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Can earthworms increase inorganic carbon sequestration in an artificial environment?

Tullia Calogiuri[1,2], Mathilde Hagens[2], Jan Willem van Groenigen[1], Alix Vidal[1]

[1]Soil Biology Group, Wageningen University & Research, Wageningen, the Netherlands

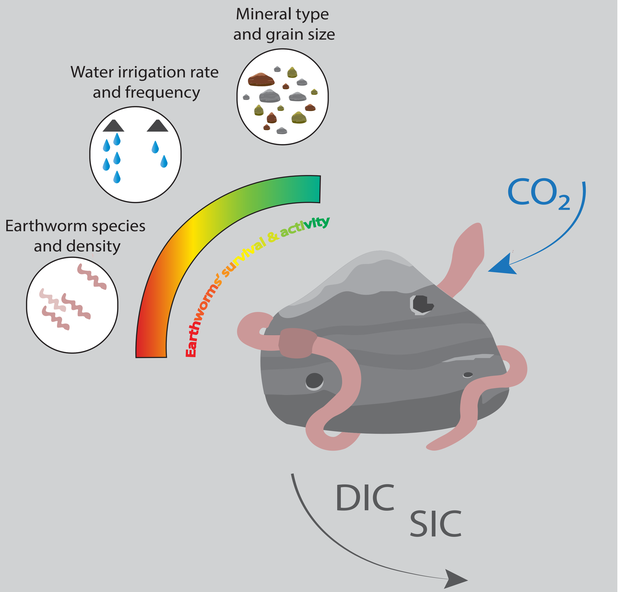
[2]Soil Chemistry and Chemical Soil Quality Group, Wageningen University & Research, Wageningen, the Netherlands

Background

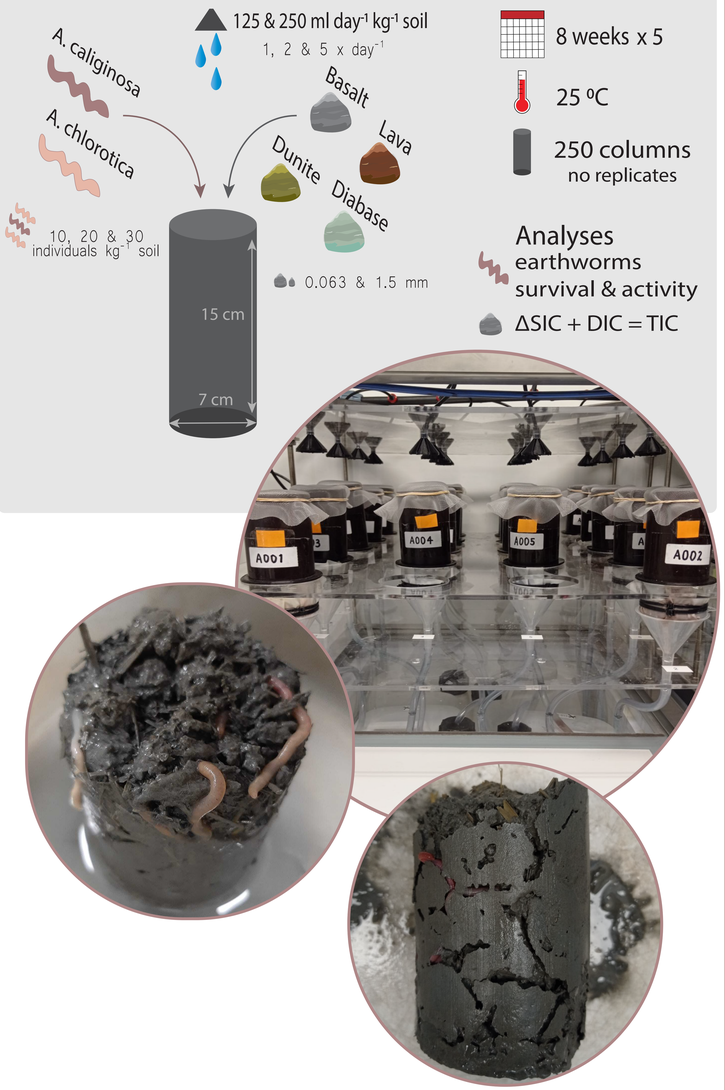
Enhanced Silicate Weathering (ESW) is a promising Carbon Dioxide Removal technology.
Earthworms have been shown to increase nutrient release from minerals, an indication of their potential to increase weathering rates and to promote inorganic carbon (IC) sequestration.

Objectives

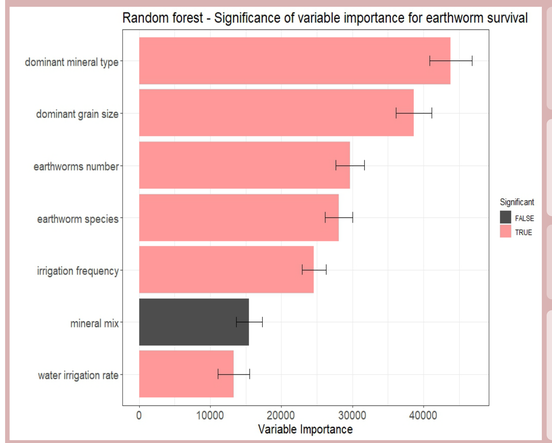
We aim at accelerating ESW rates through earthworm activity in an organo-mineral system.



Materials & Methods



Results & Discussion



All the variables considered were significant for earthworm survival, except from the mixture of minerals and/or grain sizes

Earthworm activity was mainly driven by mineral grain size and type, followed by earthworm number, watering frequency and irrigation rate

Our random forest model explained 28% of the variation in the data for both survival and activity

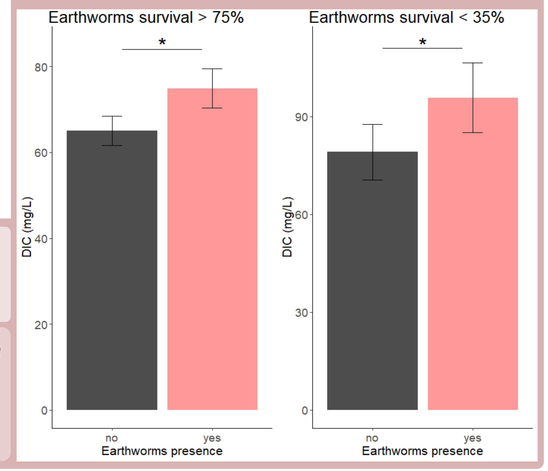
Earthworms can survive and remain active in an artificial system depending on earthworm species and density and by using a certain mineral composition and watering regime

Earthworms tended to increase DIC concentrations, especially *A. chlorotica*

A combination of basalt and lava with a mixture of fine and coarse grain sizes increased DIC concentrations together with an irrigation rate of 125 ml day^{-1} kg^{-1} soil

Both EW survival rate > 75% and < 35% increased DIC concentrations compared to treatments without earthworms

Both alive and dead earthworms contribute to increasing inorganic carbon sequestration through direct and indirect effects



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