Lawrence Berkeley National Laboratory
Recent Work

Title
Deep Unsaturated Zone Contributions to Carbon Cycling in Semiarid Environments

Permalink
https://escholarship.org/uc/item/5717t2qv

Authors
Wan, J
Tokunaga, TK
Dong, W
et al.

Publication Date
2018

DOI
10.1029/2018JG004669

Peer reviewed
Deep Unsaturated Zone Contributions to Carbon Cycling in Semi-arid Environments

Article in Journal of Geophysical Research: Biogeosciences · September 2018 with 25 Reads
DOI: 10.1029/2018JG004669

Ad

Abstract
Understanding terrestrial carbon cycling has relied primarily on studies of topsoils that are typically characterized to depths shallower than 0.5 m. At a semiarid site instrumented down to 7 m, we measured seasonal- and depth-resolved carbon inventories and fluxes and groundwater and unsaturated zone flow rates. Measurements showed that ~30% of the CO2 efflux to the atmosphere (60% in winter) originates from below 1 m, contrary to predictions of less than 1% by Earth System Model land modules. Respiration from deeper roots and deeper microbial communities is supported by favorable subsurface temperatures, moisture, and oxygen availability. Below 1 m, dissolved organic carbon fluxes from the overlying soil and C from deep roots and exudates are expected to be important in sustaining microbial respiration. Because these conditions are characteristic of semiarid climate regions, we contend that Earth System Model land modules should incorporate such deeper soil processes to improve CO2 flux predictions.