

2016 Panama ENSO gas exchange campaign metadata

February to May 2016

Compiled by Kim Ely, BNL, June 30, 2016

V2 changes

- Corrected species. The tree initially identified as ALBIED, *Pseudosamanea guachapele* has been revised to ALBIAD, *Albizia adinocephala*
 - Related data package identifiers added to data product table below.
-

Summary

Diurnal gas exchange, CO₂ response (ACi curves), leaf water potential and leaf spectra were recorded from top of canopy at monthly intervals (Feb, Mar, Apr, May) during the 2016 ENSO period. Each monthly measurement round comprised four measurement days; one day of diurnal measurements, with some ACi, and one day focused on ACi, at each of two sites. Leaf water potential and samples for NSC and Ph were only collected from diurnal gas exchange samples.

In March, measurements were also made at BCI (leaf water potential and leaf sampling only. No gas exchange or spectra).

In April, diurnal measurements were interrupted by a power outage that prevented canopy crane access. The resulting diurnal curve comprises 3 rounds from the morning of 25th April and 3 rounds from the afternoon of 26th April.

In May, leaf water potential and diurnal gas exchange were measured, and leaf samples collected for non-structural carbohydrate measurement. No spectra or ACi curves were measured.

Protocols

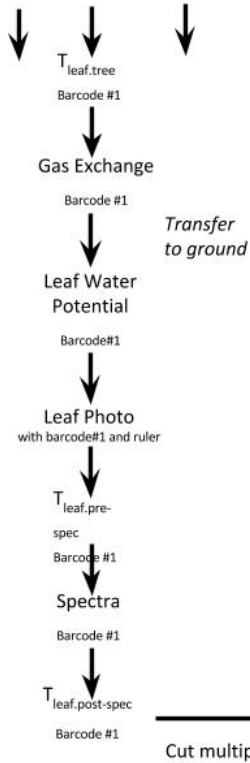
The following protocols were established for this field campaign and made available on NGEE Tropics Teamwork.

Measurement	Protocol
Spectrometry: instrument use	Spectral_Evolution_PSR+_Protocol
Spectrometry: instrument use	SVC_HR-1024i_Protocol
Spectrometry: measurements	NGEE-Tropics_leaf_spectral_collection_protocols
Gas Exchange: measurements	NGEE_Tropics_ENSO_Diurnal_Protocol
Gas Exchange: measurements	NGEE_Tropics_ENSO_ACi_Protocol
Leaf water potential: measurement	NGEE_Tropics_ENSO_Leaf_Water_Potential_Protocol
Leaf sampling: measurements	NGEE_Tropics_ENSO_leaf_sample_protocol

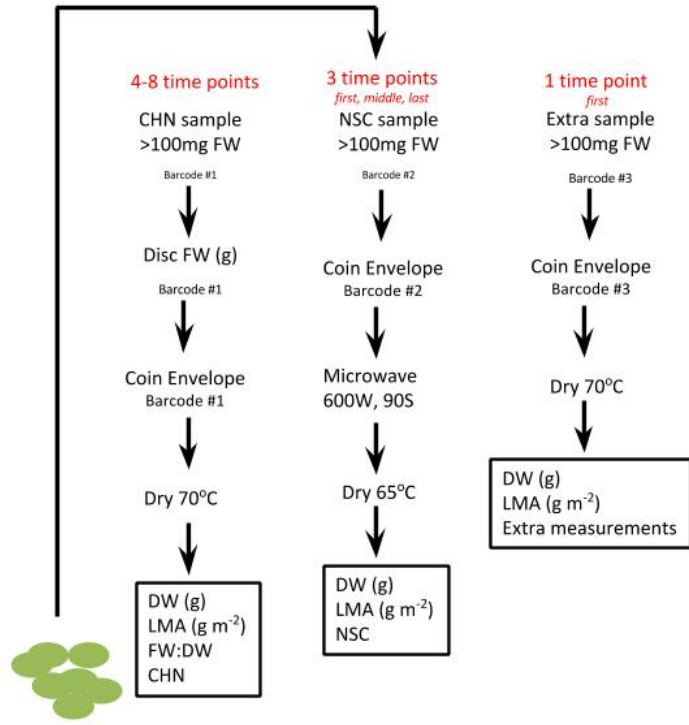
Work flow

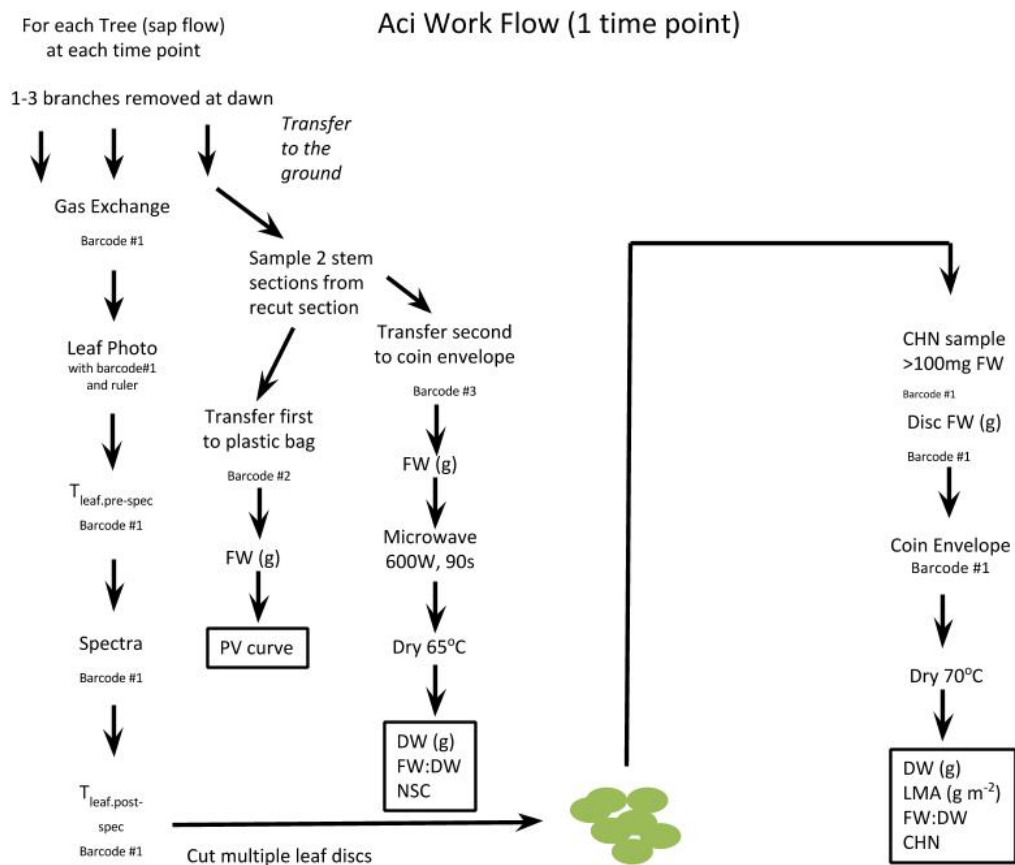
For each target tree (sap flow) at each time point (4-8)

2-3 leaf level measurements



Diurnal Work Flow





Sample numbers and Data products

Data products for each sample are linked by sample number. Sample details, including date, location, species and a photograph, are all recorded in the LeafSamples data packages. If multiple aliquots of sample were obtained from a single leaf (i.e. sample material for separate CHN and NSC analysis), these aliquots were assigned individual sample numbers. The LeafSamples spreadsheet shows where material from a single leaf has been assigned multiple sample numbers.

Data products from the 2016 Panama ENSO field campaign will be uploaded to the NGEE Tropics data archive as separate data packages. Not all products are available for all samples.

Product	Data package identifier
Leaf sample details	NGT0038
Wood sample details	see NGT0074
Leaf water potential	NGT0036
Diurnal gas exchange	NGT0039
CO2 response gas exchange (ACi)	NGT0044
Leaf spectra	NGT0037
Leaf mass area	NGT0043
Leaf carbon and nitrogen	NGT0068

Leaf phosphorus	Not measured
Non-structural carbohydrates (leaf tissue)	NGT0074
Non-structural carbohydrates (wood tissue)	NGT0074

Locations

Parque Natural Metropolitano (PNM), Panama City. 8.994517°N, -79.542975°E (crane tower)

San Lorenzo (Fort Sherman). 9.280225°N, -79.975527°E

Barro Colorado Island (BCI)

Campaign measurements and equipment used

Date	Location	Leaf water potential	Gas exchange	Spectroradiometer	White reference
2016-02-13	PNM	LWP	diurnal, ACi	SVC	0826
2016-02-14	PNM	NA	ACi	SVC	0827
2016-02-16	San Lorenzo	NA	ACi	SVC	0826
2016-02-17	San Lorenzo	LWP	diurnal	SVC	0826
2016-03-10	San Lorenzo	NA	diurnal, ACi	SVC	0827
2016-03-11	San Lorenzo	NA	ACi	SVC	0827
2016-03-12	BCI	LWP	NA	NA	NA
2016-03-14	PNM	NA	diurnal, ACi	PSR	0827
2016-03-15	PNM	NA	ACi	PSR	0827
2016-04-21	San Lorenzo	LWP	diurnal, ACi	SVC	0826
2016-04-22	San Lorenzo	NA	ACi	SVC	0827
2016-04-25	PNM	LWP	diurnal, ACi	SVC	0827
2016-04-26	PNM	LWP	diurnal, ACi	SVC	0827
2016-05-17	PNM	LWP	diurnal	NA	NA
2016-05-24	San Lorenzo	LWP	diurnal	NA	NA

Equipment

Instrument type	Owner	Manufacturer	Model/software	Serial number	Working name
gas analyzer	BNL	LI-COR	6400XT v. 6.3.2	PSC3698	Andy
gas analyzer	BNL	LI-COR	6400XT v. 6.3.2	PSC0570	Derek
gas analyzer	BNL	LI-COR	6400XT v. 6.3.2	PSC3699	Jorge
gas analyzer	BNL	LI-COR	6400XT v. 6.3.2	PSC0464	Mariano
gas analyzer	BNL	LI-COR	6400XT v. 6.3.2	PSC3613	Bernie
gas analyzer	University of Utah	LI-COR	6400XT v. 6.3.2	PSC0748	Johnny

spectroradiometer	BNL	Spectra Vista Corporation	HR-1024i	6142041	SVC
spectroradiometer	BNL	Spectral Evolution	PSR+	1586067	PSR
thermocouple	BNL	Omega	HH801B HandHeld thermocouple	150115	
thermocouple	BNL	Omega	HH801B HandHeld thermocouple	150266	
pressure chamber	LANL	PMS instrument company	Model 1000		
balance	BNL	Fisher Science Education	SLF303	B515819592	

Trees sampled (canopy tree IDs the same as for sap flow measurements)

Location	Tree ID	Species code	Species
PNM		CASTEL	Castilla elastica
PNM		LUEHSE	Luehea seemannii
PNM		ANACEX	Anacardium excelsum
PNM		CORDAL	Cordia alliodora
PNM		CAL2CA	Calycophyllum candidissimum
PNM		FICUIN	Ficus insipida
PNM		ALBIAD	Albizia adinocephala
PNM		ANTITR	Pittoniotis trichantha
PNM		PSE1SE	Pseudobombax septenatum
PNM		CECRPE	Cecropia peltata
San Lorenzo		TERMAM	Terminalia amazonia
San Lorenzo		TOCOPI	Tocoyena pittieri
San Lorenzo		CARAGU	Carapa guianensis
San Lorenzo		TACHVE	Tachigali versicolor
San Lorenzo		VOCHF	Vochysia ferruginea
San Lorenzo		VIROSP	Virola multiflora
San Lorenzo		MICOBO	Miconia borealis
San Lorenzo		APEIME	Apeiba membranacea
San Lorenzo		GUATDU	Guatteria dumetorum
San Lorenzo		CECRIN	Cecropia insignis
BCI		GUSTDU	Gustavia superba
BCI		INGAPE	Inga pezizifera
BCI		MICOAR	Miconia argentea
BCI		SIMAM	Simarouba amara
BCI		ALSEBL	Alseis blackiana

PNM	understory	ALBIAD	Albisia adenophela
PNM	understory	ANACEX	Anacardium excelsum
PNM	understory	CAL1	Callichlamys latifolia
PNM	understory	CALYCA	Calycophyllum candidissimum
PNM	understory	CAPI	Capparis indica
PNM	understory	CASTEL	Castilla elastica
PNM	understory	PIT1RU	Cojoba rufescens
PNM	understory	CUPACI	Cupania cinerea
PNM	understory	LUEHSE	Luehea seemannii
PNM	understory	PPRE	Piper reticulatum
PNM	understory	POSOLA	Posoqueria latifolia
PNM	understory	AST2GR	Astronium graveolens

Sampling position and leaf age

Leaves were sampled from fully sunlight top of canopy. Sampled leaves were “most recent fully expanded”. At PNM in April understory plants were measured for CO₂ response when the canopy was inaccessible due to power outage. Spectra and chemistry samples were also collected for these plants.