

The response of soil microbes and soil carbon to warming in tropical forests

Location:
Kospiñata transect,
Peruvian Andes

Method:
Moving soil cores down elevation simulates warming - enabling the investigation of the response of soil microbes and soil carbon to be investigated

Tropical soil under warm conditions
Lowland tropical forest
200m elevation
26°C

Tropical soil under cool conditions
Montane cloud-forest
3000m elevation
11°C

1 cm deep organic horizon

91% stable soil carbon

Fast action soil microbial community

Phosphorous limited

23cm deep organic horizon

52% stable soil carbon

Slow action soil microbial community

Nitrogen limited

Result:
4% decline in soil carbon for each 1°C increase

Translocation of soil cores across elevations

Further investigation is needed:
The **warming response of soil carbon in lowland tropical forest** is not yet evident

References:
Nottingham, A.T., Whitaker, J., Ostle, N.J., Bardgett, R.D., McNamara, N.P., Fierer, N., Salinas, N., Ccahuana, A.J., Turner, B.L. and Meir, P., 2019. Microbial responses to warming enhance soil carbon loss following translocation across a tropical forest elevation gradient. *Ecology letters*, 22(11), pp.1889-1899.
Nottingham, A.T., Whitaker, J., Turner, B.L., Salinas, N., Zimmermann, M., Malhi, Y. and Meir, P., 2015. Climate warming and soil carbon in tropical forests: insights from an elevation gradient in the Peruvian Andes. *Bioscience*, 65(9), pp.906-921.

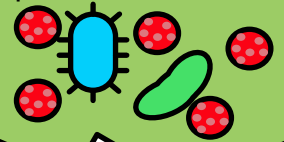
The role of microbes

Temperature Increase



Warming causes microbes to respond by increasing the use of soil carbon to increase microbial biomass and increase the activity of enzymes.

Also, there is a shift in the composition of the microbial community towards microbes that are more responsive to higher temperatures.



Soil microbes are integral to biochemical reactions in soil - including the degradation of soil organic matter

Nutrient constraints may enhance soil organic matter degradation

If demand exceeds the availability of nutrients in the soil, microbes will "mine" soil organic matter in order to gain access to more nutrients that were not readily available

Stimulates an overall **increase in microbial respiration**

Resulting in lower quantity of carbon in soil, having been respired into the atmosphere as CO₂

