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Schleswig-Holsteinischer Landtag  
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# CCS ANHÖRUNG LANDTAG SCHLESWIG-HOLSTEIN

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Kiel 27.9.2023

# CO<sub>2</sub>-ÜBERSCHUSS IN CO<sub>2</sub>-SENKEN

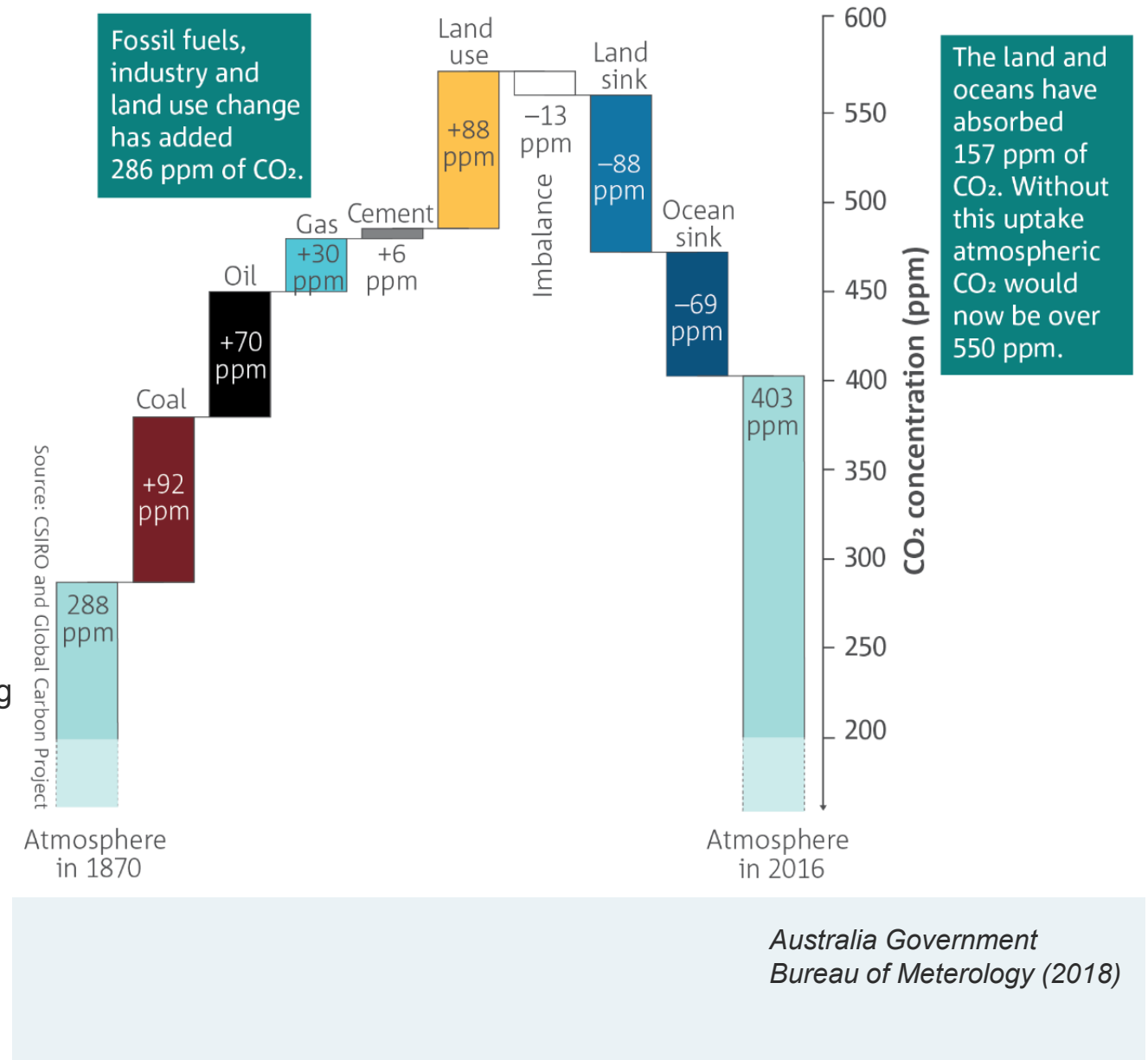
Null-Emission ist in einigen Bereichen **technisch nicht machbar** oder unverhältnismäßig.

Nicht vermeidbarer CO<sub>2</sub>-Überschuss muss durch Kohlenstoffsinken aus der Atmosphäre entfernt werden.

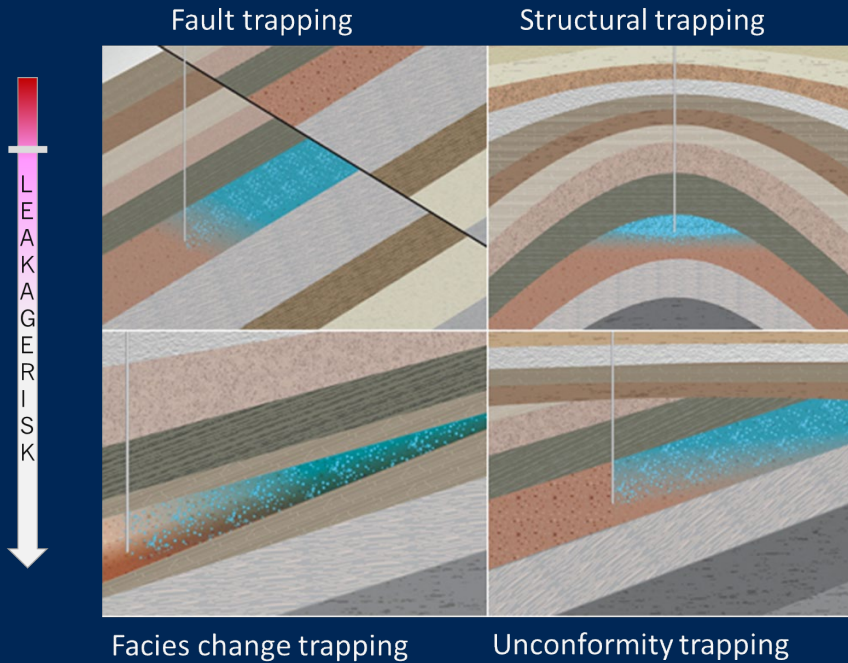
Zwei Arten von Senken:

- › Natürliche Senken, d.h. Biomasse wie Wald
- › Technische Senken, d.h. so genannte Negativemissionstechnologien wie Kohlenstoffabscheidung und -speicherung (CCS, chemische Verwitterung, etc.)

**Natürliche Senken werden in den knapp 30 Jahren, in denen wir unser Null-Emissionsziel erreichen wollen, voraussichtlich nicht ausreichen.**

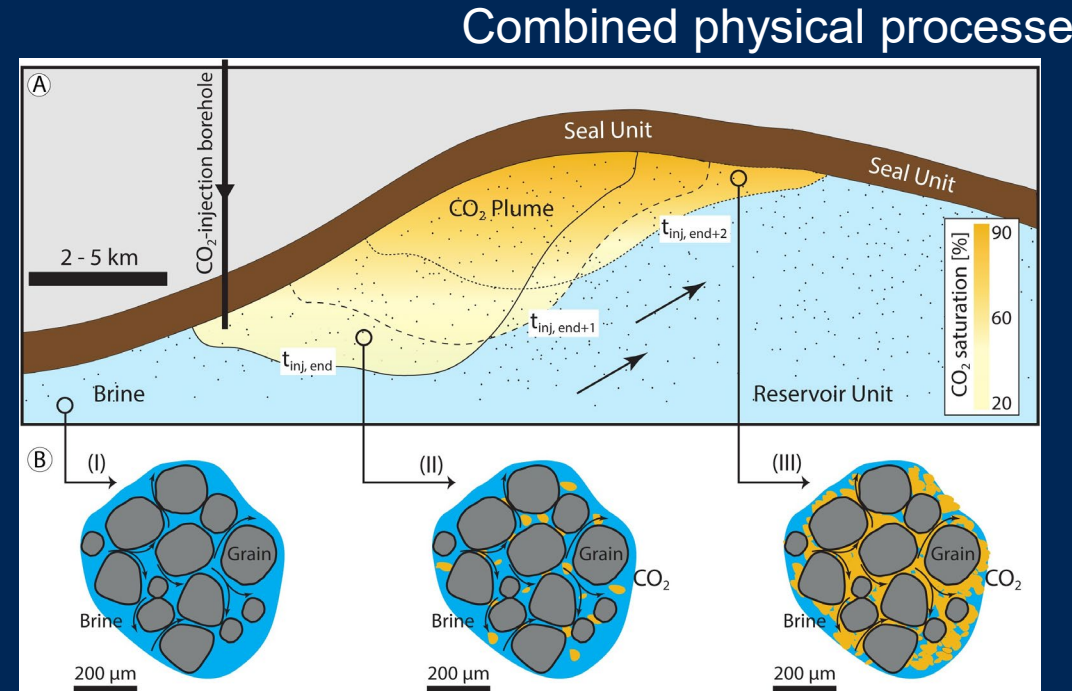


# PHYSICAL TRAPPING: STRUCTURAL & RESIDUAL



## Structural trapping

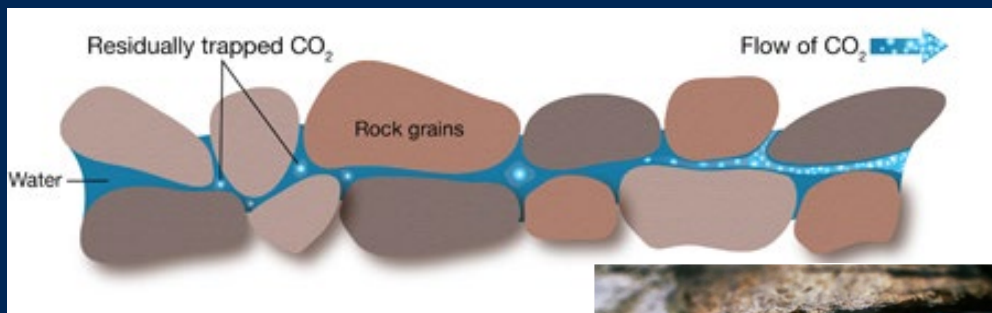
CO<sub>2</sub> attempts to move to the top of the reservoir (plume). Most of the CO<sub>2</sub> will remain as a **free phase**, with minor residual trapping along the flow path



Hefny et al. (2020)

## Residual trapping (“carbonated water”)

CO<sub>2</sub> can be prevented from moving directly upwards by the distribution of very low permeability rock layers within the reservoir. It therefore moves slowly with the formation water contacting a larger number of rock pores in which it can be **residually trapped**. Multiphase fluid flow. Residually trapped CO<sub>2</sub> will eventually dissolve in the formation water (chemical trapping)



CO2CRC

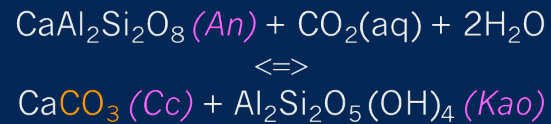




# CHEMICAL TRAPPING: SOLUBILITY & SEQUESTRATION

LEAKAGE RISK

CO2CaptureProject

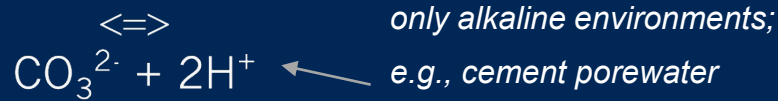


## Solubility trapping

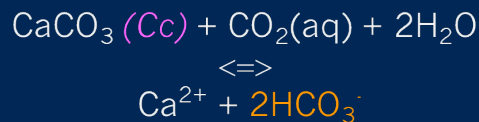
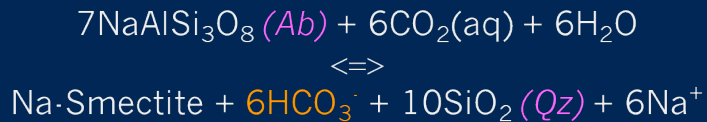
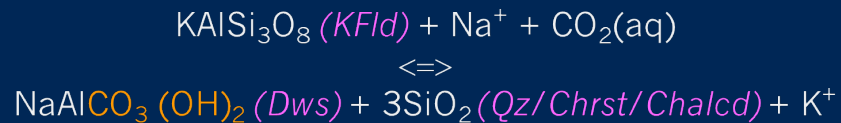
CO2 injection into large saline Formation of highly permeable rocks.

CO2 moves easily to the top of the reservoir, where it will plume beneath the caprock, eventually **dissolving into the formation brine**. There will be minor residual trapping.

The dense plume will move towards the bottom of the reservoir.



LEAKAGE RISK

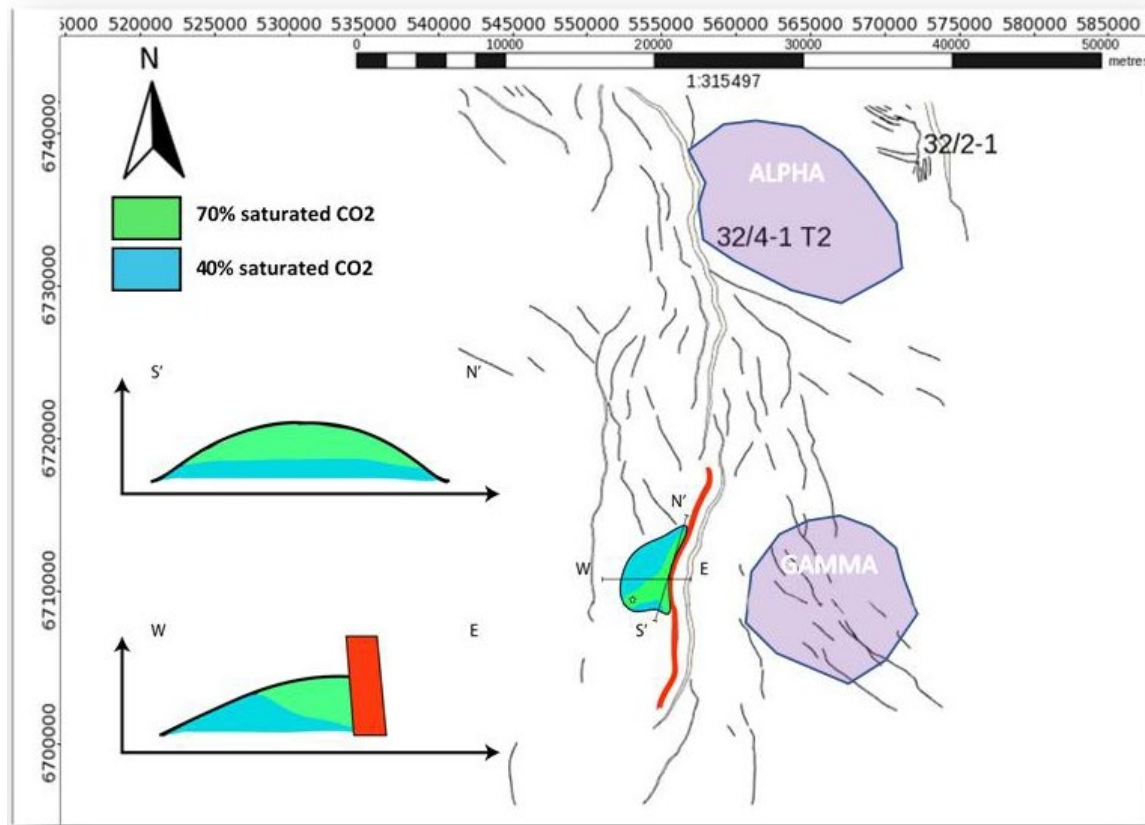


CO2CaptureProject



NaAlCO3(OH)2 (Dws)

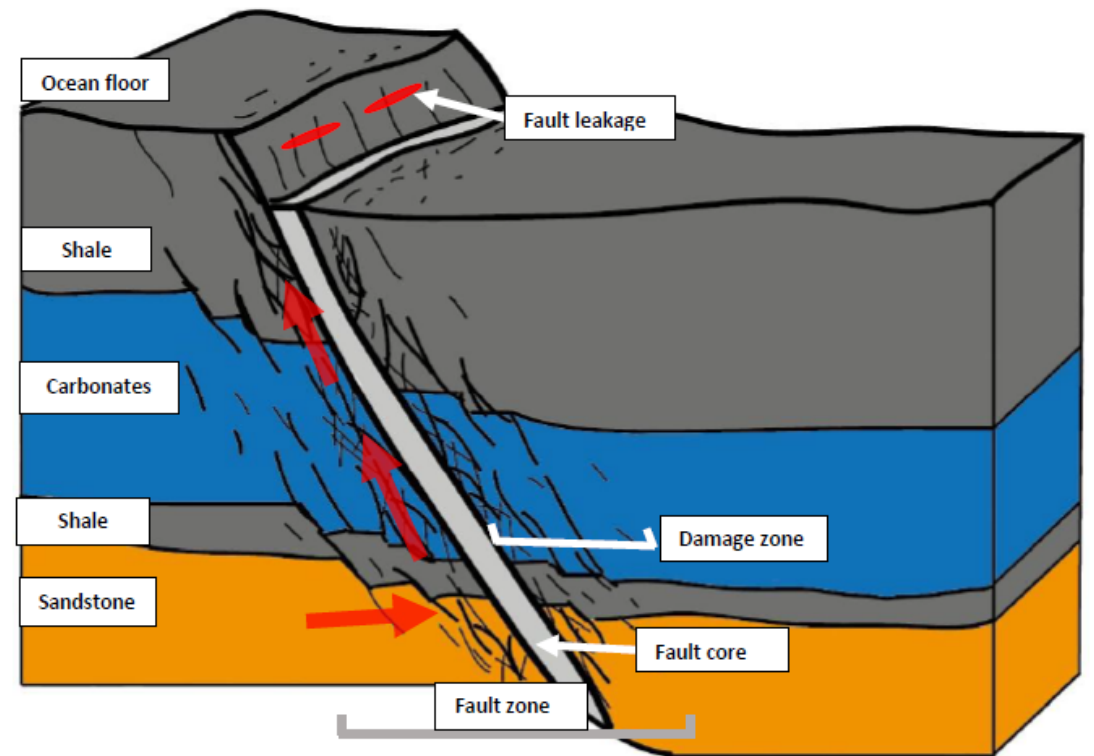
# LECKAGEN?



## “Worst case” CO2 fracture flow:

- leakage could occur after 1,200 years
- A leakage rate of 0.0016 ton/m<sup>2</sup>/year, over an estimated fault zone 35m wide x 1190m deep x 6000m long
- equal to 0.0017% of the total 20Mton assumed injected CO<sub>2</sub> in the model

To be effective as a climate change mitigation tool, CO<sub>2</sub> must be securely retained for 10,000 years with a leakage rate of below 0.01% per year of the total amount of CO<sub>2</sub> injected



"Wenn Sie  
mich fragen, will  
ich das **CO<sub>2</sub>** lieber  
im Boden als in  
der **Atmosphäre**  
**haben**"

[Robert Habeck, 05.01.23.]



-der Hintergrund wurde aufgrund fehlender Bildrechte entfernt-



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VIELEN DANK FÜR IHRE  
AUFMERKSAMKEIT