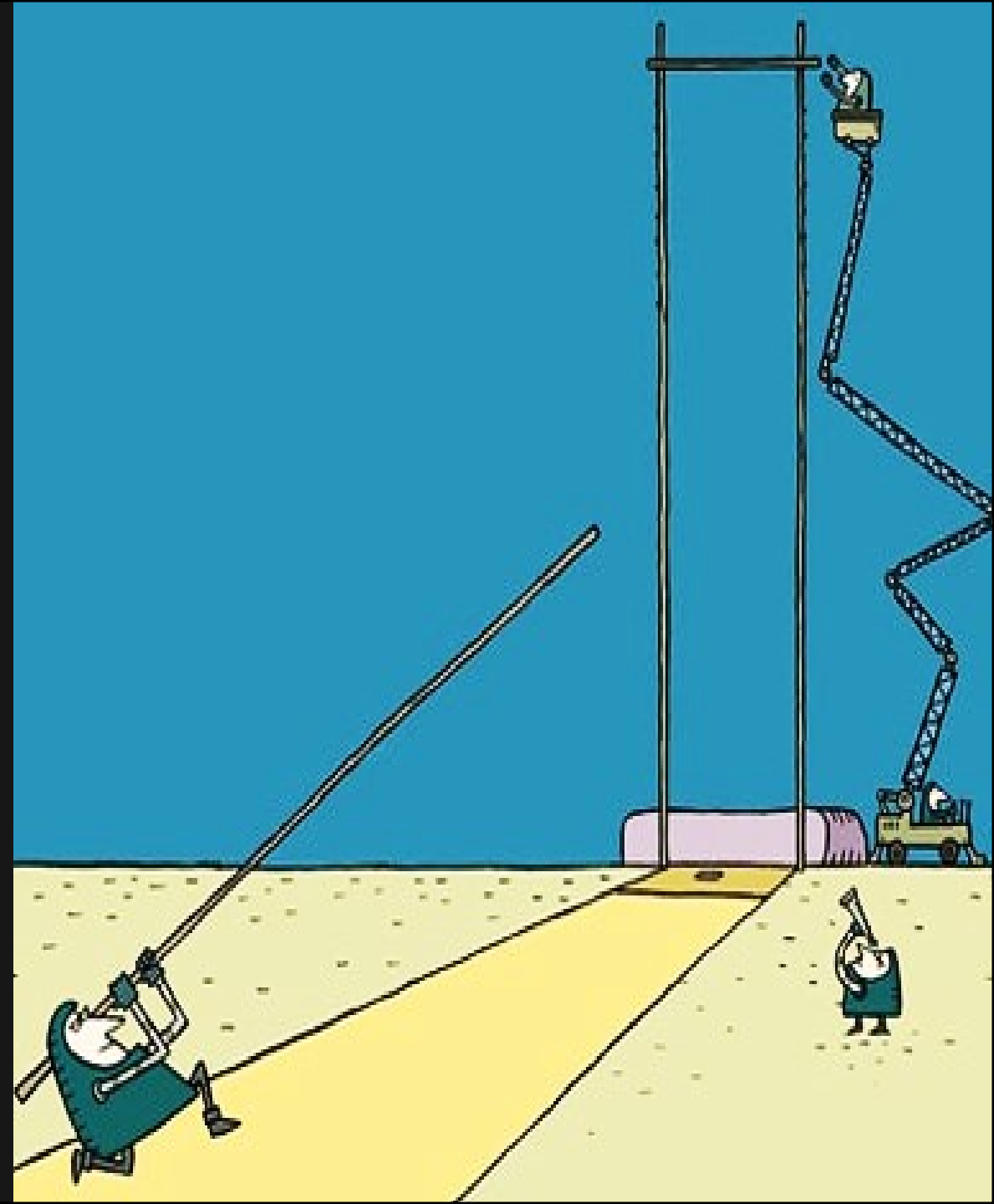
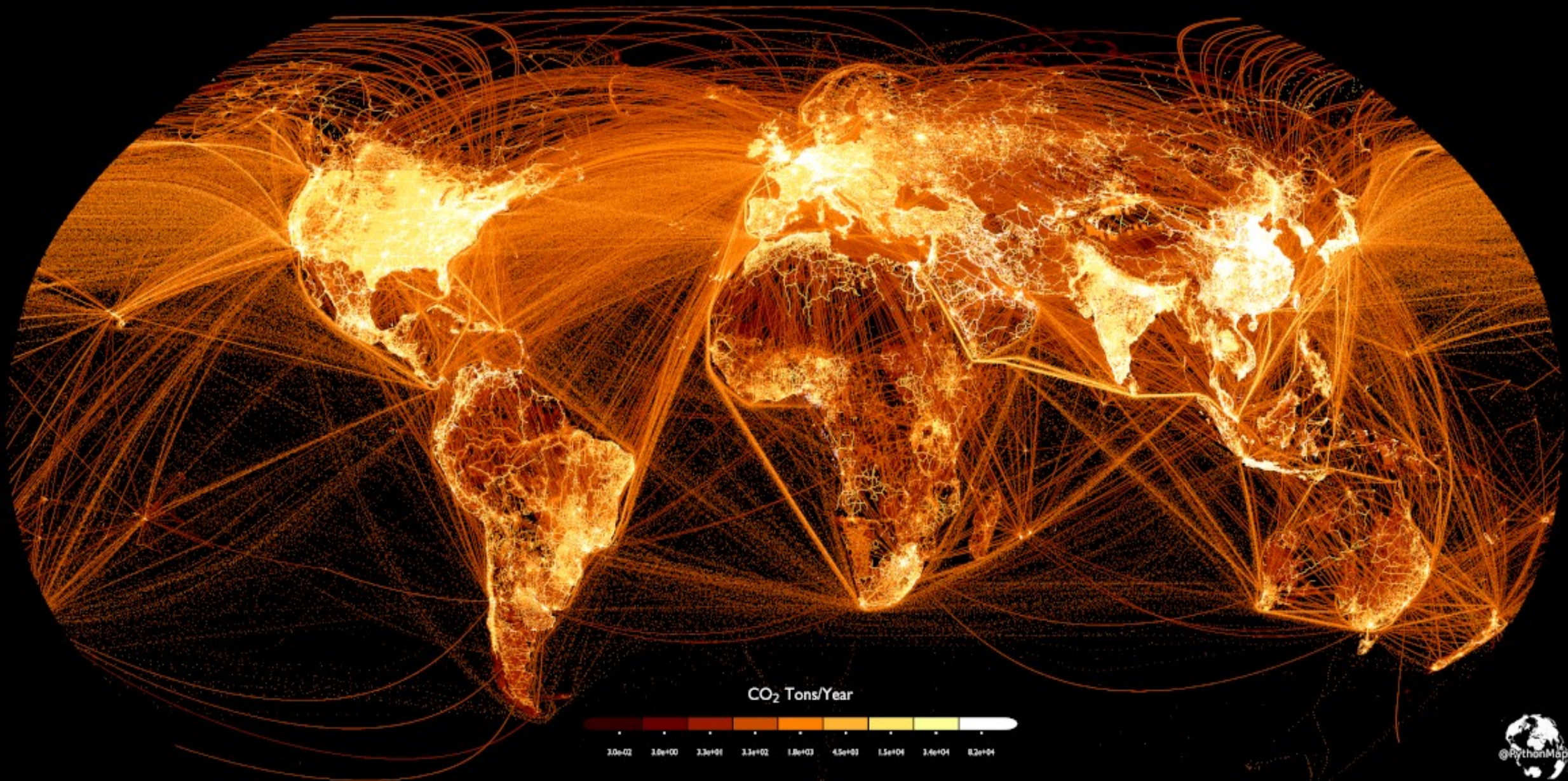




# What is the limit for organic carbon accrual in Israel's soils?

- David Yalin
- William Mielwa
- Eyal Rotenberg
- Dan yakir
- Jose Grunzweig





CO<sub>2</sub> Emissions. @PythonMaps

This map shows the world's CO<sub>2</sub> emissions and shows tonnes of CO<sub>2</sub> within 0.1x0.1 degree grid tiles in 2018.

Data source - [https://edgar.jrc.ec.europa.eu/dataset\\_ghg60](https://edgar.jrc.ec.europa.eu/dataset_ghg60)



# 4 PER 1000

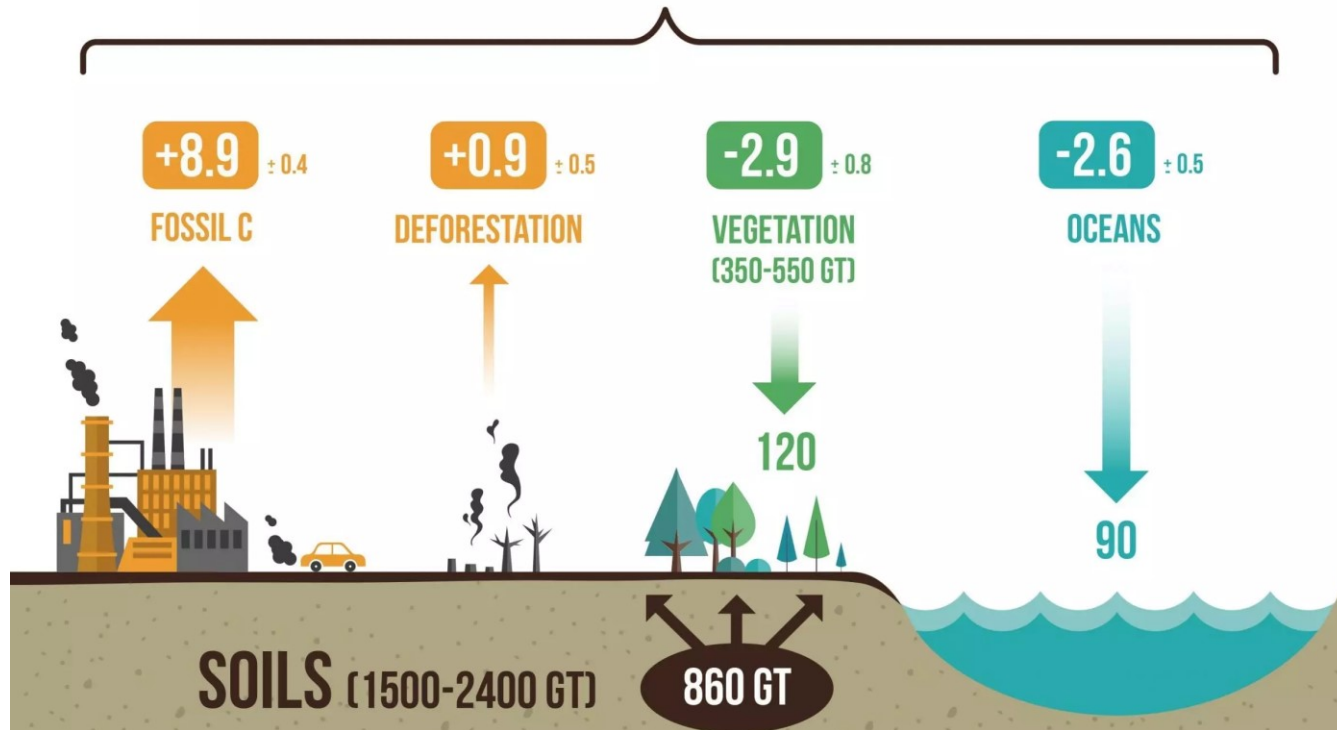
## WHERE DOES IT COME FROM ?

ATMOSPHERE (829 GT)

NET FLUXES EARTH/ATMOSPHERE (GT CY<sup>-1</sup> = PG CY<sup>-1</sup>)

+4.3 ± 0.1

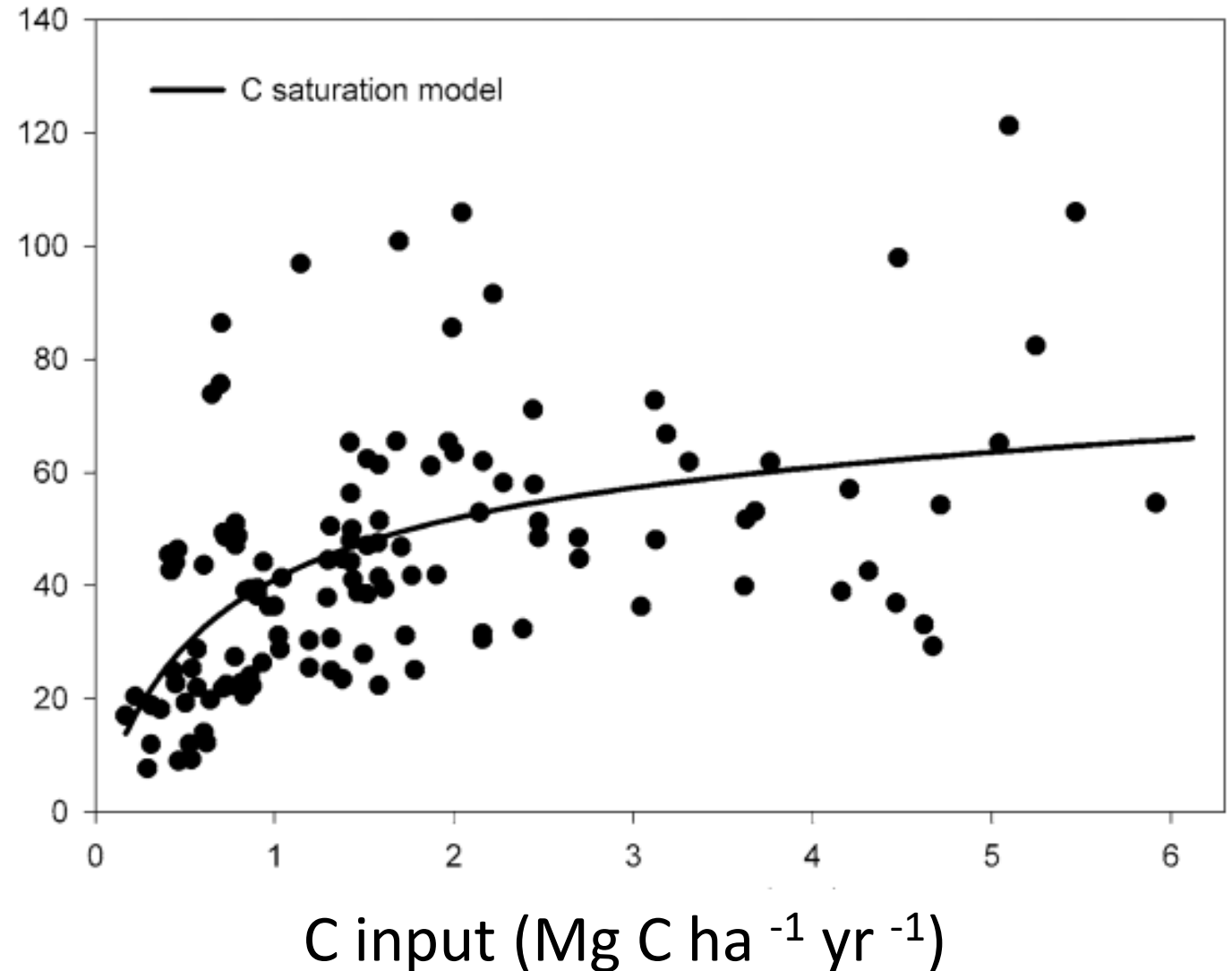
An annual increase of 4 % of the world soil surface C stocks

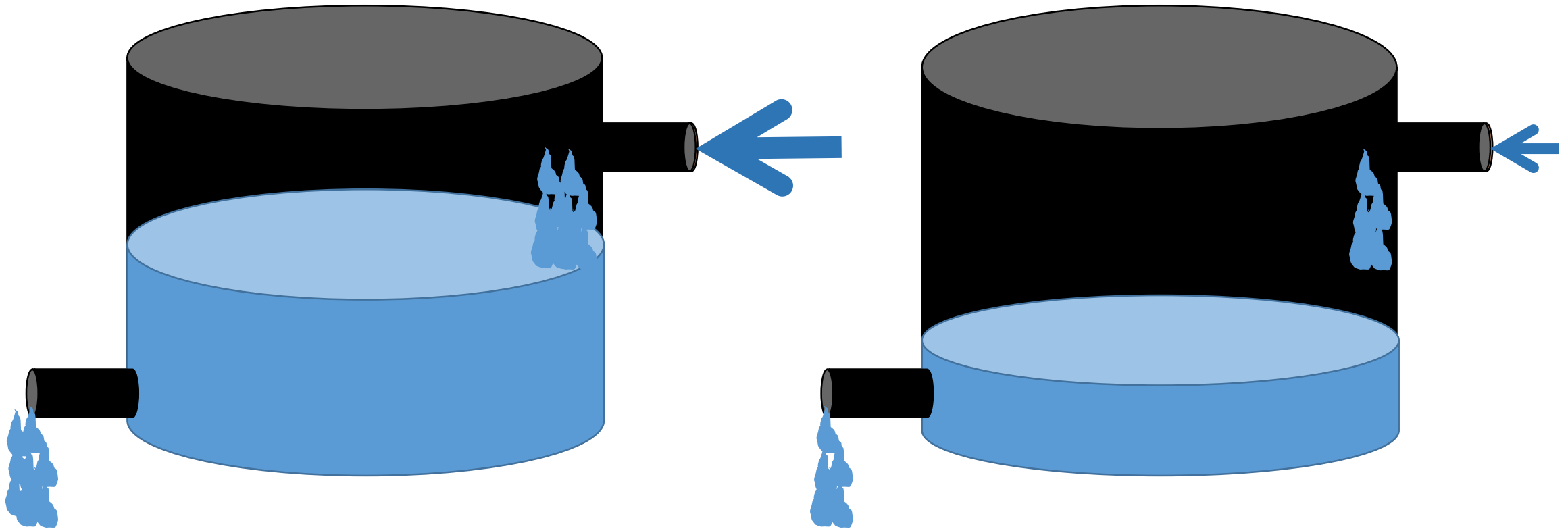


An annual increase of 4 % of the world soil surface C stocks (860\*0.004) would nearly compensate the annual CO<sub>2</sub> increase of the atmosphere

# Can we sustain annual increases?

SOC at  
steady-state  
(Mg C ha<sup>-1</sup>)





## Two limits

- 1) Steady state:  $\text{output} = \text{input}$
- 2) Storage capacity

# Back to the ground

Storage = mineral association

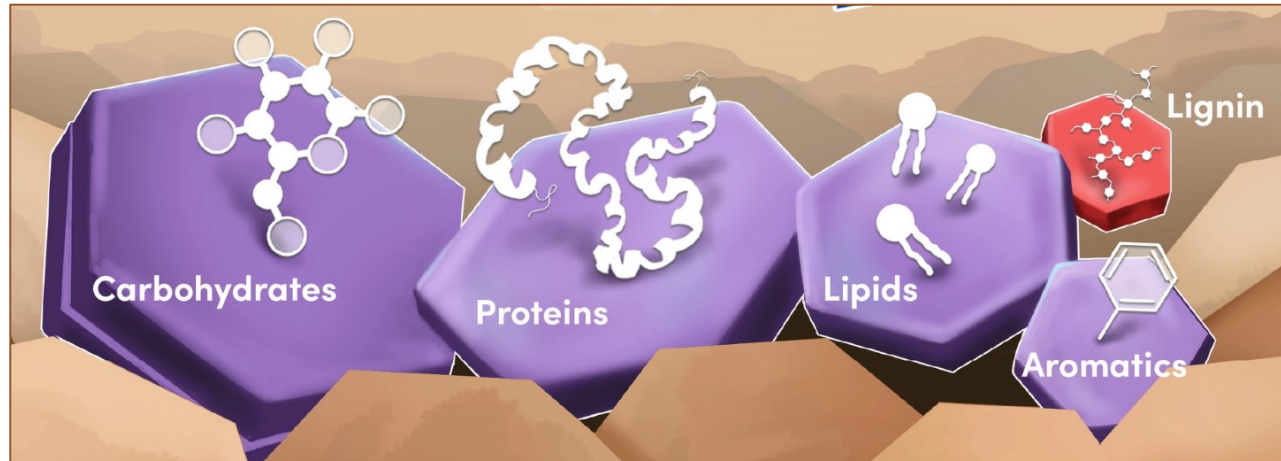


Image: Whalen et al., 2022. Glob Chang Biol.

Size  
fractionation

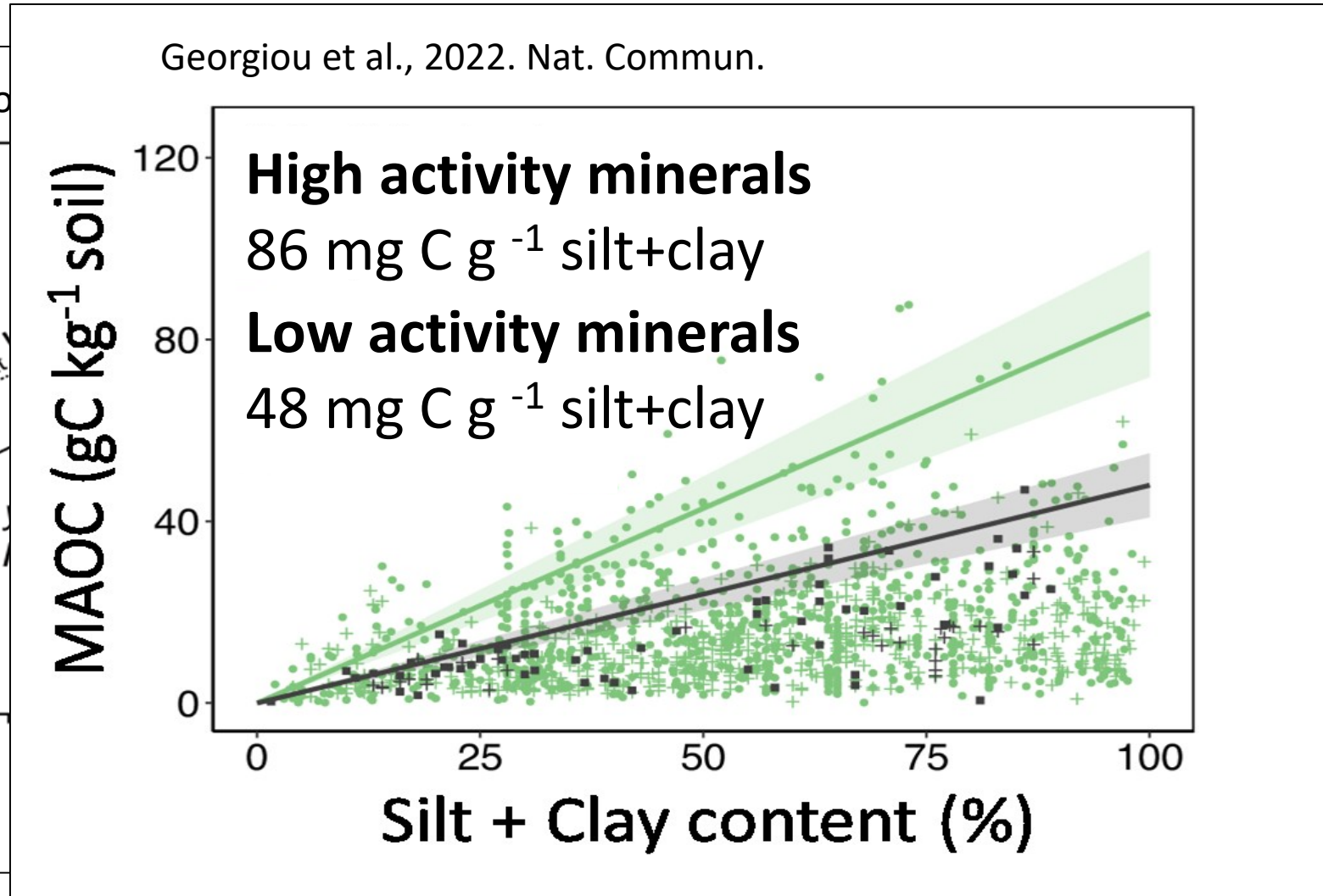
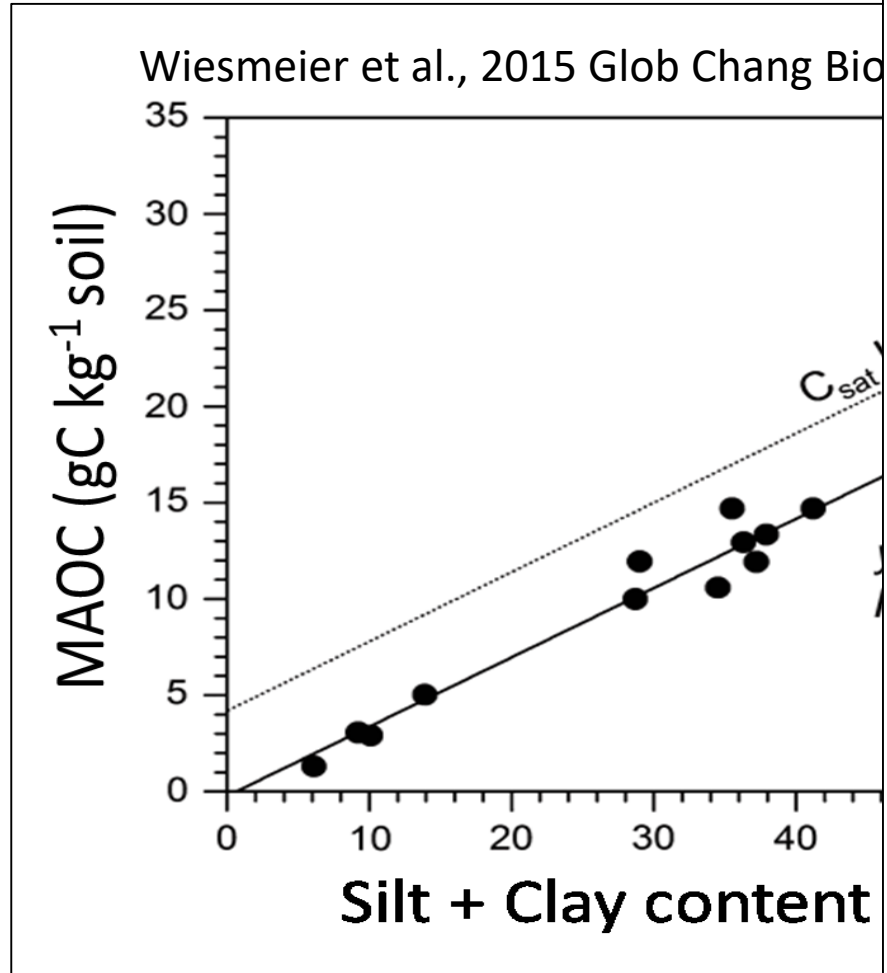


MAOC

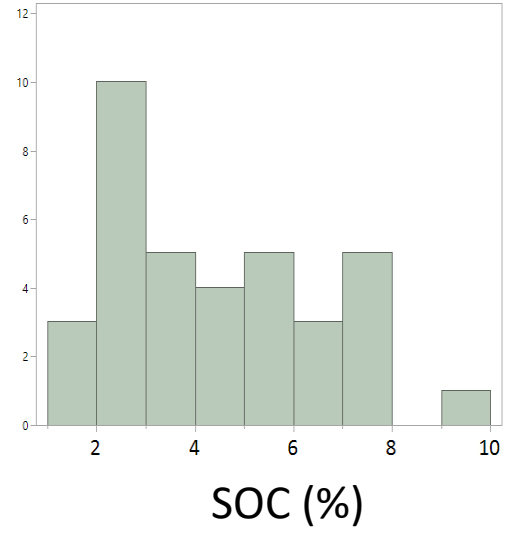
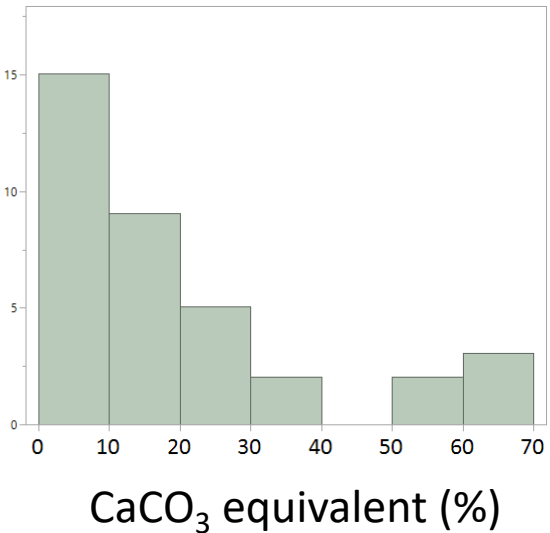
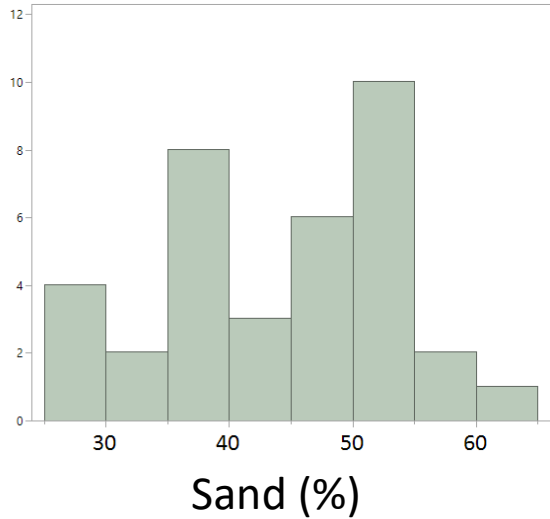
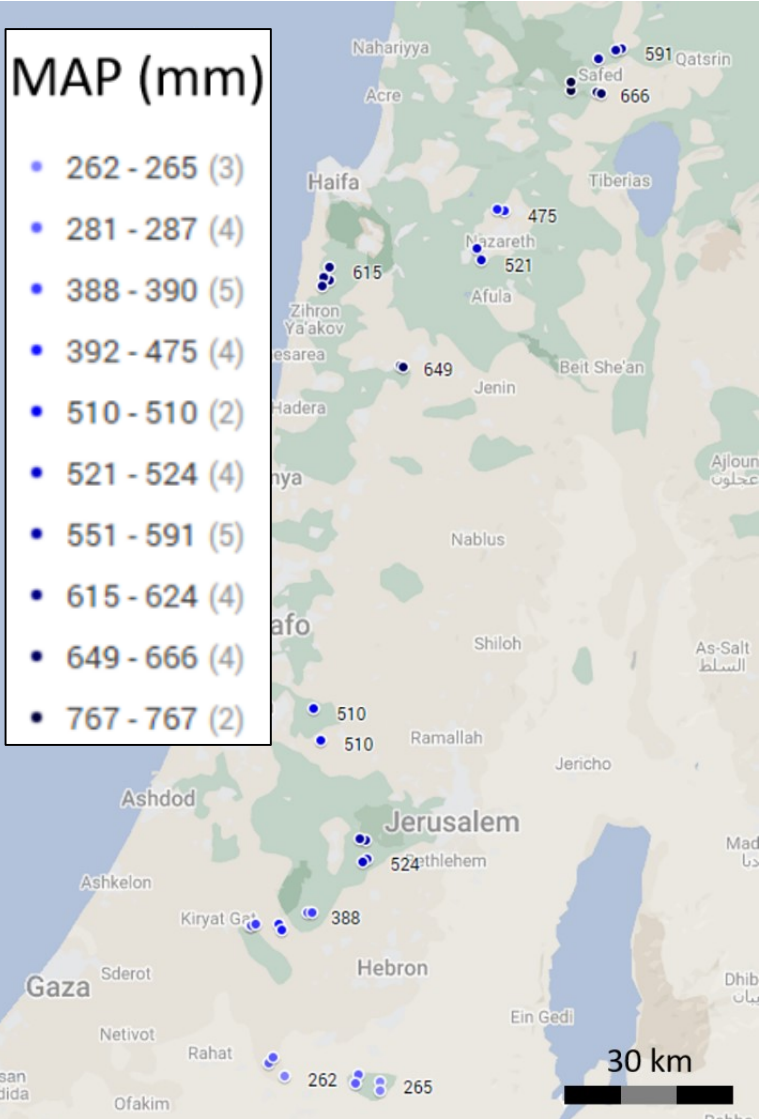
POC

# How big is the association capacity?

Storage = mineral association



# What is the limit – storage or steady state?!





# What is the limit – storage or steady state?!



Aleppo pine forests planted 1950-1970

Yatir  
287 mm yr<sup>-1</sup>

Shahariya  
390 mm yr<sup>-1</sup>

Biriya  
591 mm yr<sup>-1</sup>

Limonim  
666 mm yr<sup>-1</sup>

Sampling top-soil organic horizon

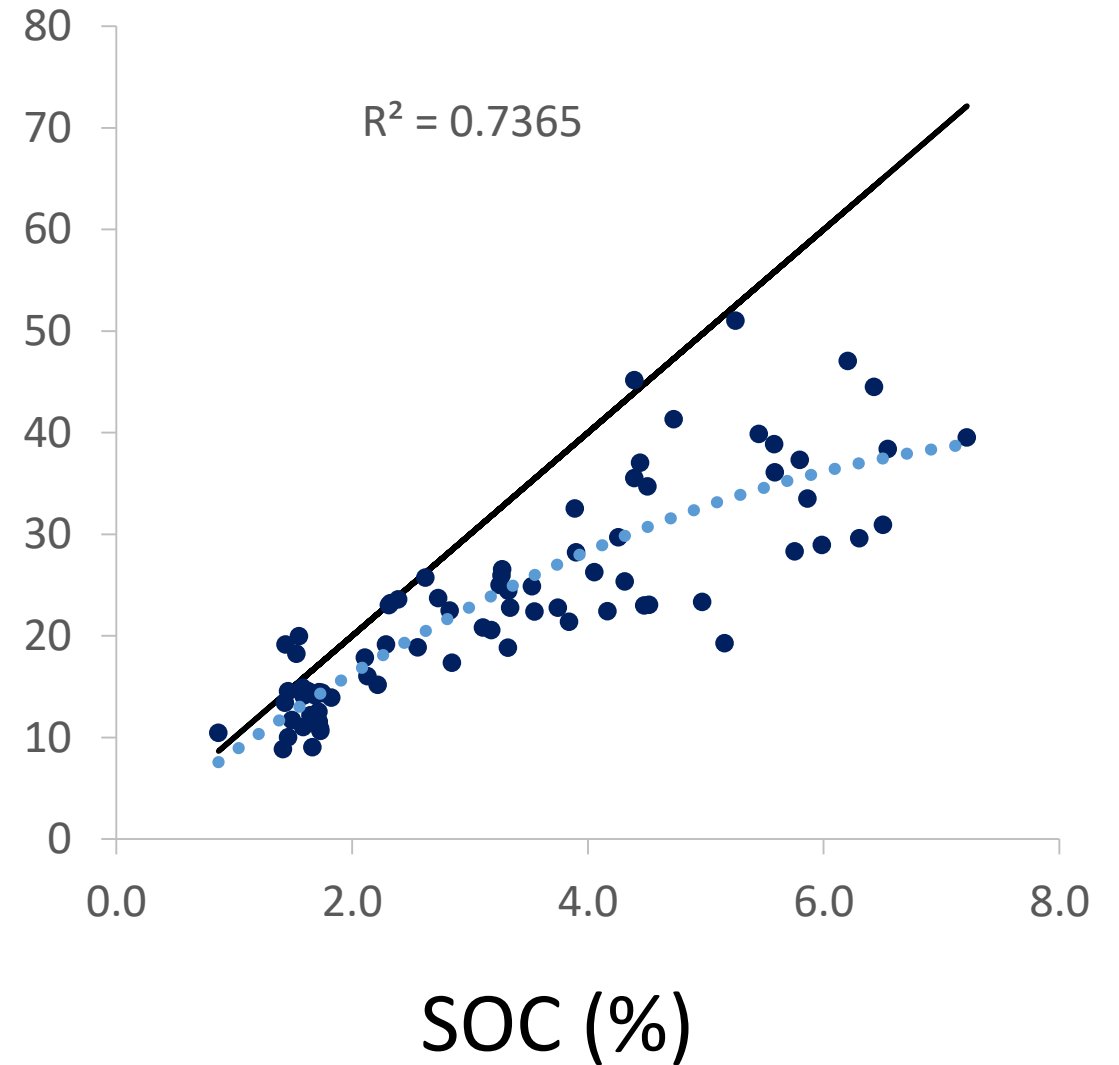


Forested

Non-forested

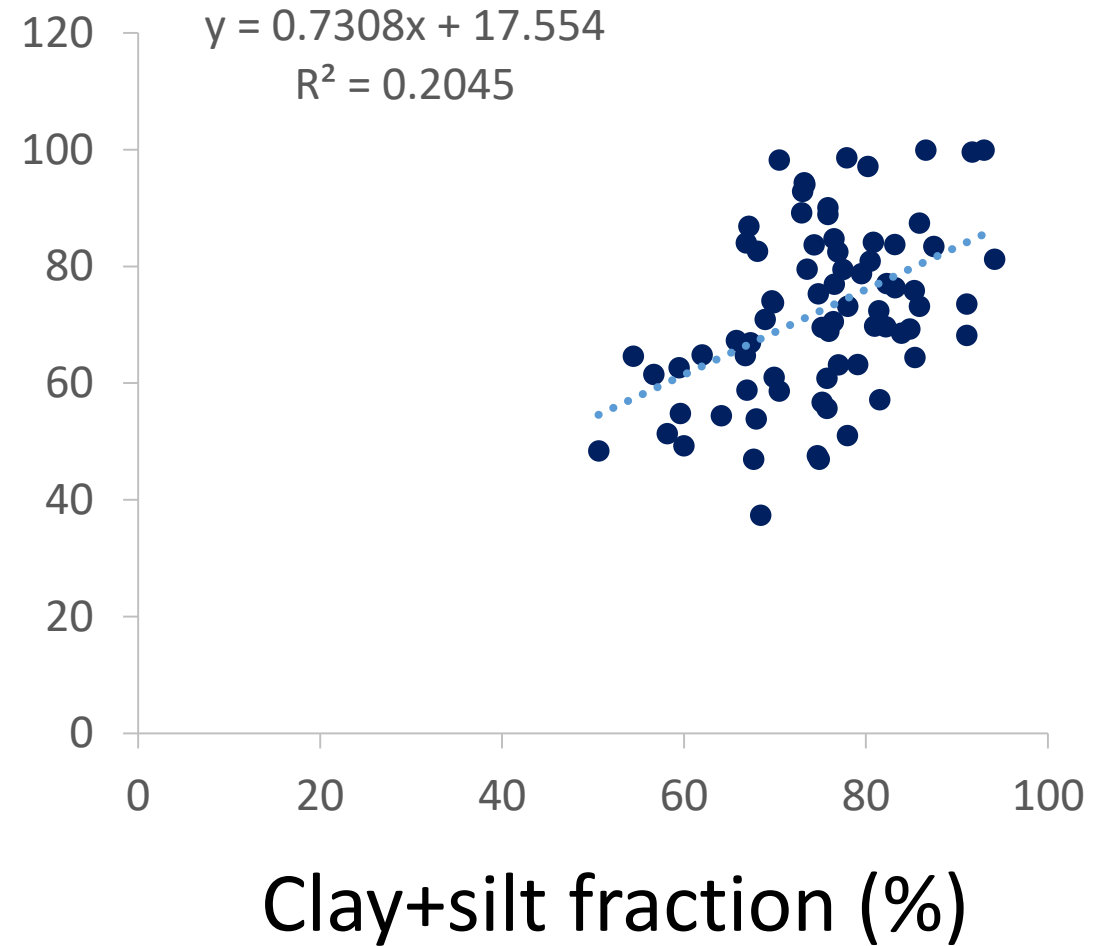
# Mineral association at 0-10 cm depth

MAOC  
(g C kg<sup>-1</sup> soil)



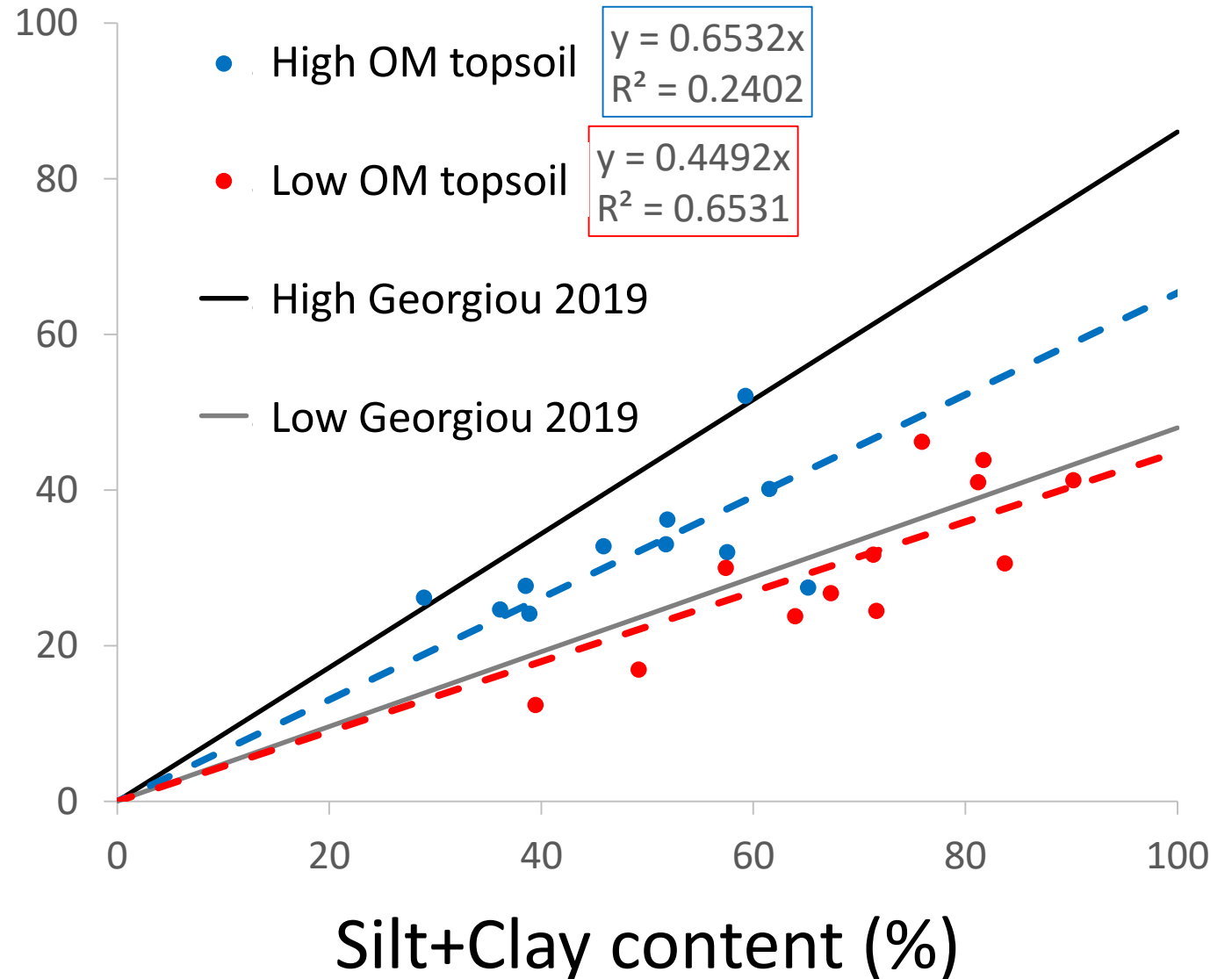
# Mineral association at 0-10 cm depth

MAOC/SOC  
(%)



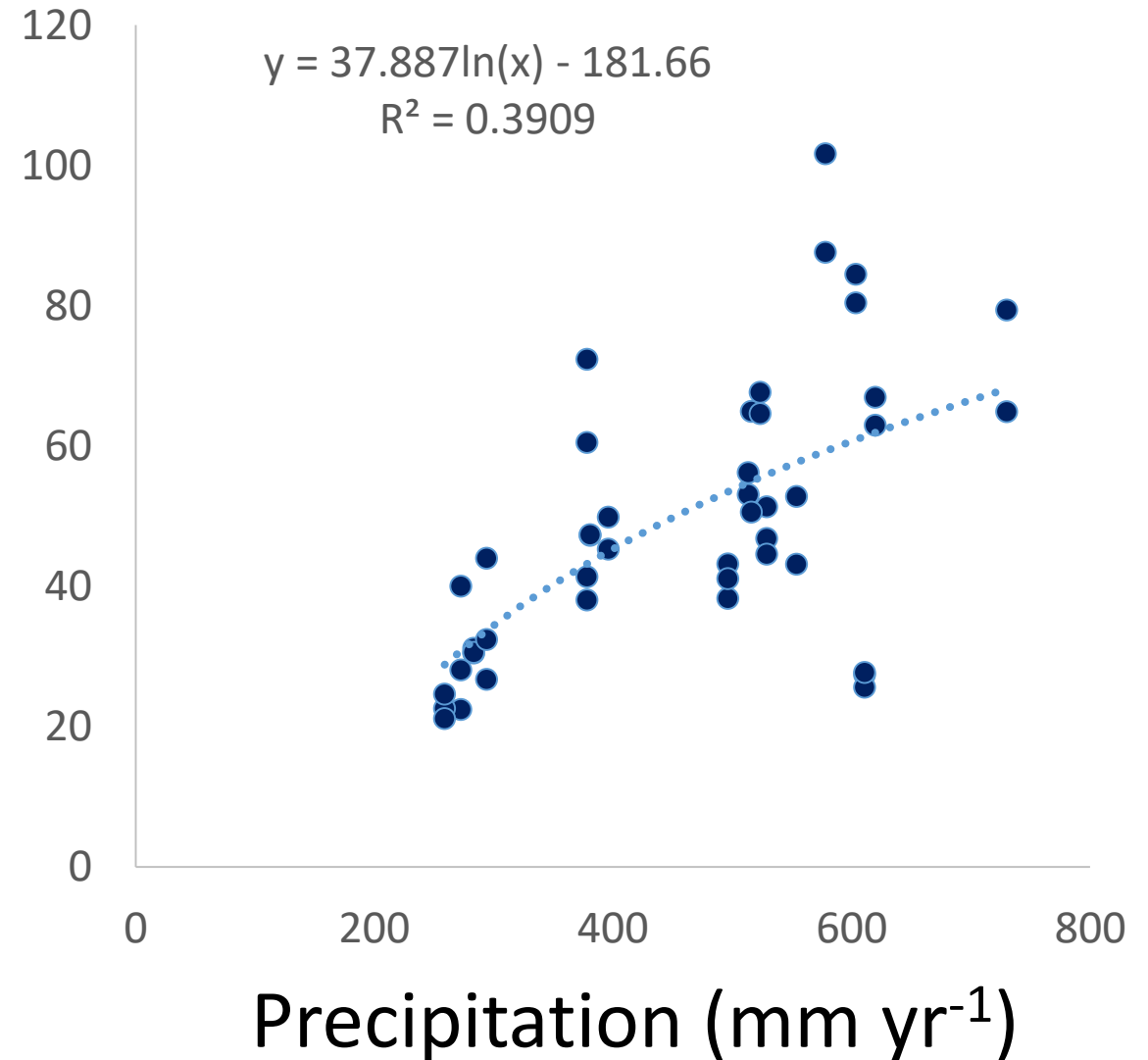
# Carbon carrying capacity by top-soil

MAOC  
(g C kg<sup>-1</sup> soil)



# Mineral association at forest 0-10 cm depth

MAOC/Capacity  
(%)

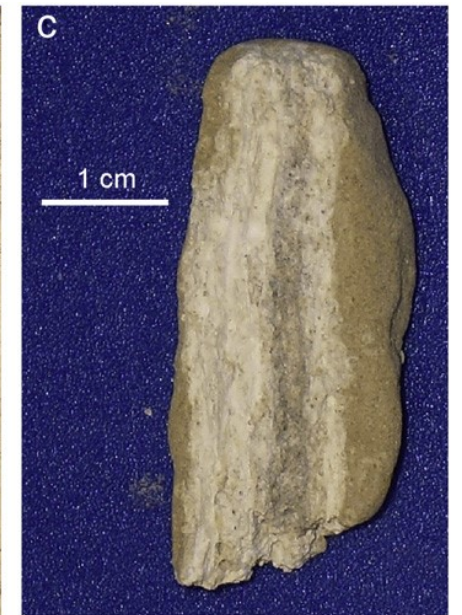


# Other storage possibilities?!

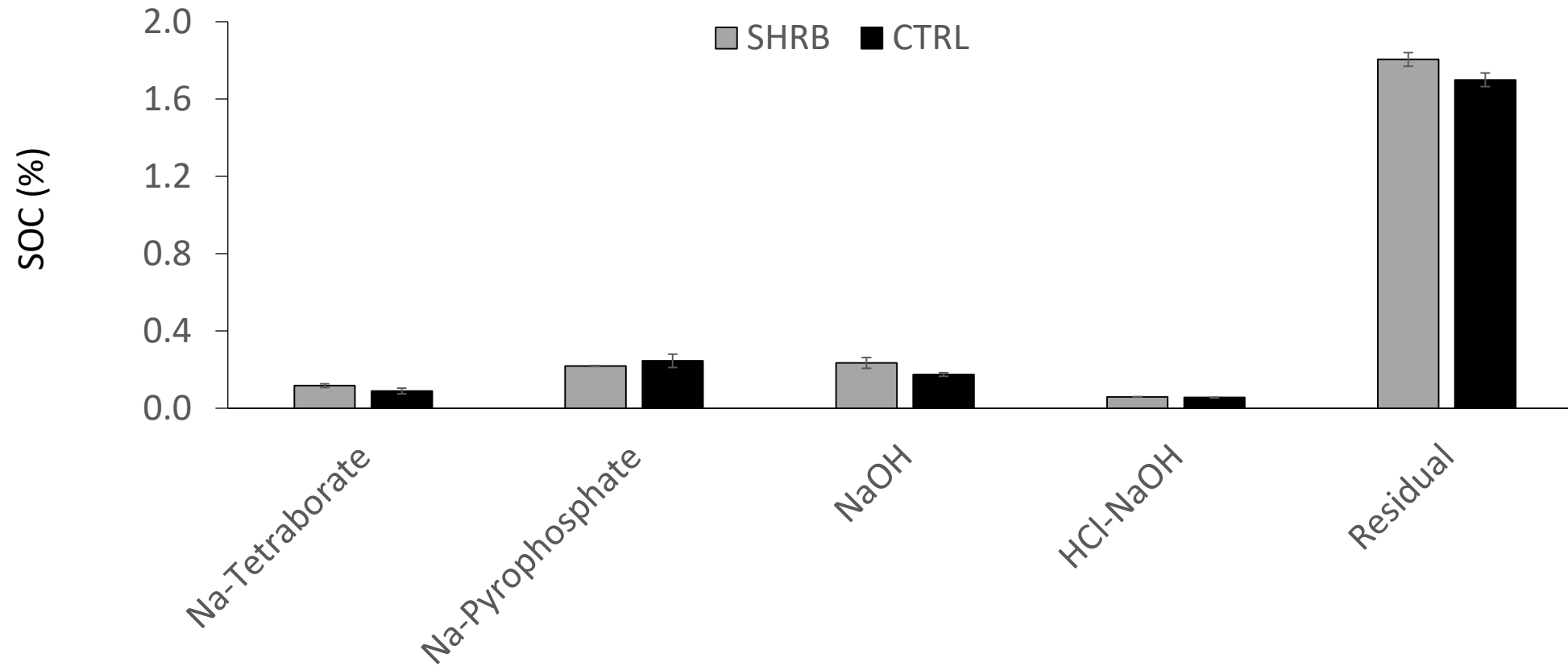
$$SOC_{capacity} = a \times HA\ clay + b \times LA\ clay + Pyr + Ocl$$

Pyrogenic OC

Occluded by  $CaCO_3$



# The possibility of another stable non-MAOM pool



# Implications for agriculture

1. There are limits to SOC accrual
2. The accrual of MAOC may reach saturation
3. Other storage options to be explored

Thank you!

