MONASH University

JAXA FLUX TOWER

Pasture Site NSW

ET data, soil moisture network to calibrate the new microwave radiometer on GCOM1

Welcome to OzNet

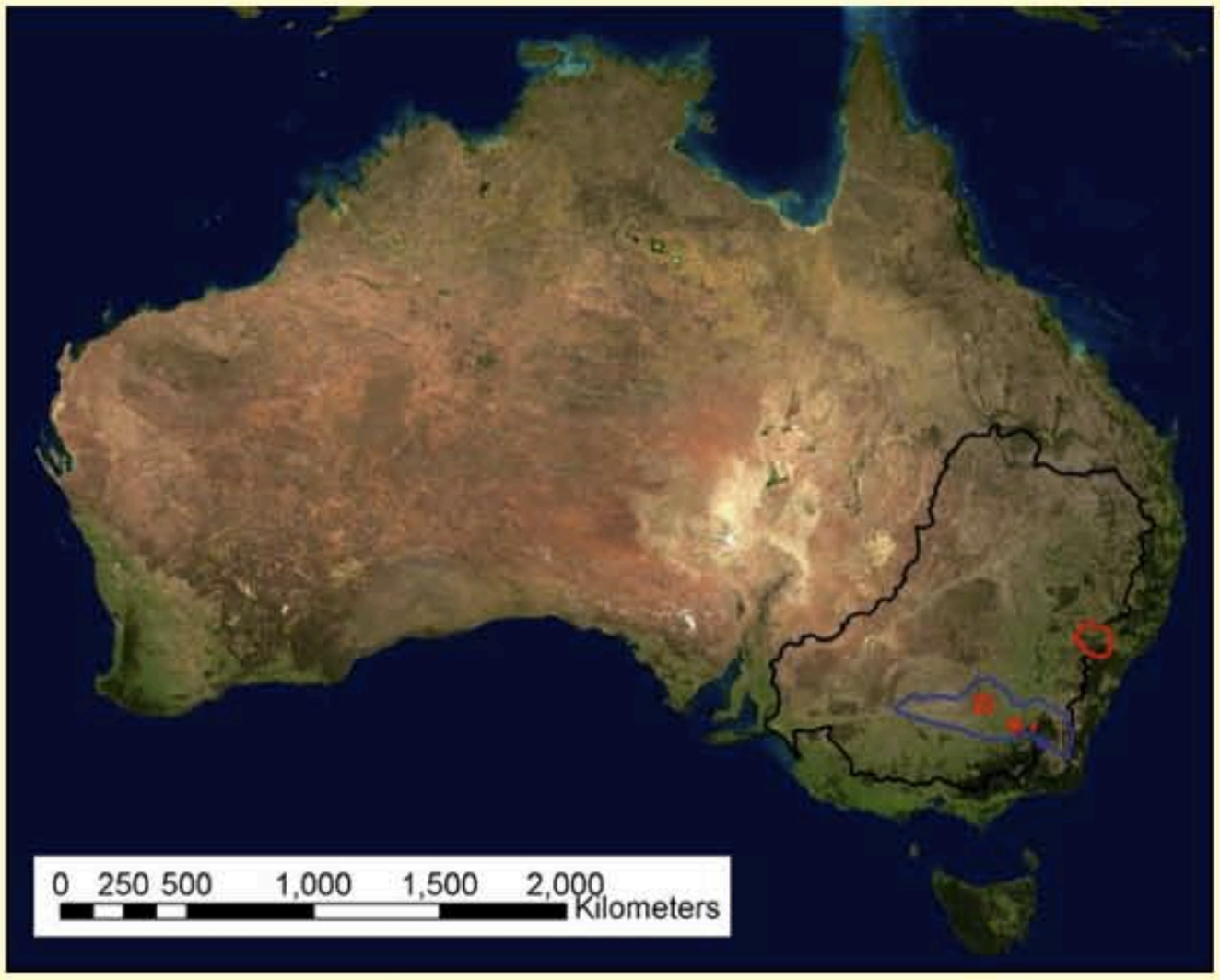
Hydrological monitoring network.

An Australian monitoring network for soil moisture and micrometeorology.

Regions... | Murrumbidgee Sites... | Yanco Sites... | Kyeamba Sites... | Adelong Creek...

MELBOURNE SCHOOL OF ENGINEERING

MONASH University Engineering

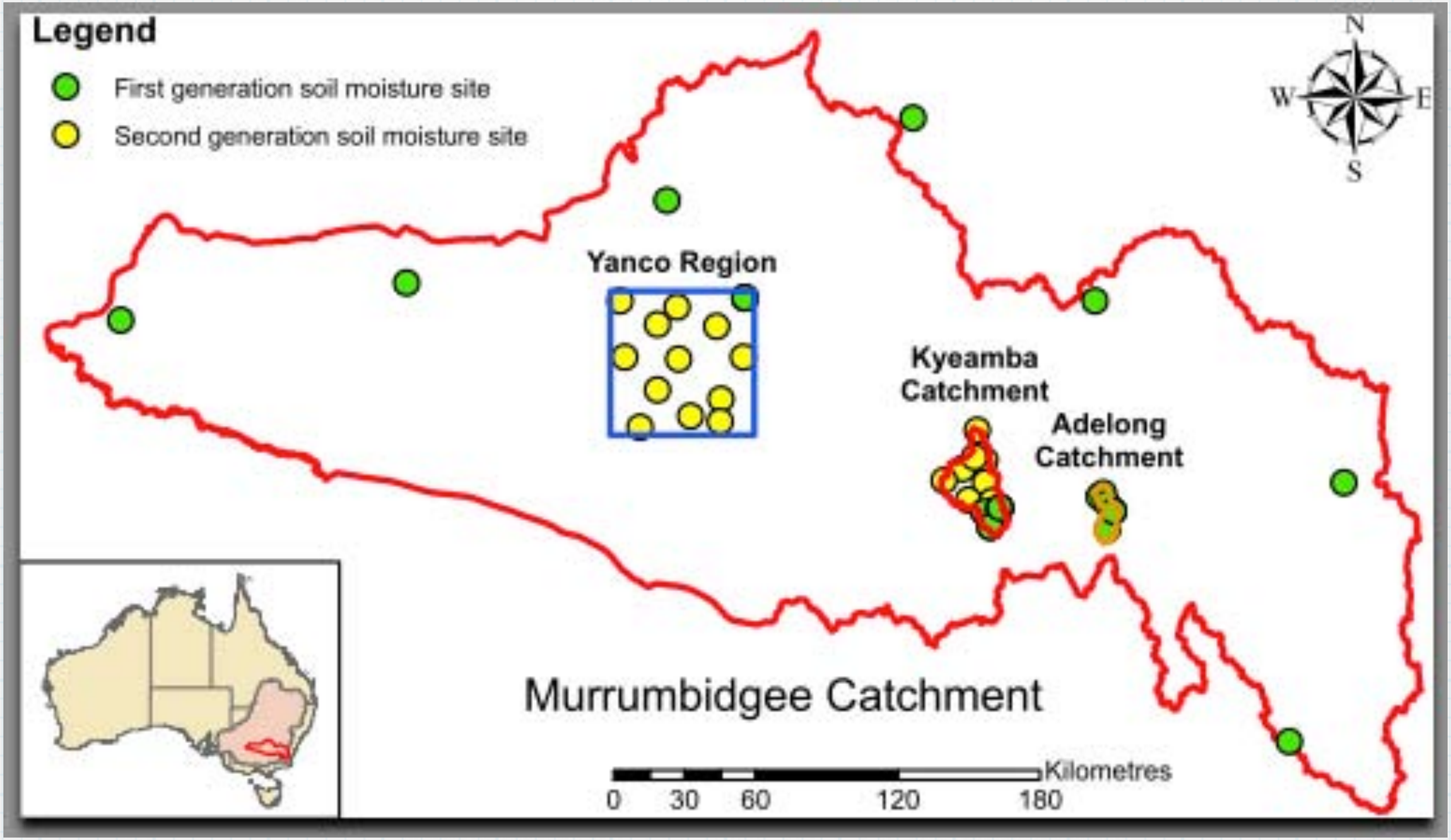


Click on the study area to zoom in.

NOTE: Information on the OzNet network can be found in the following reference:

Smith, A. B., Walker, J. P., Western, A. W., Young, R. I., Ellett, K. M., Pipunic, R. C., Grayson, R. B., Siriwidena, L., Chiew, F. H. S., and Richter, H., The Murrumbidgee Soil Moisture Monitoring Network Data Set. Water Resources Research. In Press

http://www.oznet.org.au.


Legend
First generation soil moisture site
Second generation soil moisture site
N
W
E
S
Yanco Region
Kyeamba
Catchment
Adelong
Catchment
Murrumbidgee Catchment
Kilometres
0
30
60
120
180

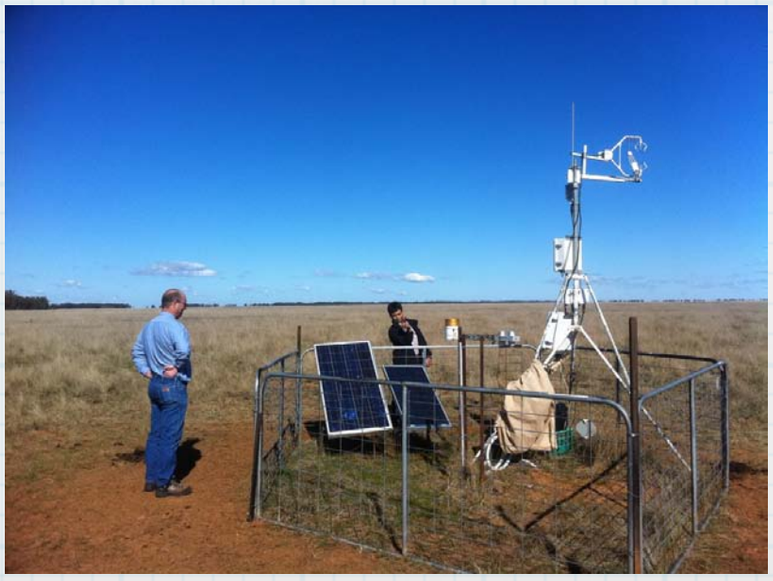
* Soil Moisture Monitoring in the Murrumbidgee Catchment NSW from 2001

* NASA Soil Moisture Active Passive SMAP mission with Monash Uni associated field EXperiment www.smapex.monash.edu.au

* Yanco sites now have a JAXA flux tower to monitor ET. This will be used to calibrate microwave radiometer instruments on the new JAXA satellite

* For crop modelling, runoff, flood forecasting, Land Surface Model forcing data

* Melb Uni put in a temporary flux tower



WATER RESOURCES RESEARCH, VOL. ???, XXXX, DOI:10.1029/,

The Murrumbidgee soil moisture monitoring network data set

A. B. Smith,[1,2] J. P. Walker,[3] A. W. Western,[1] R. I. Young,[1] K. M. Ellett,[1,4]
R. C. Pipunic,[1] R. B. Grayson,[1] L. Siriwardena,[1] F. H. S. Chiew,[5] and H. Richter[2] DRAFT 2012

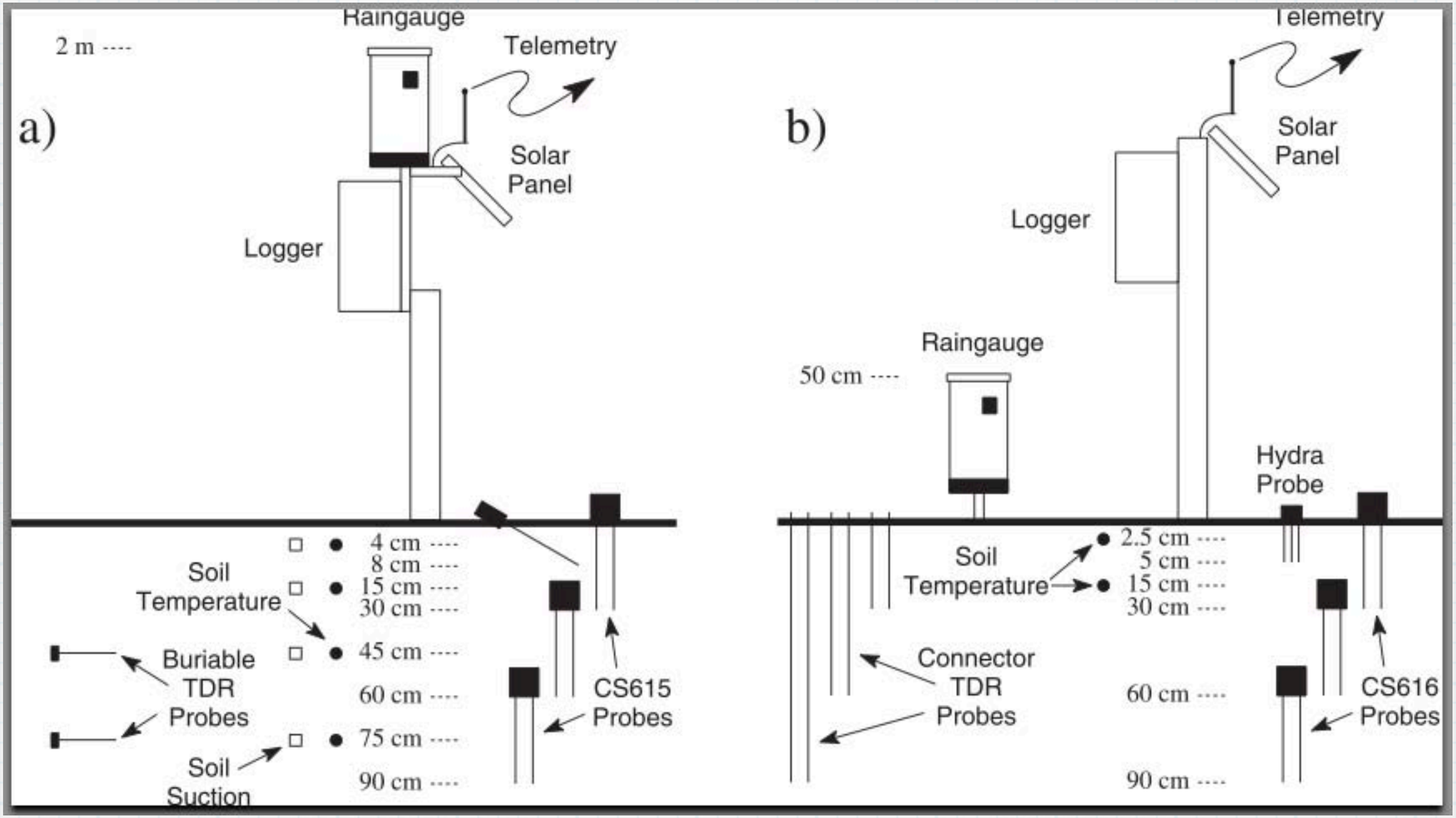
MONASH University

Engineering

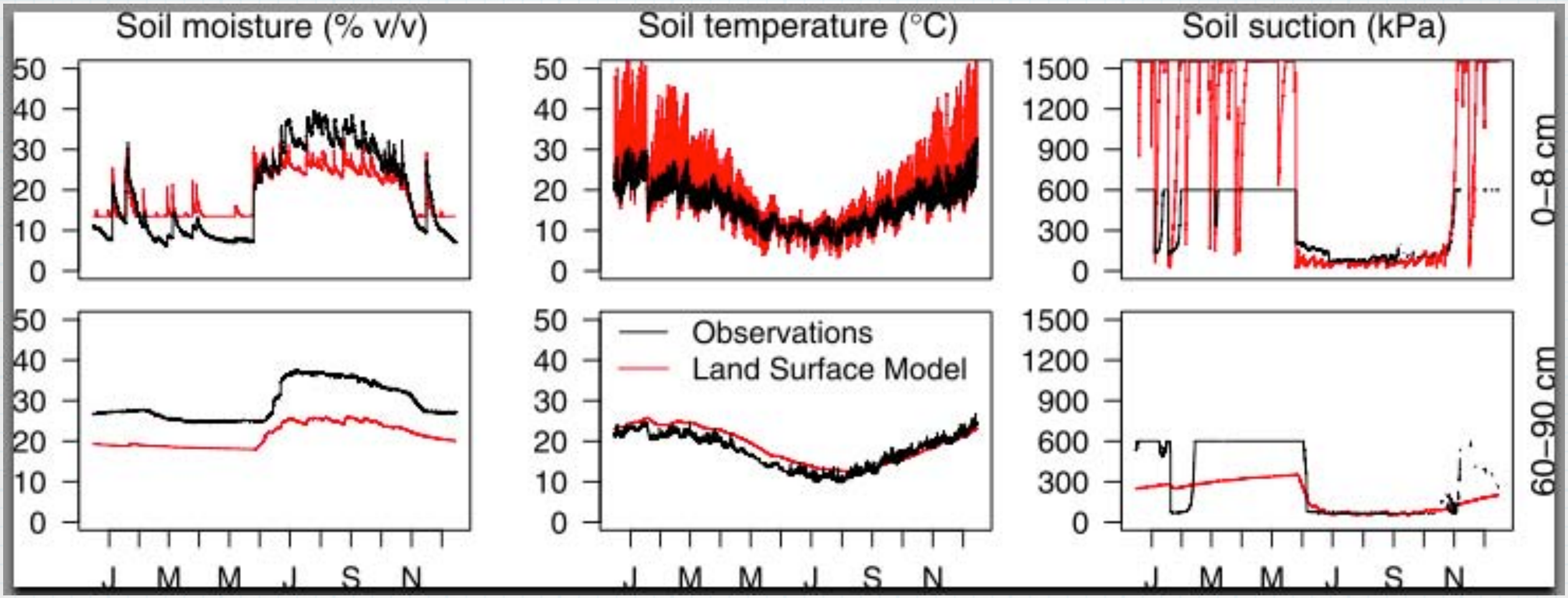
The Third Soil Moisture Active Passive Experiment

A. Monerris, J.P. Walker, R. Panciera, T.J. Jackson, D. Gray, H. Yardley, D. Ryu
MODSIM, Perth, WA
15th December 2011

www.smapex.monash.edu.au



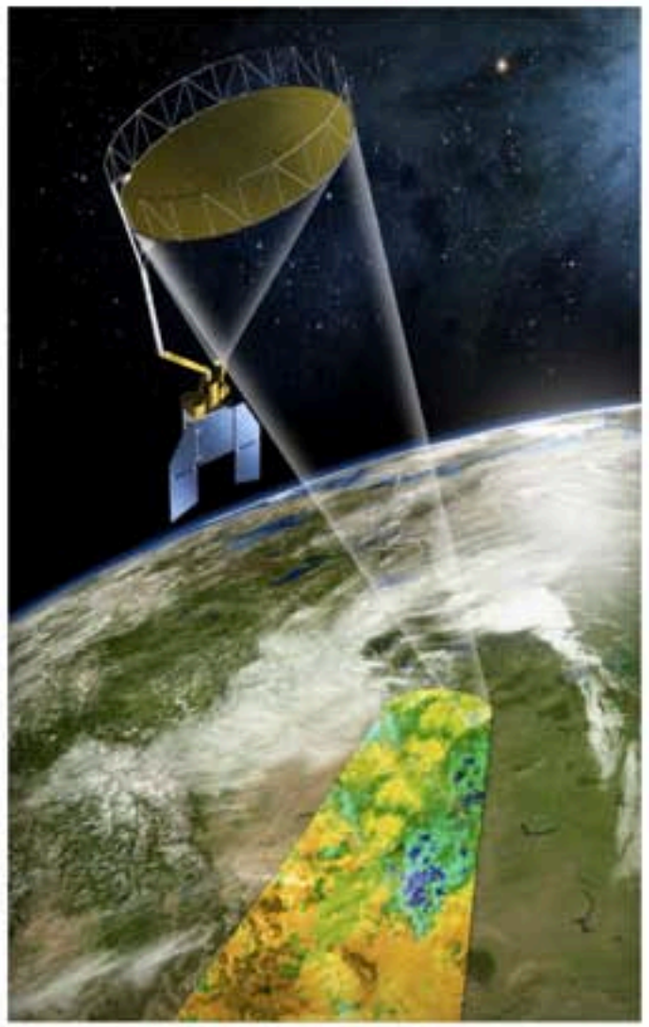
Soil Moisture Monitoring.



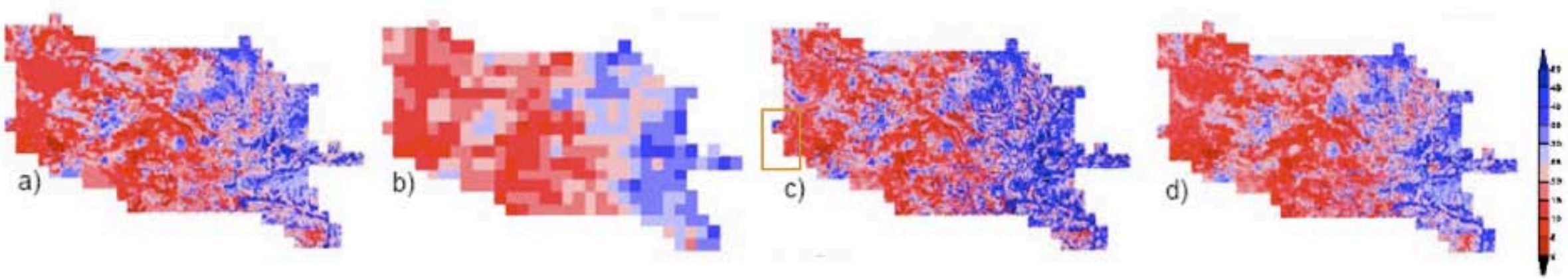
Annual soil moisture
Measurements vs Land Surface Model

SMAP concept

- Radar-only soil moisture retrieval (3km)
- Radiometer-only soil moisture retrieval (40km)
- Active + Passive soil moisture product (10km)
  - Use the high resolution (3km) but noisy SMAP radar observations to downscale the accurate but low resolution (40km) radiometer footprint



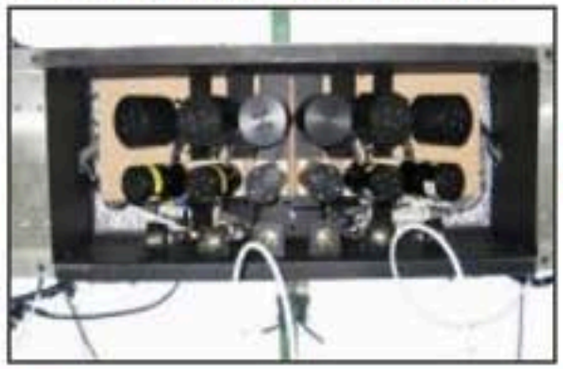
- Example (from Zhan et al. 2006)

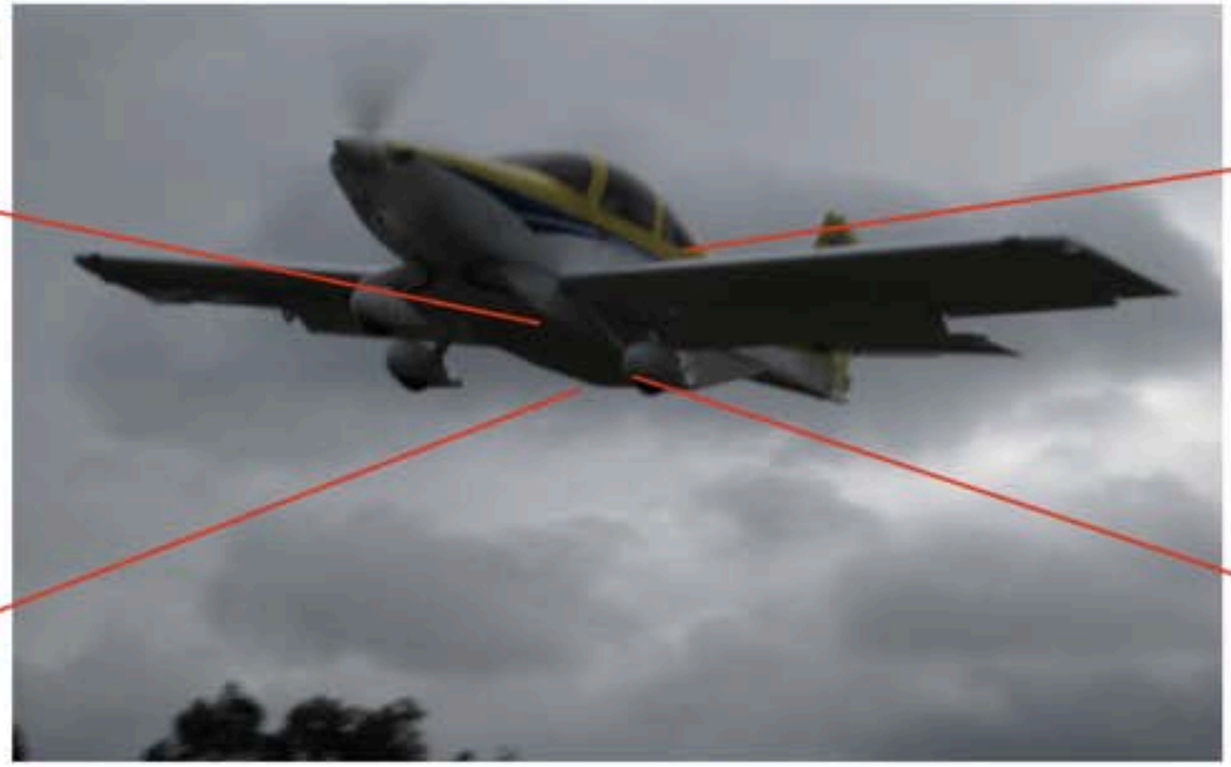


SMAP simulator

L-band radiometer (PLMR)

6 x Vis/NIR/SWIR/TIR





L-band radar (PLIS)

PLMR: Polarimetric L-band Multibeam Radiometer

Frequency/bandwidth: 1.413GHz/24MHz

Polarisations: V and H

Resolution: ~1km at 10,000ft flying height,

Incidence angles: ±7, ±21.5, ± 38.5°across track

Antenna type: 8×8 patch array

PLIS: Polarimetric L-band Imaging SAR

Frequency/bandwidth:1.26GHz/30MHz

Polarisations: VV, VH, HV and HH

Resolution: ~10m

Inc. angles 15º -45º on both sides of aircraft

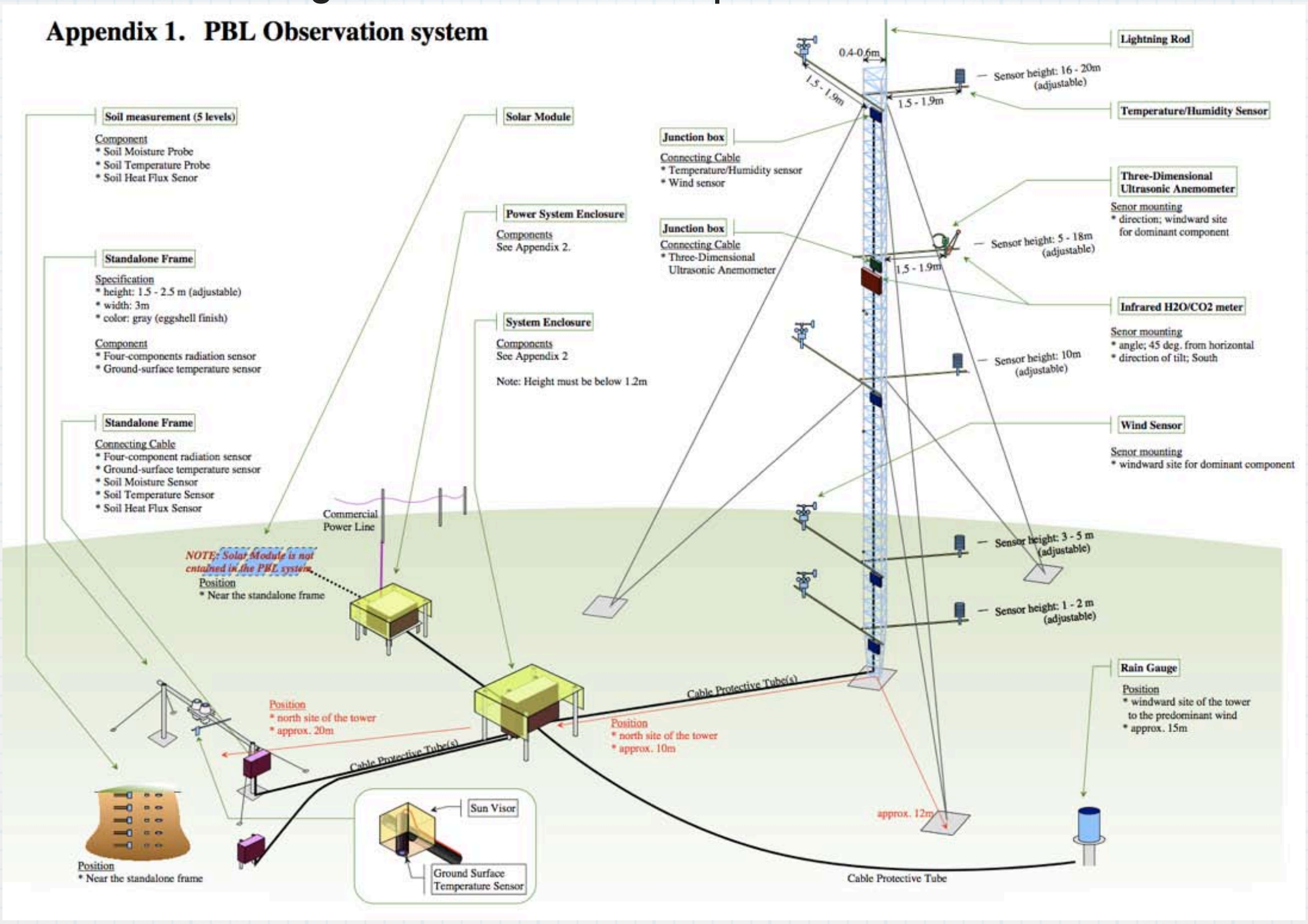
Antenna type: 2x2 patch array

SMAPEx-3 data set and archive status

	Dataset	Processing	Website
Air	**PLMR**	**Processed**	**Dec 2011**
	PLIS	**In progress**	**(*)**
	Skye VIS/NIR/SWIR	**In progress**	**March 2012**
	Thermal IR	**In progress**	**March 2012**
	Aerial Photos	**In progress**	**Dec 2011**
Ground	**Soil moisture (SMAPEx network)**	**Processed**	**Dec 2011**
	Soil moisture (HDAS)	**Processed**	**Dec 2011**
	LAI	**Processed**	**Dec 2011**
	CROPSCAN	**Processed**	**Dec 2011**
	Vegetation destructive samples	**Processed**	**Dec 2011**
	Surface roughness	**Processed**	**Dec 2011**
	Thermal IR (monitoring sites)	**Raw data**	**March 2012**

(*) PLIS data availability dependent on timeline and/or issues during geo-registration and calibration

The Japanese team at JAXA were both extremely efficient and vague about some important details...



* Flux Tower Site & EC height Considerations.

- Footprint Summary for 10m instrument height over pasture

- It is important to note that the footprint is at it's likely maximum in near neutral conditions. In stable conditions the flux instrumentation is a poor estimator of surface/ atmosphere exchanges, and in unstable conditions the exchanges measured are likely to be closer to the tower.

- These analyses used included both in-house footprint analysis (by Peter Isaac- unpublished) and Online Parameterisation for Flux Footprints. (*footprint.kljun.net/ varinput.php)* to estimate flux footprint contribution in stable, neutral, and unstable conditions.

- IN-house footprint analysis given a 10m instrument height, assuming conditions are near neutral. Results suggest 80% of exchanges are from within 1.5km (.78km online method) and from an area of 200,000sq.m.

- IN-house footprint analysis with a 20m instrument height suggest 80% of exchanges are from within 3.5km (1.5km online) and area of 800,000sq.m. This footprint is likely to include flux contributions outside the pasture site itself including local waterways and associated tree corridors, possibly the Newell Highway to the West and North.

Section 2b

IN-house footprint analysis assuming a 10m instrument height

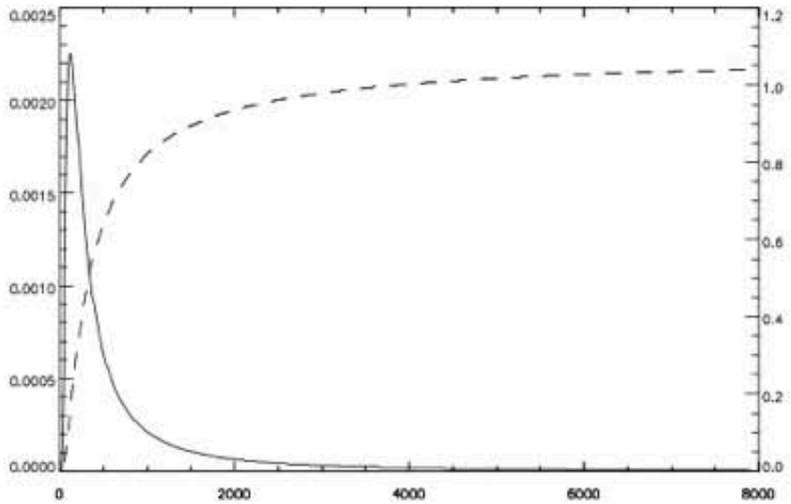
Run02

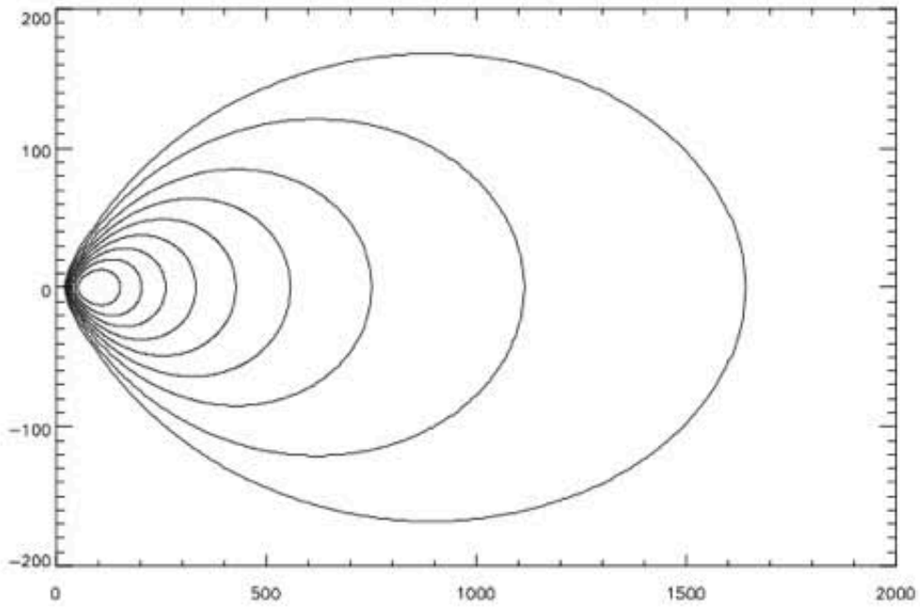
zm	z0	L	SigWD	u*	u(zm)	SigV
10.00	0.03	-1.00E+003	10.00	0.10	1.44	0.25

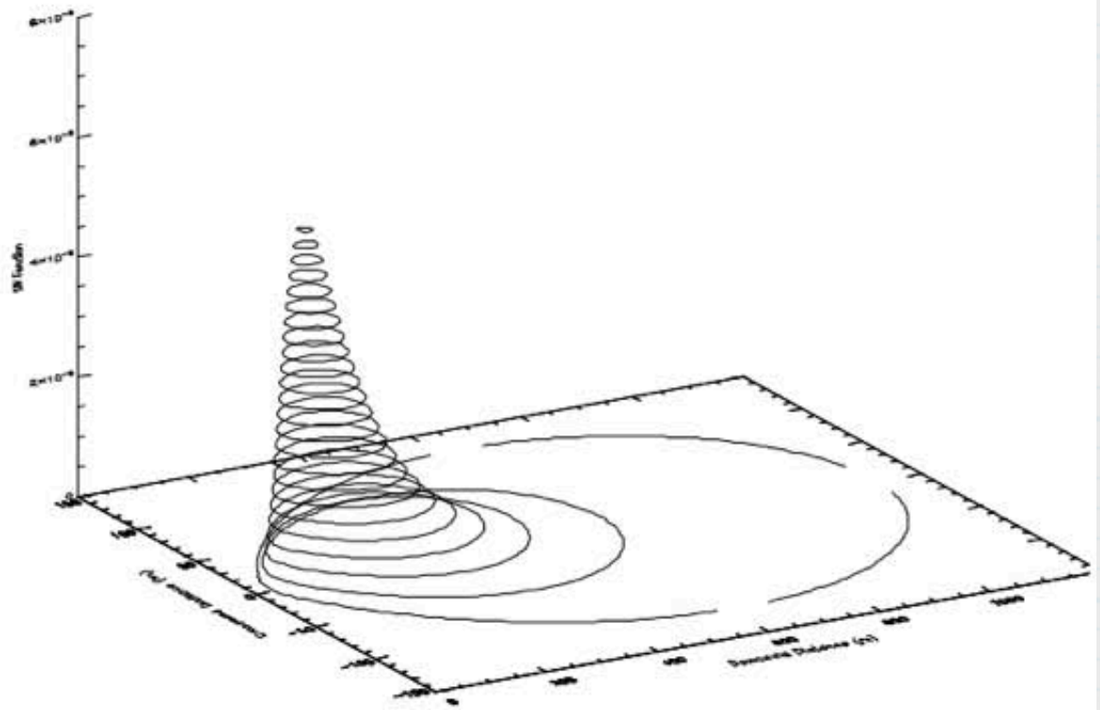
FMax	XMax	Zbx	PLim	MHgt	Nzb	N
6.19E-005	84.43	3.31	1.01	31.25	781	3

Fiev	Fval	Pf	Xp1	Xp2
0.001	6.254E-008	0.944	18.3	2747.6
0.010	6.254E-007	0.797	22.5	1107.2
0.020	1.251E-006	0.726	24.3	837.1
0.040	2.502E-006	0.639	26.6	628.7
0.060	3.753E-006	0.579	28.3	529.2
0.080	5.003E-006	0.533	29.6	466.9
0.100	6.254E-006	0.495	30.8	422.9
0.150	9.381E-006	0.420	33.2	351.0
0.200	1.251E-005	0.363	35.3	305.6
0.300	1.876E-005	0.277	39.2	248.2
0.400	2.502E-005	0.213	42.7	211.3
0.500	3.127E-005	0.162	46.2	184.1
0.600	3.753E-005	0.119	50.0	162.5
0.700	4.378E-005	0.083	54.2	144.1
0.800	5.003E-005	0.051	59.3	127.3
0.900	5.629E-005	0.023	66.3	110.5
0.950	5.942E-005	0.010	71.9	100.5
0.975	6.098E-005	0.004	76.6	93.9
0.990	6.192E-005	0.000	83.7	85.2

Fval	PfFit	Xp1	Xp2	Ypm	Ar
2.322E-007	0.875	20.4	1640.6	167.9	411037
6.150E-007	0.799	22.5	1114.7	120.8	199012
1.627E-006	0.695	25.1	751.7	84.8	92889
3.318E-006	0.598	27.8	557.8	63.9	51103
6.086E-006	0.500	30.7	426.1	49.0	29428
1.049E-005	0.398	34.0	332.9	37.4	16950
1.712E-005	0.297	38.2	260.6	28.1	9523
2.664E-005	0.199	43.6	203.5	20.3	4976
4.081E-005	0.099	52.1	152.5	12.7	1977







Section 3a: Online Flux Footprint Calculator at http://footprint.kljun.net

For details see

Kljun, N., P. Calanca, M.W. Rotach, H.P. Schmid: 2004, 'A Simple Parameterisation for Flux Footprint Predictions', Boundary-Layer Meteorology, 112, 503-523.

Instruments at 10m Inputs: .1,.3,10m, 1000, .1, 80 = 80% of fluxes are within 781m

A Simple Parameterisation for Flux Footprint Predictions

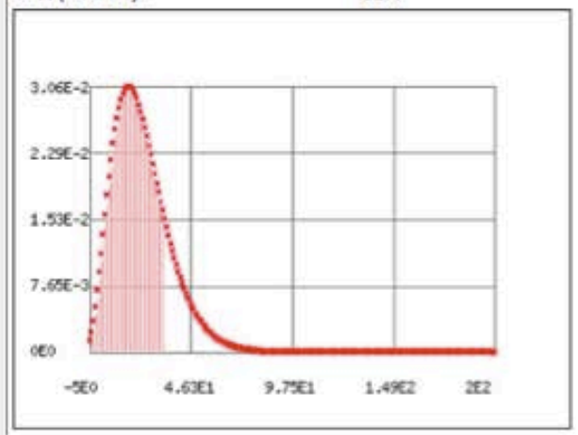
Home
Online footprint
Fair-use policy
Contact
Literature
Presentation @ EGU 2004
FAQ

Footprint from Parameterisation

Non-dimensional Master-Footprint

X* max: 14.8

X* R (R=80%): 32.4

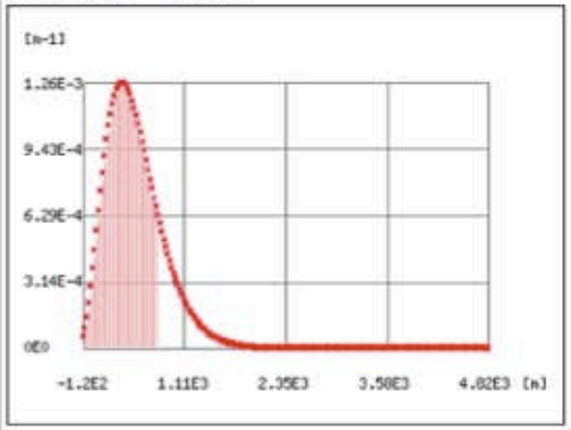


X* [ ]	F* [ ]
-5	1.307E-3
-4	2.3131E-3
-3	3.6374E-3
-2	5.2544E-3
-1	7.1201E-3
0	9.1786E-3
1	1.1368E-2
2	1.3625E-2
3	1.5889E-2
4	1.8103E-2

Real-scale Footprint

xmax: 357.1 m

xR (R=80%): 781.3 m



x [m]	fy [m^{-1}] (crosswind-integrated f)
-1.2041E2	5.373E-5
-9.6329E1	9.509E-5
-7.2247E1	1.4953E-4
-4.8164E1	2.16E-4
-2.4082E1	2.927E-4
0E0	3.7732E-4
2.4082E1	4.6733E-4
4.8164E1	5.6011E-4
7.2247E1	6.5318E-4
9.6329E1	7.442E-4

Site Data

We used the flux data and nearby long term wind data to create the below wind rose/flux data contribution mosaic The light blue represents the number of observations in each direction segment from the old flux tower, Whereas the brown is the BOM wind rose for nearby Narrandera, Based on this, the EC gear should be orientated to the NW to minimise data loss from tower shadow effects.

BOM wind rose from Narrandera

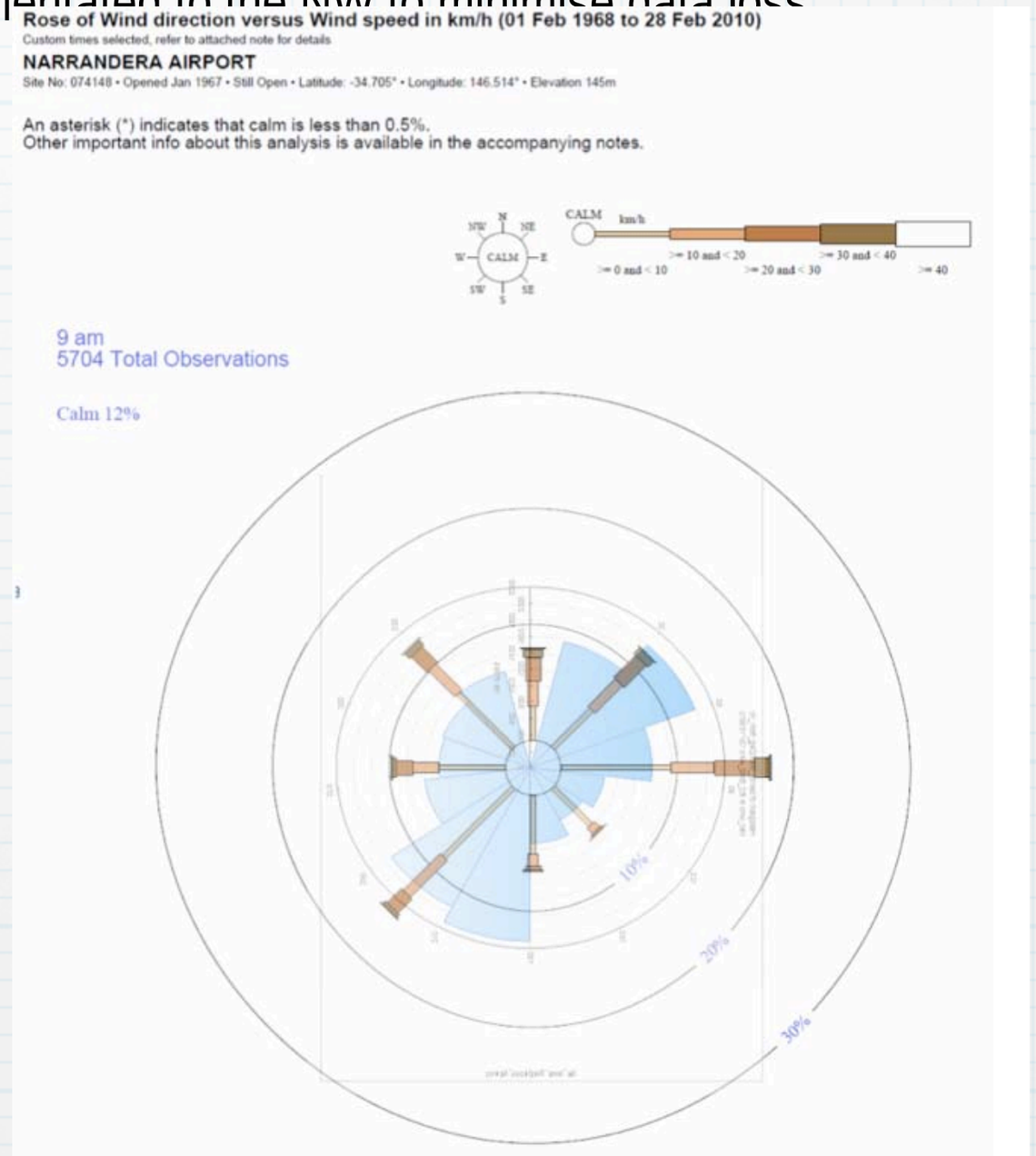
Choose the samllest contribution of fluxes

Each branch of the rose represents wind coming from that direction

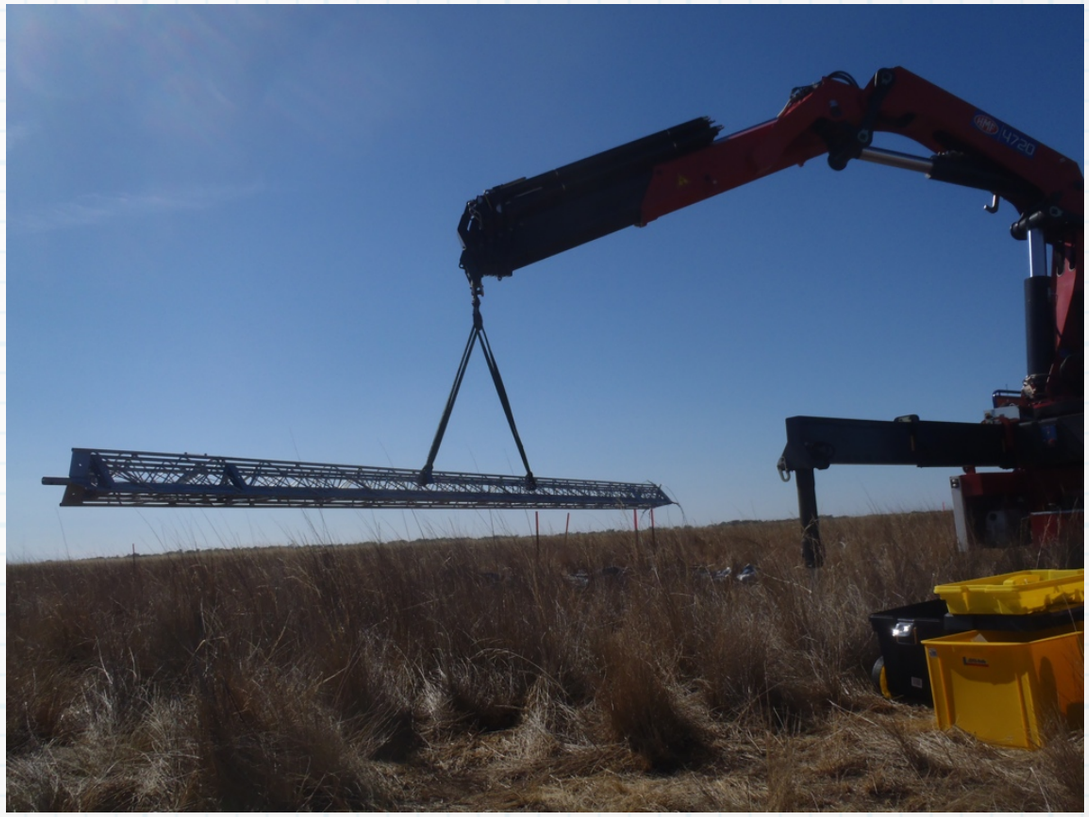
The South East has least wind so place infrastructure to the SE of EC gear

The light blue underlay is the estimated flux data contribution

The inner circle is the proportion of still conditions -10%.



Site 1 with wind rose / flux data contribution overlay.



Saturday, 14 July 2012

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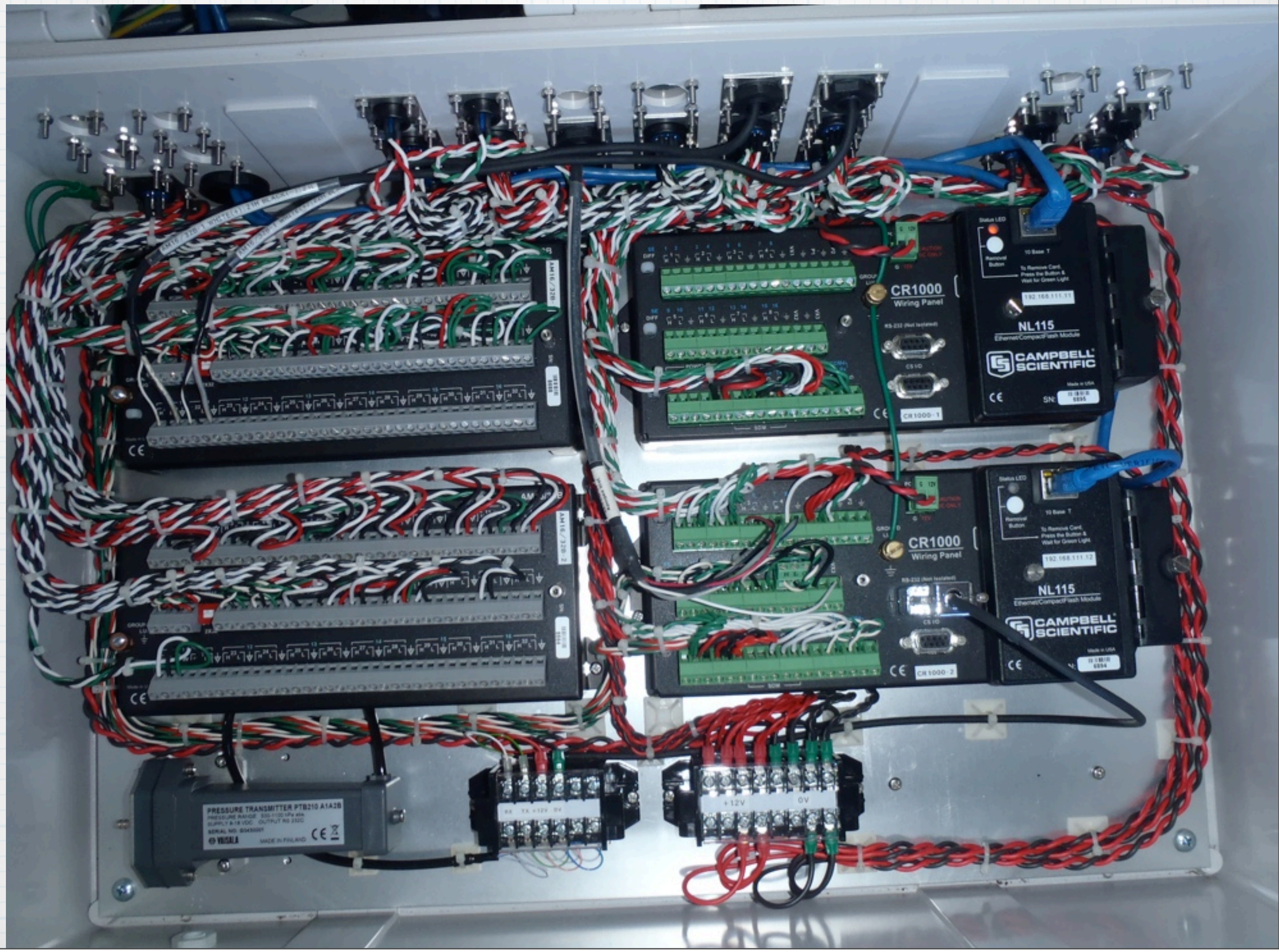

Saturday, 14 July 2012

ACKNOWLEDGEMENTS

Jeff Walker - who heads up the water group at Engineering

Frank Winston - the Eng Tech who has had the steepest learning curve - well done.

Alessandra Monerris - who provided slides for the SMAPEX part of this presentation.

* All is flux, nothing stays still.

- Heraclitus 540 BC - 480 BC

"Geography is just physics slowed down, with a couple of trees stuck in it."

— Terry Pratchett