

Alice Springs Supersite 2012–2013

Ti Tree, NT



Terrestrial Ecosystem Research Network (TERN):

Australian and New Zealand Flux Research and Monitoring Network (OzFlux)

Australian Supersite Network (ASN)

National Centre for Groundwater Research and Training (NCGRT)



UTS:

Terrestrial Ecohydrology Research Group (TERG)

Plant Functional Biology and Climate Change Cluster (C3)

School of the Environment (SoE)



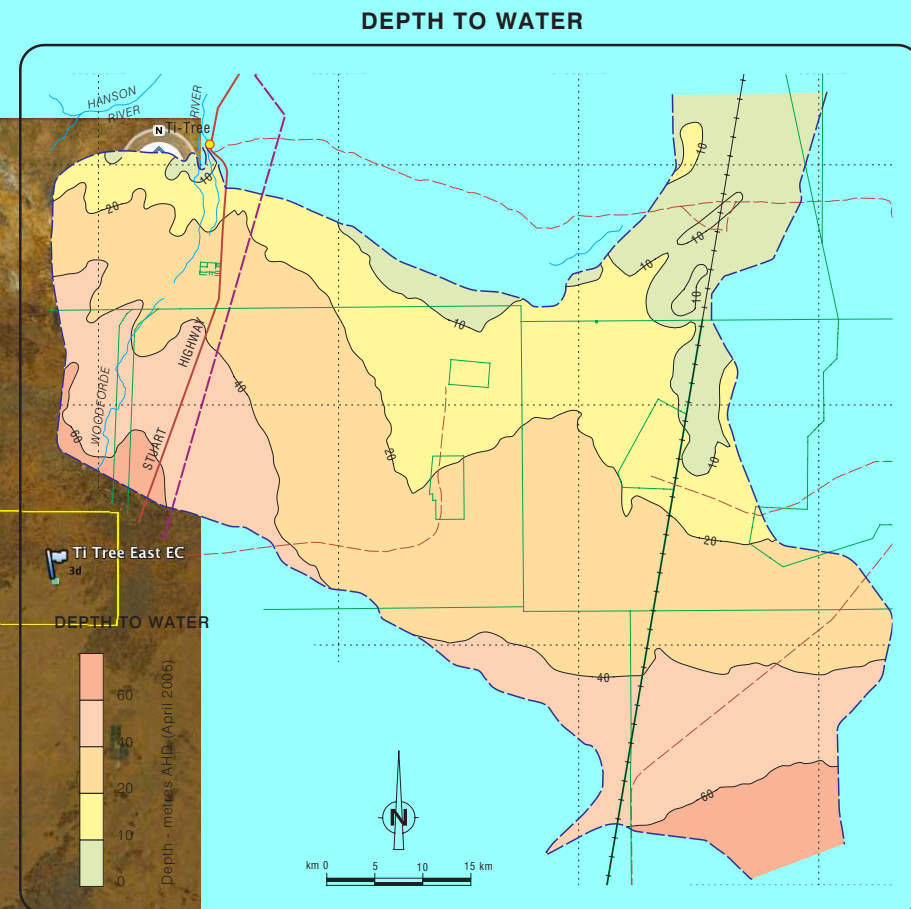
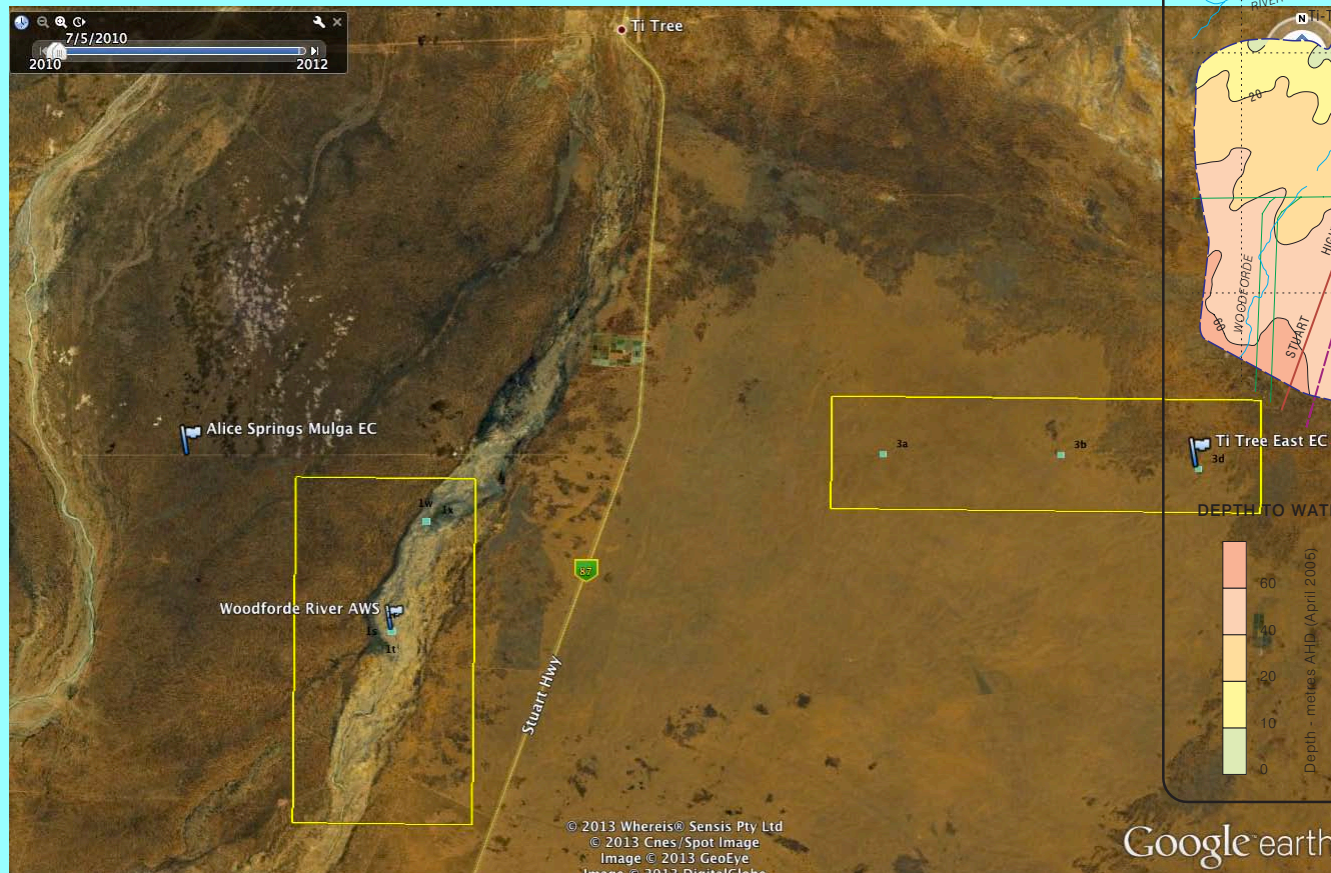
Activities

- **Site descriptions**
- **Infrastructure:**
 - **Upgrade**
 - **Construction**
- **Measurements:**
 - **A year of data**
- **New Analyses:**
 - **Footprint**
 - **Turbulence**
 - **Penman-Monteith**



Three foci: Alice Springs Mulga, Ti Tree East, Woodforde River

- **DTW: 49 m, (7–8 m), (3–5 m)**
- **Woody Mulga savanna, grassy Mulga+Eucalyptus/Corymbia savanna, riparian Eucalyptus (gum) forest**
- **EC*, EC, sapflux**



Alice Springs Mulga

Woody savanna

- **Mulga:**
 - *Acacia aneura* var. *aneura*
 - *A. aneura* var. *intermedia*
 - *A. aneura* var. *tenuis*



Alice Springs Mulga

Woody savanna

- **Forbs & Shrubs:**
 - *Psydrax latifolia*
 - *Eremophila gilesii*
 - *E. latrobei* ssp. *glabra* (Crimson turkey bush)
 - *Sida* & *Abutilon* spp.
 - *Solanum ellipticum* (Potato bush)



Alice Springs Mulga

Woody savanna

- **C_3 Perennial grass:**
 - *Thyridolepis mitchelliana* (Window mulga-grass)
- **C_4 Perennial grasses:**
 - *Eragrostis eriopoda* (Naked woolybutt)
 - *Triodia* sp. (Spinifex)
- **C_4 Annual grass:**
 - *Eriachne pulchella* ssp. *pulchella* (Pretty wanderrie)
- **Cryptobiotic crust**



Ti Tree East

Grassy savanna

- **Mixed footprint:**
 - *Mulga/grass*
 - *Corymbia/Triodia*



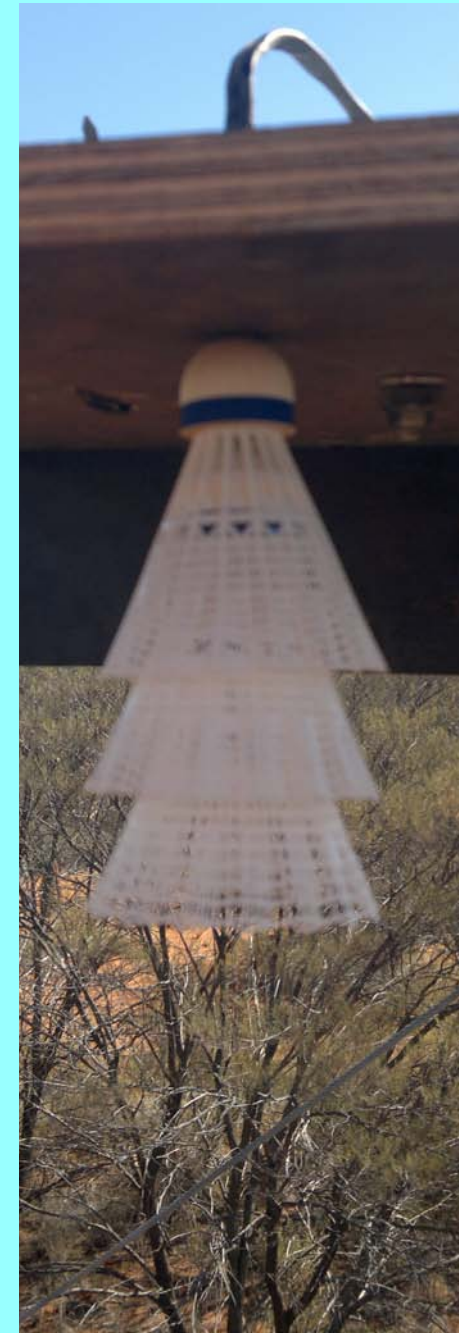
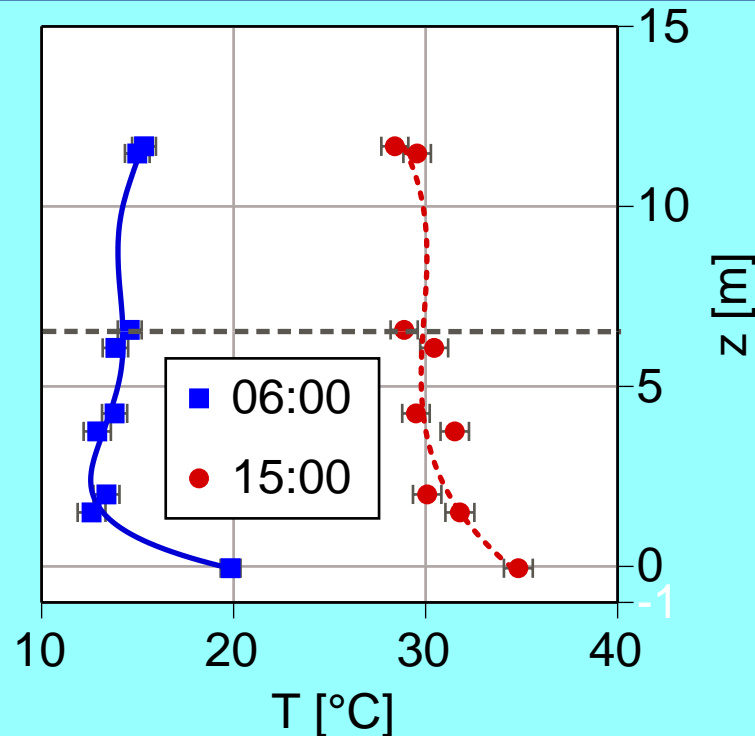
Woodforde River Riparian forest

- *Eucalyptus camaldulensis*
(River Red Gum)



Alice Springs Mulga (woody savanna) Upgrades

- **Power supply upgrade**
- **TC profile**
- **Phenocams (video?)**
- **Comms**
 - **Ethernet modem**
- **Three AusPlots:**
 - **250 m East (birdsong)**
 - **500 m East**
 - **250 m west**



Ti Tree East (grassy savanna)

Installation (nearly) complete

- ***Basic EC setup***
- ***Mixed footprint:***
 - ***Mulga/grass***
 - ***Corymbia/Triodia***
- ***Comms***
 - ***RS232 modem – 30 min., 1 min., 10 Hz***
- ***Groundwater monitoring bore:***
 - ***~8 m depth-to-groundwater***
- ***Three AusPlots:***
 - ***Mulga/grass***
 - ***Corymbia/Triodia***
 - ***Transition (birdsong)***



Ti Tree East (grassy savanna)

Rainfall responses

- ***First rainfall in over one month: 43.6 mm***
 - ***12–13 May: 25 mm***
 - ***15–18 May: 6.4 mm***
 - ***21–22 May: 12.2 mm***

“Mostly” dead



22 May 2013 8.00

Juvenile leaves



29 May 2013 7.00

Fully expanded



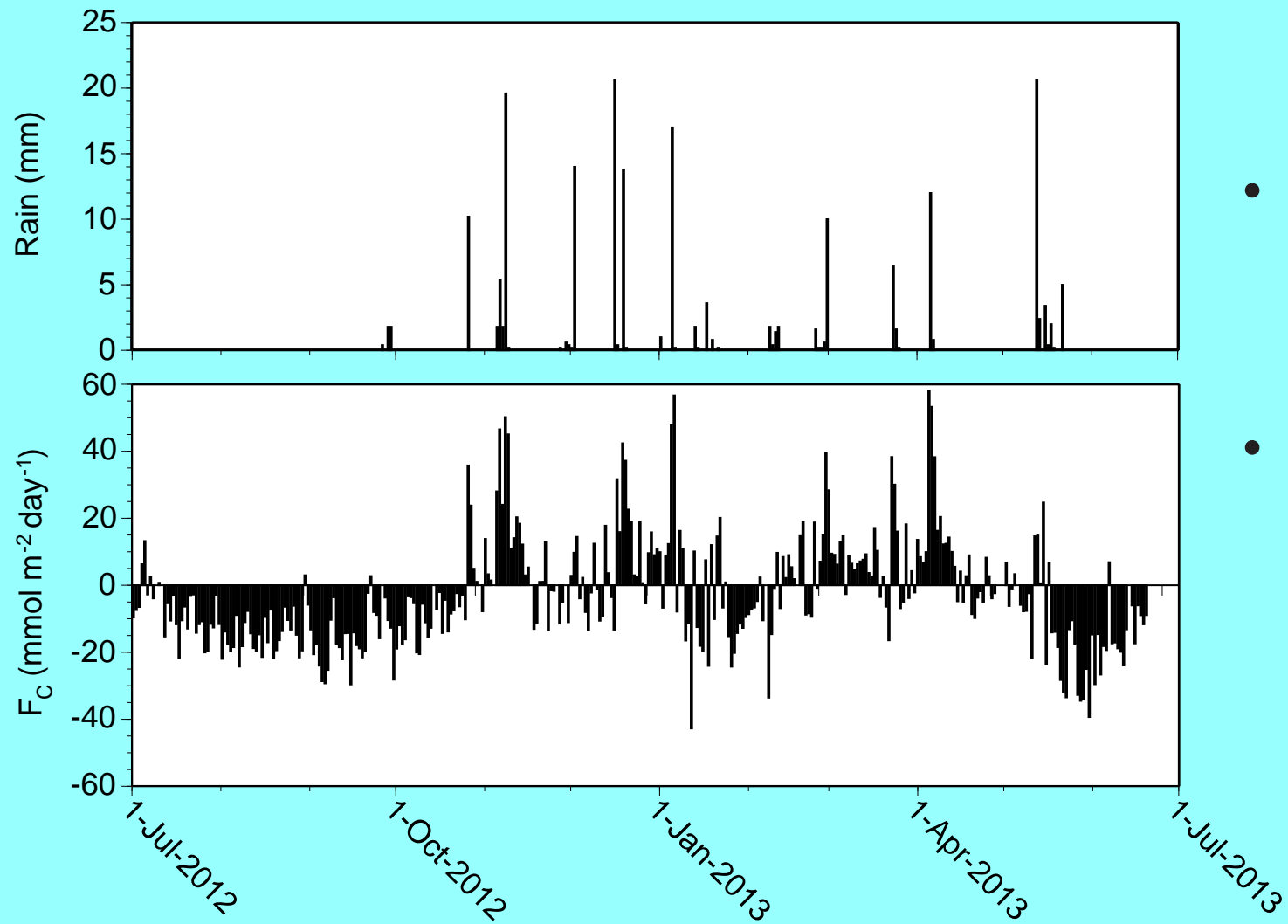
11 Jun 2013 3.00

Woodforde River (Riparian forest) Installation (mostly) complete

- **Sapflux setup**
- **River Red Gum**
- **Comms**
 - *RS232 modem – 10 min., 24 hr.*
- **Groundwater monitoring bores:**
 - *~3–5 m depth-to-groundwater*



Carbon Fluxes Alice Springs Mulga



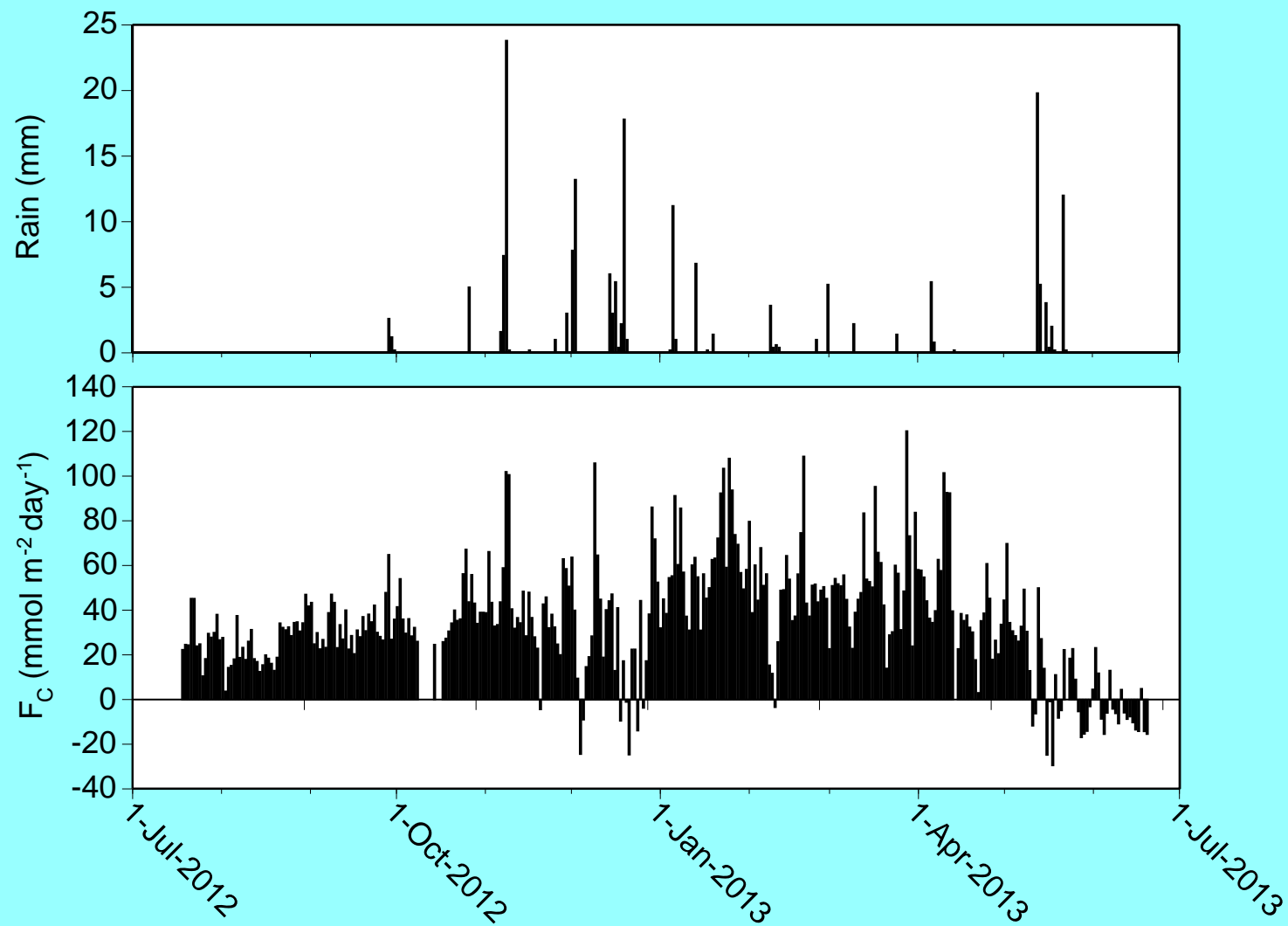
- **Annual:**
 - 191.2 mm yr^{-1}
 - $-1.03 \text{ mol m}^{-2} \text{ yr}^{-1}$
- **Summer (DJF):**
 - 92 mm
 - 2.07 mol m^{-2}



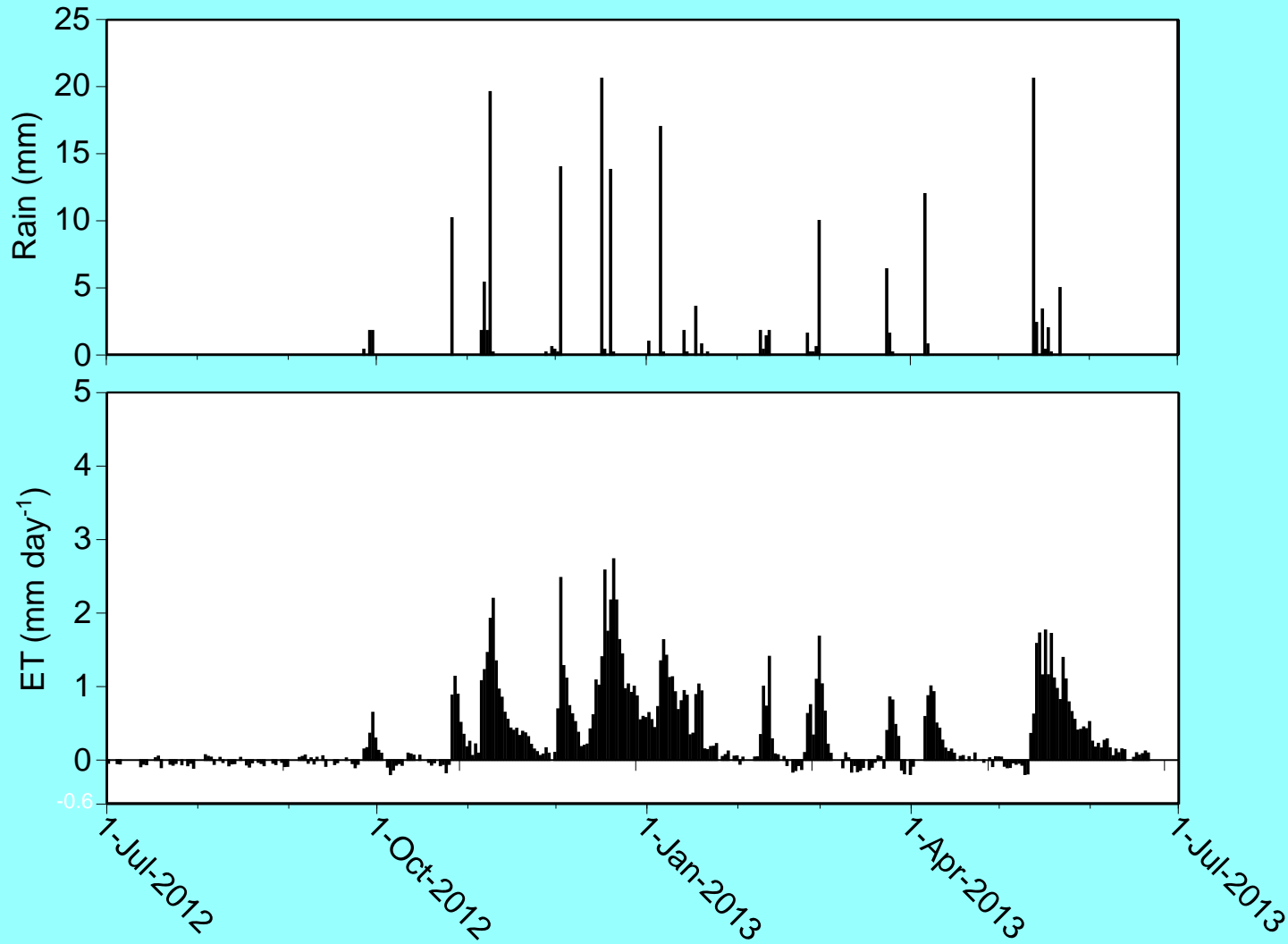
Carbon Fluxes

Ti Tree East

- **Annual:**
 - 188.6 mm yr^{-1}
 - $11.64 \text{ mol m}^{-2} \text{ yr}^{-1}$
- **Summer (DJF):**
 - 89 mm
 - 4.13 mol m^{-2}



Evapotranspiration Alice Springs Mulga



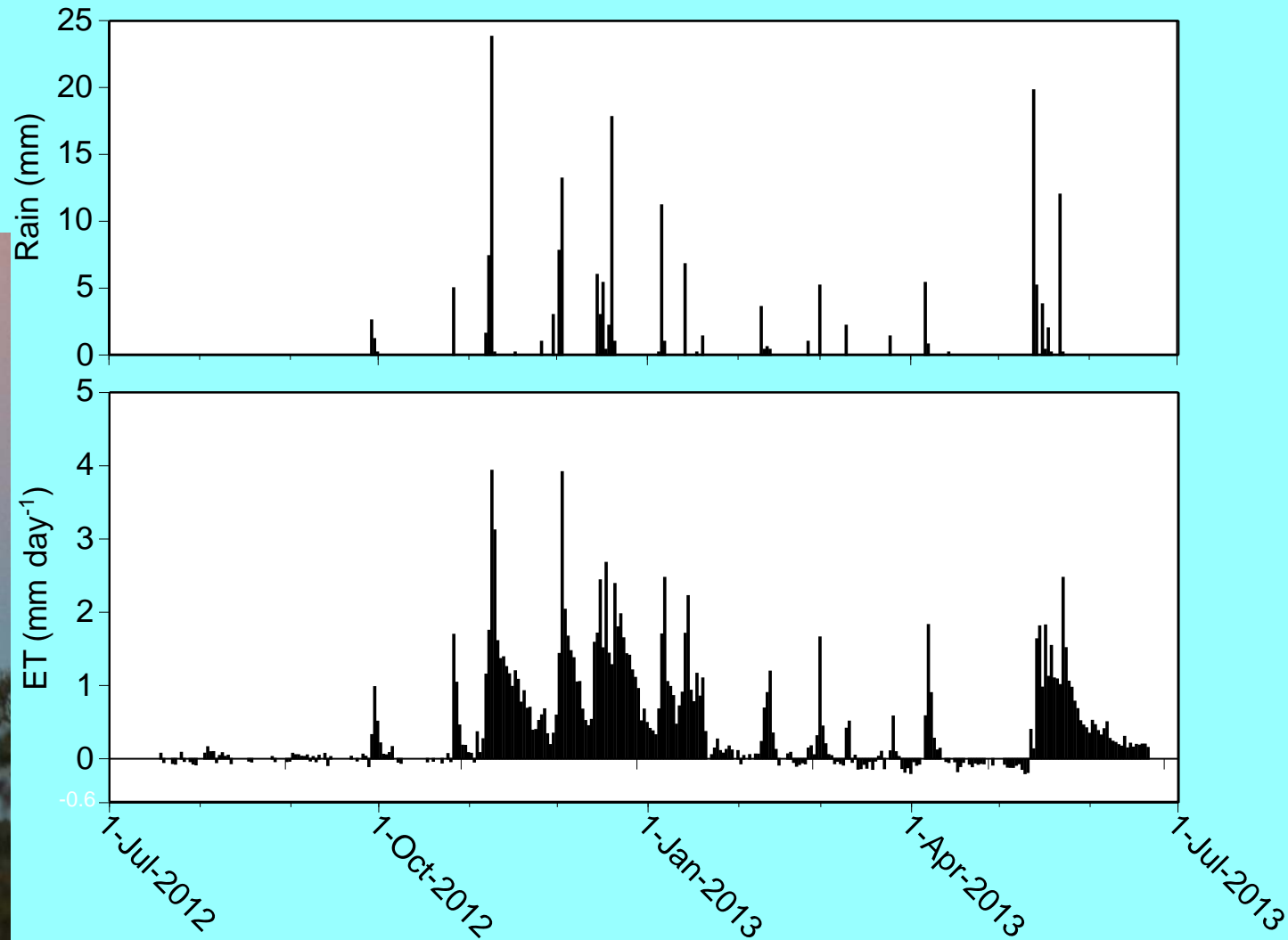
- **Annual:**
 - **110 mm yr⁻¹**
- **Summer (DJF):**
 - **60 mm**



Evapotranspiration

Ti Tree East

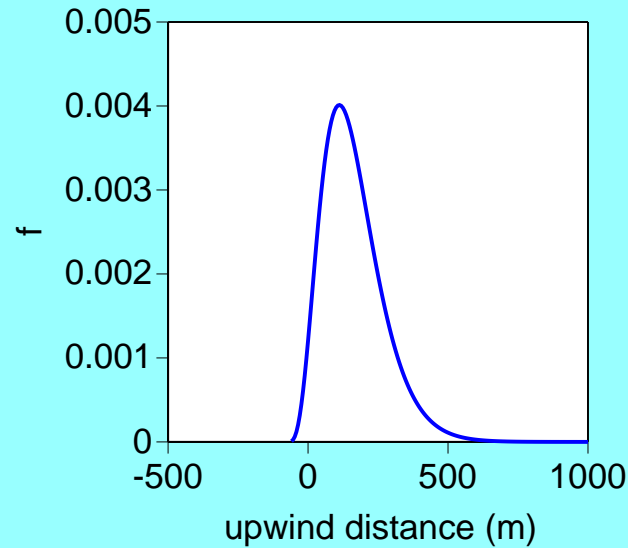
- **Annual:**
 - 135.0 mm yr^{-1}
- **Summer (DJF):**
 - 71 mm



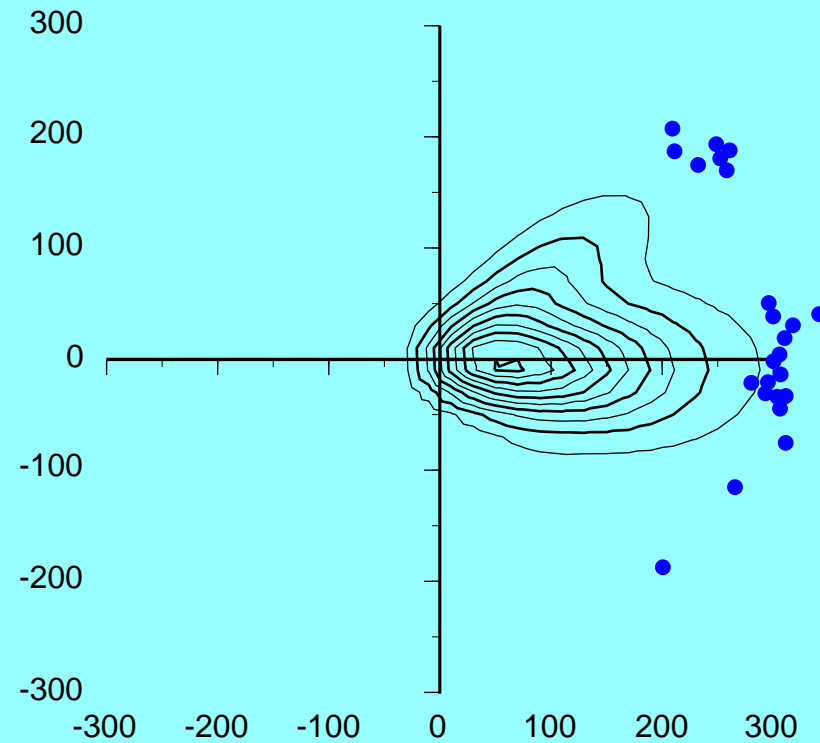
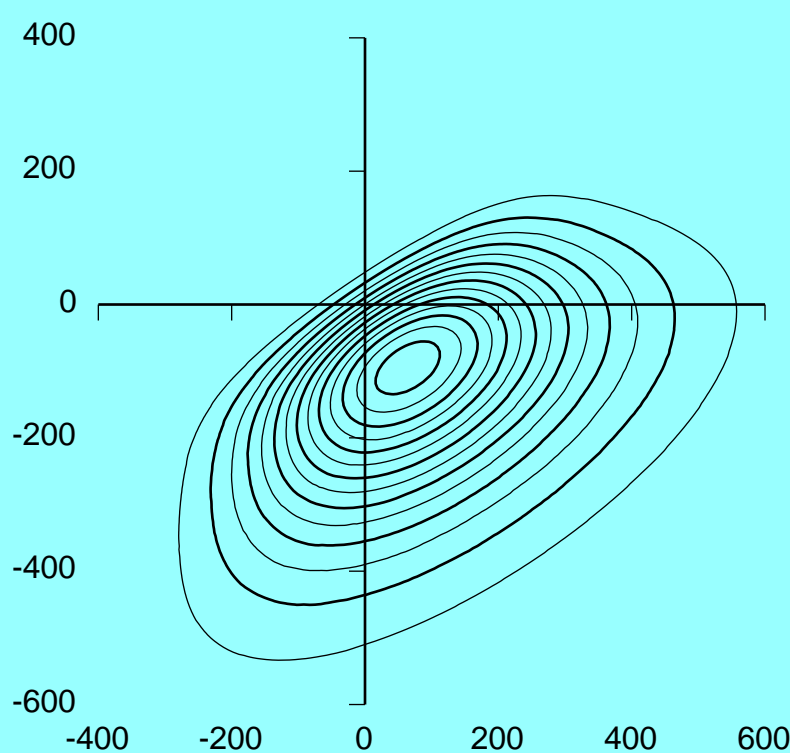
Flux footprint climatology

Alice Springs Mulga

- *Kljun et al. (2004)*
- *Analytical model*
- *Buckingham Pi Theory*
- *Rotated to wind direction*
- *Climatology: F_c F_e F_h*
- *Night, day, 24-hr, time period (include dates, exclude hours)*
- *$u^* < 0.2$ m/s*



21/1/2011–27/1/2011
Night F_c footprint climatology
 z_i from BOM TAPM



Thank you

Eamus, D., J. Cleverly, N. Boulain, N. Grant, R. Faux, and R. Villalobos-Vega, 2013: Carbon and water fluxes in an arid-zone Acacia savanna woodland: An analyses of seasonal patterns and responses to rainfall events. Agric. For. Meteor., 1–14.

Cleverly, J., N. Boulain, R. Villalobos-Vega, N. Grant, R. Faux, C. Wood, P. G. Cook, Q. Yu, A. Leigh, and D. Eamus, Revision in review: Dynamics of component carbon fluxes in a semi-arid Acacia woodland, central Australia. J. Geophys. Res.

Cleverly, J., C. Chen, N. Boulain, R. Villalobos-Vega, R. Faux, N. Grant, Q. Yu, and D. Eamus, In revision: Aerodynamic resistance and Penman-Monteith evapotranspiration over a seasonally two-layered canopy in semi-arid central Australia. J. Hydrometeorol.

Ma, X., A. Huete, Q. Yu, N. Restrepo Coupe, K. Davies, M. Broich, P. Ratana, J. Beringer, L. Hutley, J. Cleverly, N. Boulain and D. Eamus, Revision in review: Spatial patterns and temporal dynamics in savanna vegetation across an Australian sub-continental rainfall gradient. Remote Sens. Environ.

