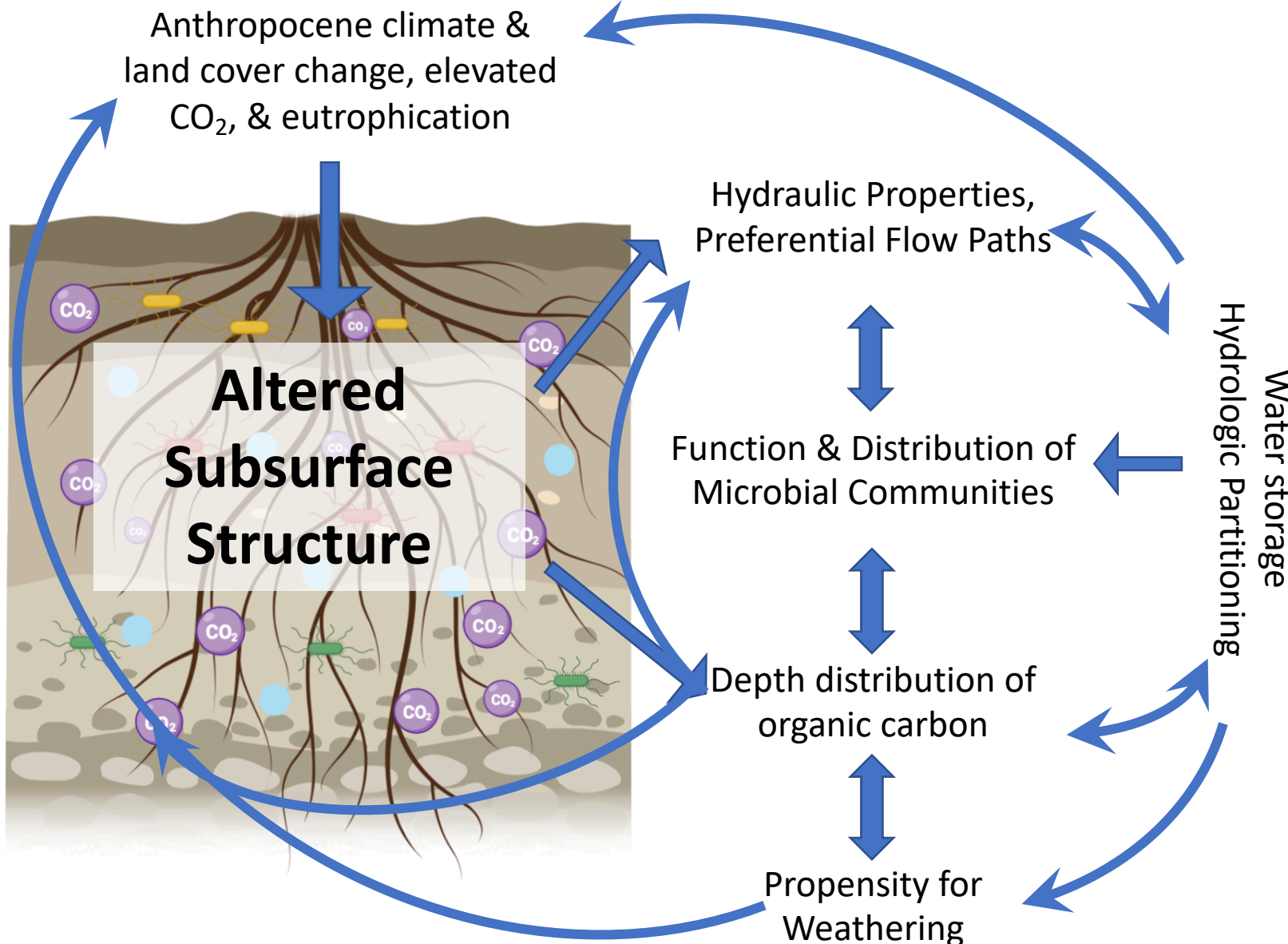


Is subsurface plumbing responding to climate and land use change in the Anthropocene?

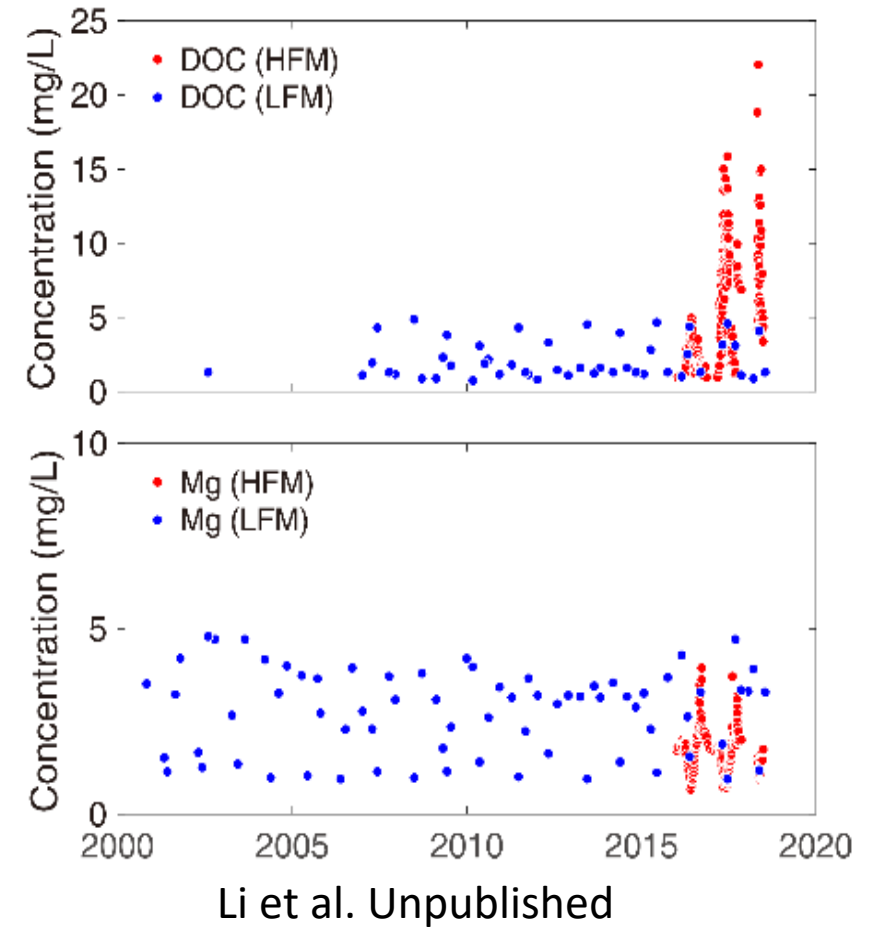
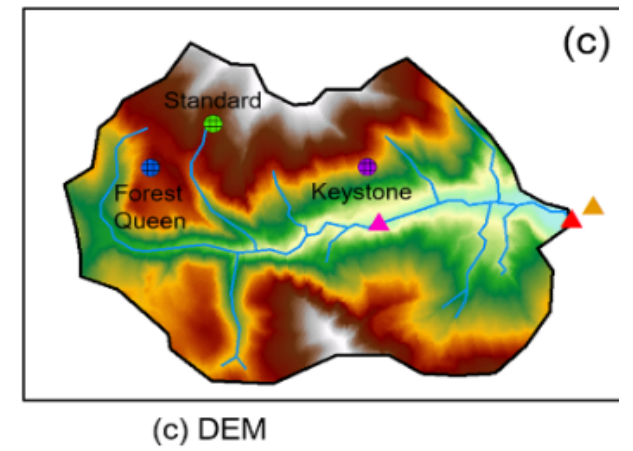
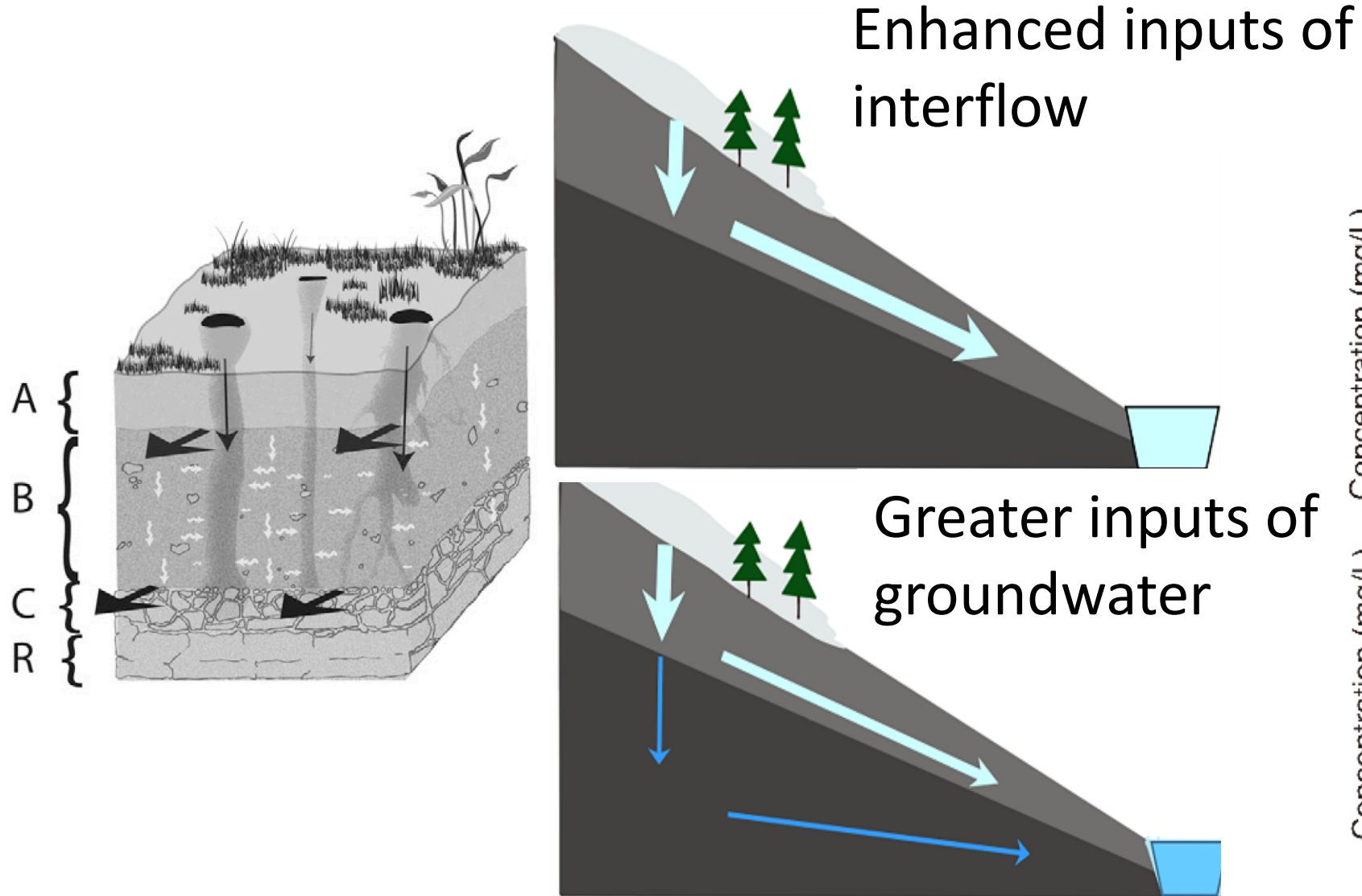
If so.... does it matter?



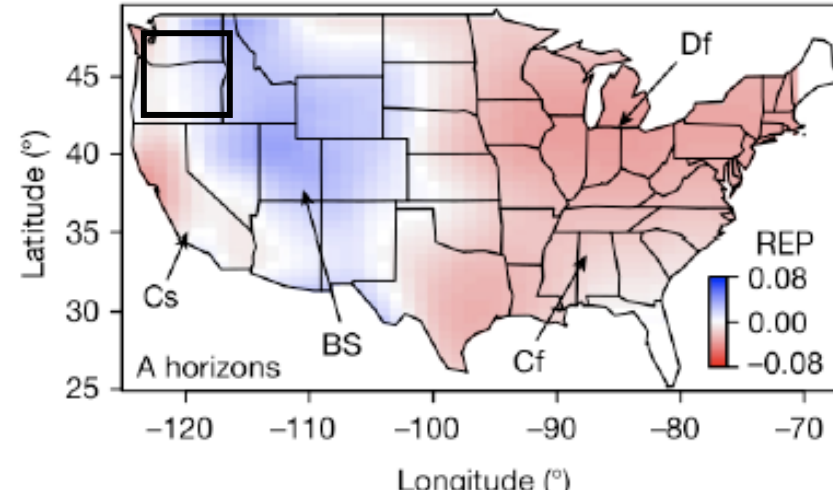
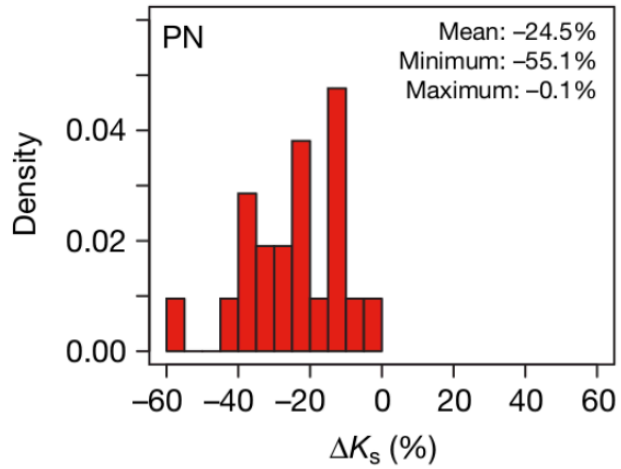
PL Sullivan¹, S Billings², D Hirmas³, L Li⁴, A Flores⁵, M Sena², H Wen⁴, M Okeson², C Nash⁵, L Souza², K Lang²

¹Oregon State University; ²University of Kansas; ³UC Riverside; ⁴Penn State; ⁵Boise State

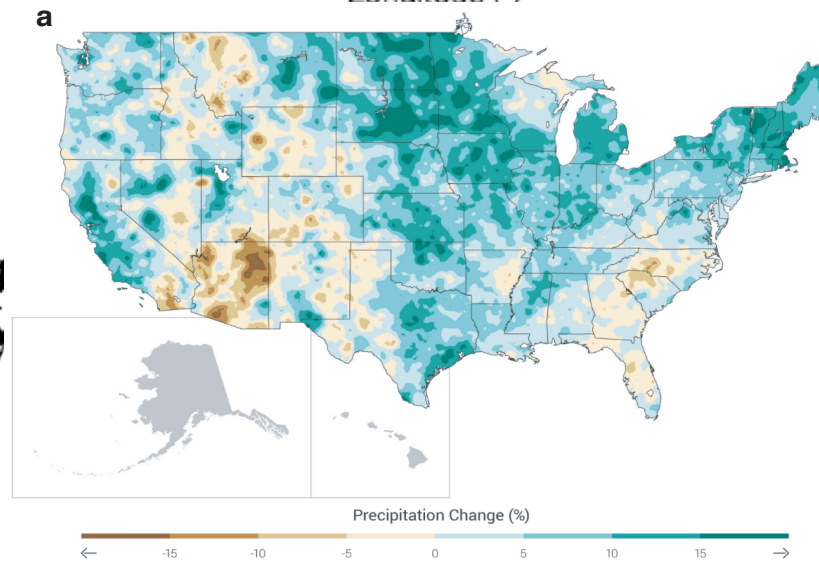
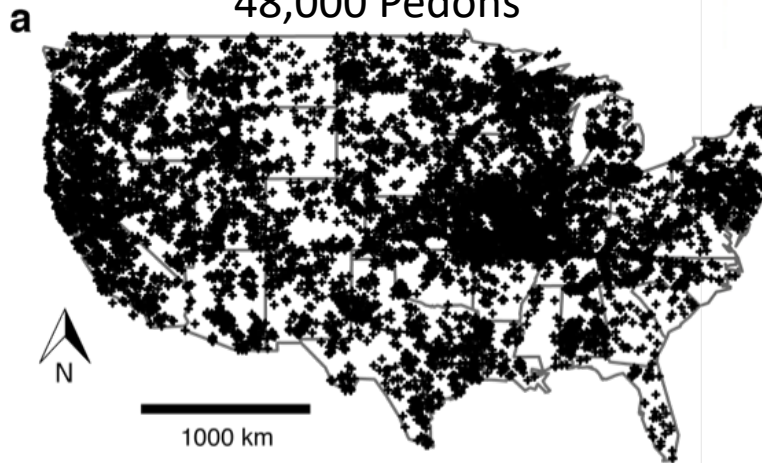
Changes in pore distributions can impact flow paths & thus water chemistry.



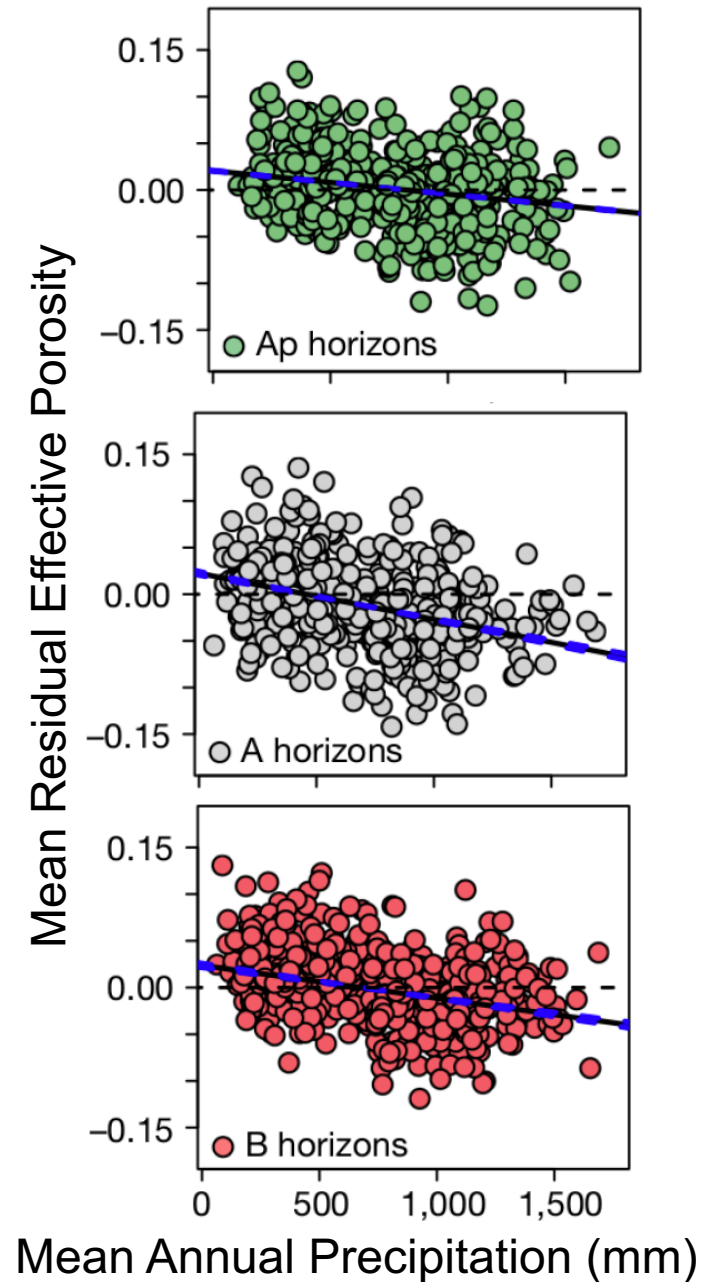
Soil structure is observed to be changing in the last ~50 years



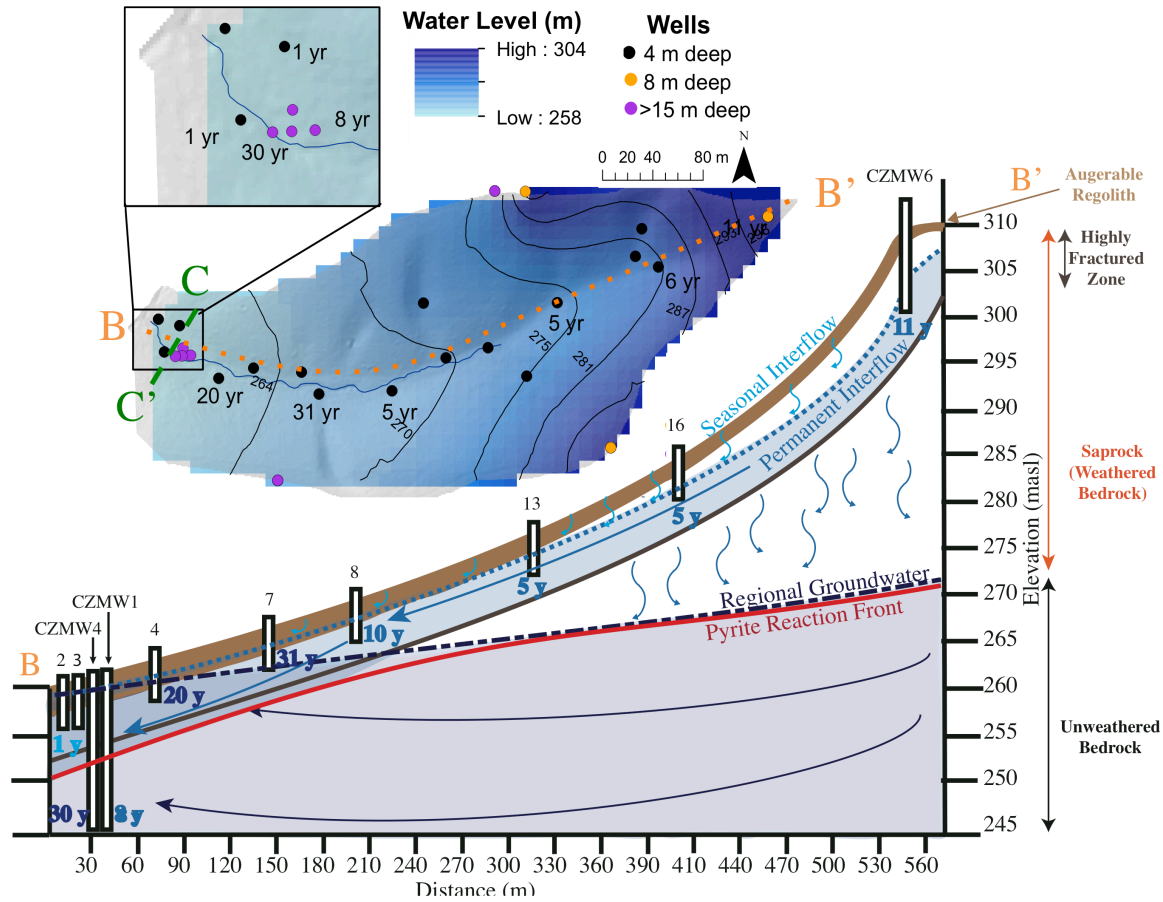
Natural Resource Conservation Service
Soil Data
~48,000 Pedons



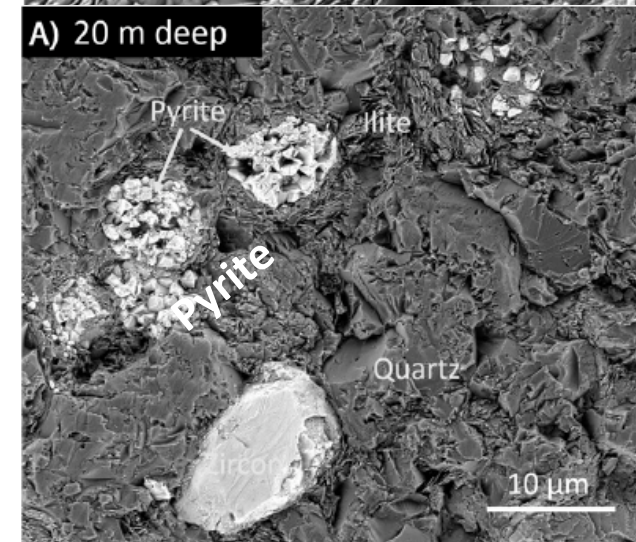
Hirmas et al. 2018



A. April 2014

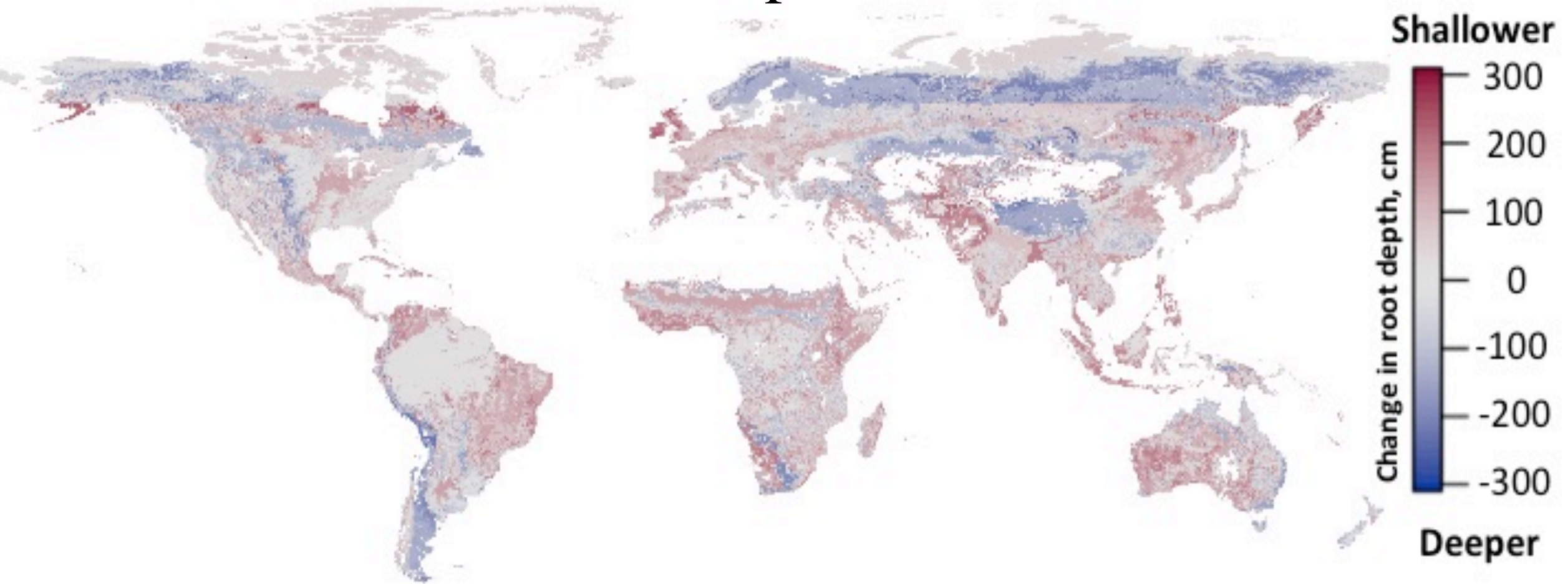


Pore structure at depth may also be sensitive to changes in the groundwater table



Sullivan et al. 2016

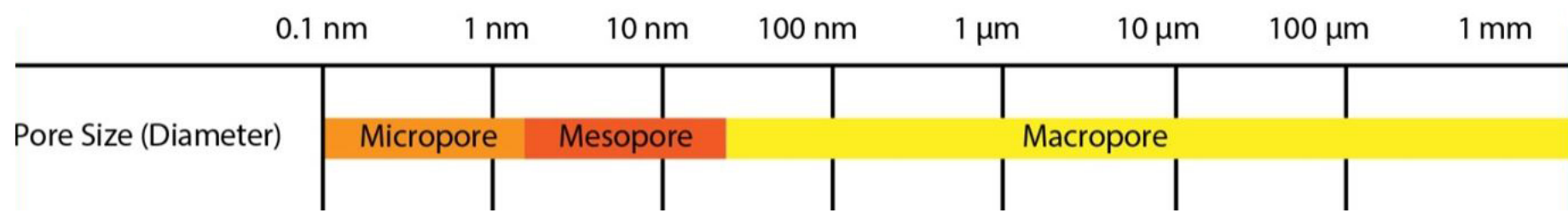
Root depth has globally been changing in the Anthropocene



Hauser et al. (In Review
PNAS; 2020; PhD Student)

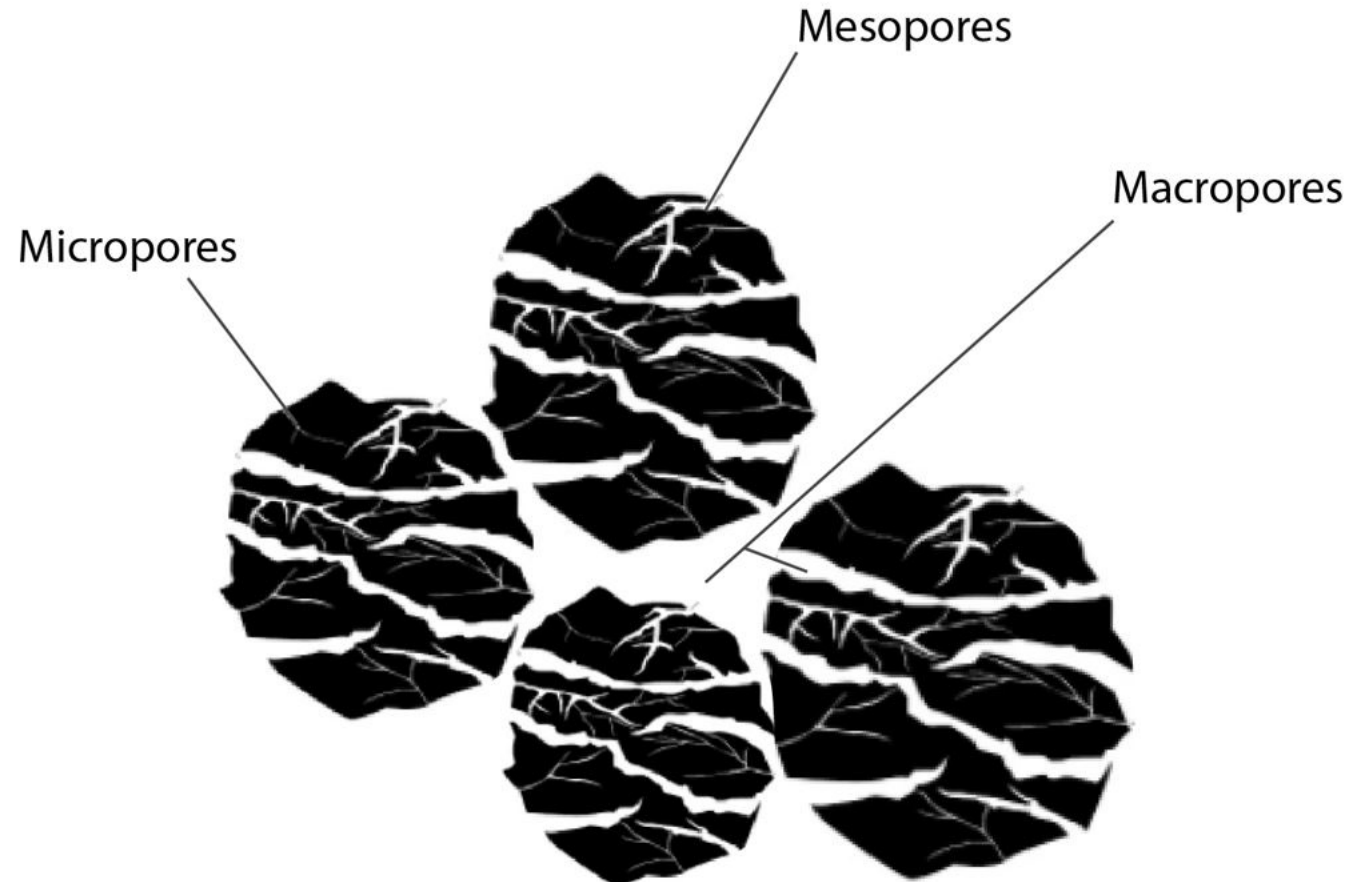
Roots can help to support 70% of macropores

Macropores



Pores are the openings in solid surfaces which gases, liquids, or small particles pass through.

Macropores are pores with a diameter bigger than 50 nm are called



Roots can help to support 70% of macropores, macropores control a large degree water flow, are changes in land cover altering hydrologic partitioning ?

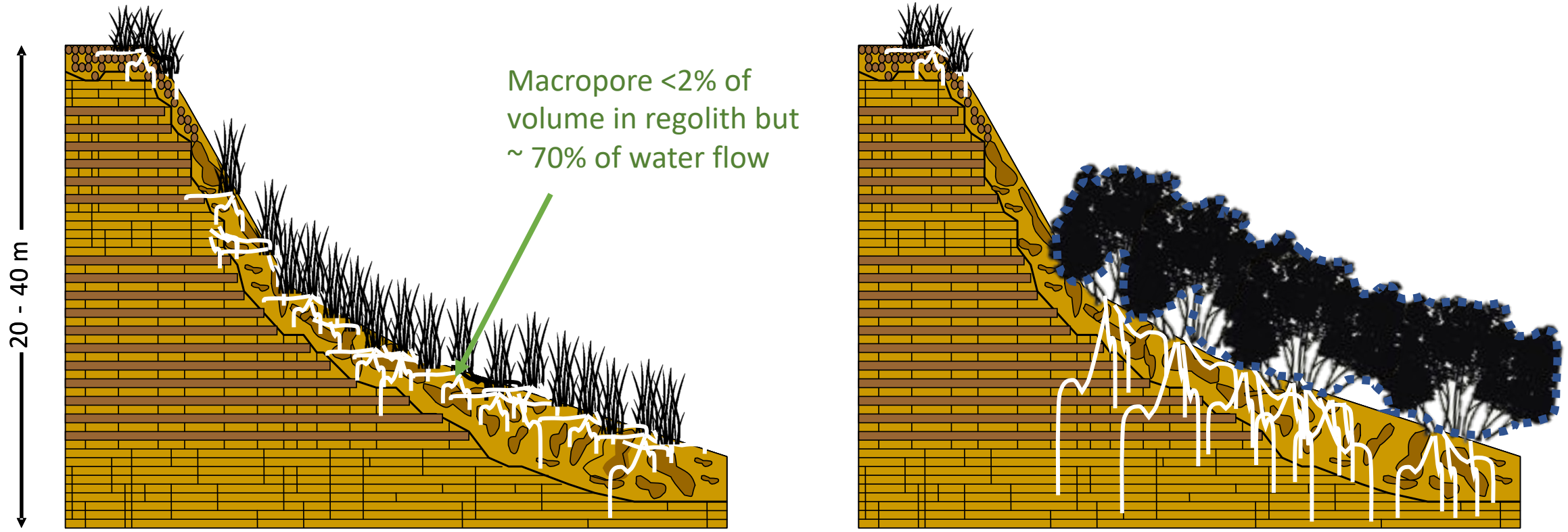
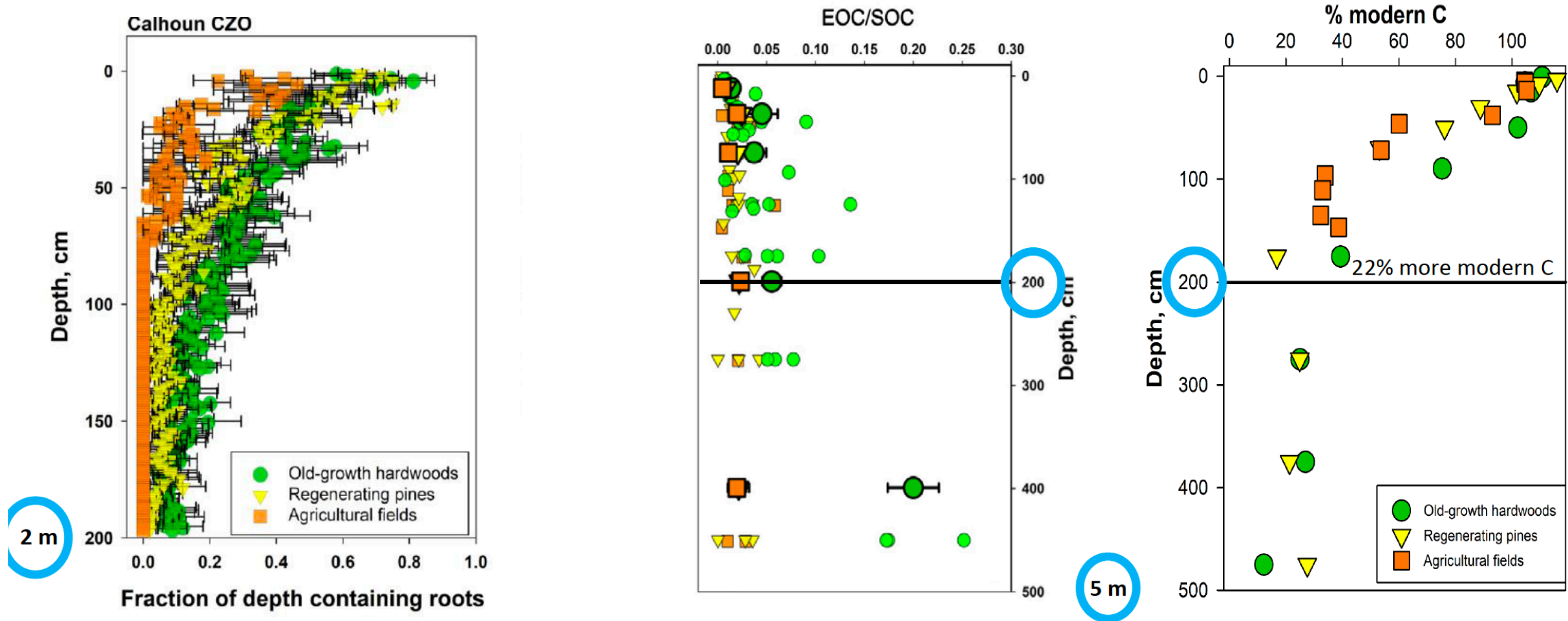


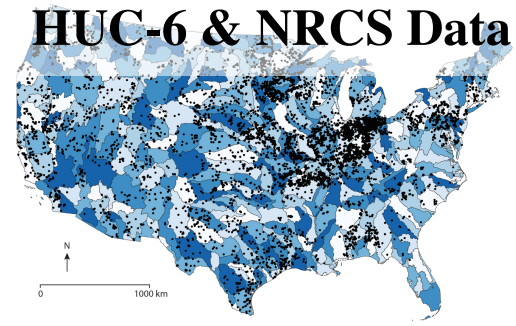
Figure by Jesse Nippert

Belowground *Ruddiman-CZ* hypothesis- Anthropocene modification of rooting networks in ecosystems imparts structural and biogeochemical signatures deep within regolith profiles.

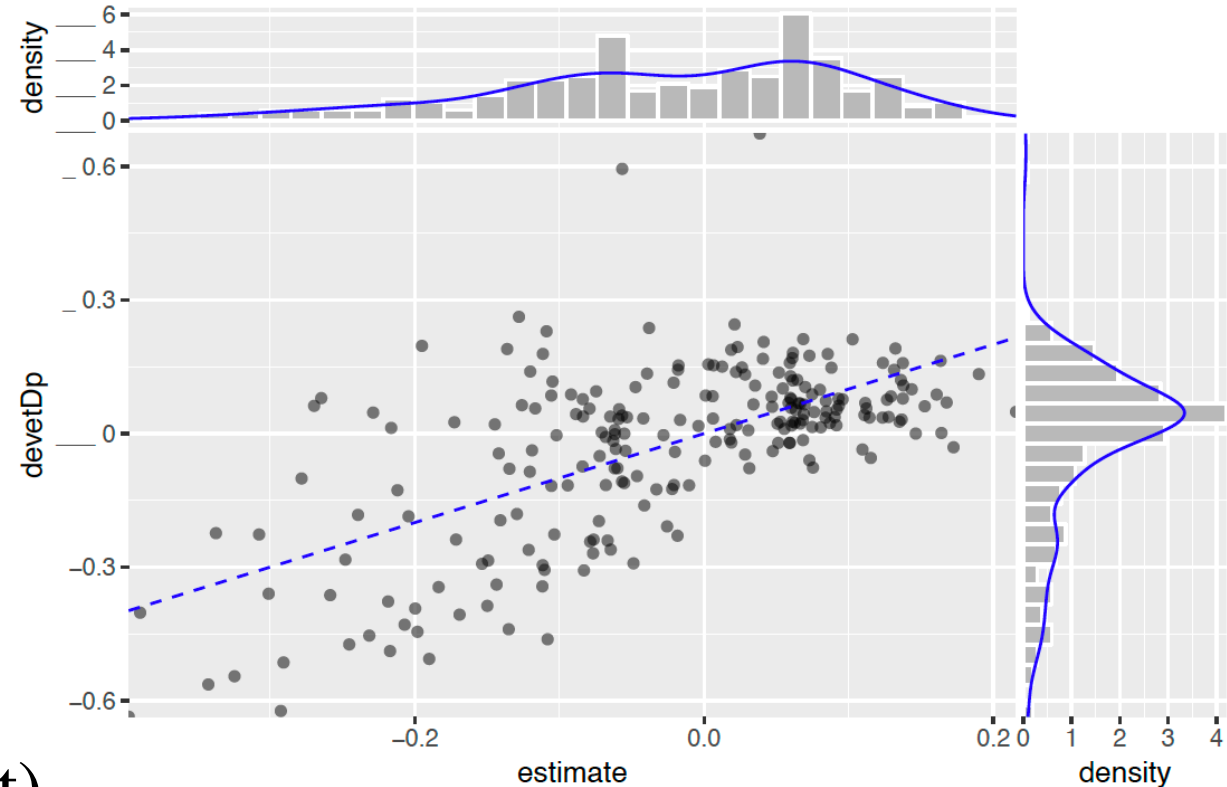


Soil properties help explain the why ecosystems can't meet evaporative demands

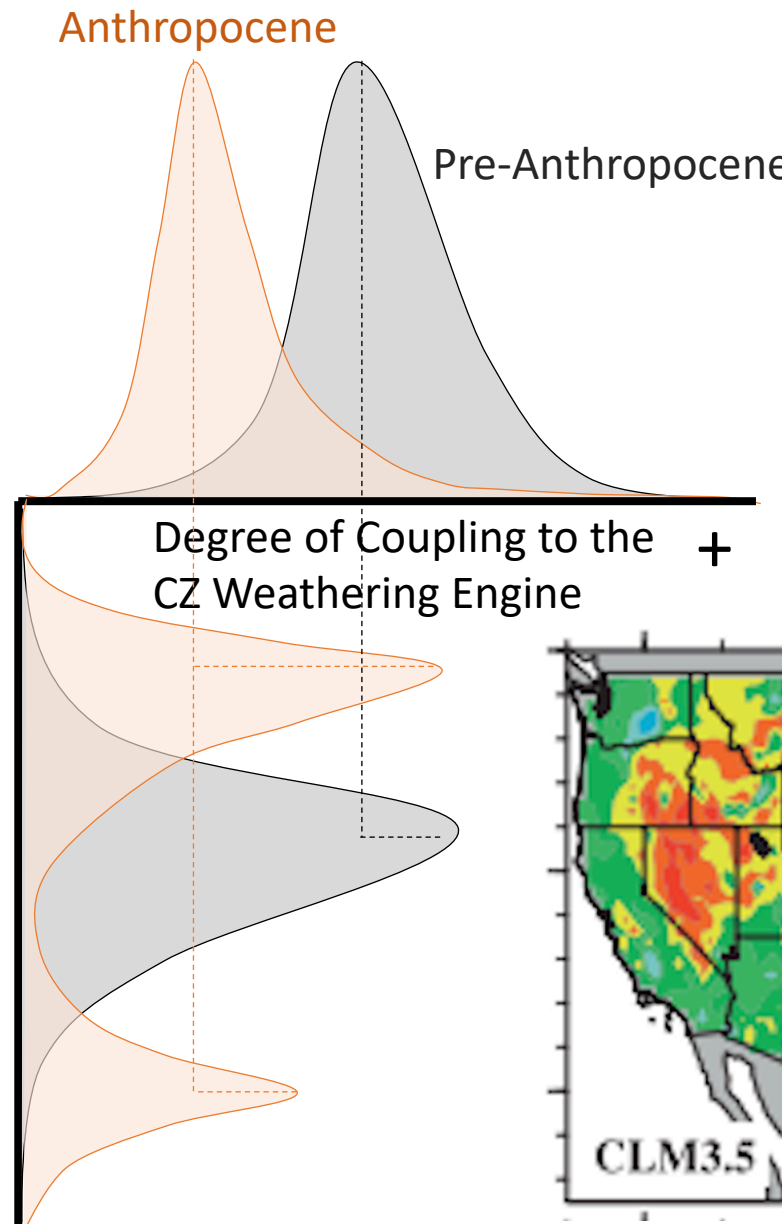
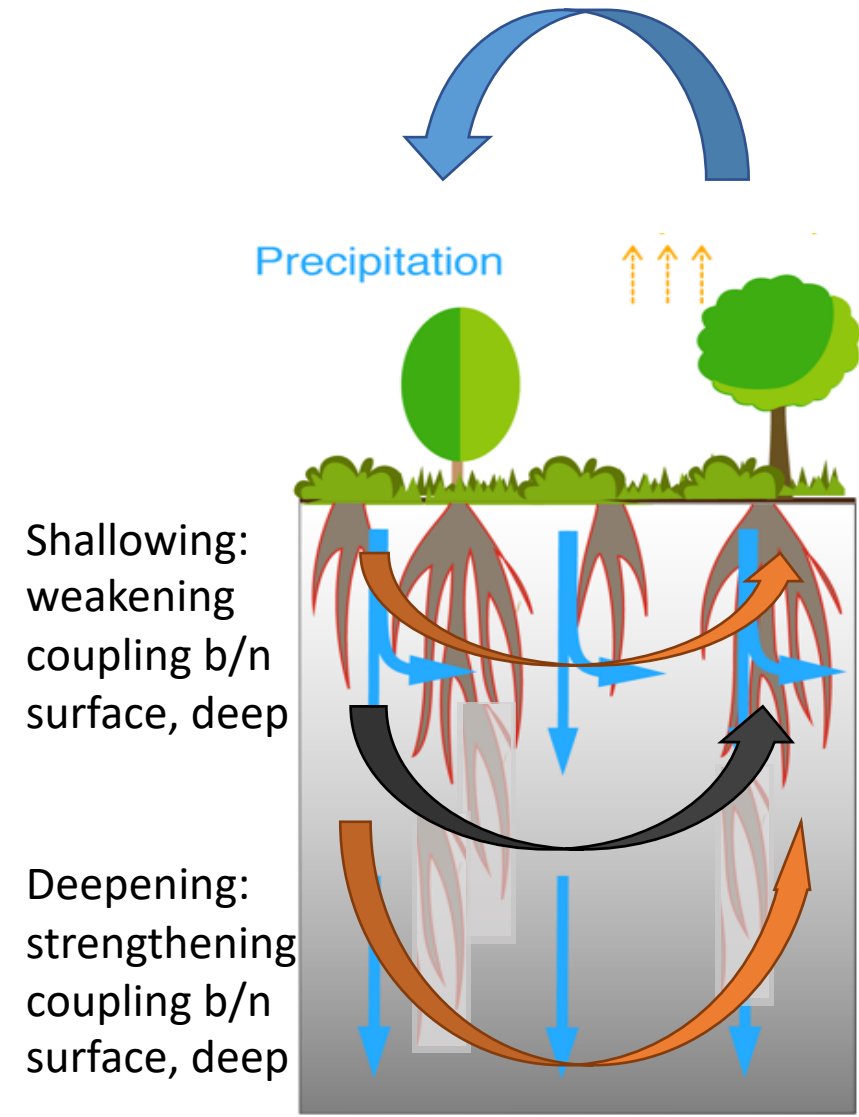
Budyko Relationship Across the US



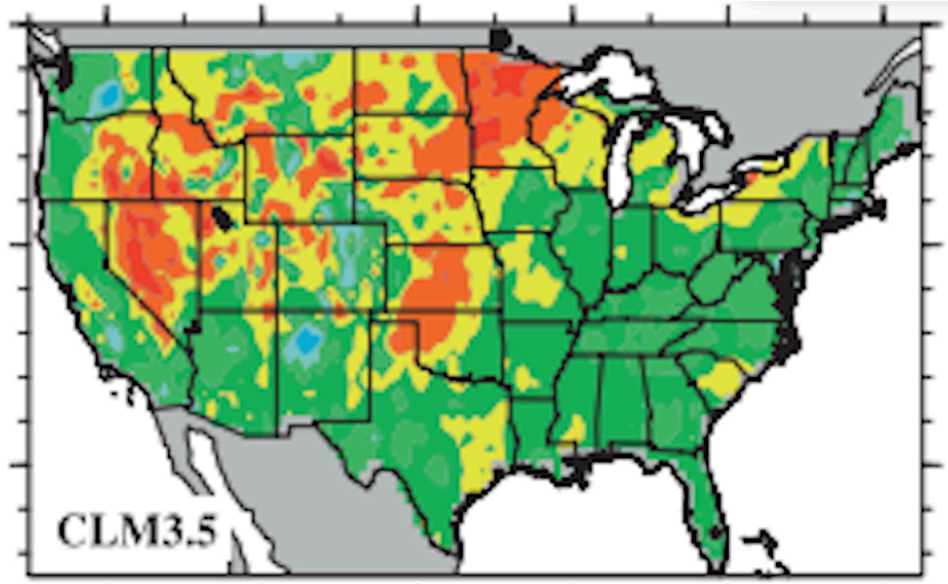
Analysis reveals soil structure (roundness and solidity) and OC content govern deviation away from Budyko curve across the aridity index



Do these changes to the critical zone subsurface feed back to govern climate



Is this important for climate projections ?



Questions and Thank you!

Up coming opportunities:

CZ:RCN Meeting June 22-25, 2020 Now hosted as a webinar

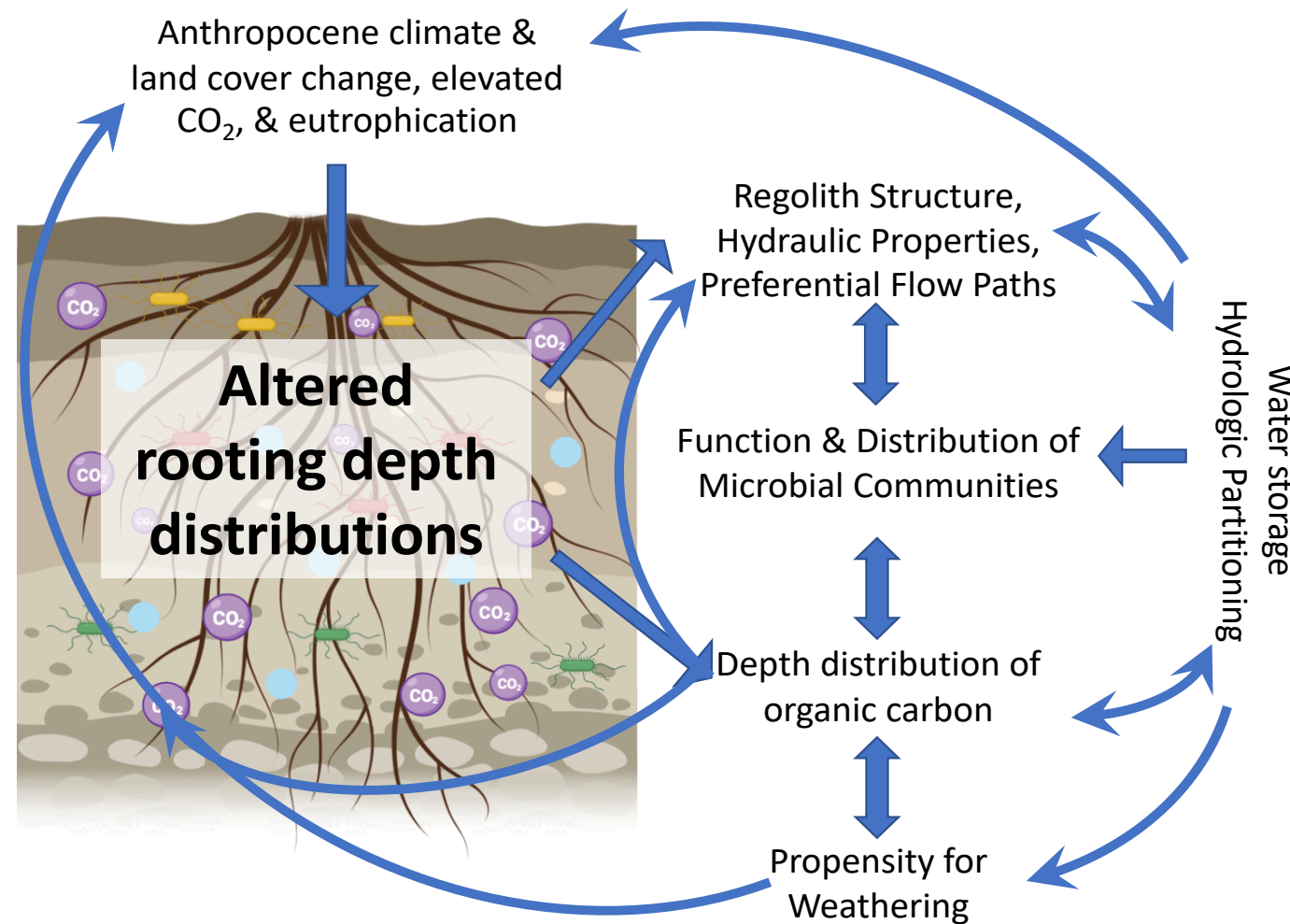
<https://sites.google.com/view/czrcn>

CZ:RCN Carbonate Terrains Meeting Aug 2-5th turning toward a webinar format

<https://carbonatecriticalzone.research.ufl.edu>



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We are looking for graduate students to join our team
Pamela.Sullivan@oregonstate.edu