

Welcome to the 2013 OzFlux Workshop

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OzFlux: the story so far and future directions



Australian and New Zealand Flux Research and Monitoring

TERN is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative.

A short history of OzFlux



Australian flux monitoring in mid 1990s
(OASIS: 1994 and 1995)

A short history of OzFlux

Charles Darwin and Monash
Universities
Howard Springs (*ca.* 2000)



A short history of OzFlux



CSIRO: Tumbarumba in 2000

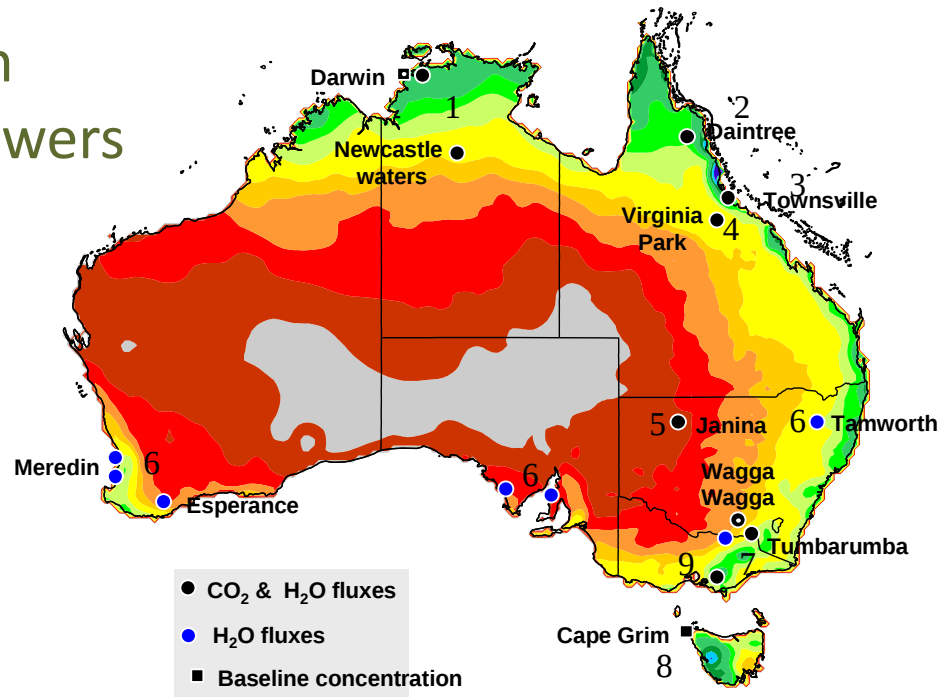


A short history of OzFlux

By 2001, OzFlux was a vision shared across CSIRO, ANU, Monash and Charles Darwin Universities....

but really a network in search of some flux towers

Ozflux sites



- 1 NT Uni.
 - 2 James Cook Uni.
 - 3 CLW Davies Lab
 - 4 CLW Pye lab
 - 5 ANU
 - 6 CSIRO PI
 - 7 CLW Pye Lab
 - 8 CSIRO Atmos. Res.
 - 9 Monash Uni.
- CSIRO Forestry
U. Wollongong
UNSW
UTS

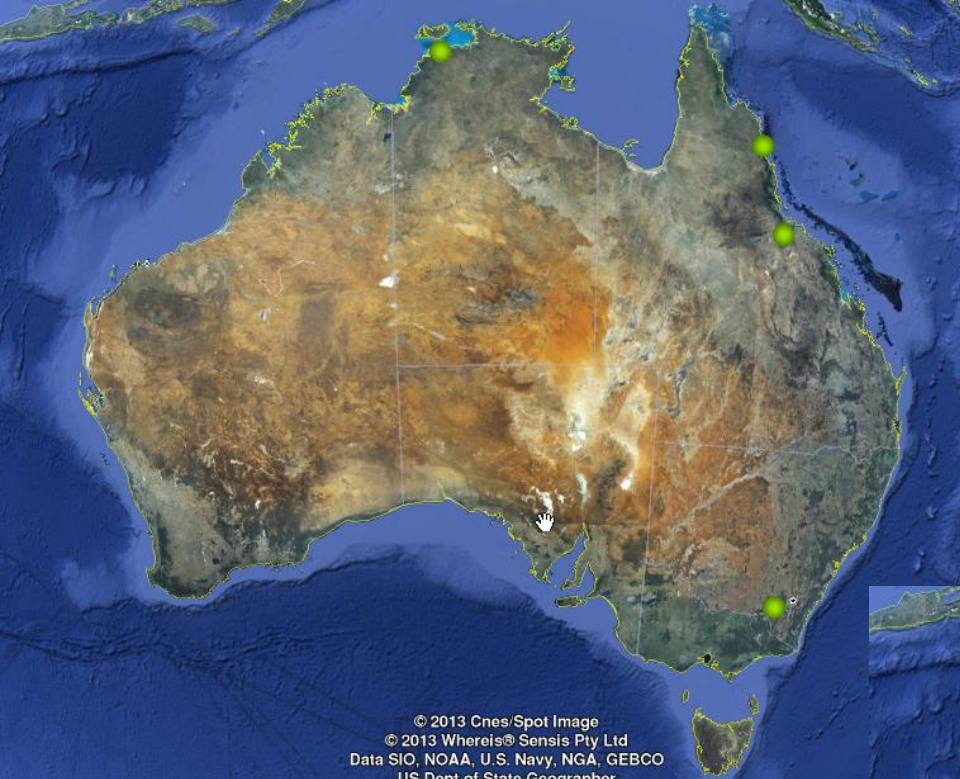
TERN - OzFlux: Achievements

1. NCRIS infrastructure investment in TERN in 2009 enabled OzFlux to grow:
 - A continental network – hardware, software
 - Nationally-consistent methods
 - OzFlux community – Workshops & training
 - Database – Monash eResearch Centre, funded by ANDS (Australian National Data Service)
- with co-investment from Unis, ARC, CSIRO ...

TERN - OzFlux: Achievements

2. A network of **flux towers and supporting infrastructure**

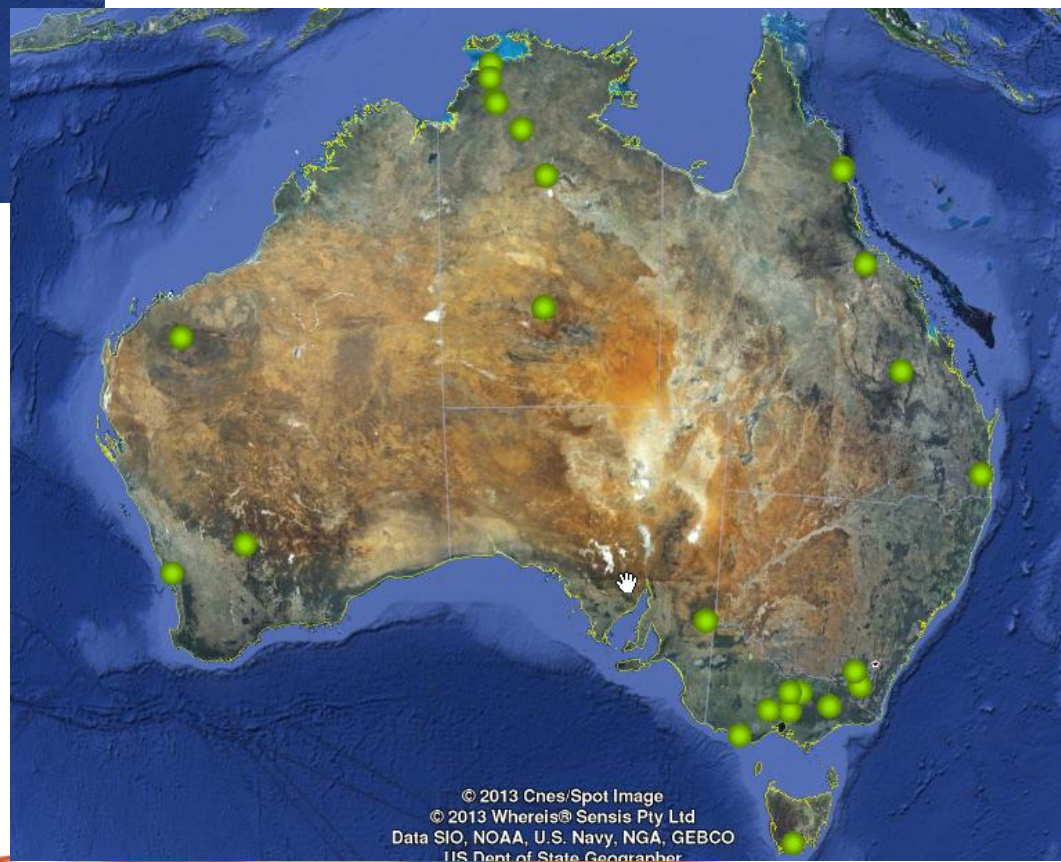
- Sensors, data acquisition and power supply
- Telecommunications
- Standardised across network of remote sites



From just 4 flux
towers and 3 agencies
in 2003 ...

... to 23 flux towers at
remote sites around
Australia (not all TERN
funded) in 2012

Operated by 10 agencies

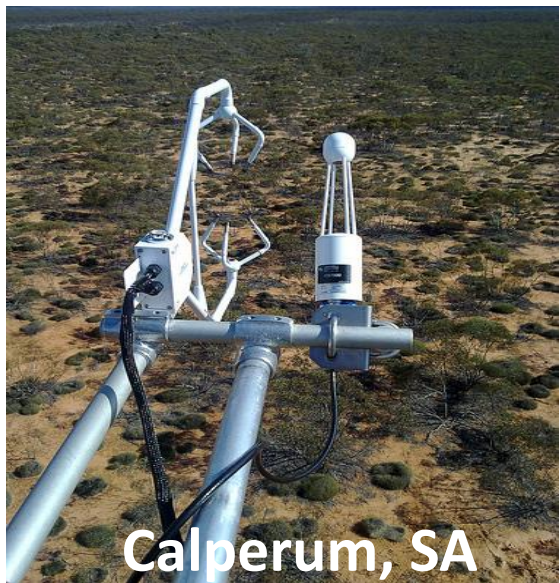




Adelaide River, NT



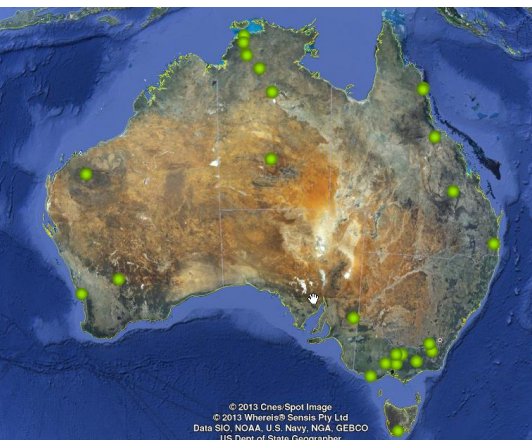
Alice Springs, Mulga, NT



Calperum, SA



Arcturus-Emerald, QLD





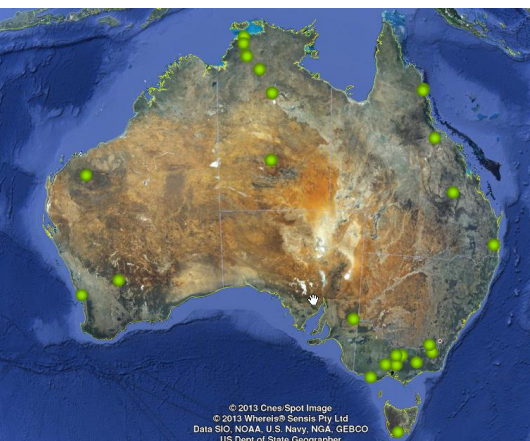
**Daintree Discovery,
QLD**



Daly Uncleared, NT



Dargo, VIC



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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geography



Dry River, NT



Gingin, WA



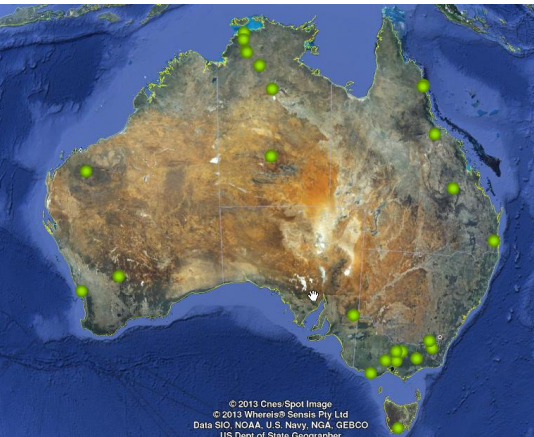
Great Western Woodlands, WA



Howard
Springs, NT



Riggs Creek, VIC



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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geography



Otway, VIC



Nimmo, NSW



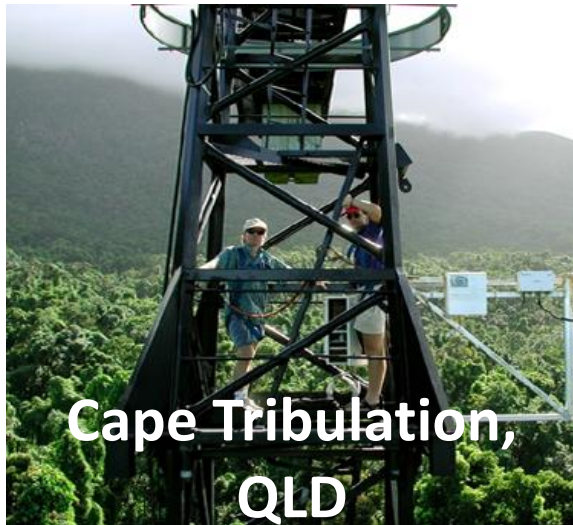
Samford, QLD



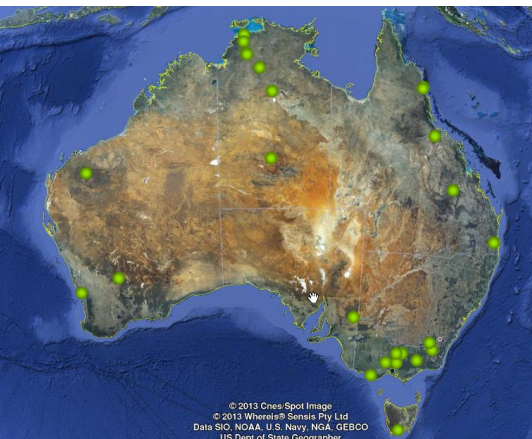
Sturt Plains, NT

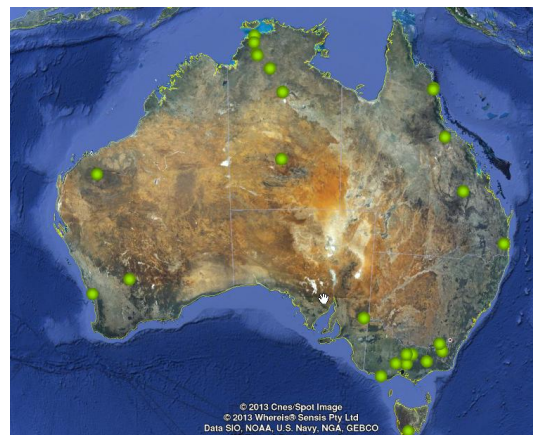


Virginia Park, QLD



Cape Tribulation,
QLD





**Wombat State
 Forest, VIC**



TERN - OzFlux: Achievements

3. A network of flux towers **plus data infrastructure**

- Technically sophisticated and complex
- Standardised approaches
- Automated processing and QC/QA
- Coordinated by OzFlux Central node – data checking, problem solving, data management

All have represented big challenges for OzFlux

TERN - OzFlux: Achievements

4. A network of flux towers **and people!**

- OzFlux Annual Workshops
- OzFlux Training Days: the art of flux measurements, data processing,



TERN - OzFlux: Achievements

4. A network of flux towers and people!

- OzFlux and TERN websites

- ❖ <http://www.ozflux.org.au/monitoringsites/index.html>

- ❖ <http://www.tern.org.au/OzFlux-pg17729.html>

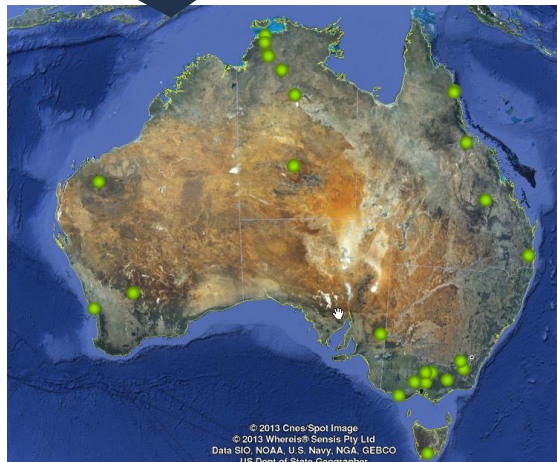
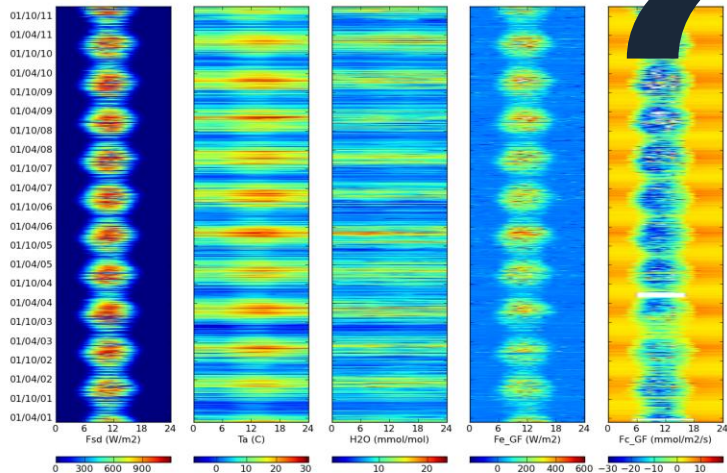
- OzFlux Project on ResearchGate

- ❖ <https://www.researchgate.net/project/OzFlux/>

- FLUXNET

- ❖ <http://fluxnet.ornl.gov/>

Tumbarumba L3 from 2001-02-22 01:00:00 to 2011-12-31 00:00:00

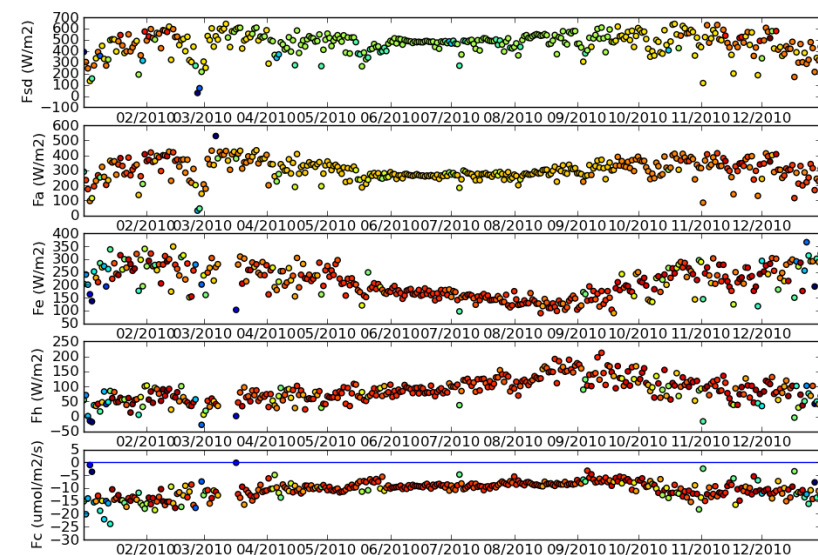


OzFlux	2013
Sites	28
Accounts	96
Site-years	62

11 years of ecosystem breathing at
Tumbarumba, NSW

A snapshot of 1-year from Howard
Springs, NT

Howard Springs: 2010-01-01 00:30:00 to 2010-12-31 00:00:00



OzFlux
Australian and New Zealand Flux Research and Monitoring

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Home

Welcome to the OzFlux Data Portal

Data from the OzFlux network of flux towers is available from this portal.

Users can browse the contents of this portal by clicking on the "All Collections" entry "List view" to view the data collections.

Users wishing to download data will need to log in to the portal. If you already have an account, click on "Login". If you would like to ask for an account, click on "Register".

Information on the data available, the license conditions and the data file format are available in the "Resources" section.

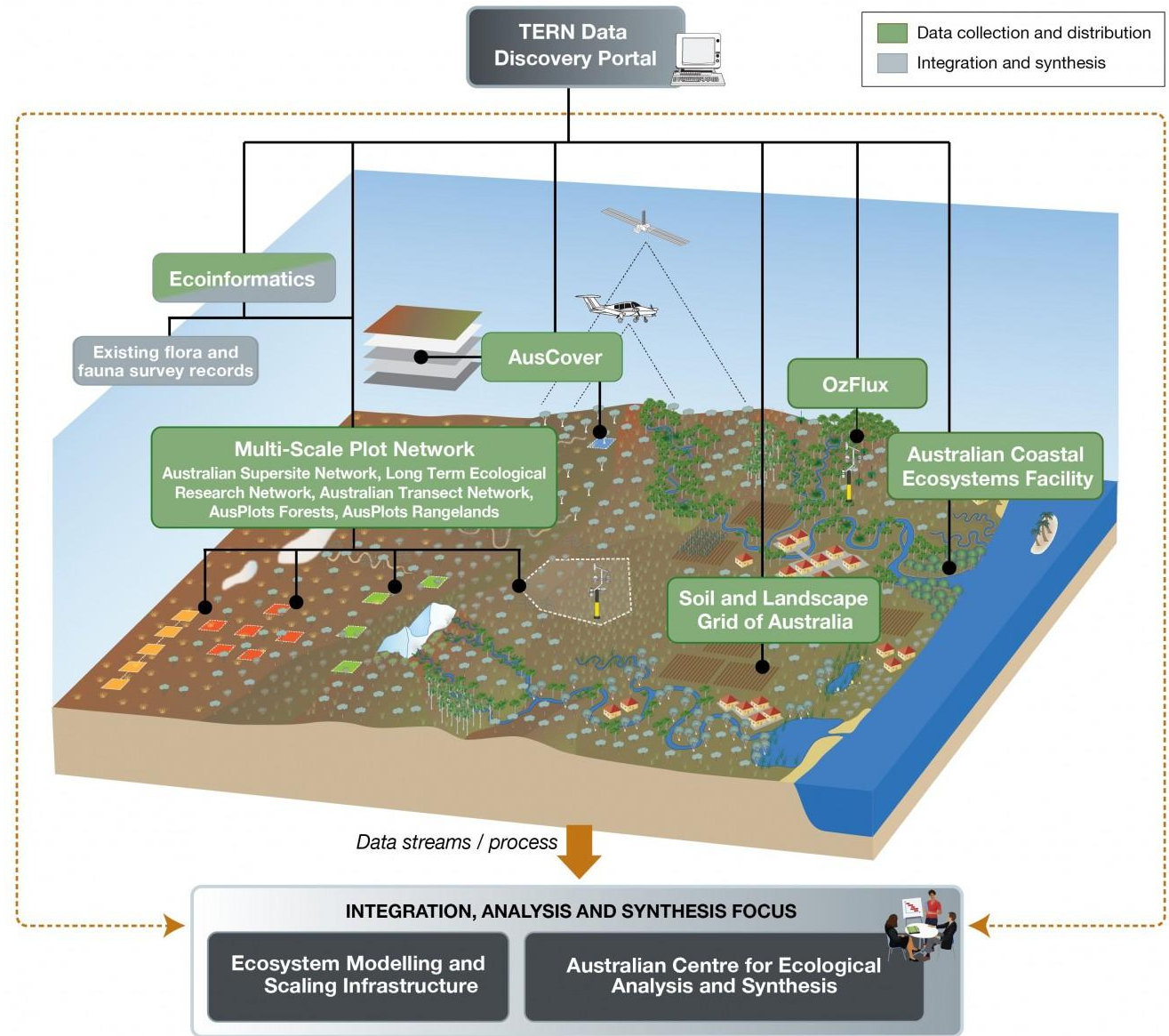


Cap... en QLD

TERN - OzFlux: Relevance and impacts

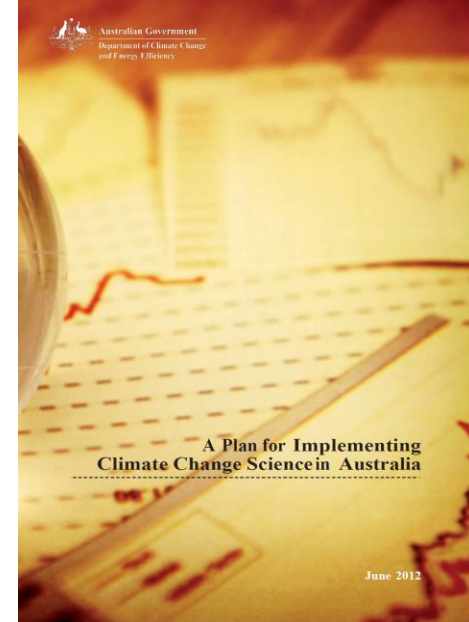
OzFlux and TERN: data and process understanding needed for research addressing national research priorities:

- Ecosystem science
- Sustainable resource management: carbon, water
- Carbon – climate – water interactions
- Ecosystem health and State of the Environment assessments



.... the TERN infrastructure “ecosystem”

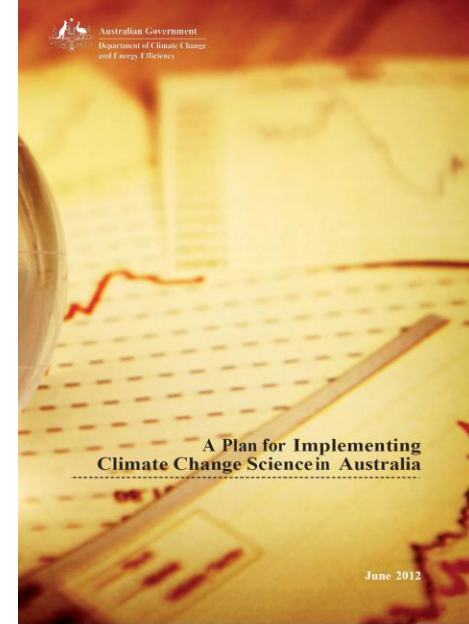
Some climate policy questions *and the research needed to provide the answers*



What is the role of natural land and ocean sinks in sequestering greenhouse gas (GHG) emissions and what will happen to these sinks in the future?

- *Carbon cycle observations that track the uptake and release of greenhouse gases in land, air and oceans*
- *How does climate change and variability affect Australia's carbon budget (sources and sinks; anthropogenic and biogenic)?*
- *Climate models (such as ACCESS) include coupled carbon and water cycle*

Some climate policy questions and *the research needed to provide the answers*



- ➔ Can natural land sinks mitigate Australia's GHG emissions?
- ➔ What is the impact of natural disturbance regimes; how are they changing?
 - *Investigate how climate and land management affect the stability of Australia's land-based carbon sinks*
 - *How will carbon dioxide fertilisation affect Australian vegetation?*
 - *Ensuring global and regional climate simulations represent Australian terrestrial ecosystem processes*

TERN - OzFlux: Relevance and impacts

A capability to determine carbon and water budgets at ecosystem to continental scales

- Uptake and release of CO₂ and other GHG [*fluxes*]
- Carbon stocks in soil, plants and air [*stores*]
- Water *and* carbon
- Measurements *and* models

.... the TERN infrastructure “ecosystem”



OzFlux Network

CO₂ and H₂O Fluxes
Radiation
Meteorology

AusPlots and Australian Supersites Network

Site characteristics
Biomass
Soil carbon & nutrients
Leaf-level photosynthesis

AusCover

Vegetation type
GPP
Veg indices (NDVI, EVI)
Leaf area index
Fire
Canopy properties

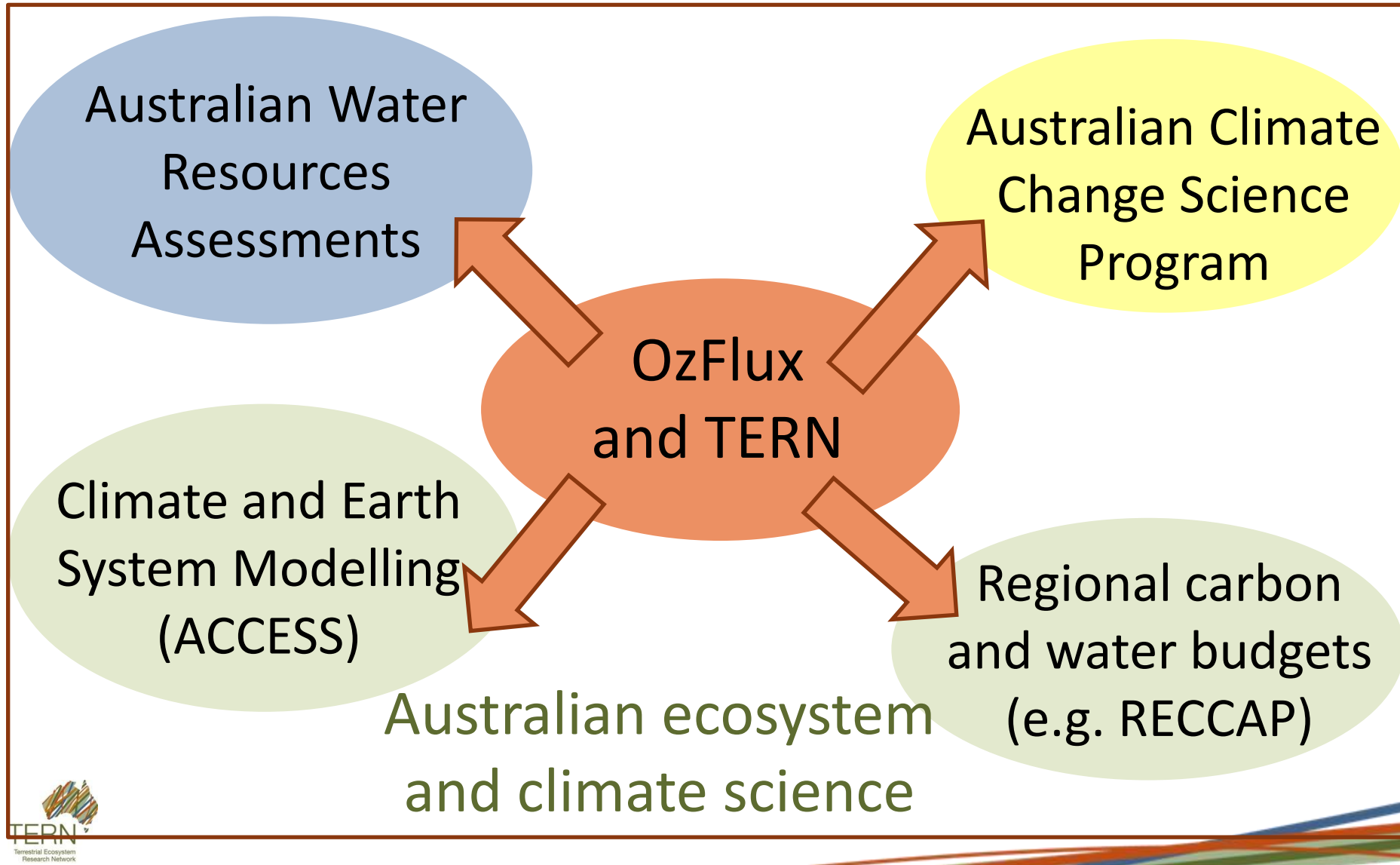
eMAST

Data assimilation and
integration into
modelling applications

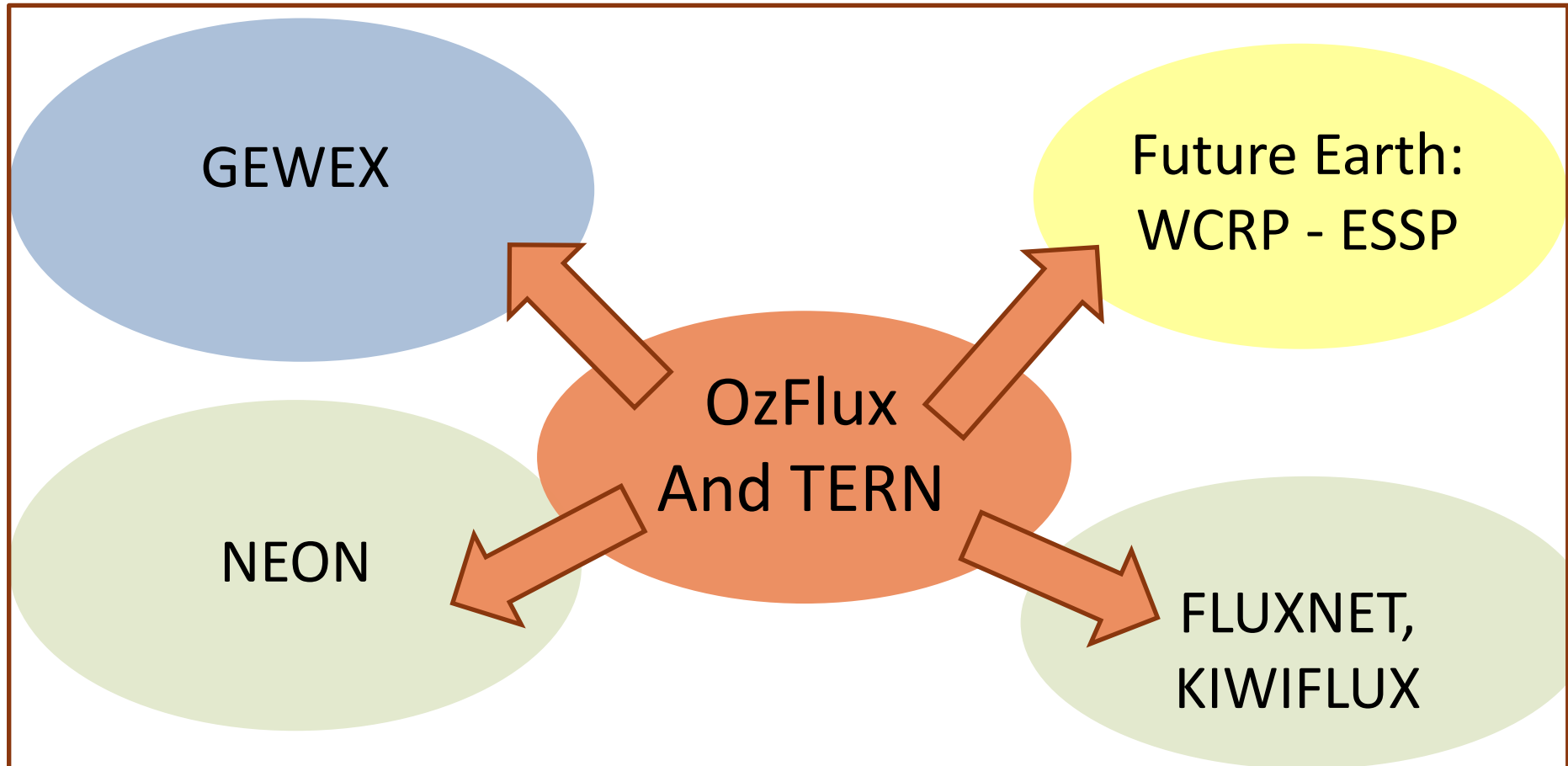
Knowledge of
ecosystem exchange
of carbon, water
and energy

.... the TERN infrastructure “ecosystem”

TERN - OzFlux: Relevance and impacts



TERN - OzFlux: Relevance and impacts



Global ecosystem, climate and Earth
system science

Future Priorities and Directions

1. Acquiring and sharing quality data

- Measurement and analysis techniques
- Data quality
- Data access, sharing and curation

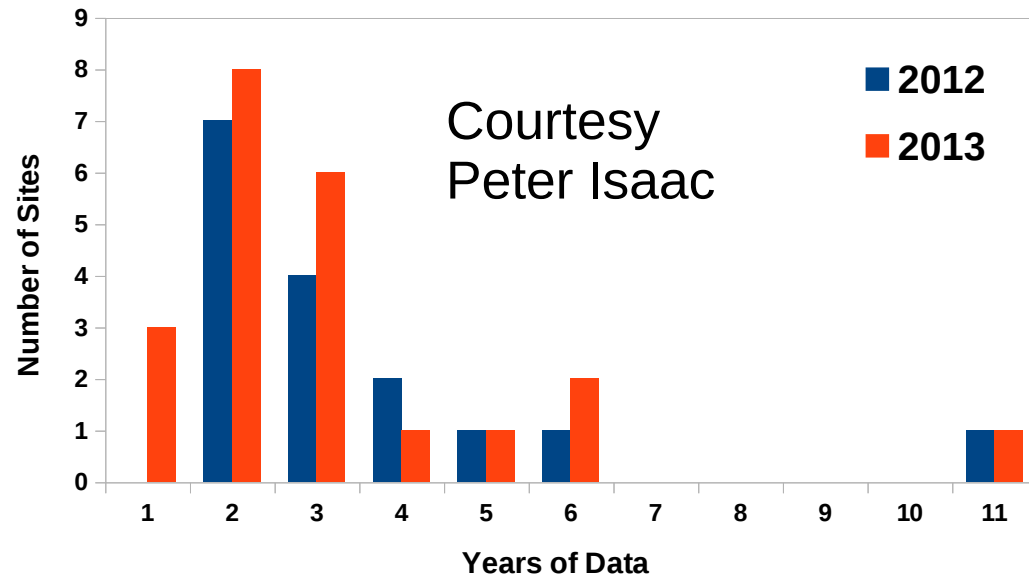
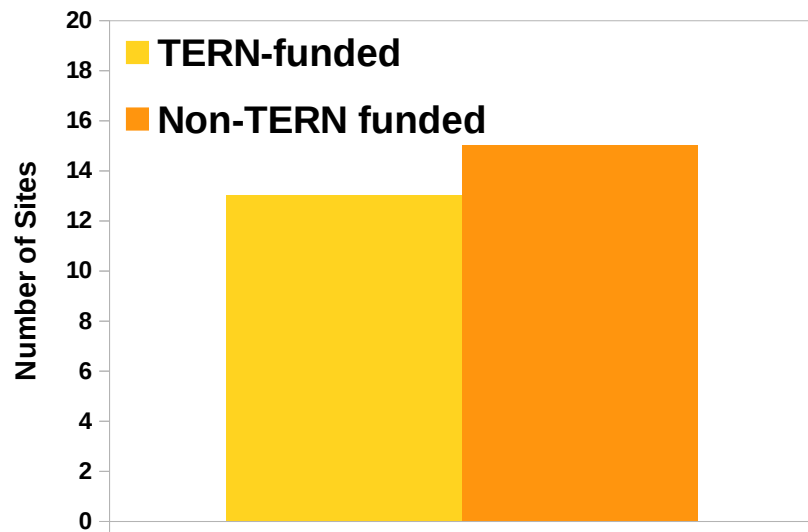
	2011	2012	2013
Sites	8	19	28
Accounts		62	96
Site-years		46	62

Courtesy
Peter Isaac

Future Priorities and Directions

2. Site and Network enhancements

- Sustainability of sites and network
- Broader suite of observations
- Enhance continental coverage



Future Priorities and Directions

3. Science and policy impact

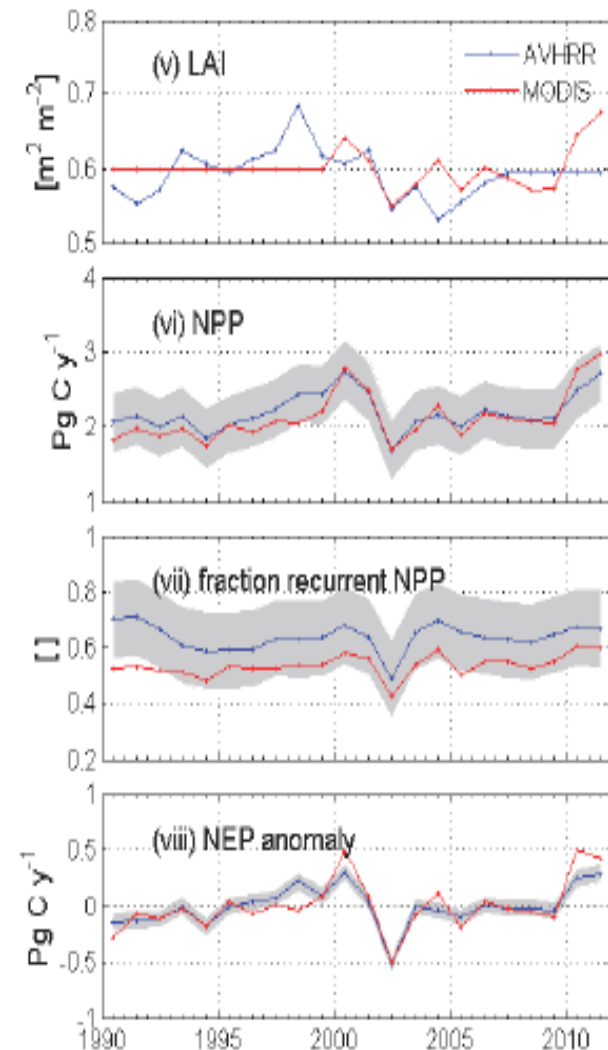
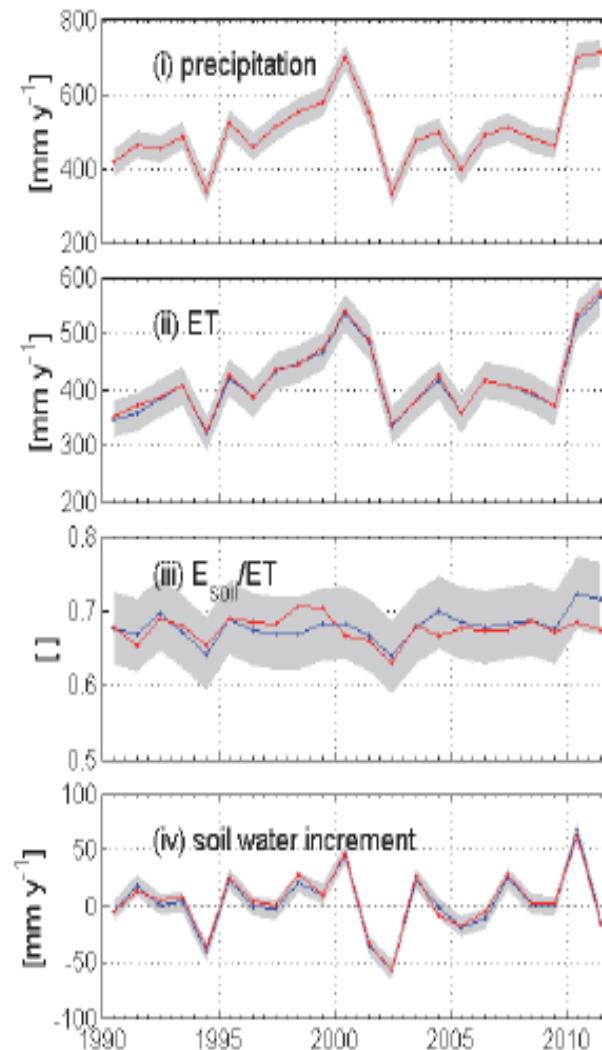
OzFlux data used to:

- Test and improve land surface models [esp. CABLE]
 - ❖ Australian ecosystems in regional and global weather and climate models
- Constrain first comprehensive carbon budget
 - ❖ Significantly reduce the uncertainty in estimated NPP for Australia
- Quantify ecosystem response to land management, disturbance and climate variability
 - ❖ Subtropical and tropical savannas, SE forests, mulga ...

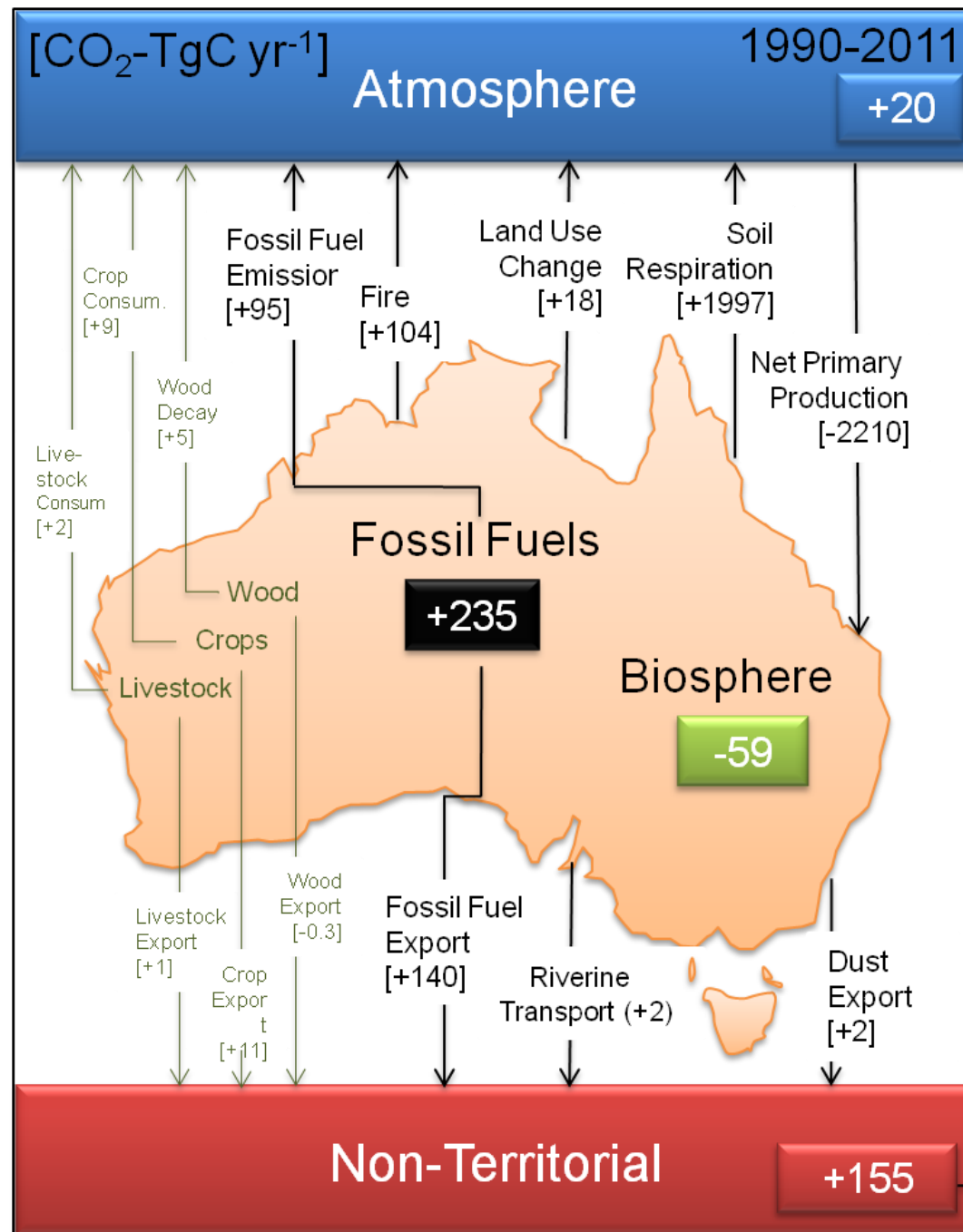
Future Priorities and Directions

Insights into carbon and water budget dynamics for the Australian continent, e.g. large interannual variability in NPP

- driven by available moisture
- larger than anthropogenic greenhouse gas emissions



Haverd et al.
2013 a, b.
Biogeosciences



Australian CO₂ Budget

Future Priorities and Directions

3. Science and policy impact

The challenge:

- Demonstrate importance of OzFlux data for key research questions



Thank You and Questions

Acknowledgements

- OzFlux
 - Ray Leuning
 - Peter Isaac and Eva van Gorsel
 - OzFlux PIs and technical support
- Collaborators
 - Vanessa Haverd (Australian carbon and water balance, BIOS2 simulations)
 - TERN community



