TERN Terrestrial Ecosystem Research Network
OzFlux Australian and New Zealand Flux Research and Monitoring
Australian SuperSiteNetwork

Quarterly Newsletter

Issue 8, September 2014

SuperSite Central Update

Welcome to Issue #8 of the SuperSites/OzFlux newsletter. This quarter, for the first time, sees the SuperSites running as a network of 10 funded sites. The majority of subcontracts have been signed and PIs are asked to ensure invoices for milestone payments 1 and 2 are sent to JCU (Tammy Shmueli <tamar.shmueli@jcu.edu.au>) as soon as possible. Due to delays in sub-contracting the requirement, for payment 2, to complete Milestone 1 by 01/08/2014 has been waived with the end date for Milestone 1 moved to 01/04/2014 (same as Milestone 2).

In September there will be a TERN Board meeting which will help shape the future funding of the TERN Facilities.

At the moment it appears that NCRIS funding may be reduced in the 2014-15 year (another year of gap funding) but that on-going funding in an operational sense should commence the year after. The aim for the SuperSite network is to present a strong case for continued funding to the board meeting. A key part of this will be to ensure that the strong links with OzFlux, LTERN and AusCover help ensure the continuity of these Facilities in TERN going forward.

Alvin is on holiday for a month and so software development is largely on hold. Once he returns the key tasks in the data agenda are the implementation of the QC button once the trial by the PIs is completed, Shiela is currently converting the WAC files to WAV in the acoustic data portal, and the acoustic software shootout is planned for October once Alvin has mounted the software platforms. Next there is cleanup of the metacat/joomla code base and then upgrade of metacat (which is the data repository behind the data portal) and then development of the code which facilitates cross portal queries between ALA, SuperSites and LTERN.

Update on news from TERN Central

Face to Face PI meeting
Mike Liddell, Eva van Gorsel and Helen Cleugh assisted in the presentation of the TERN Facility proposal to the board.

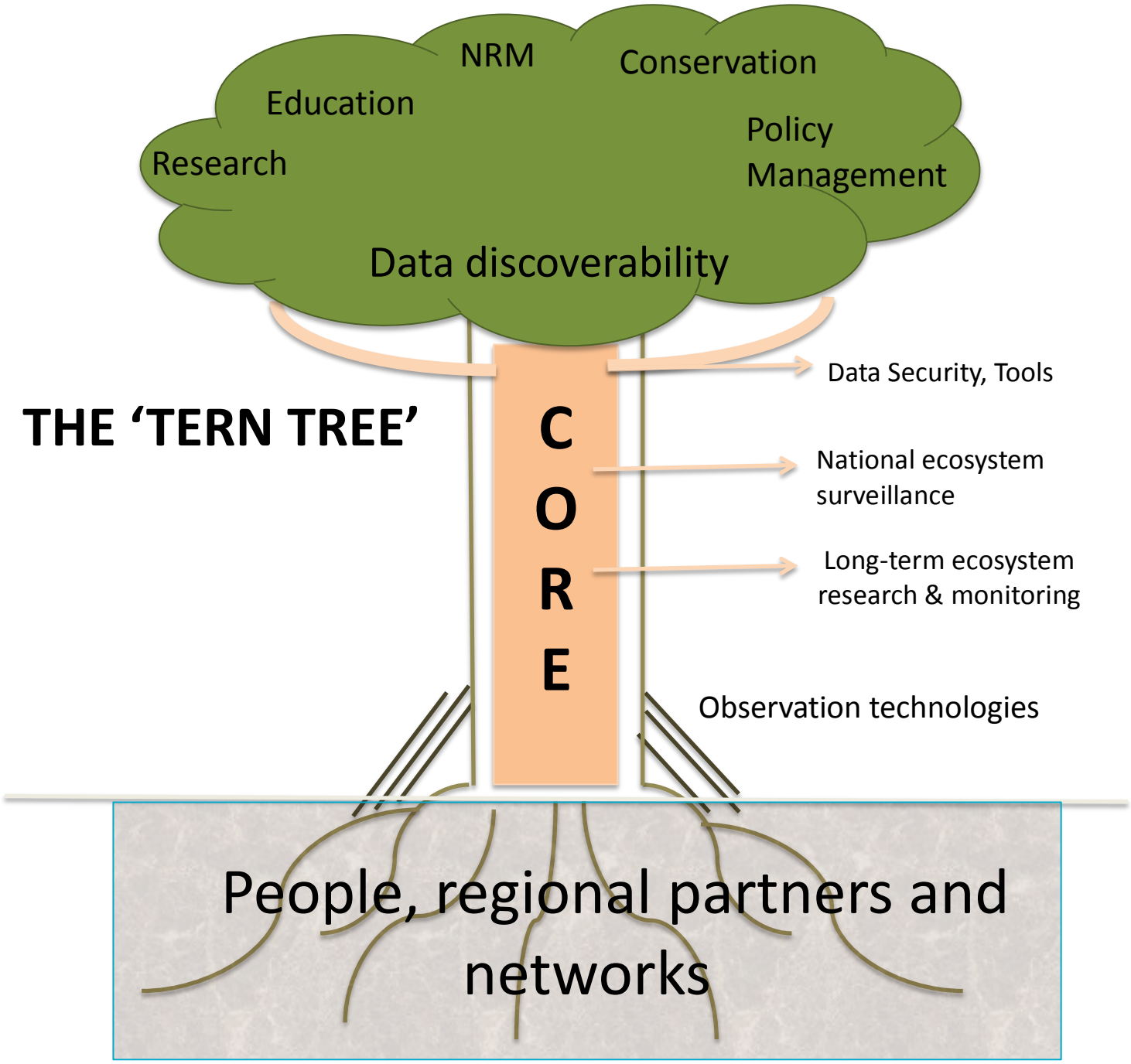
This joint proposal indicated the highlights from the different Facilities and presented a consensus view on where TERN should head in the future.

The key directions were as indicated in the TERN tree below. The SuperSites comfortably bracket both the national ecosystem surveillance monitoring (as OzFlux also does) and long-term ecosystem research and monitoring, with the data portal backing up in terms of data security and tools.

At this stage there is still no word on when the details of the NCRIS funding for the 2015-16 period will be released but at least the TERN board now has a clear idea of where the Facilities want the investment to be made.

In response to the review of TERN, the Board has taken the following actions:

> Appointed a **Strategy and Structure Subcommittee** represented by Margaret Byrne, Bronwyn Harch, Mark Westoby and myself as Chair, supported by Stephen Walker on behalf of the University of Queensland. The Subcommittee will work closely with Facility Directors, Tim Clancy and Stuart Phinn to develop and refine strategic options for TERN over the next five years; with particular attention being paid to measures we could take over the next twelve months that will optimise the transition of TERN into its future model. A draft proposal will be circulated out of session to the Board before the end of 2014.
>
> Appointed a **Governance Subcommittee**, Chair Lauren Rickards with Peter Woodgate and Warwick McDonald as members. The Governance Subcommittee will work with the Strategy and Structure Subcommittee to develop options for TERN's organisational structure and governance, to clarify and streamline roles and responsibilities across both decision-making, and advisory mechanisms including the Advisory Board. This group will provide its recommendations to the March 2015 Board meeting.


NRM
Conservation
Education
Policy
Management
Research
Data discoverability
THE 'TERN TREE'
C
O
R
E
Data Security, Tools
National ecosystem surveillance
Long-term ecosystem research & monitoring
Observation technologies
People, regional partners and networks

CZEN

The Critical Zone Exploration Network is a worldwide network of field-based research sites using inter-disciplinary scientists and engineers to study variables such as climate, biota, time, topography, weathering and soil formation. Critical Zone Observatories are located in the USA (8 sites), EU (13 sites) and the islands of Guadeloupe and Mayotte (off Africa). There are two CZOs being developed in Australia in South East Queensland and Western Australia. Affiliate sites are those that work on the same questions and have similar goals. The SuperSites are progressively being added to the CZEN website as international affiliate sites (http://www.czen.org/sites/int_affiliates).

So far, we have seven SuperSite nodes listed as international affiliates with the remainder to be added. Each site has its own web page describing the site:

http://www.czen.org/content/great-western-woodlands

http://www.czen.org/content/warra-tall-eucalypt-supersite

http://www.czen.org/content/litchfield-savanna-supersite

http://www.czen.org/content/calperum-mallee-supersite-0

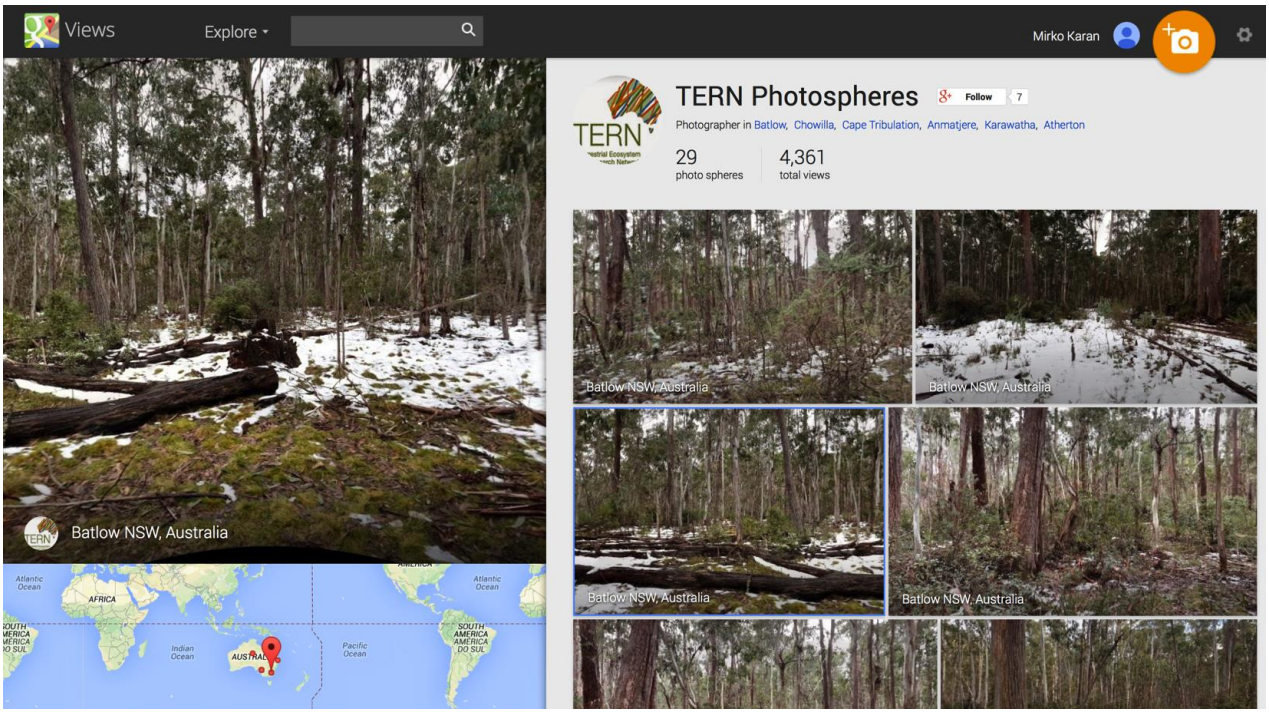
http://www.czen.org/content/victorian-dry-eucalypt-supersite-whroo

http://www.czen.org/content/victorian-dry-eucalypt-supersite-wombat

http://www.czen.org/content/seq-peri-urban-supersite-karawatha

Google Photosphere Images

The Google phone is working its way around the SuperSites to collect photospheres. To date we have photospheres embedded in the web pages for Karawatha Forest, Robson Creek, Cape Tribulation and Tumbarumba. All the photospheres are viewable on a page maintained by Peter Scarth (https://www.google.com/maps/views/profile/112909826384451762314?gl=us) from AusCover who was lucky enough to win the Android phone with the Google app as a prize – as long as he ensured it was delivered around the SuperSites.



SuperSites at the 51st Annual Meeting of the ATBC, Cairns, July 2014

A number of SuperSite and TERN personnel presented papers at the annual meeting of the Association for Tropical Biology and Conservation in Cairns in July. The Robson Creek node of the FNQ Rainforest SuperSite hosted a conference field trip with attendees getting a comprehensive understanding of why it is called the wet tropics and those wearing shorts and sandals were generous with their blood donations to the local leech community.

The ESA meeting at the end of September will also feature a SuperSite visit to Alice Mulga SuperSite.

OzFlux Central Update

OzFlux Governance

As many of you will have heard, CSIRO has gone through a restructure: Divisions have gone and been replaced by entities called Flagships. CSIRO's climate and atmospheric research now resides in the Oceans and Atmosphere (O&A for short) Flagship, which has been up and running since July 1. This is also where OzFlux, the TERN project, resides in "CSIRO space".

And further, as some of you know, Helen was appointed as the Deputy and Science Director of the O&A Flagship, effective July 1 2014. With the new tasks and challenges on hand Helen has decided to step down as OzFlux Facility Leader. After considerable discussion with Eva; a new governance structure for TERN OzFlux is proposed – the below draft schematic shows the key elements and relationships for the part of OzFlux funded by TERN.

The implications are as follows:

1) Eva will take on the role of TERN OzFlux Facility Director – effective September 1.
2) Expressions of Interest are sought to fill the role of Associate Director from across the TERN-OzFlux community. The Associate Director will be voted in democratically.
3) Expressions of Interest are sought to fill the roles of Steering Committee Members.
4) And advisory committee will need to be formed.

Another change also underway: Helen will be assisting the TERN Executive over the coming months, as TERN prepares for renewed funding – this is why the attached figure includes her as part of the Exec. In this way Helen will maintain a role in TERN (in general), but also be available to provide advice and guidance to OzFlux if needed and as appropriate.

Directorate

OzFlux is managed and coordinated by the Directorate. The Directorate

- provides the strategic and science direction of OzFlux
- proposes the financial direction
- oversees the administration of finances and contracts where the administration is hosted with the CSIRO
- deals with TERN business (engagement, reporting and milestone delivery)
- engages in communication (to TERN, the OzFlux community and stakeholders through newsletter, meetings, conferences and workshops).

After Ray Leuning, Helen Cleugh was director of OzFlux, Eva van Gorsel had the role of the Deputy Director under Helen Cleugh.

Eva van Gorsel takes on the role of OzFlux Director and we create the role of an Associate Director to assist with ongoing management and coordination tasks. Eva van Gorsel will take on the role of overseeing the administration of finances and contracts, other roles will be negotiated but will include

- give strategic and science advice (potentially oversight of development of strategic plan)
- TERN business (deputy of EAC meetings, assist with or implement reporting, assist with proposals)
- engage in communications.

The Associate Director will be democratically elected by the OzFlux Steering committee, Central Node and PI's.

Steering Committee

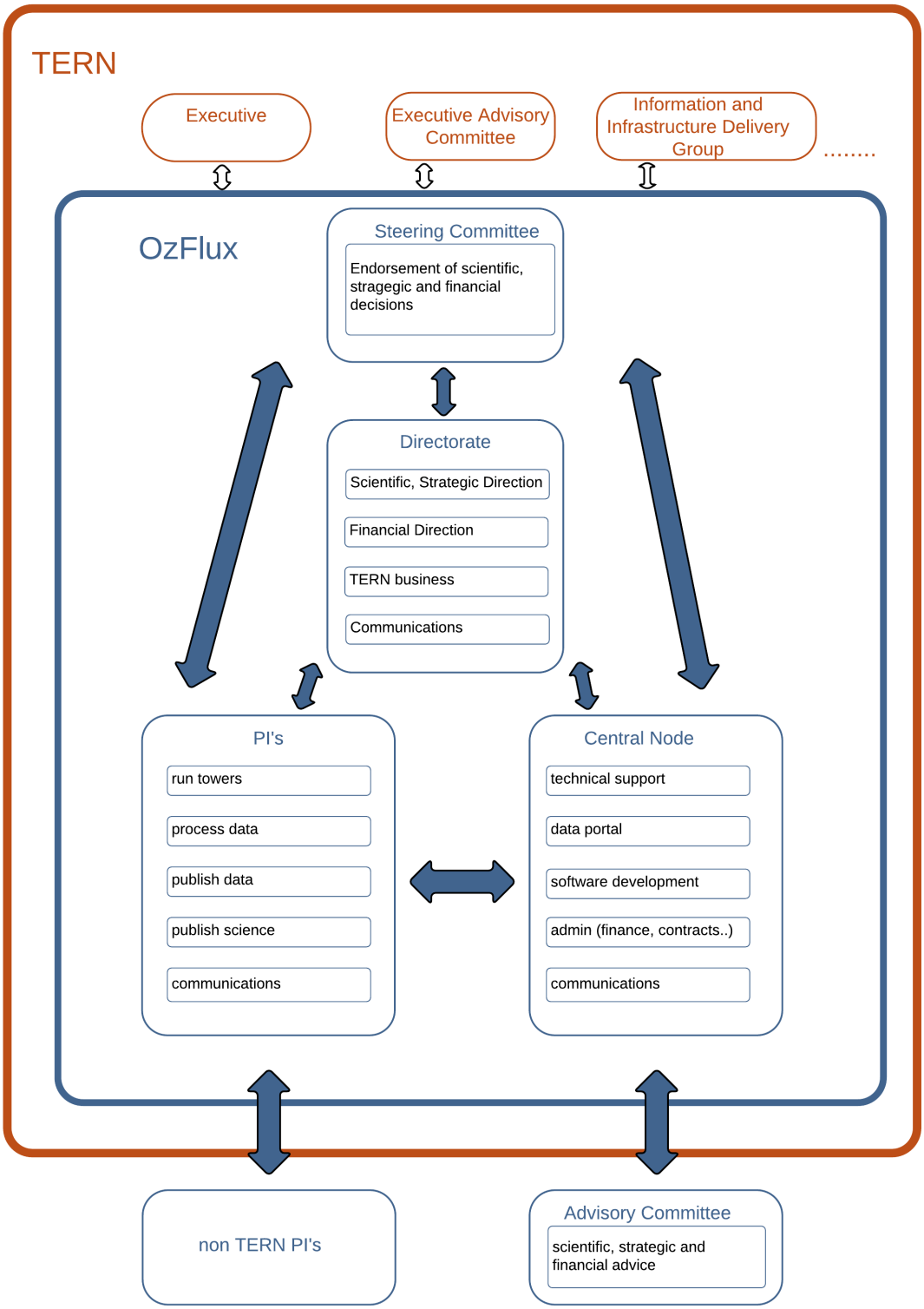
The central role of the steering committee was to give

- scientific, strategic and financial advice and
- endorse scientific, strategic and financial decisions.

The Steering Committee at present (09/2014) consists of Helen Cleugh (Director), Eva van Gorsel (Dep. Director and OzFlux PI), Alex Held (facility leader AusCover), Mike Liddell (facility leader Supersites and OzFlux PI), Peter Isaac (Central Node), Lindsay Hutley (OzFlux PI), Jason Beringer (OzFlux PI) and Wayne Meyer (OzFlux PI).

We suggest changing the role of the Steering Committee to endorsing scientific, strategic and financial decisions and introduce an **Advisory Committee** to give scientific, strategic and resourcing (financial) advice. The AC will include policy advisors (e.g. through DoE) and provide links to other facility leaders while the SC will consist of OzFlux members. SC and AC are to be newly formed.

The SC and AC will be democratically elected by Central Node and PI's.


TERN
Executive
Executive Advisory Committee
Information and Infrastructure Delivery Group
.....
OzFlux
Steering Committee
Endorsement of scientific, stragegic and financial decisions
Directorate
Scientific, Strategic Direction
Financial Direction
TERN business
Communications
PI's
run towers
process data
publish data
publish science
communications
Central Node
technical support
data portal
software development
admin (finance, contracts..)
communications
non TERN PI's
Advisory Committee
scientific, strategic and financial advice

Central Node

The role of the CN is to

- provide technical support
- build, develop and maintain the data portal
- build, develop and maintain OzFlux processing software
- assist with administration (finance, contracts)
- assist with communication.

Technical support is currently given through Caecilia Ewenz, Ian McHugh and Emma White. The data portal has largely been built and developed through Peter Isaac and MeRC. The data portal has now moved to NCI and Matt Paget and Matt Nethery have assisted with this move and further development. The operational OzFlux processing software is developed by Peter Isaac and in depth training has been provided to Caecilia and Emma. Administration assistance has been given by Eva van Gorsel and Rowena Smith. Peter Isaac and Eva van Gorsel have assisted with communications.

TERN OzFlux PI's

The role of the PIs is to

- run towers
- process data
- publish data
- publish science
- engage with the community

Current TERN OzFlux PI's are Derek Eamus, Lindsay Hutley, Mike Liddell, Peter Grace, Suzanne Prober, Robert Simpson, Richard Silberstein, Stefan Arndt, Tim Wardlaw, Eva van Gorsel, Wayne Meyer and Jason Beringer.

OzFlux PI's

Can make use of many functions provided by Central Node. Publishing of site information through web page and publishing of data through OzFlux data portal is encouraged, engagement with community most welcome.

Advisory Committee

See Steering Committee

OzFlux Data Processing

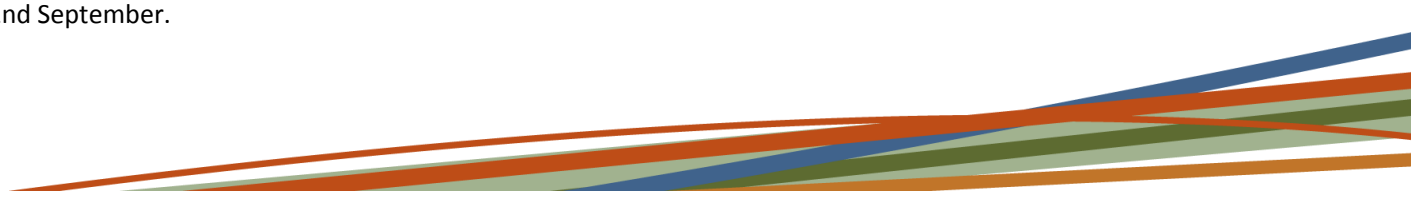
A new version of the OzFluxQC data processing system, V2.8.4, is now available from Dropbox, CloudStor+ and the OzFlux organisation on GitHub.

The new version introduces the following features:

1. Gap filling of meteorological quantities using data from the Bureau of Meteorology ACCESS NWP model, from the CSIRO/RECCAP BIOS2 model and from adjacent Bureau of Meteorology automatic weather stations (AWS). V2.8.4 calls this L4 data.
2. Gap filling of momentum, energy and CO_2 fluxes using the gap-filled meteorological quantities from L4 as drivers and a neural network trained on the flux data. This is now L5 data.
3. Estimating the friction velocity (u*) threshold and the uncertainty in this threshold.
4. Partitioning of net ecosystem exchange (NEE) into gross primary productivity (GPP) and ecosystem respiration (Fre) using a neural network trained on u*-filtered, nocturnal CO_2 flux observations.

The steps involved in processing at L4 require the input of external data into OzFluxQC. The data from ACCESS, BIOS2 and the Bureau's AWS network is now available for download from the OzFlux shared area on CloudStor+. If you have not already done so, visit the CloudStor+ web site (https://cloudstor.aarnet.edu.au/plus/) to create an account and then send your username to Peter Isaac (pisaac.ozflux@gmail.com). I will then invite you to join the OzFlux shared folder, after which you will be able to download the data for gap filling your site.

Full training in using OzFluxQC will be given at the OzFlux Data Processing Workshop in Alice Springs starting the week of the 22nd September.



The release of the new version is being used as an opportunity to change the underlying format of the netCDF files produced by OzFluxQC. The change should be transparent to OzFluxQC users and is being done to make the OzFlux netCDf files compatible with the THREDDS server installed on the OzFlux Data Portal. See below for details.

Data Processing Workshop

The OzFlux Data Processing Workshop begins in Alice Springs the week of 22nd September 2014. This year the morning lectures will be given by George Burba and Israel Begashaw from LI-COR Biosciences and the afternoon hands-on sessions will be run by Peter Isaac, Eva van Gorsel and James Cleverly.

OzFlux Data Portal News

The OzFlux Data Portal (ODP) has now been fully migrated to NeCTAR and RDSI. A test instance THREDDS server has also been installed as part of the ODP. This allows users to access the OzFlux data remotely via a URL as though the data were stored on their local computer. This is an important milestone in OzFlux's journey to make its data easily available to other researchers.

The test instance of the THREDDS server as be accessed at the following URL:

http://dap.ozflux.org.au/thredds/catalog/ozflux/sites/test/test_collection/catalog.html

There are many options for viewing the contents of a THREDDS server. Panoply, made available by NASA GISS, is an easily installed viewer for both local and remote netCDF files that allows plotting of variables contained in the netCDF file. Contact Peter Isaac for more details.

Technical Staff Roundup

Caecilia Ewenz has visited the Warra site in Tasmania, along with Darren Hocking from Monash, to help Tim Wardlaw resolve some instrumentation issues. An NR-lite net radiometer was installed but unfortunately, the problems with the CSAT and the gas analyser could not be fixed. Tim Wardlaw is now pressing ahead with replacing their original EC150 with a closed-path EC155. Caecilia has also visited the Calperum site and helped Wayne and Georgia with replacing cables damaged in the fire earlier this year as well as assisting with wiring and programming of the CS650 soil moisture probes. She has also been honing her data processing skills and preparing data quality summaries for some sites. Caecilia will be at the data workshop in Alice Springs.

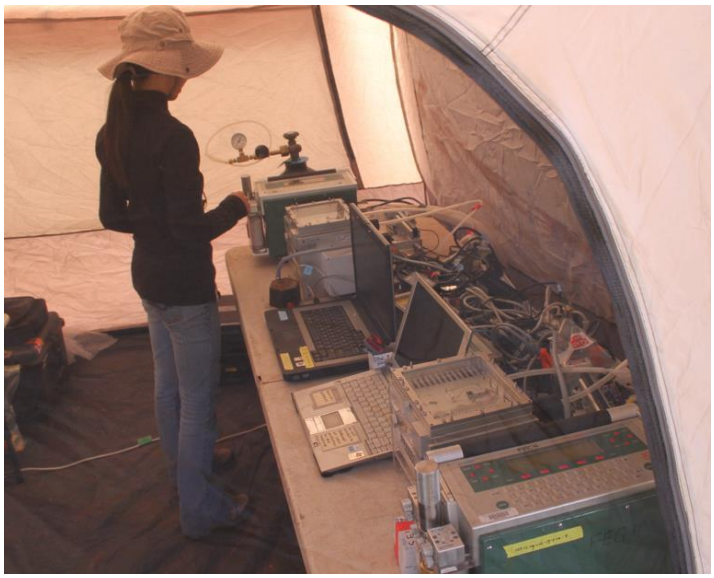
Emma White has been kept busy with processing of the NATT and Victorian flux tower data. This amounts to 6 sites and is a substantial part of the OzFlux data repository. She has also been compiling summaries of data quality for some sites and generally increasing her ecosystem exchange knowledge and data processing skills. Emma will also be at the data workshop in Alice Springs.

Ian McHugh has been running the Whroo site, building a profile system for Mike Liddell's site at Robson Creek and helping integrate some of the new features into OzFluxQC. On top of this, Ian has been doing some very interesting analyses of the Whroo data, looking at the effect of including CO_2 storage calculated from profile measurements within the canopy on the observed net ecosystem exchange.

News from around the SuperSite and OzFlux networks

Alice Mulga

Owen Atkin's group, including Keith Bloomfield have reported a successful winter plant physiology measurement campaign at the Alice Mulga SuperSite. Their focus was on interspecific patterns of thermal tolerance and autotrophic respiration.



Flux readings were affected by a mid-winter storm in July that produced a sizeable photosynthetic response (up to 0.45 gC m^{-2} d^{-1}) in the Mulga woodland. Otherwise, it has been a typical winter, with small rates of uptake in the Mulga woodland and continued carbon emissions from the open Corymbia/hummock savanna.

Planning has progressed for the upcoming OzFlux/Ecological Society of Australia field trip to the SuperSite. Derek and James will also be participating in the session on savannas at the ESA meeting.

New personnel that have arrived who are working at the SuperSite include PhD student Tonantzin Tarin Terrazas and Drs Rachel Nolan and Nadia Santini.

Recent SuperSite activities include ongoing LAI and stable isotopes collections, xylem anatomy. Sapflux and flux towers are working fine and IRGA calibration will begin at the end of August.

Calperum Mallee

Dry conditions have prevailed recently at Calperum with only 19 mm rain recorded in the last 2 months (18 mm in one day). Burnt areas are recovering with growth from lignotubers and some spinifex coming back. The flux tower is fully operational, soil water monitoring has started again and LAI measures happening on core 1 ha site. Two honours students have started studies on floodplain ground water looking at historical changes in levels over decades and using chemistry and stable isotopes to look at the origin of the water. A bore will be installed in the mallee site in next two months. Soil characterisation is nearly completed for three major ecosystems (floodplain, woodland, mallee). Phenocams and acoustic monitors are operational. Vegetation and bird surveys have been scheduled and sampling will started for the University of Guelph, Global Malaise Trapping project. A study (CSIRO/student) will compare N dynamics in the mallee and the floodplain.

Cumberland Plain

Research teams have been established along sampling/data streams, with first meeting to be held soon. The SM2+ acoustic monitor has been moved from EucFACE to the core 1 Ha. Justin Welbergen is testing new SM3bat acoustic sensors that have been set up in an array to triangulate distances. Ben Moore has an Honours student studying possum activity at the site. A UTS PostDoc (Wouter Maes) has flown a drone with thermal IR, RGB cameras over site to get detailed imagery that will allow production of a crown map. James Cook (ant surveys) is also getting involved in University of Guelph, Global Malaise Trapping project. The next vegetation survey will occur in Oct with the assistance of Sydney botanical gardens staff. The one off soil characterisation is to be started soon by Elise Pendall. The flux tower is operating as normal.

FNQ Rainforest

Robson Creek

All instrumentation is operating as usual (water samplers, bore monitoring, flux tower). A profile system should be installed in September. Steve Williams and Dave Westcott are carrying out bird and fauna surveys. Soil surveys have been completed. Vegetation structure assessment has been completed and vegetation phenology monitoring is continuing. There was an ATBC conference visit to the Robson Creek site in July which was well attended.

Cape Tribulation: Daintree Rainforest Observatory

The drought experiment is still under construction and should start later in the year. A new core 1 ha plot has been established and contains a few new species. The DBH measures are completed with height yet to be done. Susan Laurence is working on vegetation structure and LAI and Steve Williams is working on bird surveys. Two students from the UK spent two months establishing bird survey transects and the first thesis has been written up on the back of their studies. The flux tower is operational and eight soil pits have been installed as part of the drought experiment. The new buildings are completed and there are now more visitors arriving at the site.

Great Western Woodlands

All of the flux tower instruments are functioning well, except for the net radiometer, which has problems after rain/storm events. A new head was installed but it still has problems following storm events. This may be due to a cabling issue. Gap filing data is problematic as the BOM is currently one year behind. In June, a second eddy covariance system was installed at 3 m high to measure soil + understorey fluxes. The first of this flux data will be downloaded in a few weeks. All else is running smoothly. Litter trapping is ongoing and new sap flow monitors are to be installed for four trees species and *in situ* soil evaporation and maybe soil respiration measures will be started soon. Pauline Grierson (UWA) has run an undergraduate ecology field trip to Credo (21 students, for 1 week) and it is hoped this will become an annual event. Carl Gosper is working on tree ring analysis on the Gimlet transect to improve the regression of tree size vs age. Aiming to collect soils from 36 Gimlet plots in Oct for a Bioplatforms metagenomics project. The two yearly tower rescue refresher course was carried out on the tower at Gingin.

SEQ Peri-urban

Samford: SERF

The flux tower, GHG automatic soil monitoring, stream monitoring and soil moisture instrumentation are working well. Bird surveys and acoustic monitoring is continuing. New equipment installations include litter traps in forest including the core 1 Ha and automatic dendrometers that were installed in Sept (12 in the core 1 ha plot). Extensive soil sampling is underway (PhD student and German exchange student) that includes the Samford node (SERF) and the rest of the Samford valley. A student from the USA is carrying geophysical mapping of soil moisture patterns in the pasture site and looking at how it relates to GHG emissions.

Karawatha Forest

All is going well. The sub-contract has arrived from QUT. Currently organising phenocam, video camera and the weather station. Authorisations are organised and orders placed for equipment. The SM3 acoustic recorder has arrived and will be deployed in the next week. A student is ready to trial ant sampling at the site. Prof Scott Salesca from the University of Arizona (remote sensing) visited Karawatha. Trees have been retagged for further remote sensing with AusCover, airborne/ground LiDAR/tree measures comparisons.

Tumbarumba Wet Eucalypt

Google photosphere pictures have been captured and uploaded during testing of AusCover dual wavelength echidna LiDAR (DWEL) laser scanner. Lea Monin, a French student is coming to look at in-canopy light data, DWEL data and DHP to work on canopy structure. Two AusCover phenocams were installed on the tower and some remote sensing instruments taken down for repairs. The AusCover DGPS was tested on site and found to be accurate to 20cm. The core 1 ha plot was marked out and the 100 m x 10 m grid will be installed in Sept. Heather Keith (ANU) will do the vegetation identification work and the bird surveys will be done in collaboration with Greening Australia using a 200 m transect.

Litchfield Savanna

The focus of the last quarter has been on tower construction (which washed out last year). The concrete footings were poured two weeks ago under difficult conditions. A fire went through the SuperSite on the morning of the pour (six trucks for 37 cubic m of concrete). Also, an accident on the highway delayed the pour and it is still not known if this has affected quality of the concrete. The integrity of the footings will be tested after a month of curing.

Camera laden drone flights (UTS) were carried out over the site in the wet season. Karen Joyce (CDU) has run an undergraduate remote sensing course at the site.

An ornithologist has been lined up to design and carry out bird surveys and CSIRO are due to carry out ant surveys.

Tower update: The concrete problems have been fixed with a series of rods embedded through the blocks and the tower sections are *en route* to the site for erection

Victorian Dry Eucalypt

Whroo

The instrumentation is mostly working well. The soil pit instruments will be replaced when weather allows. The profile system has some problems, so looking to update. The OzFlux standard program has a few issues with Campbell Sci instruments when working with a multiplexer (tends to drop scans). (Craig McFarlane has Licor program available that is working well with multiplexer). Ongoing surveys include up to monthly LAI and vegetation sampling for DNA. Currently looking for a bird expert to help design a bird survey.

Wombat

Flux measures and automatic soil CO_2 monitoring progressing with the aim to model below ground respiration. Other instrumentation operating as normal including dendrometers, Vegnet sensors, sapflow monitoring.

Warra Tall Eucalypt

Recent weather has included 200 ml rain in 1 week and 120 km wind gusts. Problems with the Flux instruments (IRAGASON not calibrating). New radiometer installed on the tower. Aiming to get a closed path IRGASON to improve data in winter. Acoustic data sent on hard drives for the time being. Soil metagenomics sampling/contextual data completed. German student intern starts in Sept on re-measurement of core 1 ha plot tree heights, dendrometer banding and plant genetic sample collection. The current bird survey method will be reviewed. Finished 10 years of sampling for the post-harvest (silvicultural systems) trial with 20,000 invertebrate samples being sorted. Looking at a conference at the end of next year for Warra's 20th anniversary and release of the silvicultural systems trial report. Six months of weekly, global malaise trap samples are in storage. Google photosphere images to be captured in the next couple of weeks.

Recent Publications

Chen C, Eamus D, Cleverly J, Boulain N, *et al*. (2014) Modelling vegetation water-use and groundwater recharge as affected by climate variability in an arid-zone Acacia savanna woodland. *Journal of Hydrology* (Accepted).

Cunningham S, Cavagnaro T, MacNally R, Keryn P, *et al.* (2014) Reforestation with native mixed-species plantings in a temperate continental climate effectively sequesters and stabilizes carbon within decades. *Global Change Biology* (Submitted).

Cunningham S, MacNally R, Baker P J, Cavagnaro T R, *et al.* (2014) Balancing the environmental benefits of reforestation in agricultural regions. *Perspectives in Plant Ecology, Evolution and Systematics* (Submitted).

Donohue R J, Hume I H, Roderick M L, McVicar T R, *et al.* (2014) A diffuse-light function for estimating light use efficiency and gross photosynthesis of vegetation. *Remote Sensing of Environment* (Accepted).

Fountain-Jones N M, Jordan G J, Baker T P, Balmer J M, *et al.* (2014) Living near the edge: Being close to mature forest increases the rate of succession in beetle communities. *Ecological Applications* (Accepted).

Gosper C, Yates C J, Prober S M & Wiehl G (2014) Application and validation of visual fuel hazard assessments in dry Mediterranean climate woodlands. *International Journal of Wildland Fire* **23**, 385-393.

Hoogmoed M, Cunningham S, Baker P, Beringer J & Cavagnaro T R (2014) N-fixing trees in restoration plantings: effects on nitrogen supply and soil microbial communities. *Soil Biology & Biochemistry* **77**, 203-212.

Joiner J. (2014) The seasonal cycle of satellite chlorophyll fluorescence observations and its relationship to vegetation phenology and ecosystem-atmosphere carbon exchange. *Remote Sensing of Environment* 375-391. doi: 10.1016/j.rse.2014.06.022.

Ma X, Huete A, Yu Q, Restrepo Coupe N, *et al*. (2014) Parameterization of an ecosystem light-use-efficiency model for predicting savanna GPP using MODIS EVI. *Remote Sensing of Environment* (Accepted).

Macfarlane C, Ryu Y, Ogden G N & Sonnentag O (2014) Digital canopy photography: exposed and in the raw. *Agricultural and Forest Meteorology* **197**, 244-253. doi: 10.1016/j.agrformet.2014.05.014

Mahoney C, Kljun N, Los S O, Chasmer L, Hacker J M, Hopkinson Ch, North P R J, Rosette J A B and van Gorsel E (2014) Slope Estimation from ICESat/GLAS. *Remote Sensing* (Accepted).

Shi H, Li L, Eamus D, Cleverly J, *et al.* (2014) Intrinsic climate dependency of ecosystem light and water-use-efficiencies across Australian biomes. *Environ. Res. Lett*. (Accepted).

Yuan W, Cai W, Xia J, Chen J, *et al.* (2014) Global comparison of light use efficiency models for simulating terrestrial vegetation gross primary production based on the LaThuile database. *Agricultural and Forest Meteorology* **192-193**, 108-120.

Upcoming Events

28 Sept - 3 Oct 2014

Ecological Society of Australia 2014 Annual Conference, Alice Springs, Australia. Details at Conference Website

29 Sept - 2 Oct 2014

TERENO International Conference 2014 - From observation to prediction in terrestrial systems. Rheinische Friedrich-Wilhelms-Universität, Bonn, Germany. Details at Conference website.

30 September - 2 October

Climate Adaptation 2014: Future Challenges, Gold Coast, Australia. Details at Conference Website

5-9 October

AusPlots Field Method Training Alice Springs, Australia. See here for details

4-7 November 2014

2014 ForestSAT Conference, Riva del Garda, Italy. Details at forestsat2014.com.

1-3 December 2014

AAA/ASHA 2014 Joint Conference, Culture, Climate, Change: Archaeology in the Tropics, Cairns, Queensland. Details at: Conference website.

2015-16 ABRS National Taxonomy Research Grant Program

The 2015-16 round of the ABRS National Taxonomy Research Grants Program -Research and Capacity-Building Grants streams are now open for applications. For further information see the website. Closing Date: 31 October 2014.

The next issue of the Newsletter will be published in December 2014. If you have any news articles, photos, upcoming events, etc that you would like included please email shiela.lloyd@jcu.edu.au

TERN is supported by the Australian Government through NCRIS

NCRIS National Research Infrastructure for Australia
An Australian Government Initiative