



Soil evaporation as a function of canopy cover: method calibration and preliminary observations at the Santa Rita Experimental Range

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Problem Statement

- Evapotranspiration is the dominant portion of the water budget in semiarid ecosystems. How evapotranspiration is partitioned into evaporation and transpiration is ecologically important but highly uncertain.
- In particular, the ratio of soil evaporation to total evapotranspiration likely depends on the amount of tree or shrub cover at a site and the presence of a litter layer in the soil, perhaps in a non-linear manner, and different for canopy and intercanopy locations at all levels of canopy cover.
- Such basic relationships have yet to be developed from field experiments

Objective

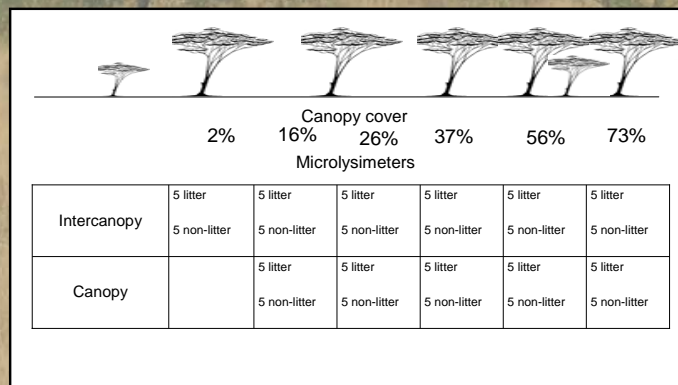
- To quantify the response of soil evaporation to changes in the amount of vegetation cover and the presence of a litter layer in the soil

Hypotheses

- The dynamics of soil evaporation vary between canopy and intercanopy patches and this variation is in turn influenced by the levels of canopy cover and exacerbated by the presence of a litter layer in the soil
- This dynamic relationships of evaporation are modified by phenological stages in deciduous vegetation, with more dramatic differences between canopy and intercanopy locations occurring during seasons of total leaf-out

Methods

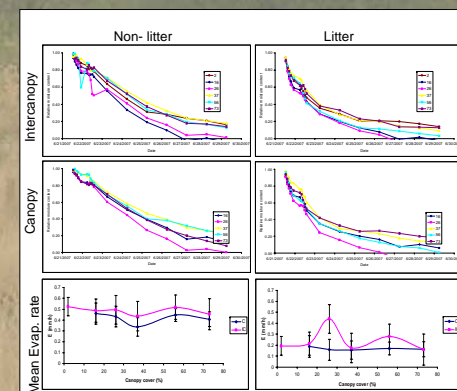
- Patches with different canopy cover in Santa Rita Experimental Range close to UA Cell
- 6 transects with canopy covers ranging from 2 to 73%
- For each level of canopy cover, deployed 2 identical microlysimeters at 5 canopy and 5 intercanopy locations
- One microlysimeter contained bare soil and the other had soil that was covered at the surface with a litter layer



- A pulse of water equivalent to 16 mm rainfall was simulated by adding a uniform layer of commercially available ice the night before
- Evaporation rates were calculated from the changes in gravimetric soil moisture content, intensively measured through the duration of the experiment

Preliminary results (from one season)

- The temporal dynamics of evaporation after a pulse of moisture vary between canopy and intercanopy locations
- This variation is exacerbated by the presence of a litter layer in the soil
- Mean evaporation rates are greater in intercanopy patches for both litter and non-litter treatments



Next steps

- Repeated experiments in remaining three seasons
- Partitioning of evapotranspiration experiment using a controlled vegetation gradient, in progress at the Biosphere 2
- Partitioning of evapotranspiration experiment under natural conditions

Acknowledgments

- Mitch McClaran and Mark Heitlinger at SRER for Logistical and technical support. Henry Adams, Colleen Boodleman, Jennifer Davison, Jason Field, Patrick Royer, Haiyan Wei for assistance on field site selection, plot establishment and experimental support