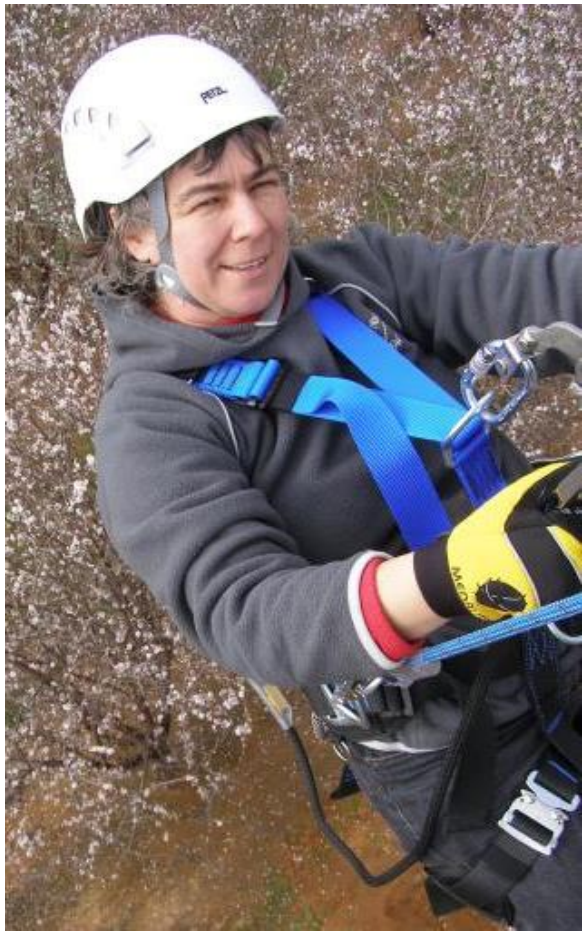
OzFlux Technical Support



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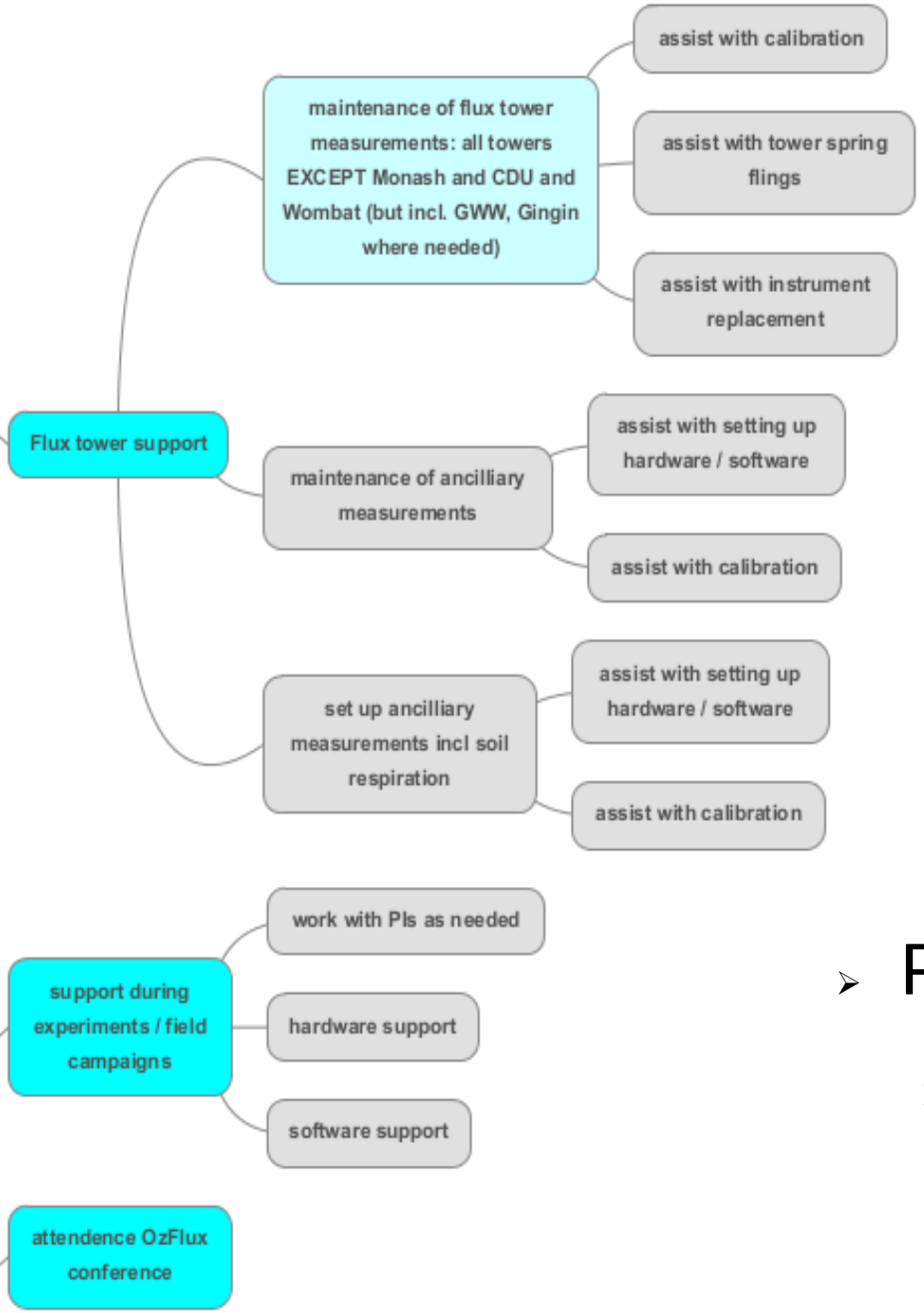

- So far:
  - Fluxtower support:
    - Calperum
    - Warra
  - Data Analysis
    - OzFluxQC

From here:

- PIs:
  - Ask me to support YOU

Support OzFlux Groups

- Flux Tower support
  - Maintenance of measurements
  - Maintenance of ancillary measurements
  - Set up ancillary measurements
- Support during Experiments/Field campaigns
  - Work with PI's as needed
  - Hardware support
  - Software support
- OzFlux workshops/meetings

Maintenance Flux Tower & Ancillary Measurements

- Assist with calibration
- Assist with instrument maintenance
- Assist with instrument replacement
- Assist with hardware/software set up
- Assist with data analysis
- Assist with data quality control

Experiments/Field Campaigns

MONASH University

OzFlux Technical Support

Emma White

Monash University

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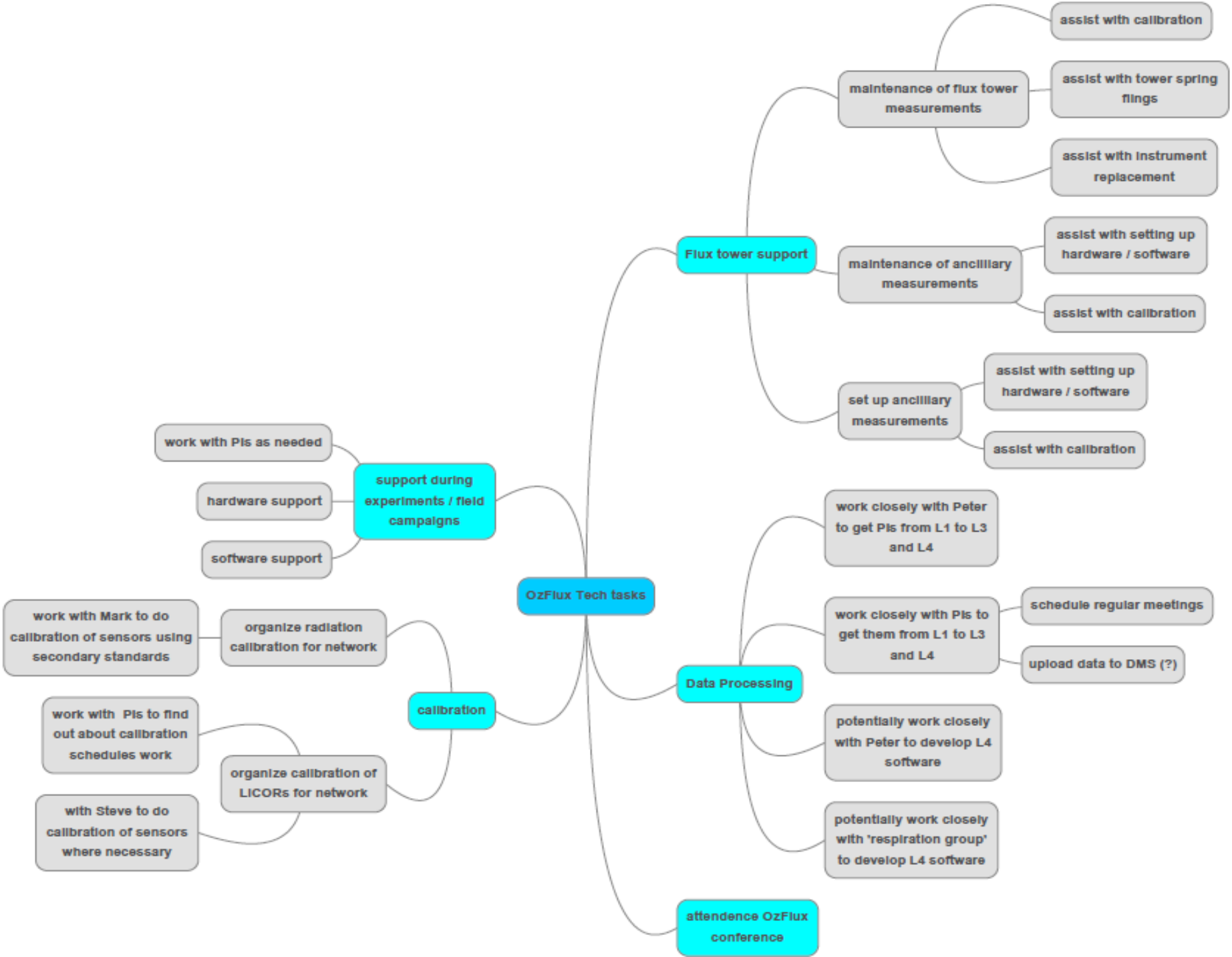
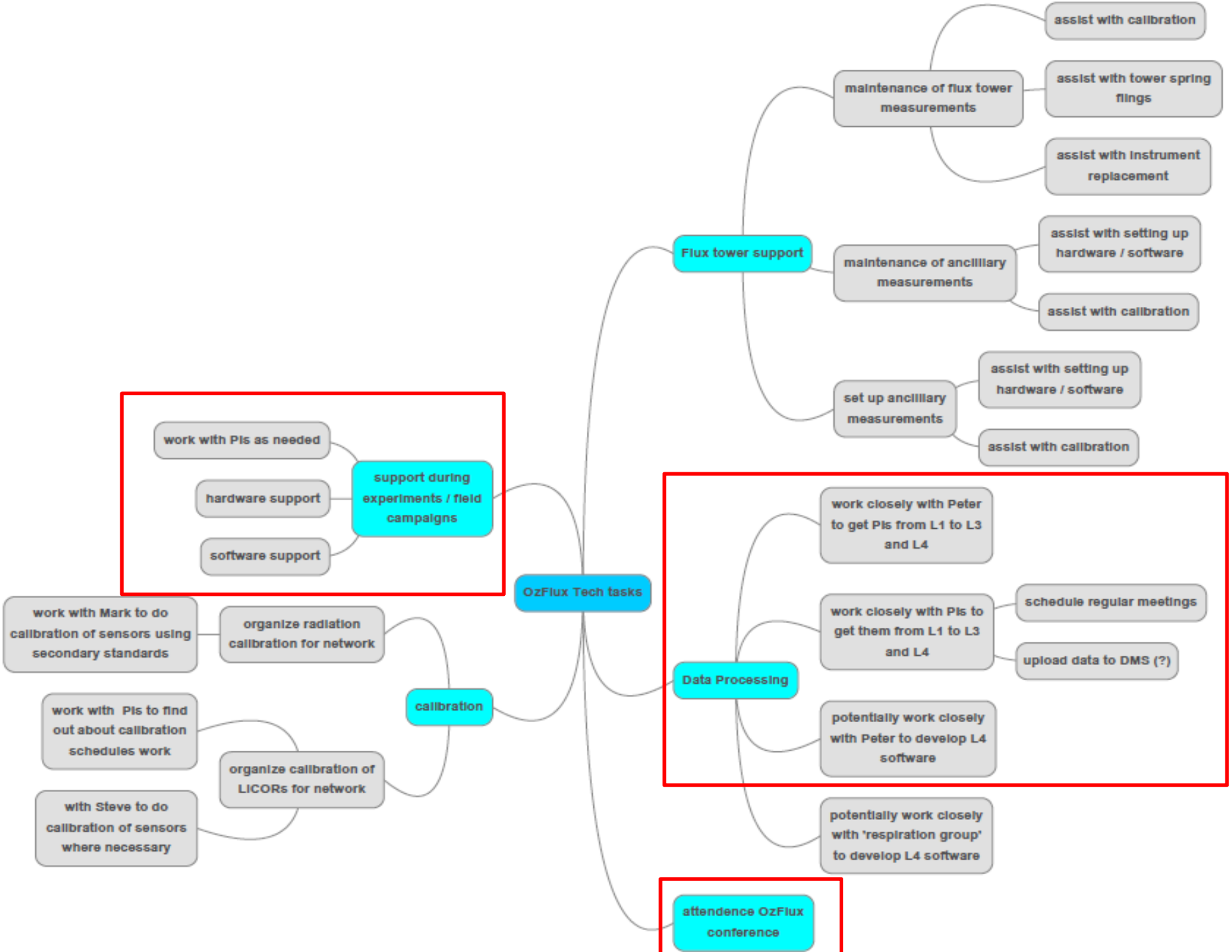
(03) 9902 4243

OzFlux Australian and New Zealand Flux Research and Monitoring


OzFlux Tech tasks
Flux tower support
maintenance of flux tower measurements
assist with calibration
assist with tower spring flings
assist with instrument replacement
maintenance of ancilliary measurements
assist with setting up hardware / software
assist with calibration
set up ancilliary measurements
assist with setting up hardware / software
assist with calibration
Data Processing
work closely with Peter to get PIs from L1 to L3 and L4
work closely with PIs to get them from L1 to L3 and L4
schedule regular meetings
upload data to DMS (?)
potentially work closely with Peter to develop L4 software
potentially work closely with 'respiration group' to develop L4 software
attendence OzFlux conference
support during experiments / field campaigns
work with PIs as needed
hardware support
software support
calibration
organize radiation calibration for network
work with Mark to do calibration of sensors using secondary standards
organize calibration of LICORs for network
work with PIs to find out about calibration schedules work
with Steve to do calibration of sensors where necessary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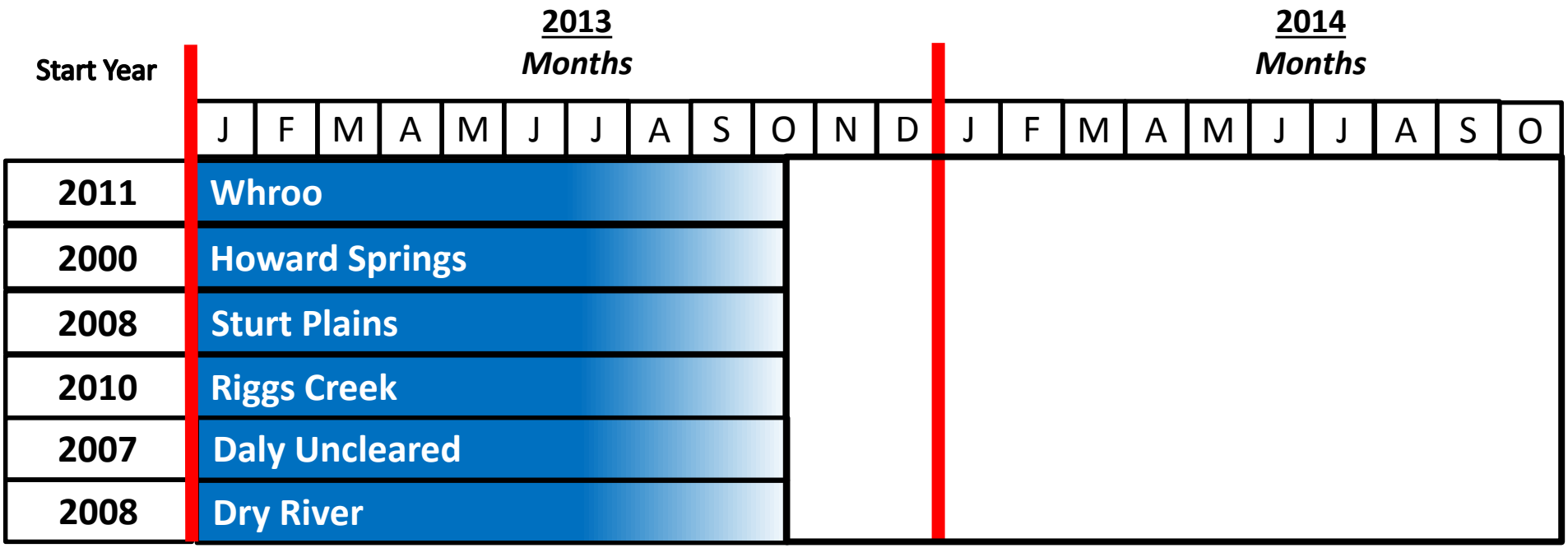
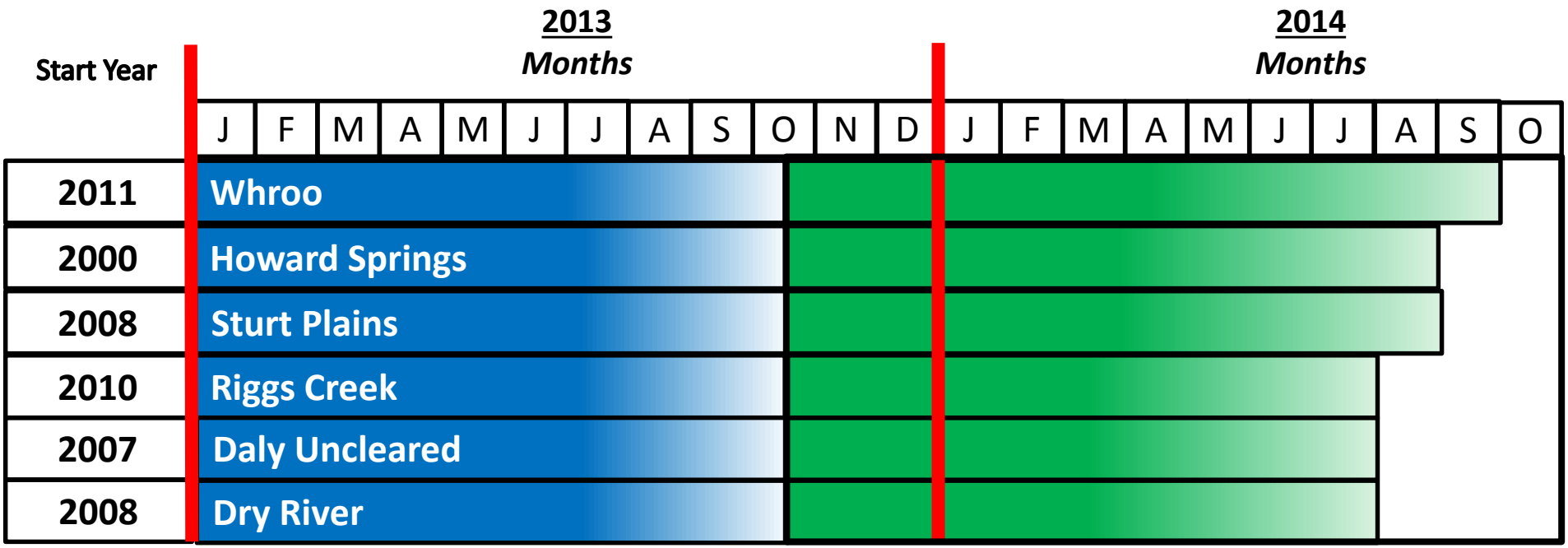
L1 – L3


2013
Months
2014
Months
Start Year
J F M A M J J A S O N D J F M A M J J A S O
2011
Whroo
2000
Howard Springs
2008
Sturt Plains
2010
Riggs Creek
2007
Daly Uncleared
2008
Dry River

L1 – L3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Some other stuff

- **Analysis**:
  Technical support within data analysis, past and current years

- **Data portal**:
  Maintaining the OzFlux Data Portal;
  FluxNet submissions;
  Data summaries of portal submissions;
  Portal audit
  Past datasets for further processing (Daly Regrowth and Wallaby sites)
- **Field work assistance**

Things I've been working on

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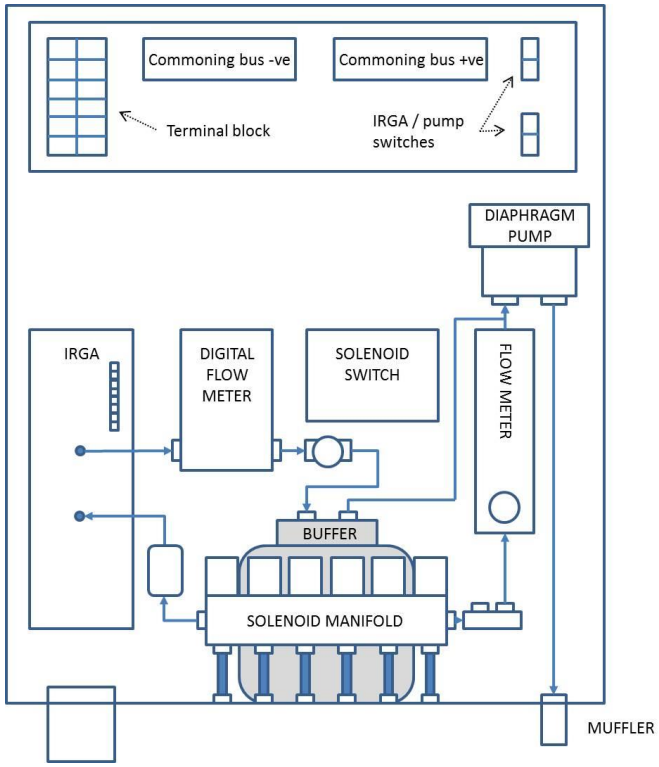
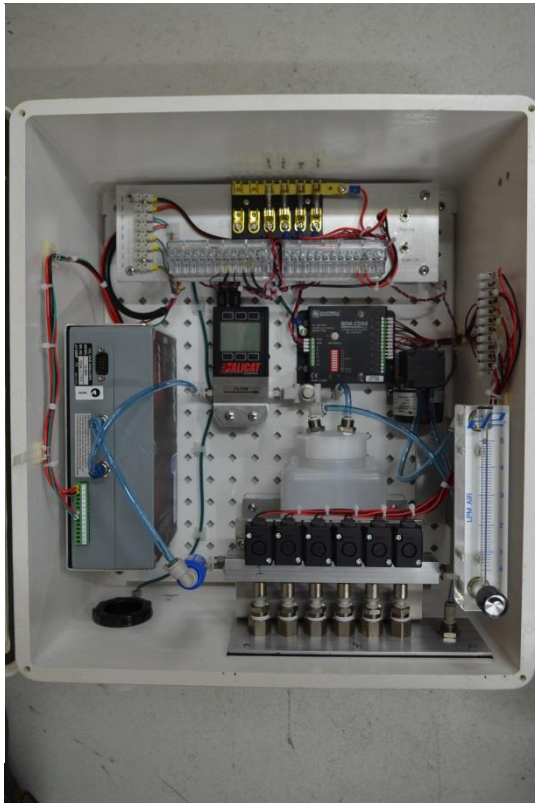
Infrastructure and measurement





- Support arm with dolly for instrument mounting
  - Endless cable used to roll dolly along arm
  - Easily replaceable generic aluminium side plates for instrument mounting
- Profile system:
  - Constantly draws on all lines; sequentially connects routes each level to IRGA (up to 1 cycle / minute)
  - 2-stage filter intake assemblies smooth fluctuations in [CO_2 / H_2O]

Data processing (change point detection)

Change point detection (adapted from Barr et al., 2013):

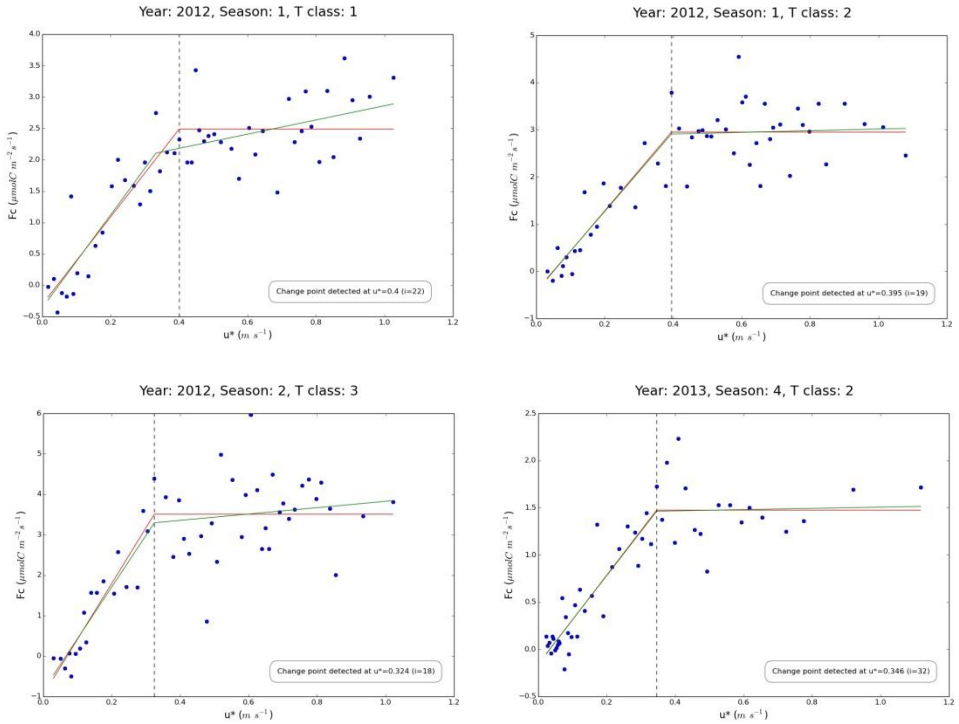
1. Stratify nocturnal NEE into fixed length periods; stratify periods into temperature classes by quantile; bin average NEE within temperature classes ordered by ↑u*
2. Identify unknown change points (c) using two-phase linear regression
3. Test all possible change points in range 2 ≤ c ≤ n-1; select c that minimises SSE
4. Calculate f score to test two-phase regression performance against null model
5. Bootstrap data to yield distribution of change points; mean is best threshold estimate
6. Propagate variance to test effect on cumulative NEP of underlying threshold uncertainty (in progress)

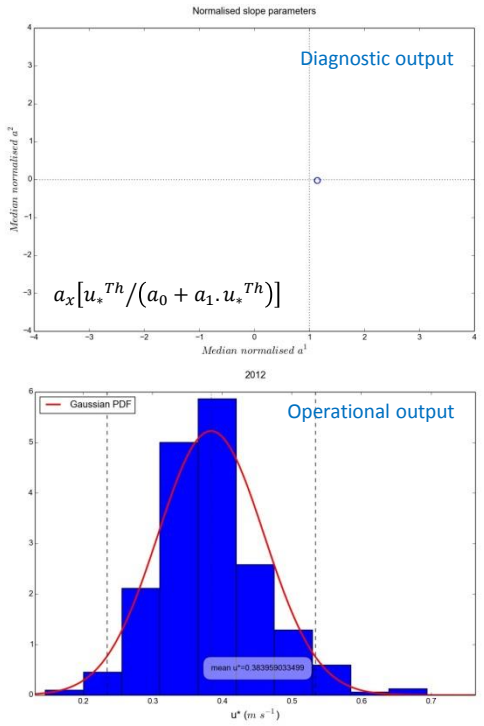
Diagnostic model:

$$y_i = \begin{cases} a_0 + a_1 x_i + \varepsilon, & 1 \le i \le c \\ a_0 + a_1 x_c + a_2 (x_i - x_c) + \varepsilon, & c < i \le n \end{cases}$$

Operational model:

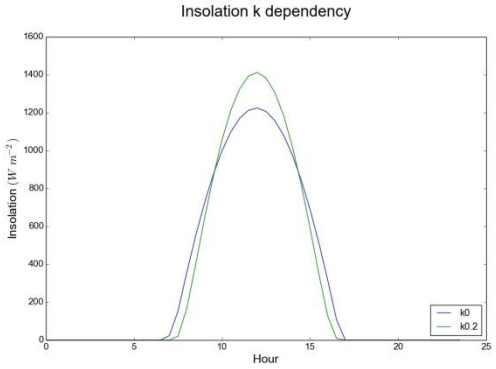
$$y_i = \begin{cases} b_0 + b_1 x_i + \varepsilon, & 1 \le i \le c \\ b_0 + b_1 x_c + \varepsilon, & c < i \le n \end{cases}$$



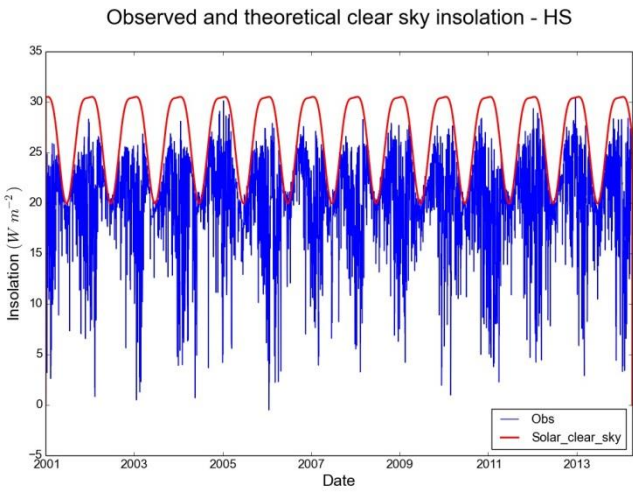


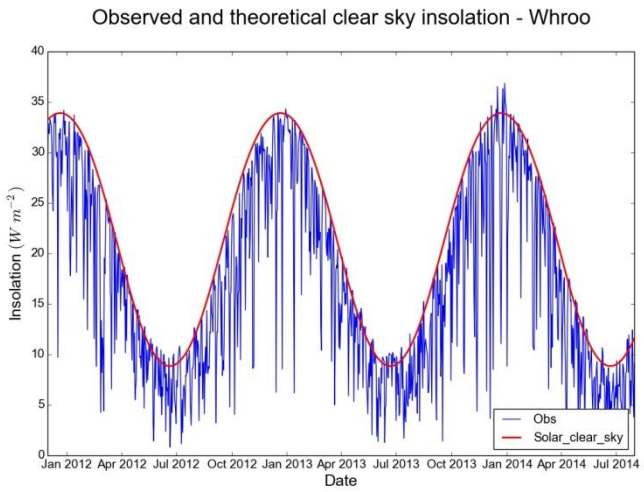
Data processing (gap filling - insolation)

Uses variant of Beer's law: $S = I_0 \cos Z \, e^{-km}$



- Z (zenith direction), $Z = \sin\varphi \sin\delta \cos\varphi \cos\delta \cos h$
  - $\varphi = latitude\ (^o)$
  - $\delta = solar\ declination\ (^o)$, $\delta = -23.4 \sin[(d + 284)/(2\pi * 365)]$
    - $d = day\ of\ year$
  - $h = hour\ angle$, $h = (t - sn)/12 * 360$
    - $sn = solar\ noon$, $sn = 12 + [(gmt_z * 15 - \lambda)/15] - EOT$
      - $gmt_z = time\ zone$
      - $EOT = equation\ of\ time$, $\mathrm{EOT} = 0.17 \sin[(4\pi d - 80)/373] - \sin[(2\pi d - 8)/355]$
- I_o (TOA normal insolation), $I_0 = [1 + 0.034 * \cos(d/\{2\pi * 365.25\})] * 1367.0$
- m (optical air mass term), $m = -alt/8343.5/[\cos Z + 0.15 * (90 - Z + 3.855)^{-1.253}]$
  - $alt = altitude\ (m)$
- k (extinction coefficient):
  - Optimised using site observations

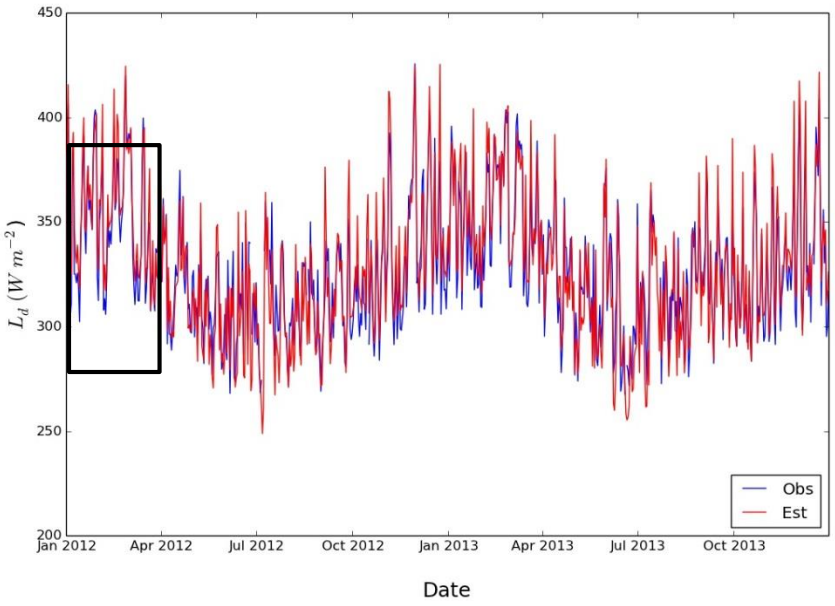


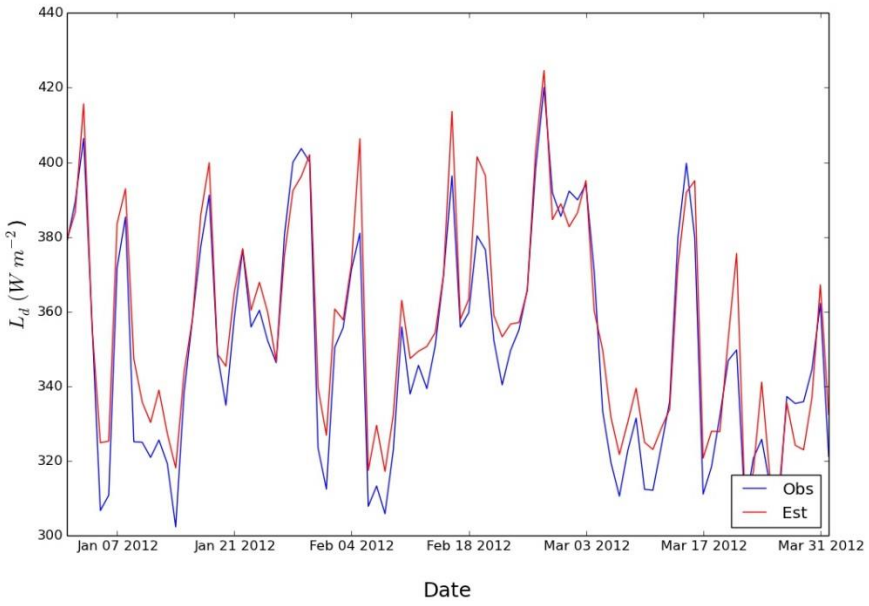


Data processing (gap filling – LW)

Uses standard Stefan-Boltzmann relation: $L\downarrow = \varepsilon\sigma T^4$

- ε (emissivity), $\varepsilon = \left(clf + [1 - clf]\left[a\frac{e}{T}\right]^b\right)$
  - $a \text{ and } b \text{ are fitted parameters } (a = 1.24 \text{ and } b = 1/7 \text{ in original formulation})$
  - $clf \text{ (cloud fraction)} = \text{ratio of observed to theoretical clear sky insolation}$
  - $e = \text{vapour pressure (screen level)}$
  - $T = \text{air temperature (screen level)}$





Downscaled from daily using climatological approach

Field work

- Whroo Conservation Area:
  - Ongoing ancillary measurements including litterfall, LAI, birdsong, dendrometers
  - Upcoming campaign: bird, vegetation and ant surveys
  - Reinstallation of soil moisture / temperature profile to 1.8m depth
  - Simultaneous formal soil characterisation and full analysis

- Riggs Creek:
  - Basic maintenance
  - Repair and reinforcement of damaged sensors (soil gear and rain gauge)

- Wombat State Forest:
  - Installation of second sonic anemometer
  - Installation of multiplexer and reprogramming (mostly done by Anne Griebel)

- Future priorities:
  - Refine respiration estimation algorithms
  - Revisit OzFlux standard eddy covariance programs (fix dropped scans, insert profile system control, output stationarity calculations)