

The  project:

## **Noble Gases as Monitoring Tracers: Sampling Campaigns at Capture Sites Technology Center Mongstad and Melkøya**

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Ringrose P, Sundal A



**eawag**  
aquatic research ooo

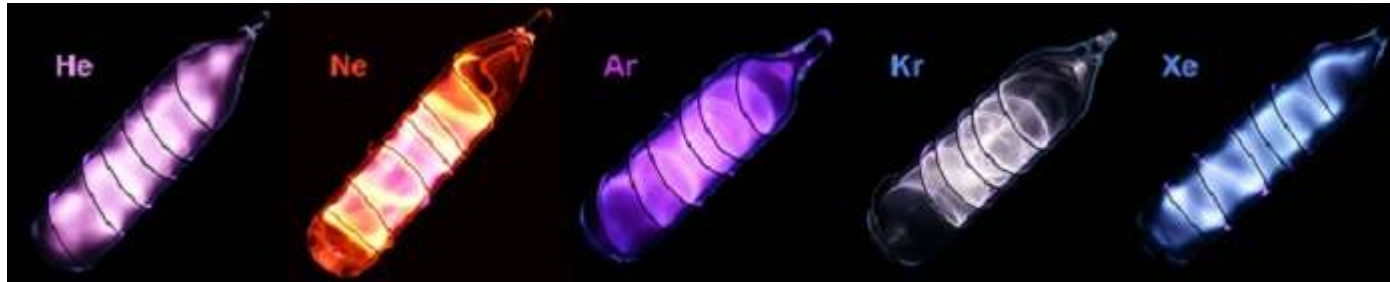


**CLIMIT**

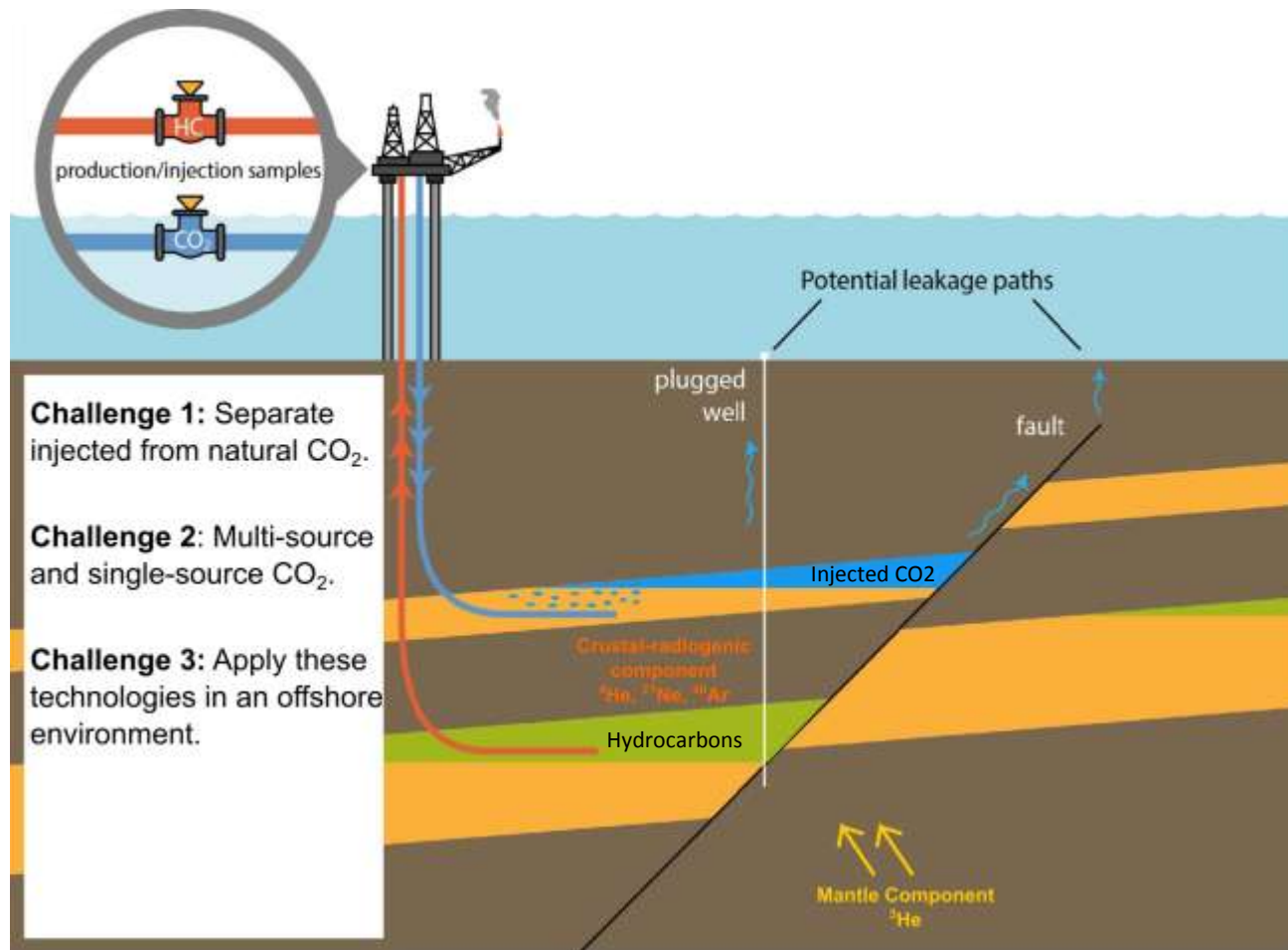


# Noble Gases as Monitoring Tracers

- ❖ Inherent trace gases
- ❖ No environmental hazard
- ❖ Rel. concentration and isotopic ratios allow source identification



# Noble Gases as Monitoring Tracers



# Absorption

## Source:

### *Exhaust/Post-combustion:*

Coal

Gas

Refinery gas

Biomass

### *Pre-combustion:*

Hydrogen production

### *Non-combustion:*

CO<sub>2</sub> contained in Natural Gas



# Absorption

## Source:

*Exhaust/Post-combustion:*

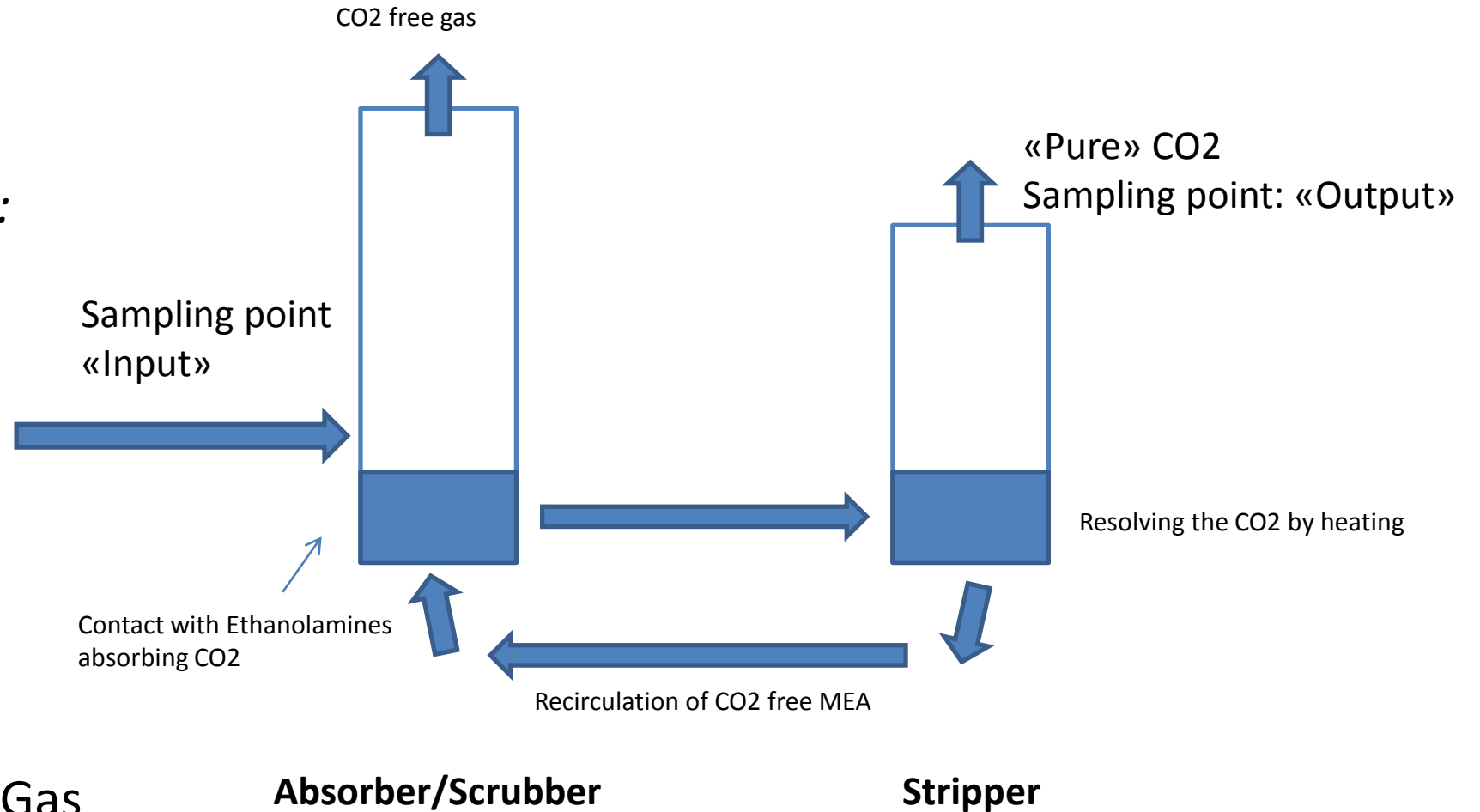
- Coal
- Gas
- Refinery gas
- Biomass

*Pre-combustion:*

Hydrogen production

*Non-combustion:*

CO<sub>2</sub> contained in Natural Gas



# Sampling campaign



# Melkøya/Snøhvit

- ❖ Flue gas source:
  - ❖ Natural CO<sub>2</sub> content in natural gas
- ❖ Amine capture
  - ❖  $\sim 0.7 \frac{MtCO_2}{a}$
- ❖ Only single samples



# Technology Center Mongstad (TCM)

- ❖ Amine capture research

- ❖  $\sim 0.1 \frac{MtCO_2}{a}$

- ❖ Exhaust gas from two sources

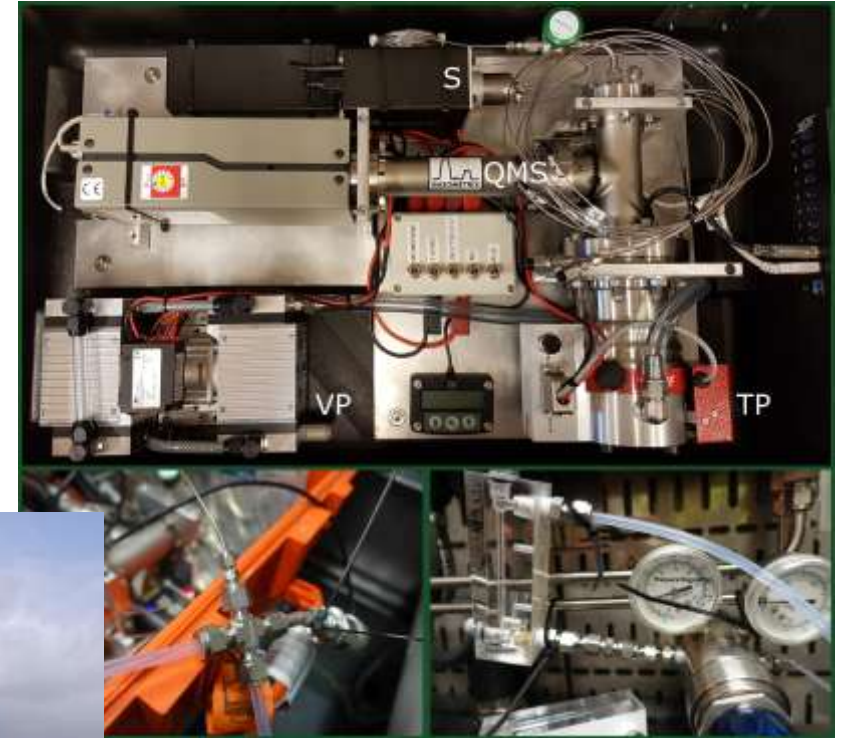
- ❖ Single and temporal sampling





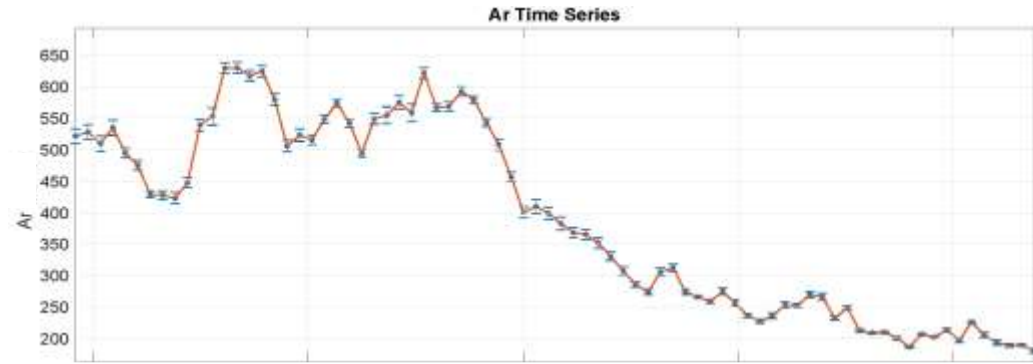
# Temporal Measurement

- ❖ On-Site mass spectrometer
- ❖ Portable and easy to install
- ❖ Sampled incoming gas and CO<sub>2</sub> Product



# Argon

❖ Not calibrated!



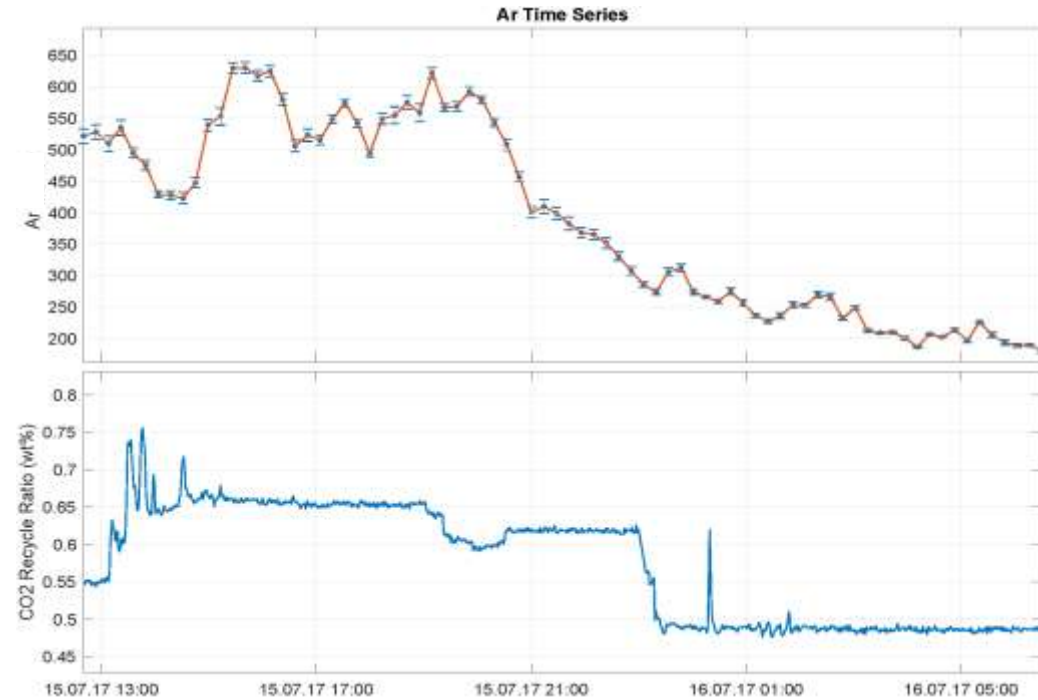
Sundal et al. [2019], GHGT-14



Feasibility Study 2017

# Argon

- ❖ Not calibrated!
- ❖ Decrease during change of recycle ratio

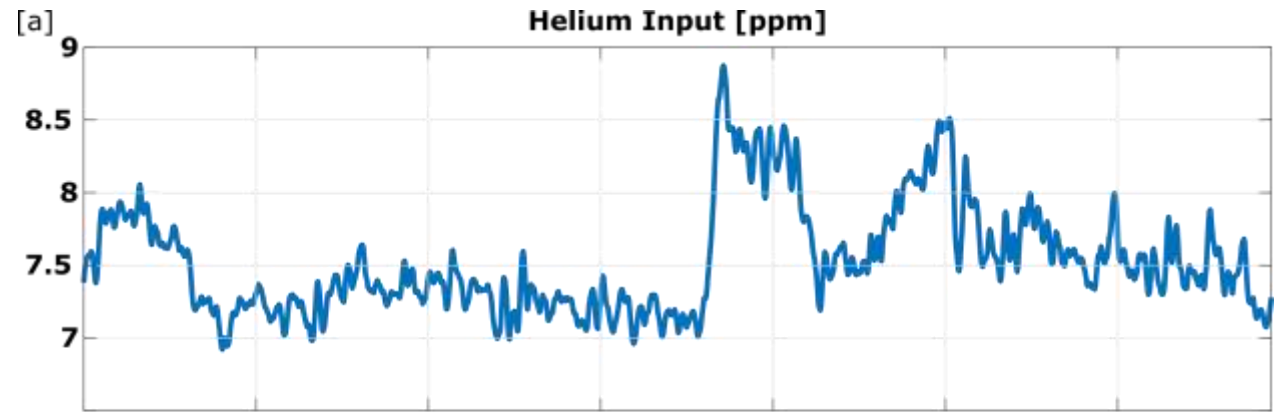


Sundal et al. [2019], GHGT-14



# Helium

❖ Only Incoming gas measureable

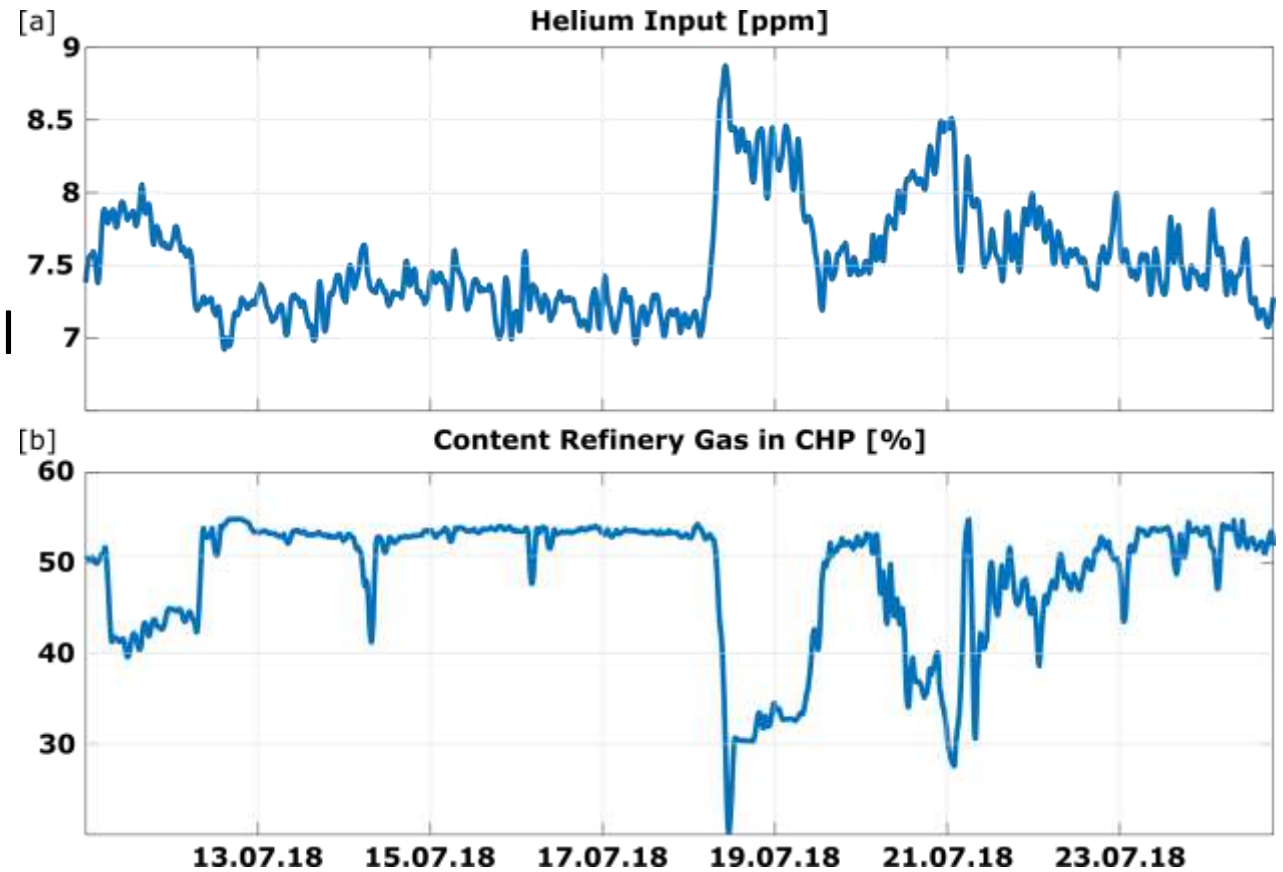


Campaign 2018

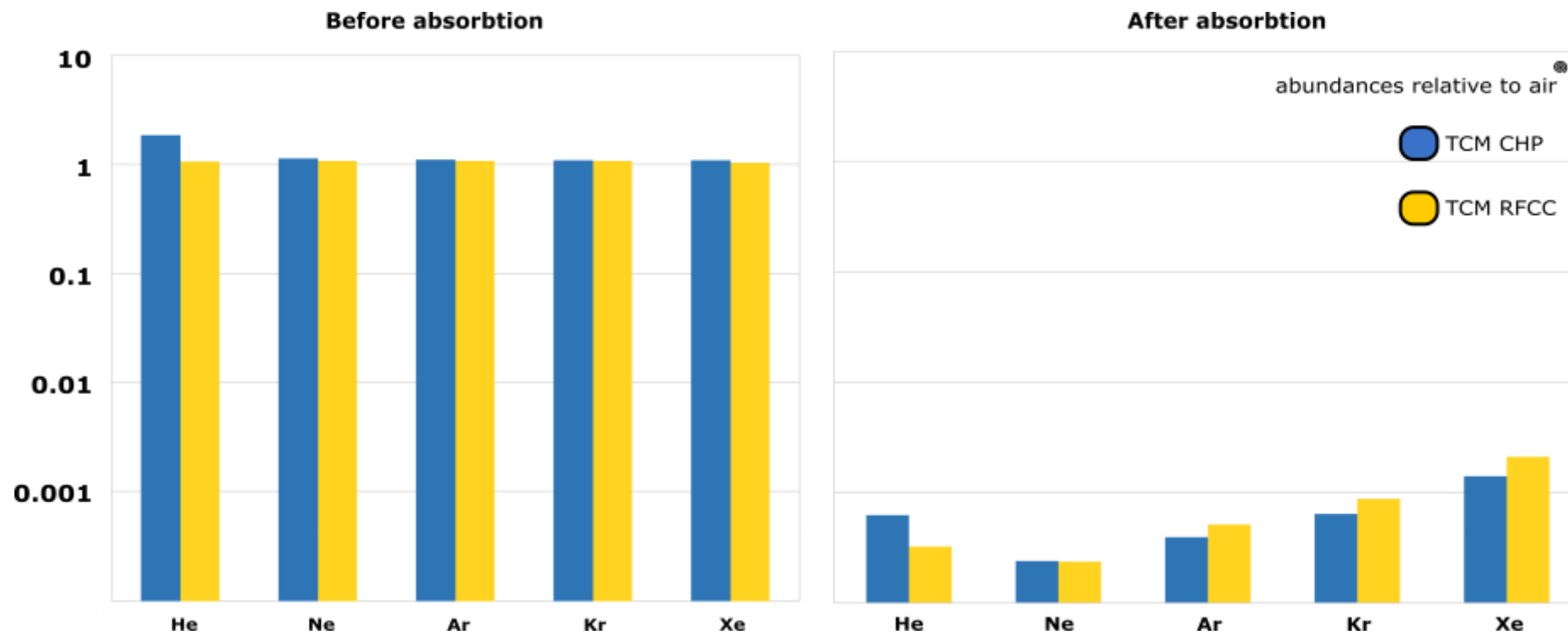


# Helium

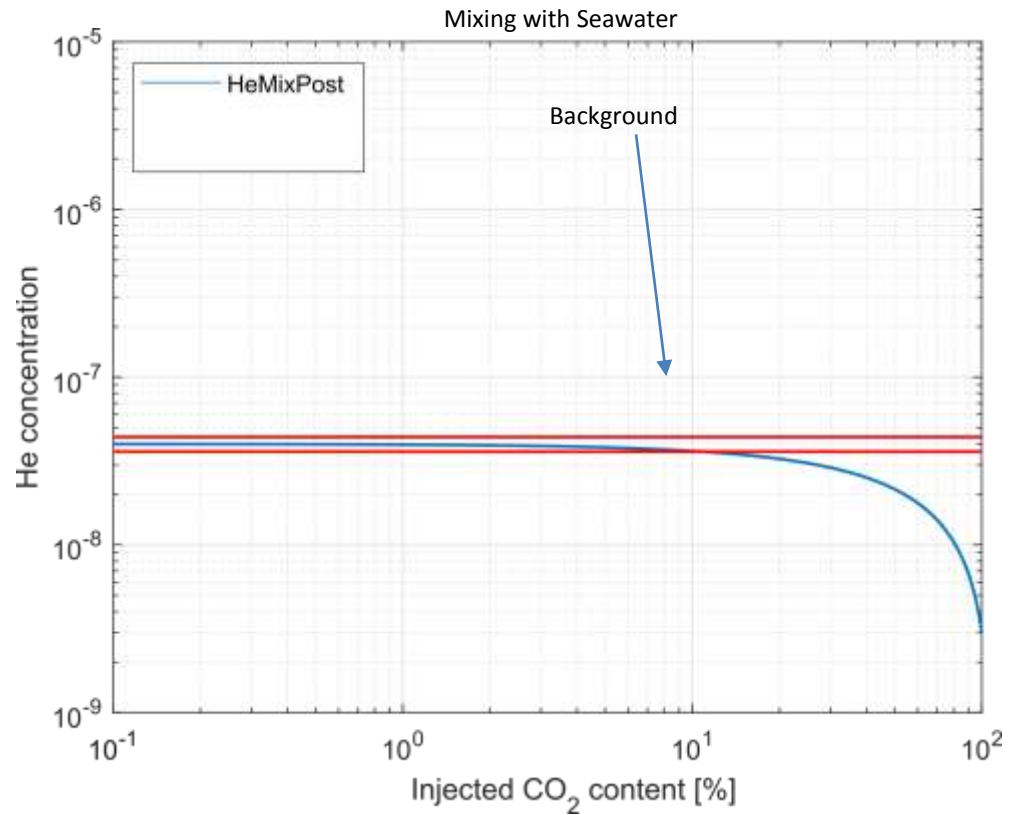
- ❖ Only Incoming gas measureable
- ❖ RFCC less radiogenic Helium
- ❖ Mixture from CHP plant correlates well
- ❖ Single samples from Output agree



# Single Samples



# Mixing Scenarios

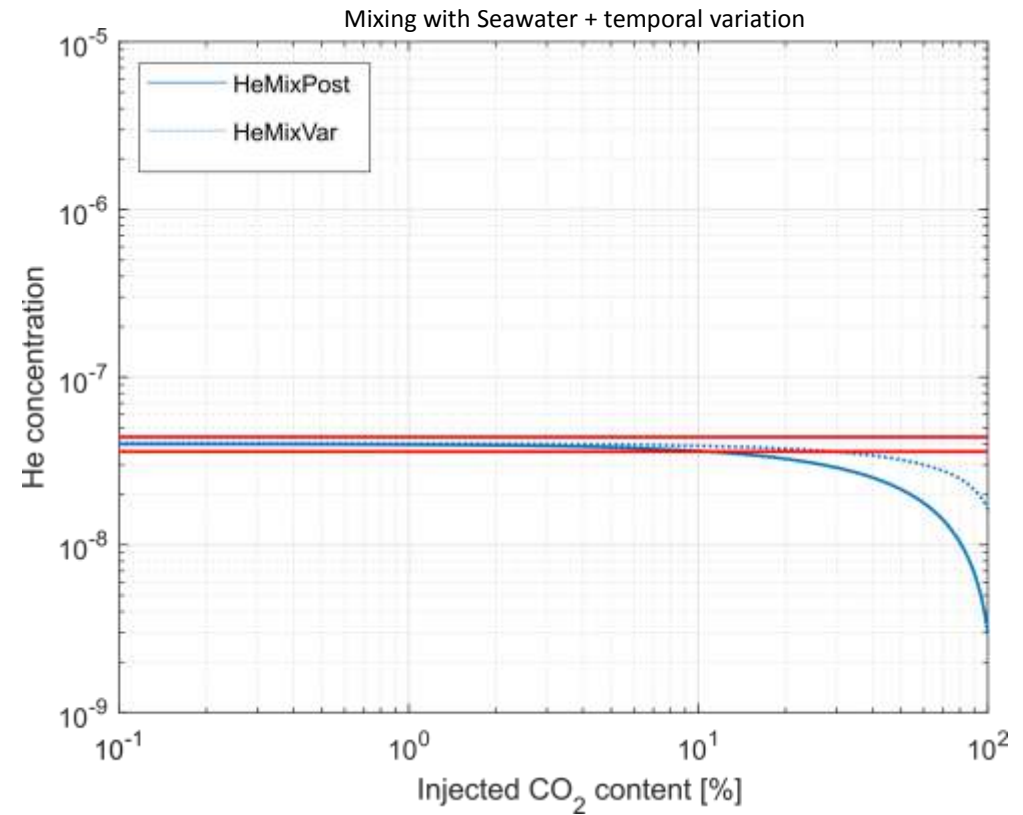
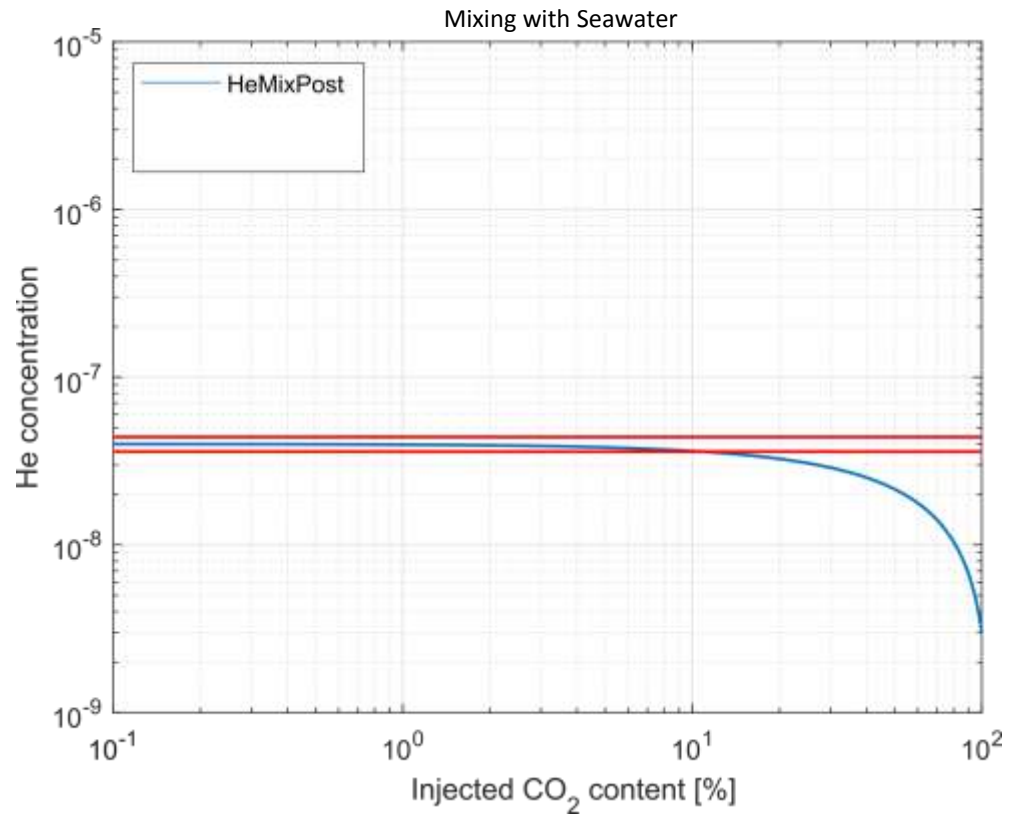


- Simplified two-component mixing!
- Dilution of noble gases



Campaign 2018

# Mixing Scenarios

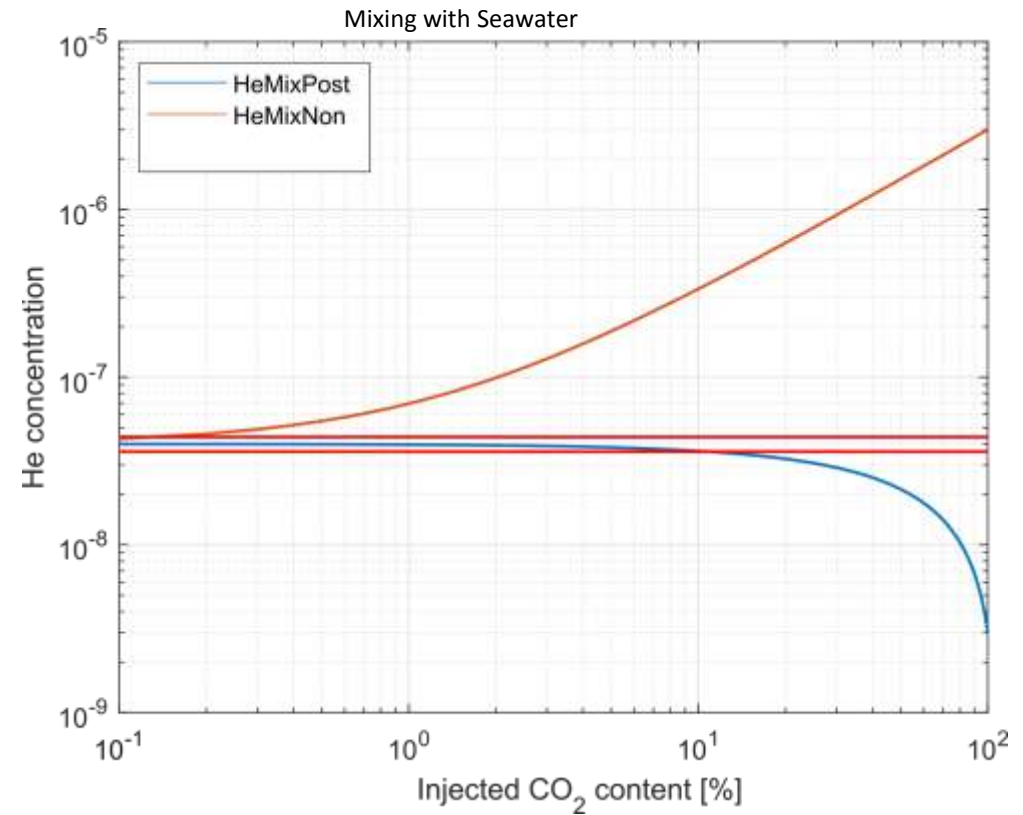
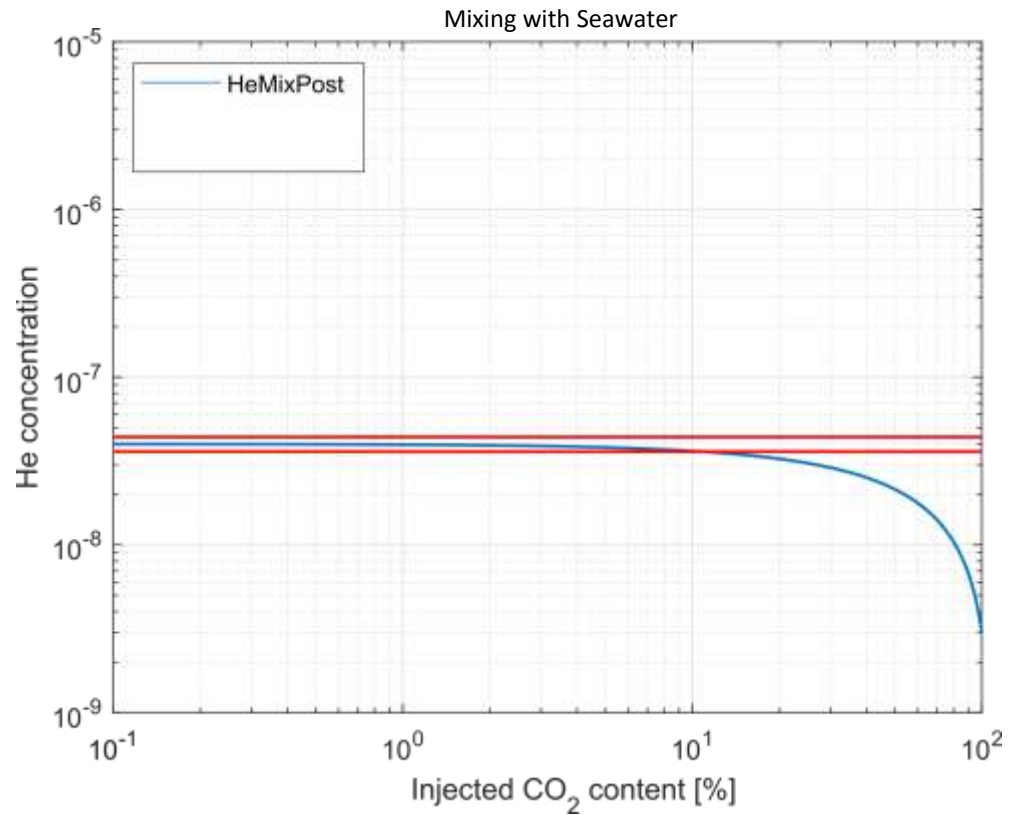


Campaign 2018





# Mixing Scenarios

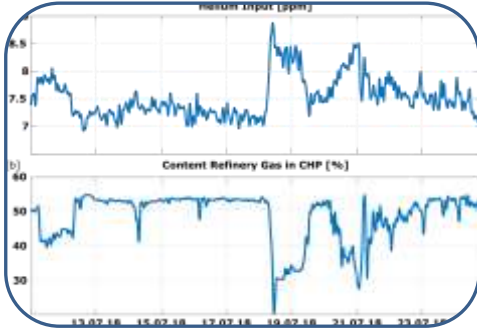


Campaign 2018



# Conclusion

❖ Valuable data collected for Norway



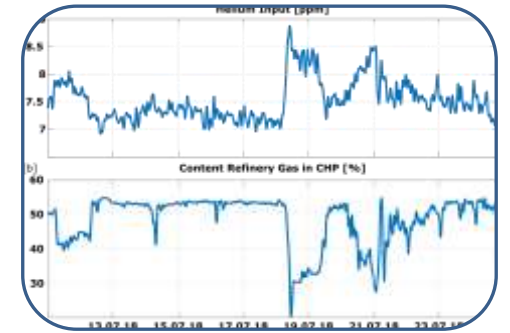
# Conclusion

- ❖ Valuable data collected for Norway
- ❖ Temporal variation in noble gases
  - More significant with several CO<sub>2</sub> sources



# Conclusion

- ❖ Valuable data collected for Norway
- ❖ Temporal variation in noble gases
- ❖ Potential to «finger-print» capture sites



# Conclusion

- ❖ Valuable data collected for Norway
- ❖ Temporal variation in noble gases
- ❖ Potential to «finger-print» capture sites
- ❖ Future work:
  - ❖ CO<sub>2</sub> signature in offshore subsurface systems
  - ❖ Fluid-Fluid interaction



Thanks to TCM and Melkøya!  
Thanks to the Norwegian Research Council!  
(Projectnumber: 280551)  
Thank you!



end