Tropical Dry Forest Resilience and Water Use Efficiency

Tropical dry forests: barometers of climate change

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TROPI DRY

LETTER

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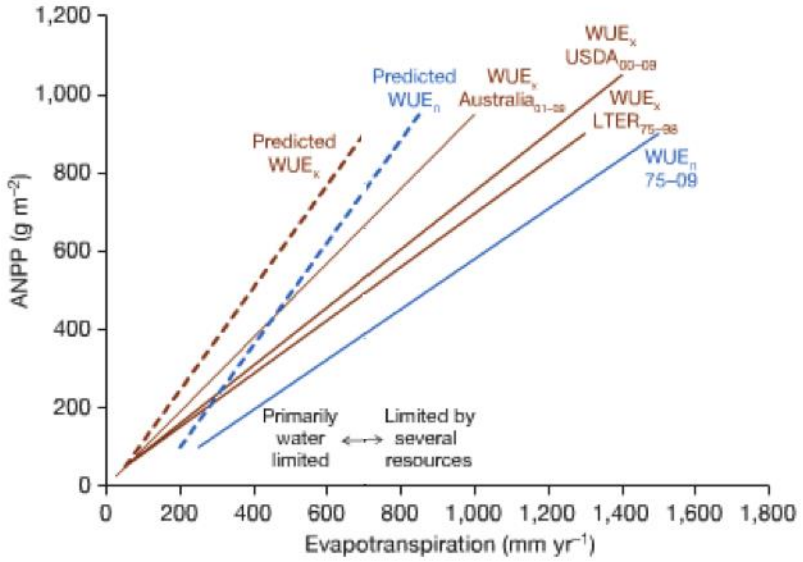
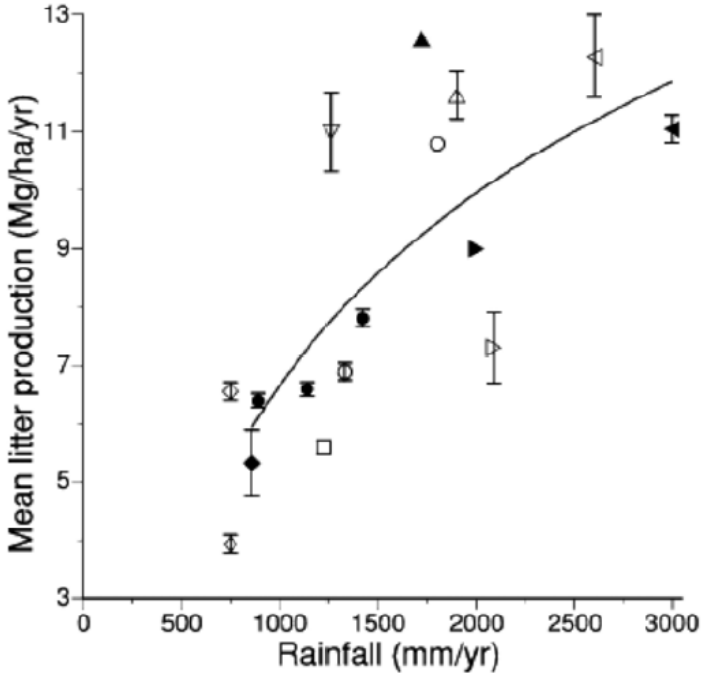
Ecosystem resilience despite large-scale altered hydroclimatic conditions

The WUE Ecosystem Resilience Model = same biomass produced with less available water

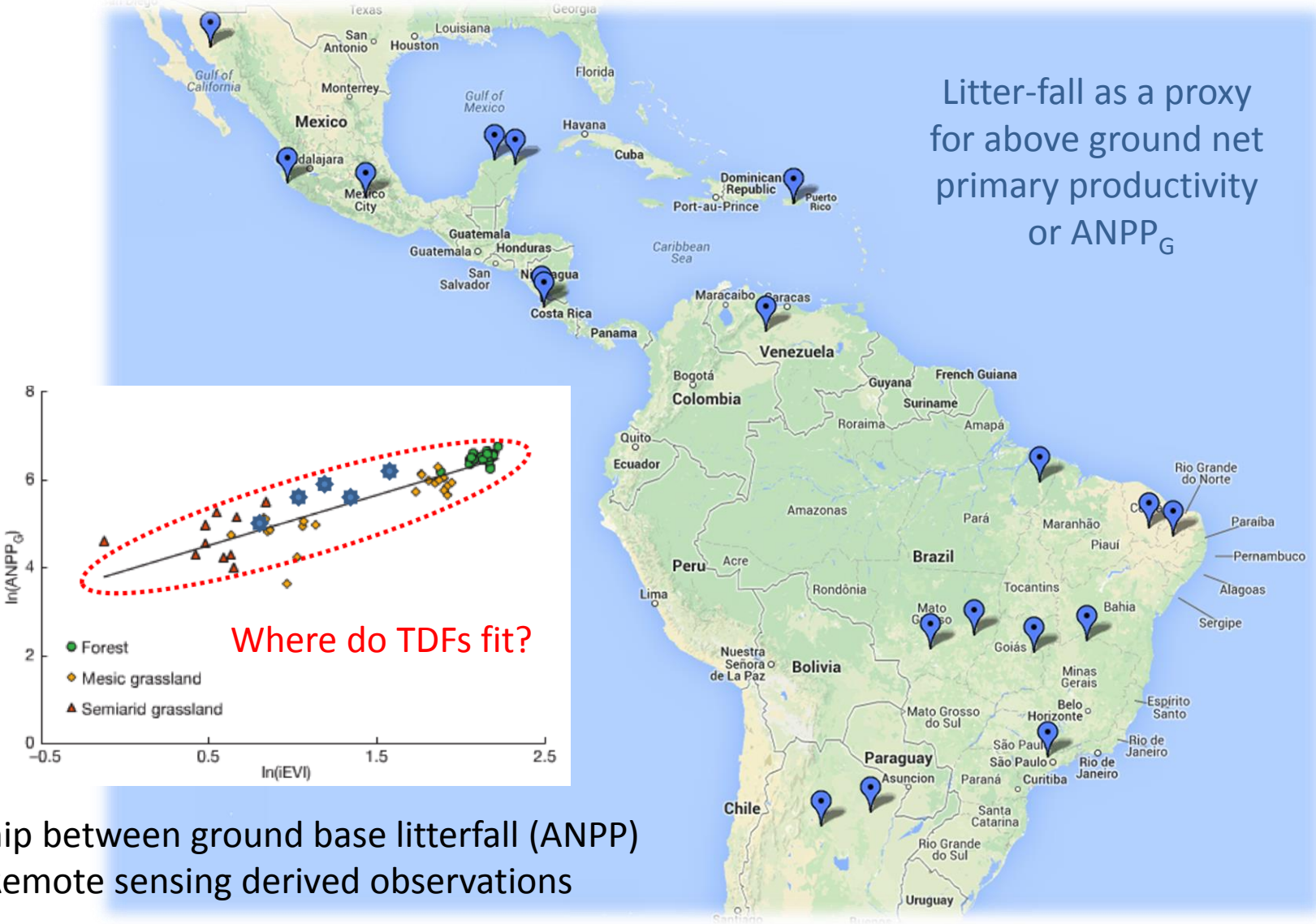


Litterfall and Precipitation for SDTF



Mean annual litter production in seasonally dry, mature tropical forests around the globe, after Lawrence (2005, *Biotropica*)

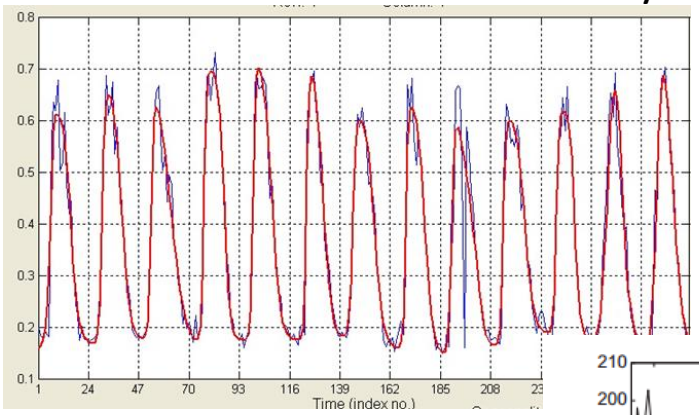
TDF Litter-fall Meta-Analysis Case Study Sites

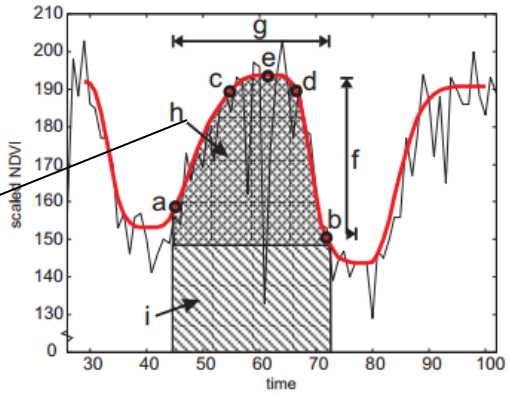


Relationship between ground base litterfall (ANPP) and Remote sensing derived observations

TDF Remote Sensing Sites – Latin America

TIMESAT MODIS EVI Seasonality





Small Integral of EVI = ANPP

EOS Sensors:

MODIS EVI = ANPP

TRMM = MAP

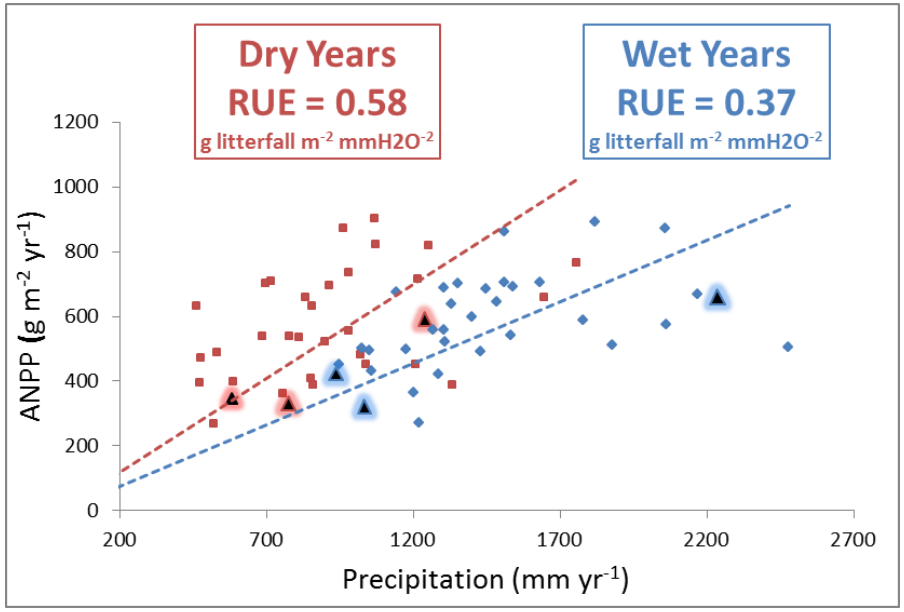
2001-2011

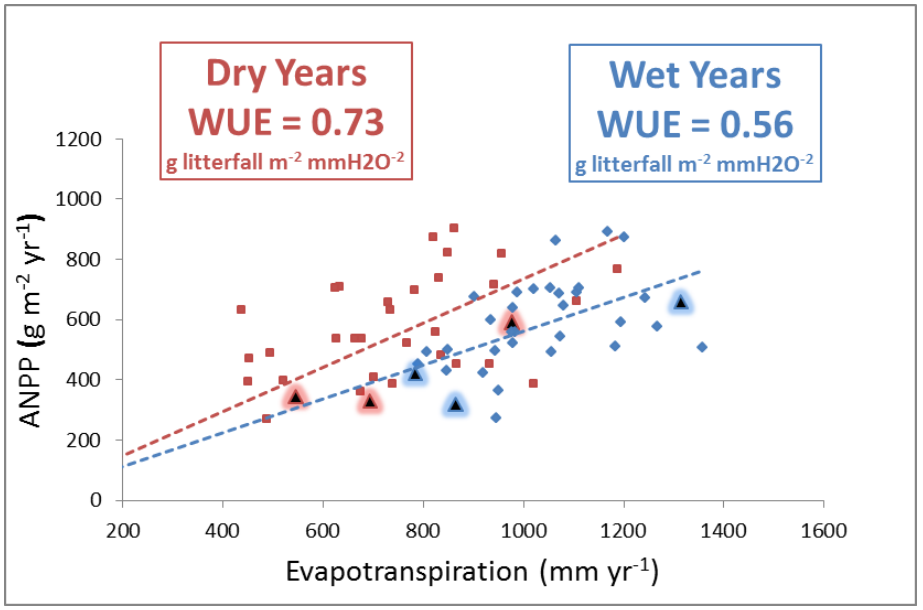
Site Criteria:

500m pixels with 1km of intact forest buffer

Results – RUE and WUE in TDFs

Tropical Dry Forests showed increased rain and plant-available water use efficiency in years with less rainfall….meaning less water was required to produce a given amount of above ground biomass



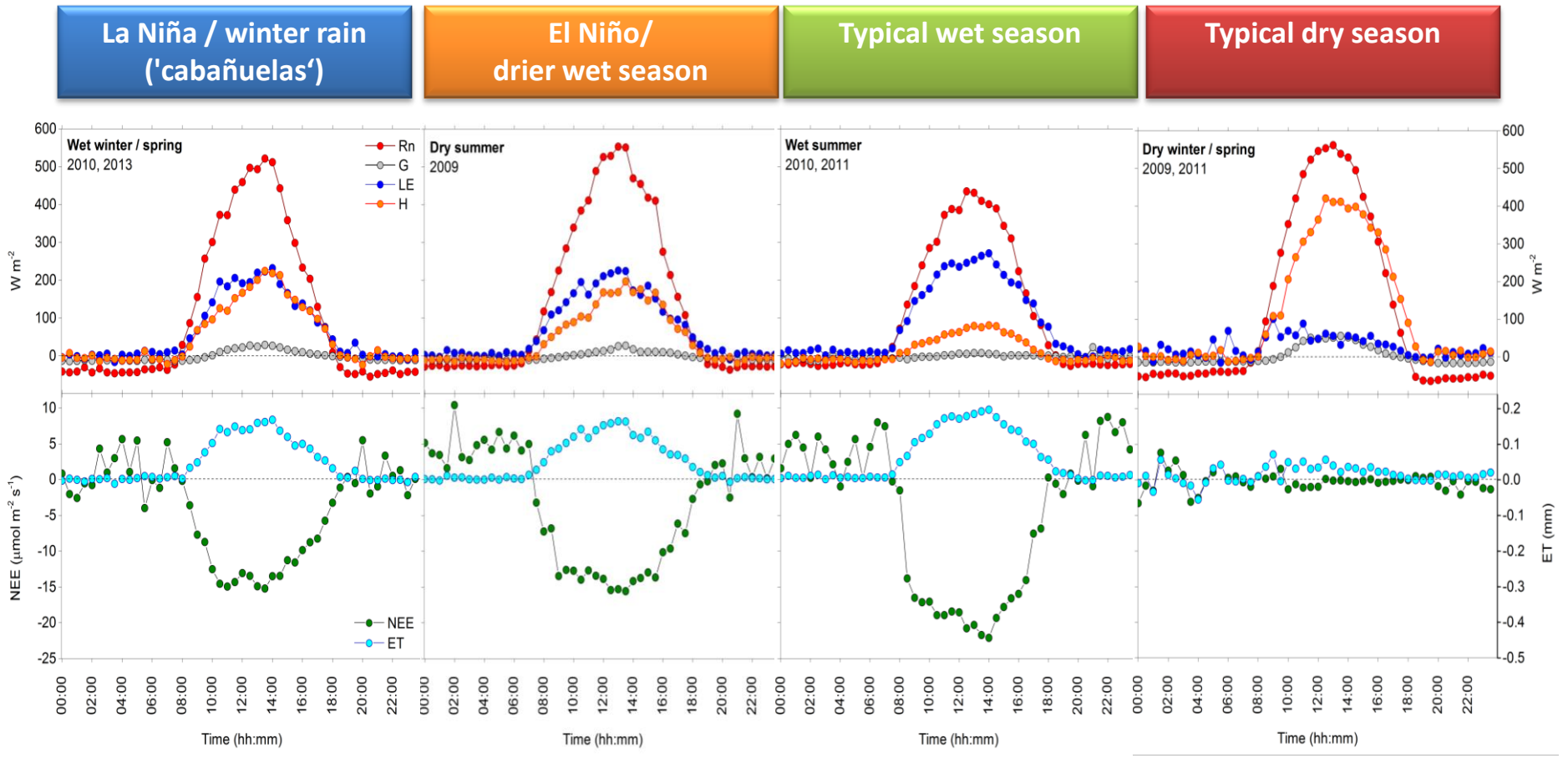


Rain Use Efficiency (RUE) = ANPPs/MAP

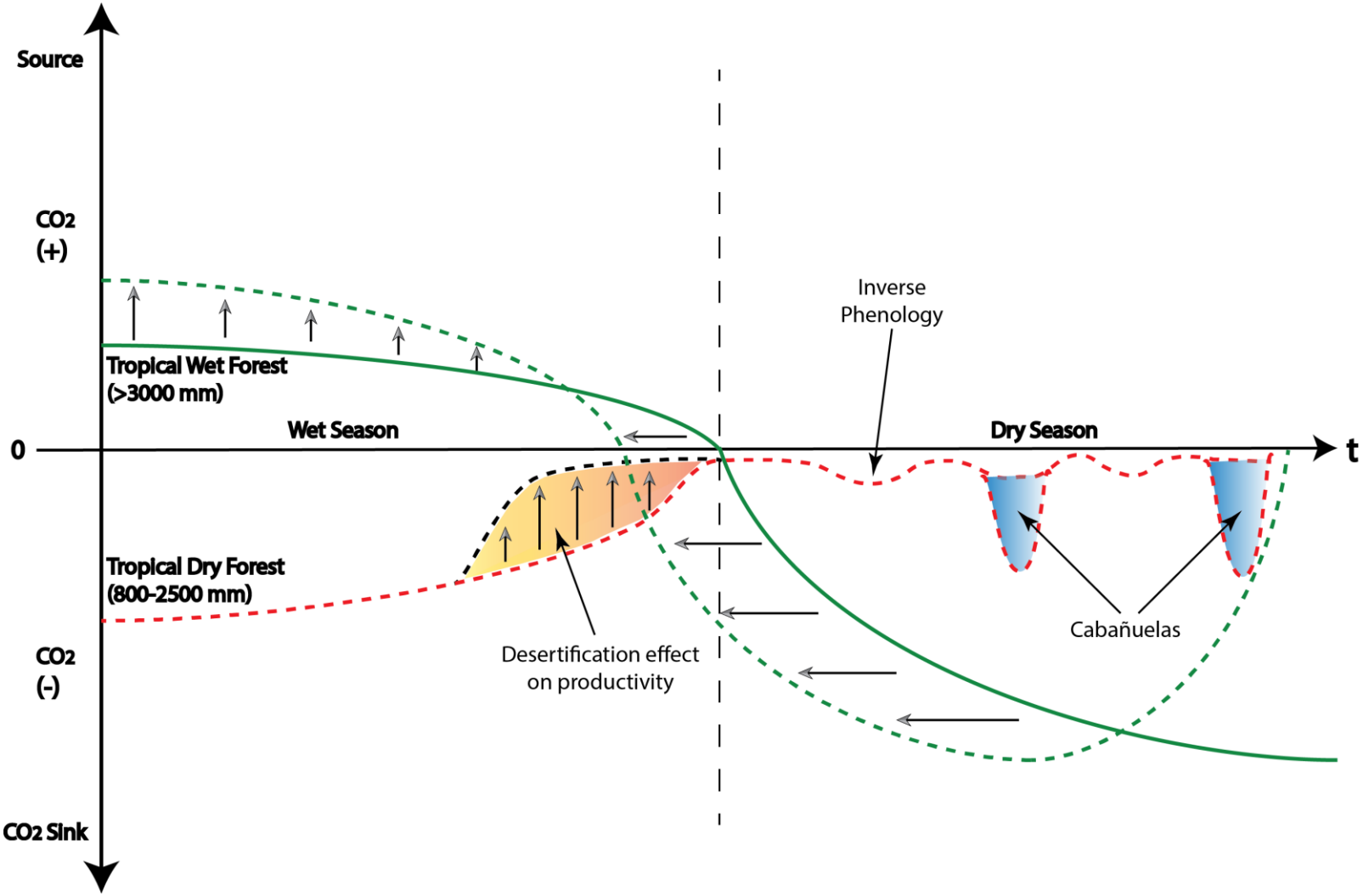
Water Use Efficiency (WUE) = ANPPs/ ET

Note – highlighted points are from ground data in Mexico, Costa Rica, and Brazil

Daily course of energy and matter fluxes



Conceptual model of Future Behaviour under Drought and Climate Change



What does this mean for TDFs?

- Might indicate TDFs are more resilient to droughts than other forest types, but this is only a decade long study.

- Could mean that TDFs are better at utilizing water than other ecosystems, this makes evolutionary sense. Are TDFs the tropical forests of the future in a hotter, drier world? → can TDF's used as contemporary barometers of climate change

- Can this remotely sensed Water Use Efficience metric be used to monitor ecosystem drought resilience globally? → We will need more ground data for validation, best obtained using carbon and water flux monitoring

Thank You!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