Improving Land-Surface Modeling of Evapotranspiration Processes in Tropical Forests

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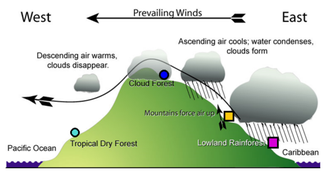
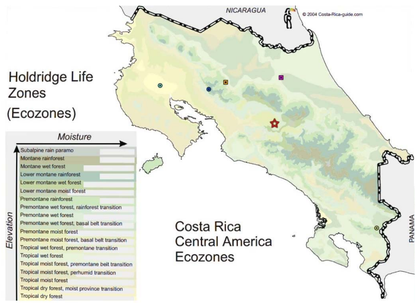
1. Project Objectives

- **Objective 1: Measure hydrometeorological variables** along in-canopy and above-canopy profiles at spatially distributed locations throughout a mountainous forest watershed in Costa Rica.
- **Objective 2: Revise CLM** to improve its estimates of evapotranspiration in tropical forests.
- **Objective 3: Model tropical forests** and their interactions with rainfall at regional scales using CLM coupled with an atmospheric model (WRF).

2. Overview of Field Site and Climatology

- Texas A&M University Soltis Center in Costa Rica
- Dominant tree species include Sapotaceae (hibiscus), Moracea (fig), and Malvaceae (milkwood) families
- Transitional forests straddle the gradient between cloud forests (Monteverde) and lowland rainforests (La Selva)
- Over 4200 mm/yr rainfall
- Sap flow records indicate 450 mm/yr in transpiration
- Average throughfall 85 and 90% for low and high intensity events, respectively





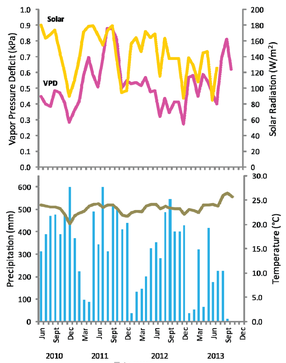


Image credits: Google Earth, Marietta College Biomes Website, and Costa-Rica-Guide.com. Graph from Andrea DuMont, Texas A&M.

Image credit: Chris Houser, Texas A&M

3. Field Methods and Equipment

Currently:

- 10-m meteorological station at center
- 39-m canopy tower, construction of above canopy extension currently in progress
- Campbell AP200 $H_2O/CO_2/T$ profile system
- Five LI-COR quantum sensors for photosynthetically active radiation (PAR)
- Five Decagon leaf wetness sensors
- Array of watershed monitoring equipment

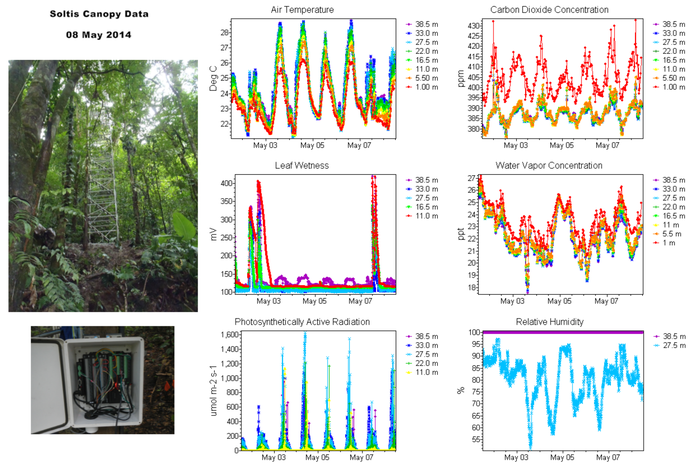
Installation in progress:

- Two LICOR-7200 and CSAT3 systems for fluxes using eddy-covariance method
- Parsivel disdrometer for above canopy precipitation
- Sap flow sensors on 16+ trees

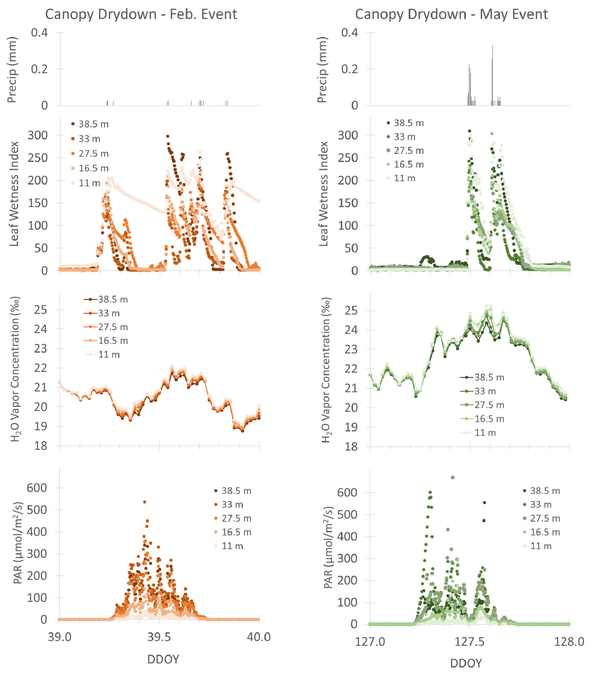
Measurements to be submitted to AmeriFlux repository and follow its QA/QC standards.

4. Real-Time Data Monitoring Website

- Towers wirelessly connected to center network and transmitted automatically to TAMU campus server
- Allows for immediate detection of problem sensors (e.g., RH as shown on screenshot of the prototype page)

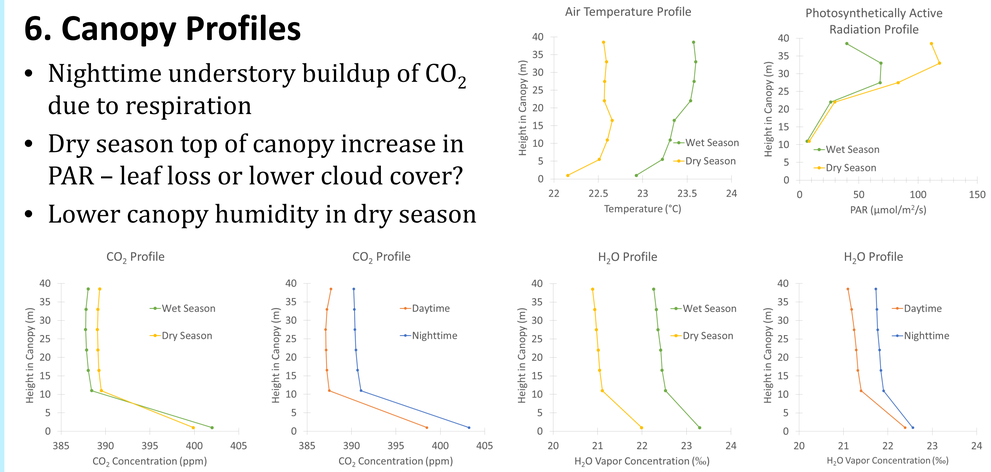


5. Canopy Drydown Examples



6. Canopy Profiles

- Nighttime understory buildup of CO_2 due to respiration
- Dry season top of canopy increase in PAR – leaf loss or lower cloud cover?
- Lower canopy humidity in dry season



7. Acknowledgements and Contact Information

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