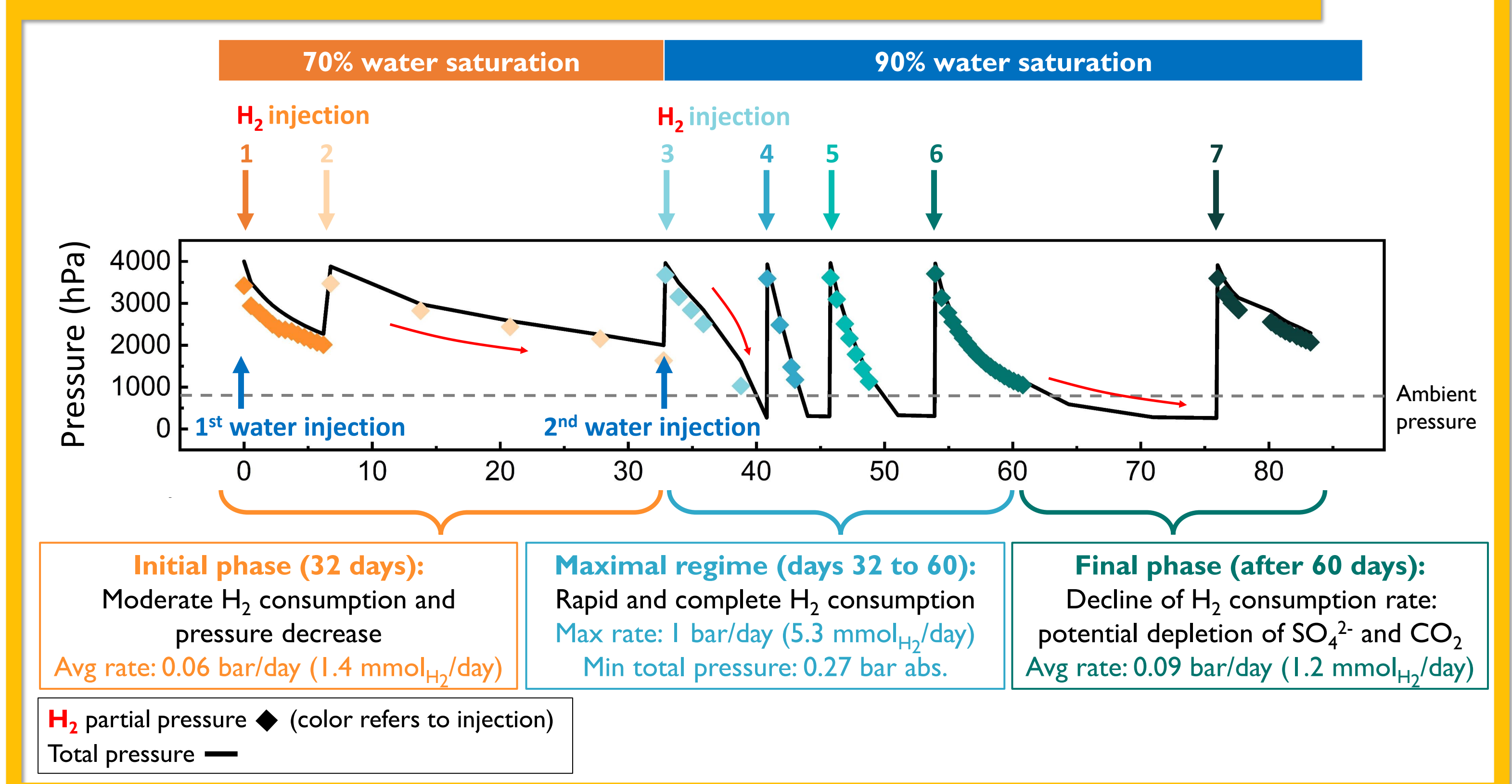
QUESTIONS

1. Could microbes consume H<sub>2</sub> and decrease the gas overpressure?
2. What is the rate of H<sub>2</sub> consumption in partially saturated sand-bentonite?
3. Which microbial processes are involved?

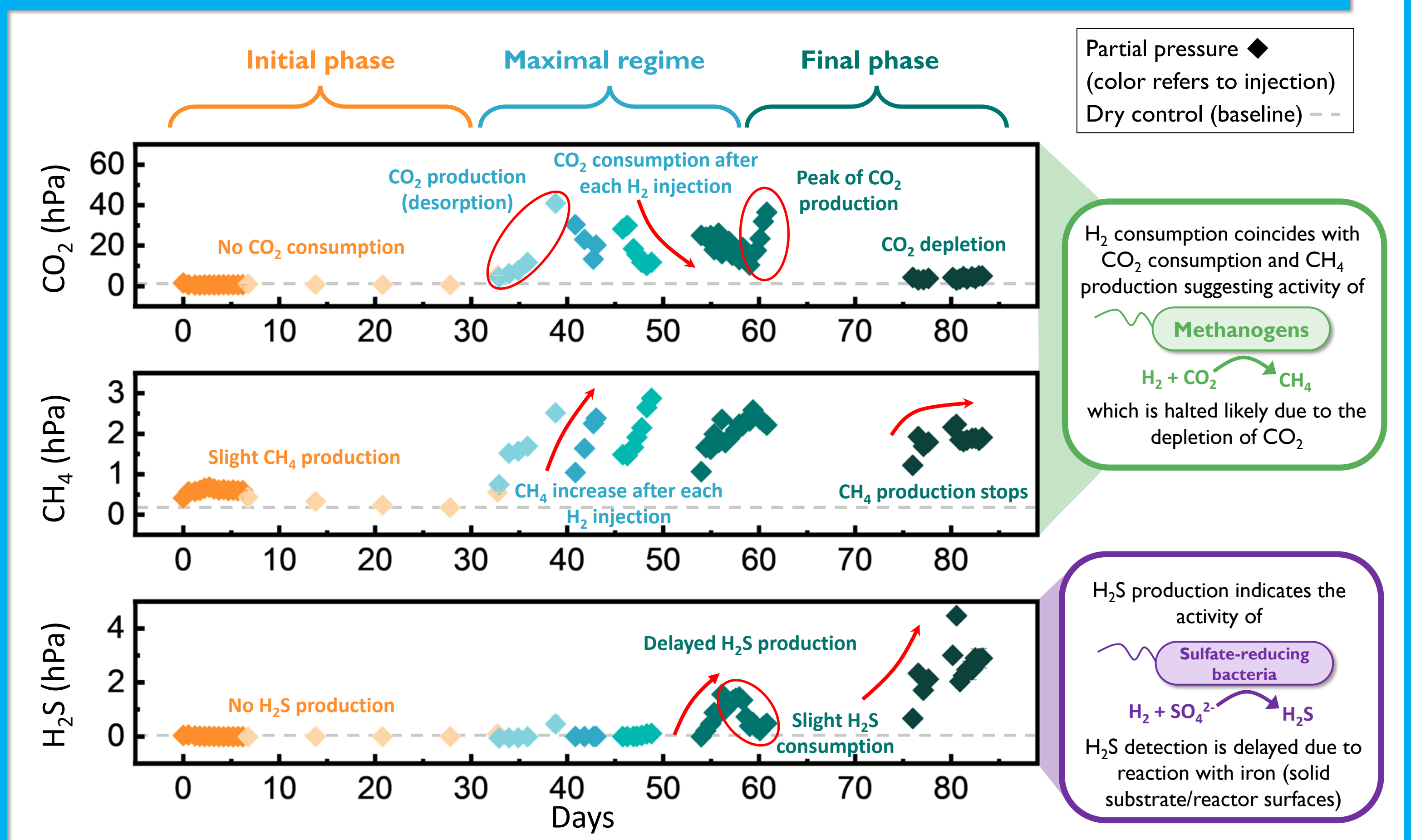
### Experimental setup



### Evolving rate of H<sub>2</sub> consumption after each injection



### H<sub>2</sub> transformed by methanogens and sulfate-reducing bacteria



### Conclusion

1. Naturally-occurring H<sub>2</sub> consuming microbes were incubated under deep geological repository-like conditions
2. Real-time monitoring of pressure and gas composition reveals fast and complete H<sub>2</sub> consumption (up to 5.3 mmol/day), resulting in pressure decrease (up to 1 bar/day)
3. H<sub>2</sub> consuming processes involve methanogenesis and sulfate-reduction, and appear to be contingent on water availability



These experimental rates will help to model the long-term evolution of H<sub>2</sub> pressure in the Swiss radioactive waste repository