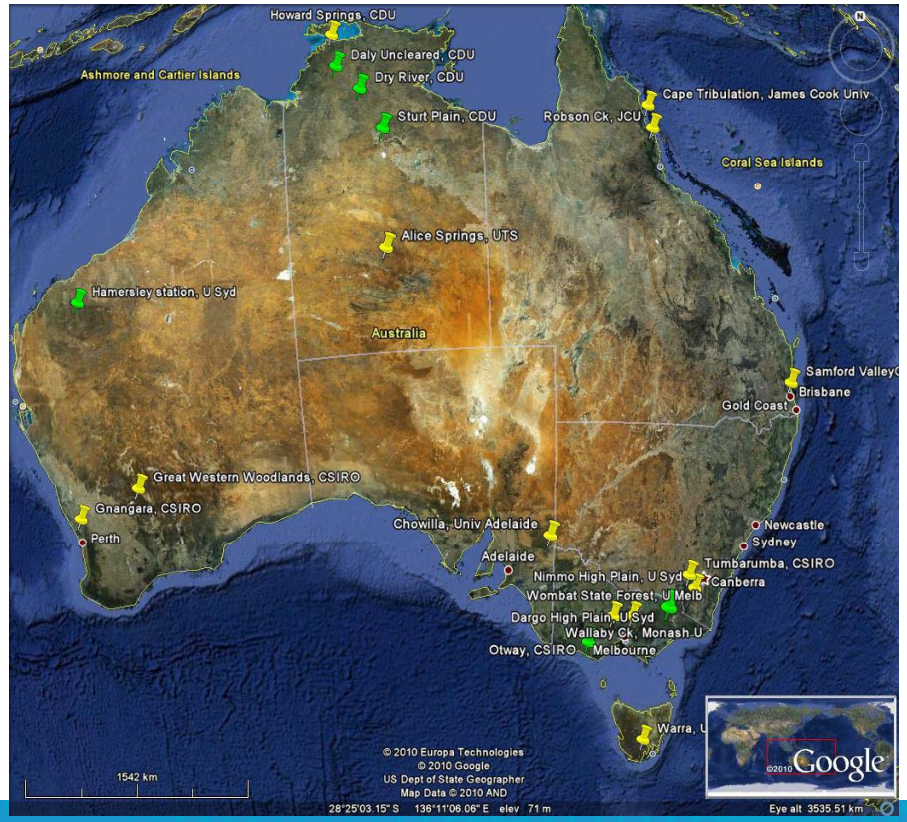


www.csiro.au

OzFlux Workshop 2011

OzFlux

CSIRO

Welcome

1. Logistics
2. Housekeeping and HSE
3. Program for OzFlux Workshop

TERN
Terrestrial Ecosystem Research Network

OzFlux

www.csiro.au

Overview of OzFlux and TERN

Helen Cleugh and Eva van Gorsel
TERN OzFlux Facility Leader and Deputy Leader

CSIRO

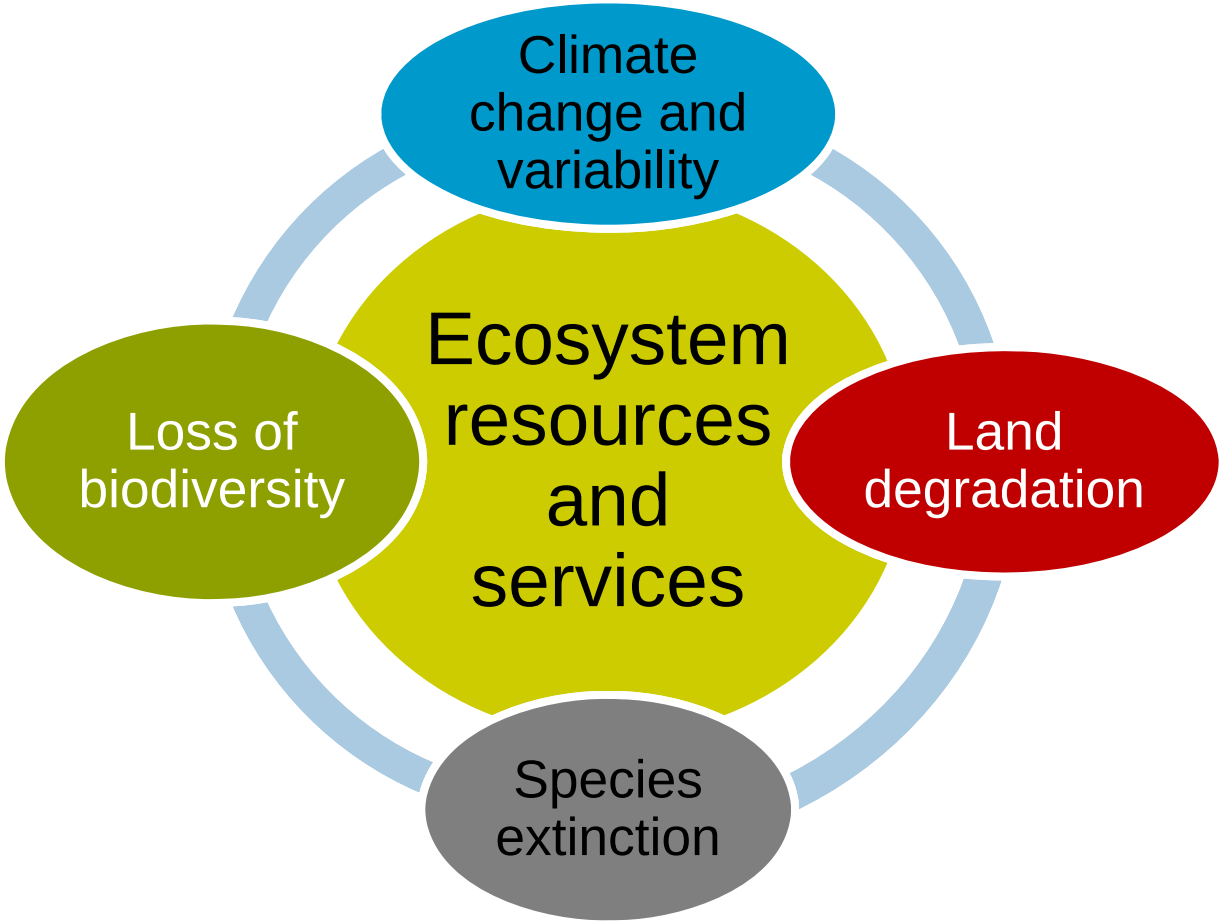
Context (1): Carbon, water and climate feedbacks in Australian ecosystems

- Terrestrial ecosystems:
  - Modulate climate via exchanges of energy, water, momentum and greenhouse gases (GHGs)
  - Are the biggest users of water via evapotranspiration
- Some key research questions
  - What is the net carbon uptake for Australian ecosystems and the continent, and how does this vary?
  - What is the stability of the land-based carbon sinks and what does this mean for our future climate?
- Impact of climate change on terrestrial ecosystem functioning and services can be informed by ecosystem energy, water and carbon budgets

CSIRO

Context (2): Australian ecosystem data, information and understanding

- Information and knowledge needed for the sustainable management of ecosystems, and the services they provide, in the context of significant environmental change



Context (2): Australian ecosystem data, information and understanding

- How are ecosystems changing – including the spatial distribution of plant and animal species – over time?
- How do land management and climate drivers affect ecosystems and ecosystem processes?
  - Terrestrial carbon, water and nutrient cycles
  - GHG emissions
  - Biodiversity
  - Soil and water quality
- What is the impact of natural disturbance regimes and how are they changing?

CSIRO

TERN:
A Terrestrial Ecosystem Research Network

Goal

- Provide data, information, understanding and capabilities needed to answer these questions and overcome long-standing

VISION:

The network and resources to enable sustained, long-term collection, storage and sharing of ecosystem data to meet terrestrial ecosystem and natural resource management research needs in Australia

- Enabling and fostering collaboration among ecosystem science communities

CSIRO

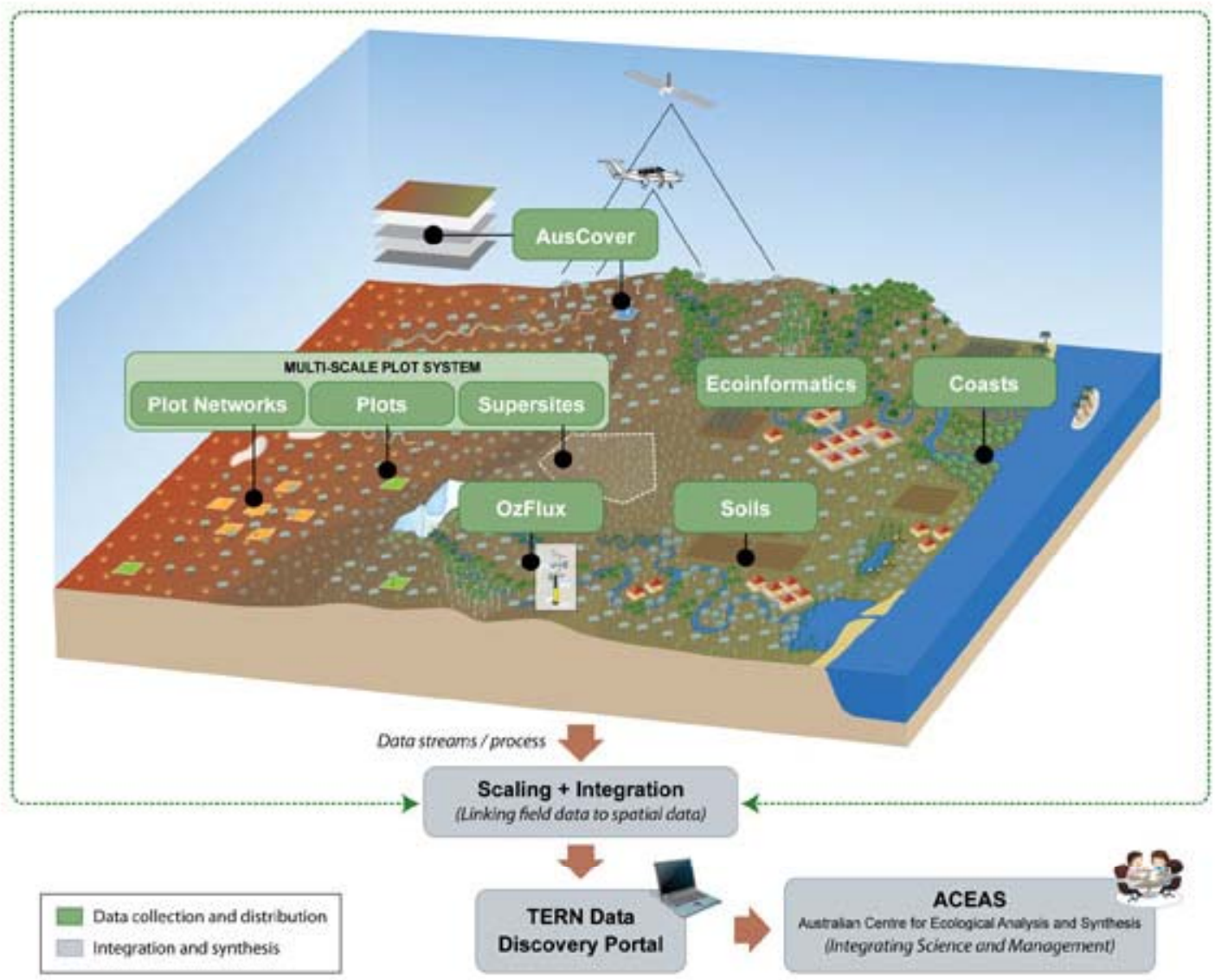
TERN:
A Terrestrial Ecosystem Research Network

- Resources and Timing
  - 2009 - 2011: $20m from DIISR's National Collaborative Research Infrastructure Strategy to create TERN-NCRIS
  - 2011 - 2014: $25.63m from DIISR's Education Investment Fund for a second phase of TERN - TERN-EIF

- Structure
  - 6 data collection and 2 integration & synthesis (eMAST; ACEAS) Facilities
  - TERN Office (Univ. Queensland)
    - TERN Director
    - Coordination and Communication
    - TERN data portal

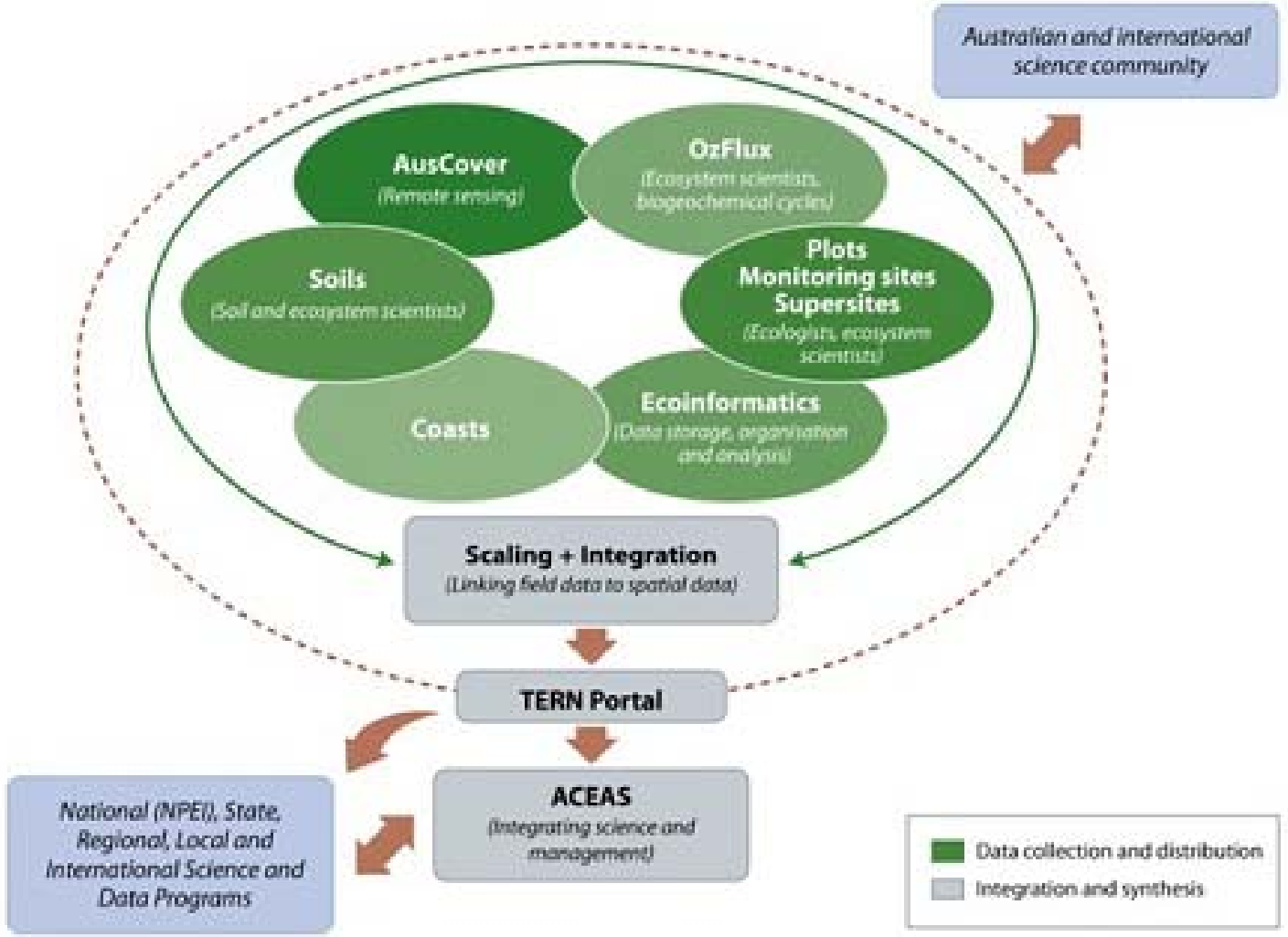
CSIRO

TERN:
A Terrestrial Ecosystem Research Network



CSIRO

TERN:
A Terrestrial Ecosystem Research Network



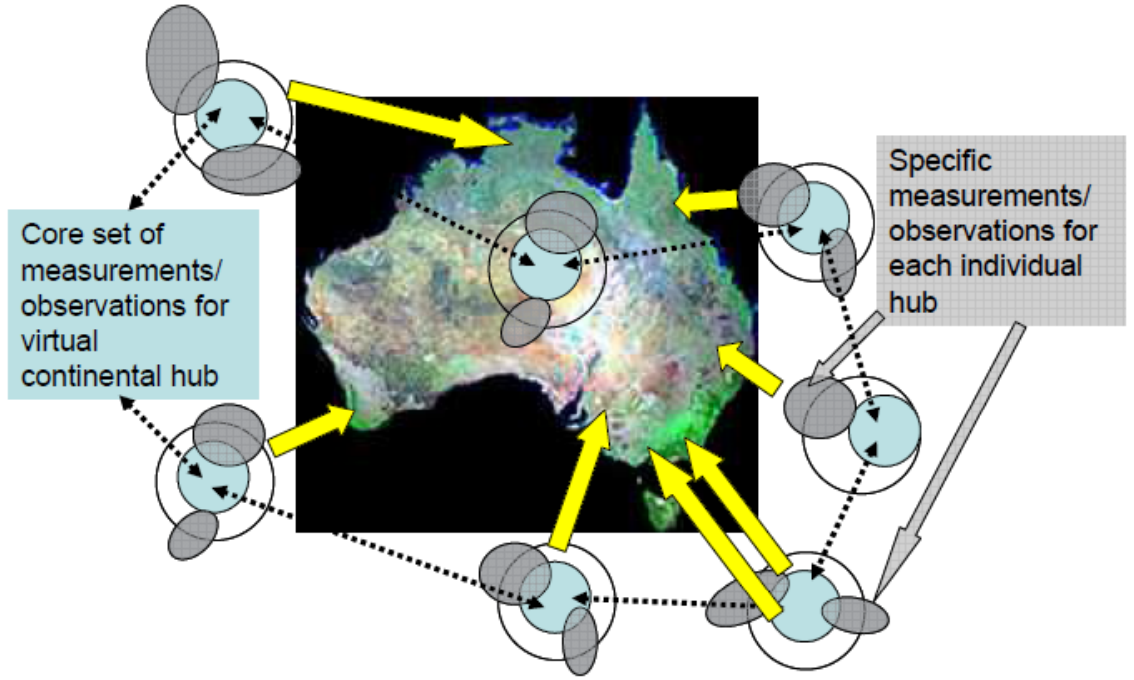
CSIRO

OzFlux and TERN

A network of flux stations delivering nationally consistent observations of energy, carbon and water fluxes

To:

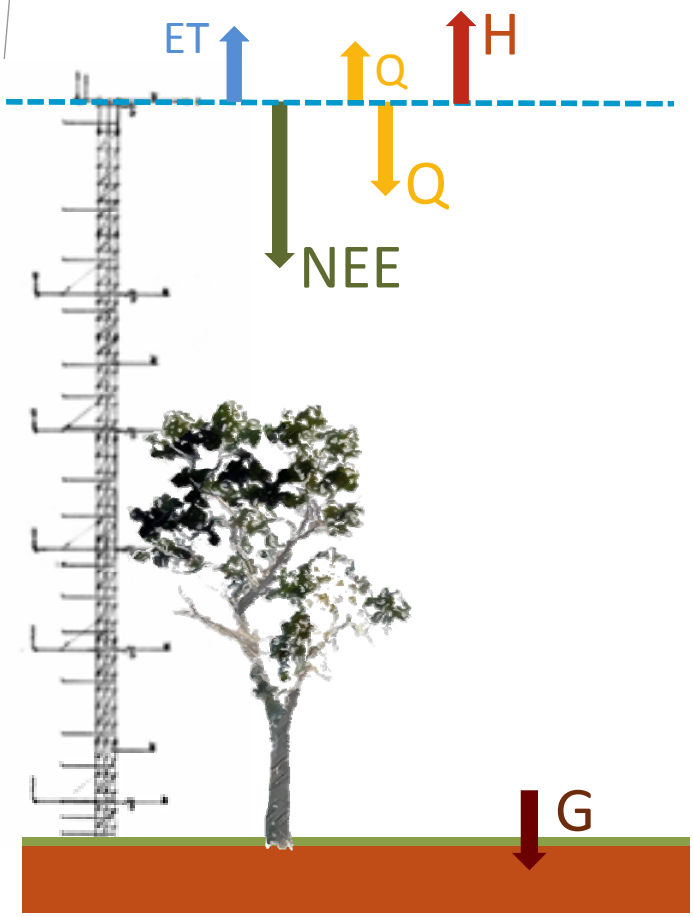
- In … an
- Q … er and
- A … CABLE –
- V … ory for



Green - core observations made to standard measurement protocols
Gray - 'constellation' measurements specific to each site

CSIRO

Flux stations measure ecosystem water use and carbon fluxes



Purpose is to measure:

- CO_2 and water vapour fluxes using eddy covariance method
  - Water (λE, ET) and CO_2 (NEE)
- Energy fluxes
  - Radiation (Q) and heat (H, G)
- Above canopy, spatially-averaged fluxes
- Continuous: hourly to multi-annual

CSIRO

Flux stations measure ecosystem water use and carbon fluxes

Flux towers measuring vineyard and forest CO_2 and water fluxes

Purpose is to measure:

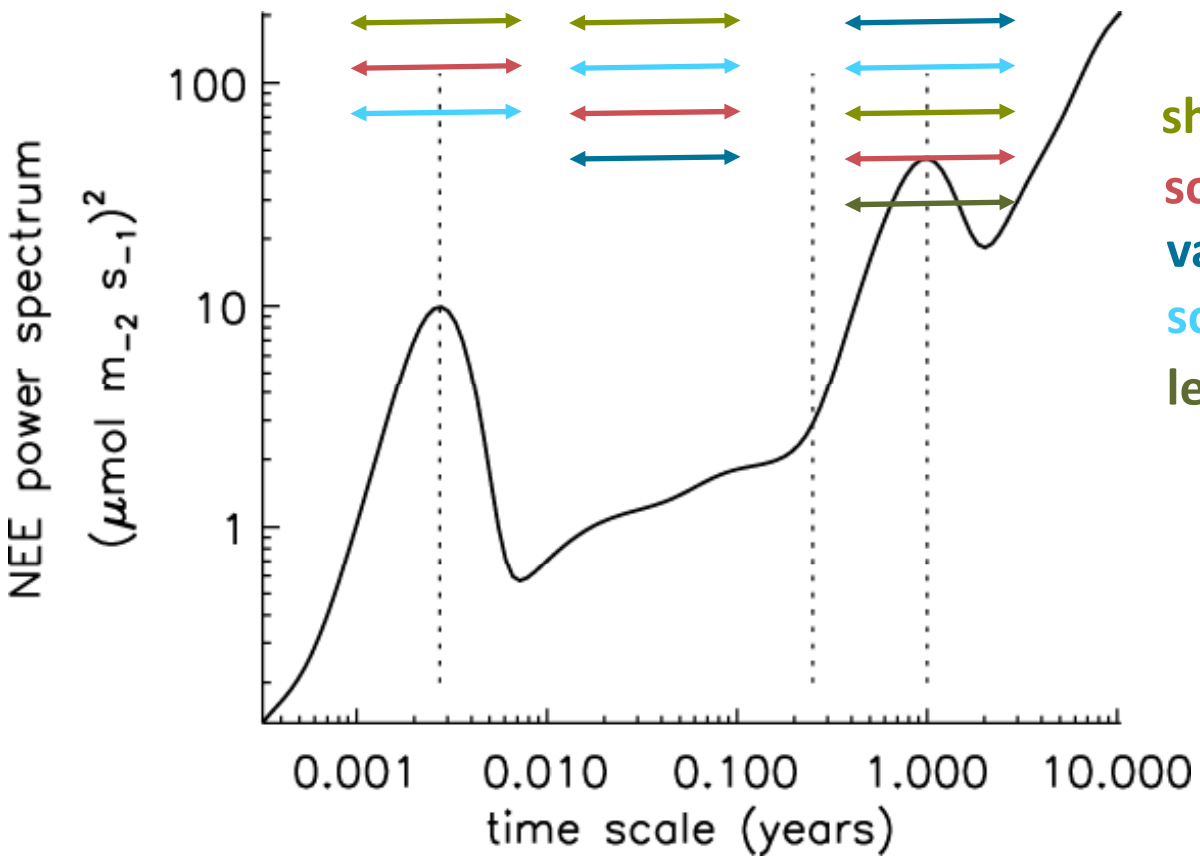
Drivers:

- Above-canopy meteorology
- Soil temperature and moisture

Data for analysis & interpretation:

- Within-canopy temperature, CO_2, humidity and wind profiles

Flux stations measure ecosystem water use and carbon fluxes



shortwave radiation

soil temperature

vapour pressure deficit

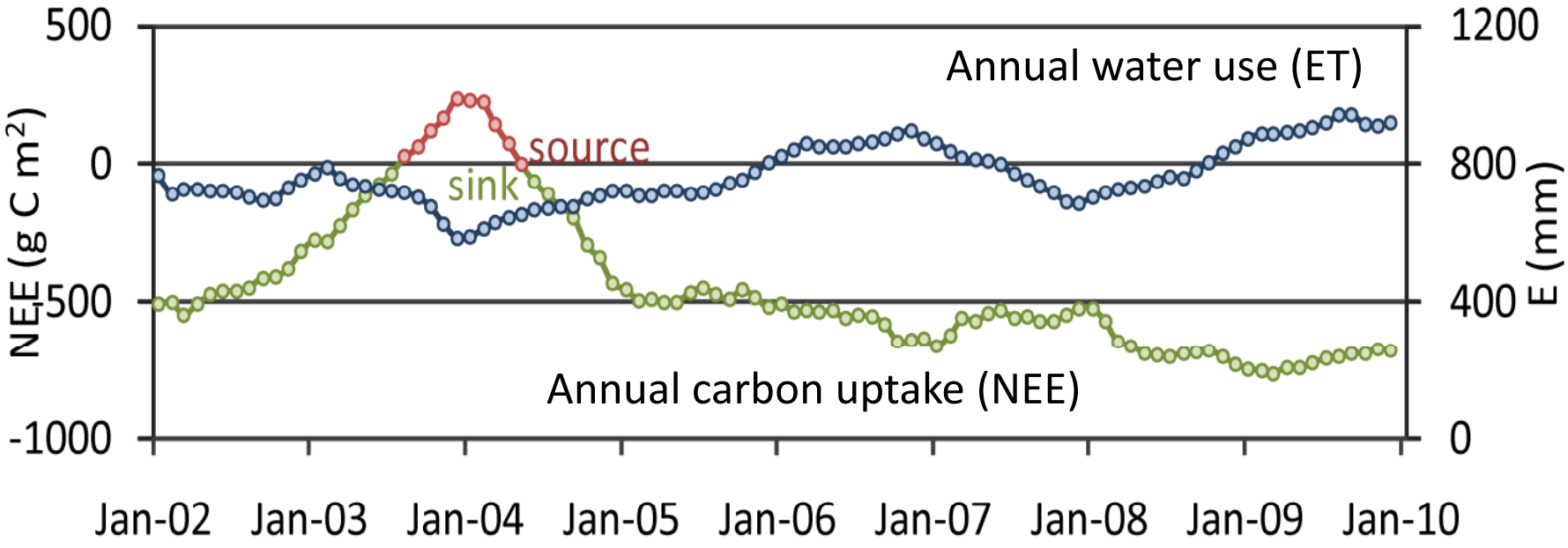
soil water content

leaf area index

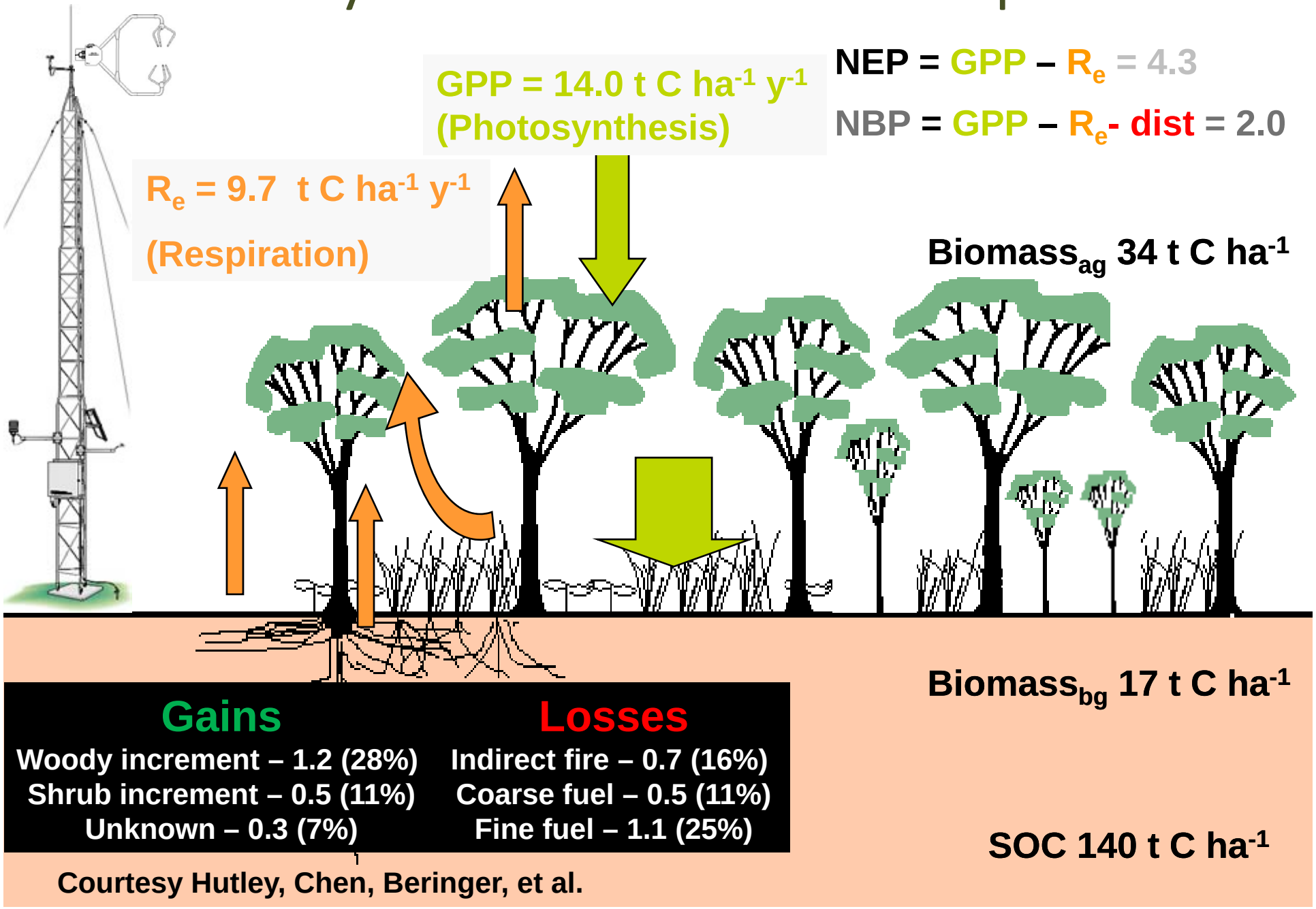
From van Gorsel et al., 2011

Flux stations measure ecosystem water use and carbon fluxes

A decade of continuous fluxes for a mixed Eucalypt forest in SE Australia - showing the importance of multi-annual time series of carbon and water fluxes

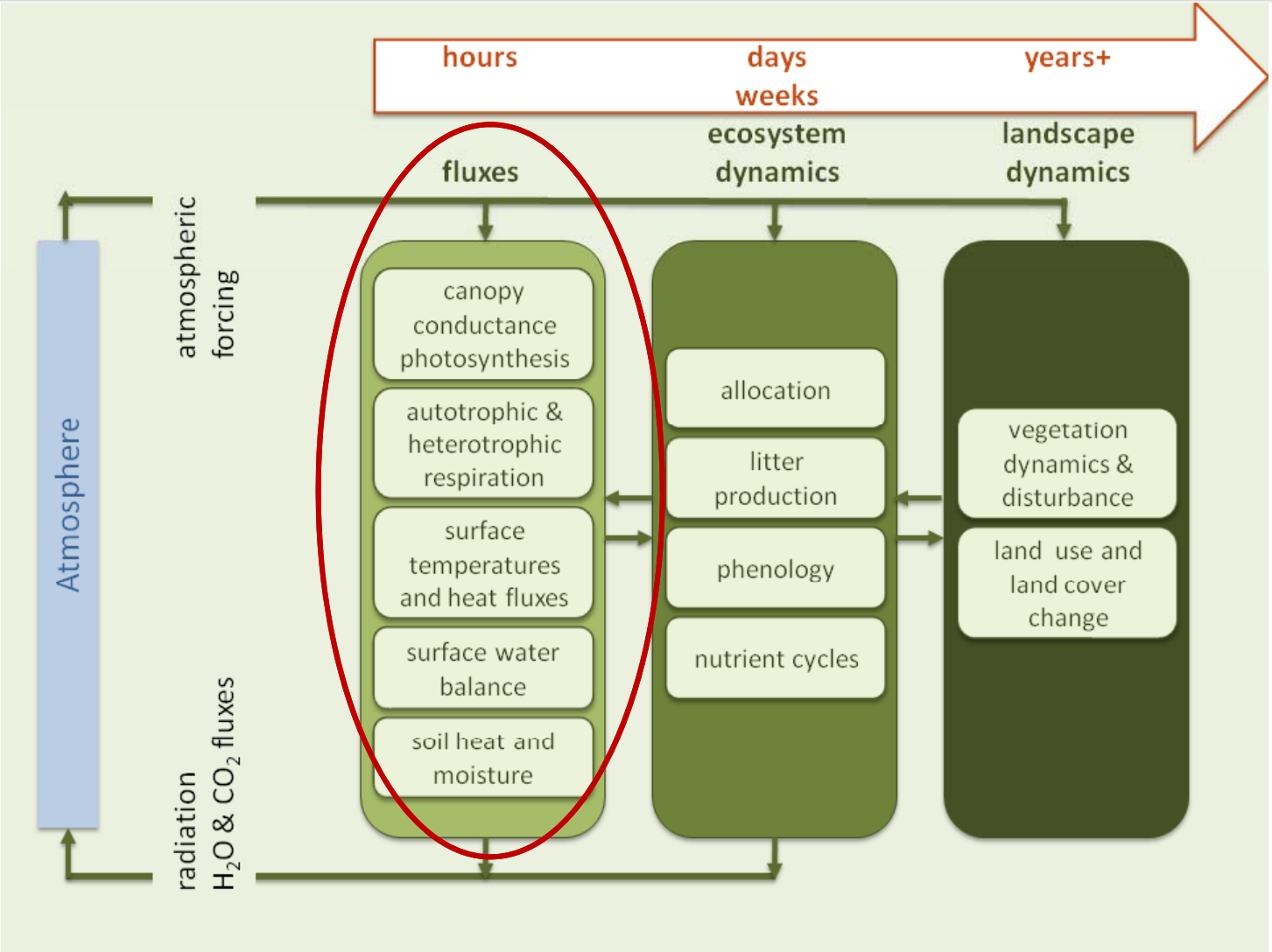


Ecosystem carbon fluxes and pools



Courtesy Hutley, Chen, Beringer, et al.

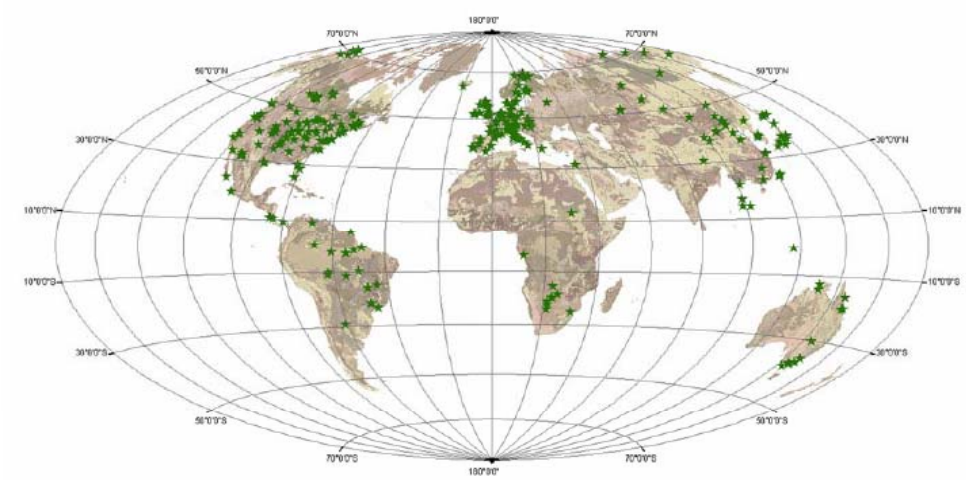
Flux stations and Ecosystem models

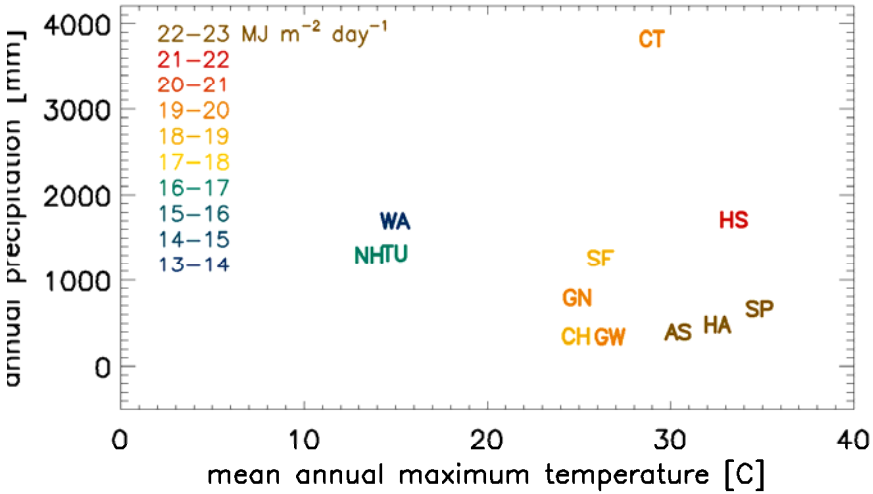


From M. Williams et al., www.***biogeosciences***.net/6/1341/**2009**/

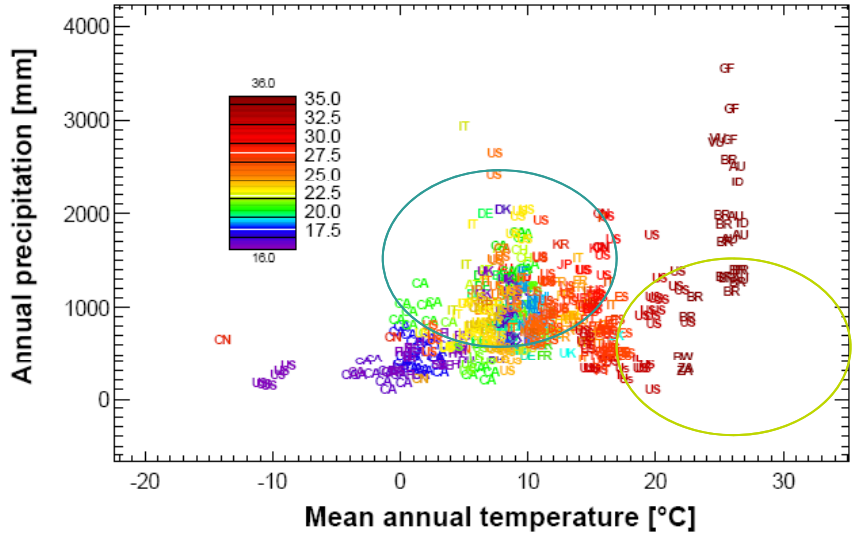
OzFlux and Fluxnet: A broad range of ecosystems and climates

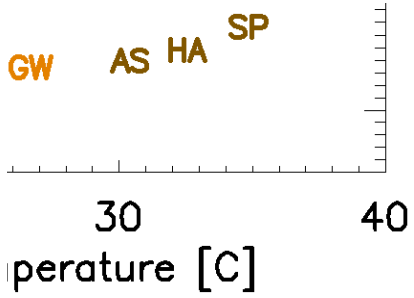
(A)





(B)



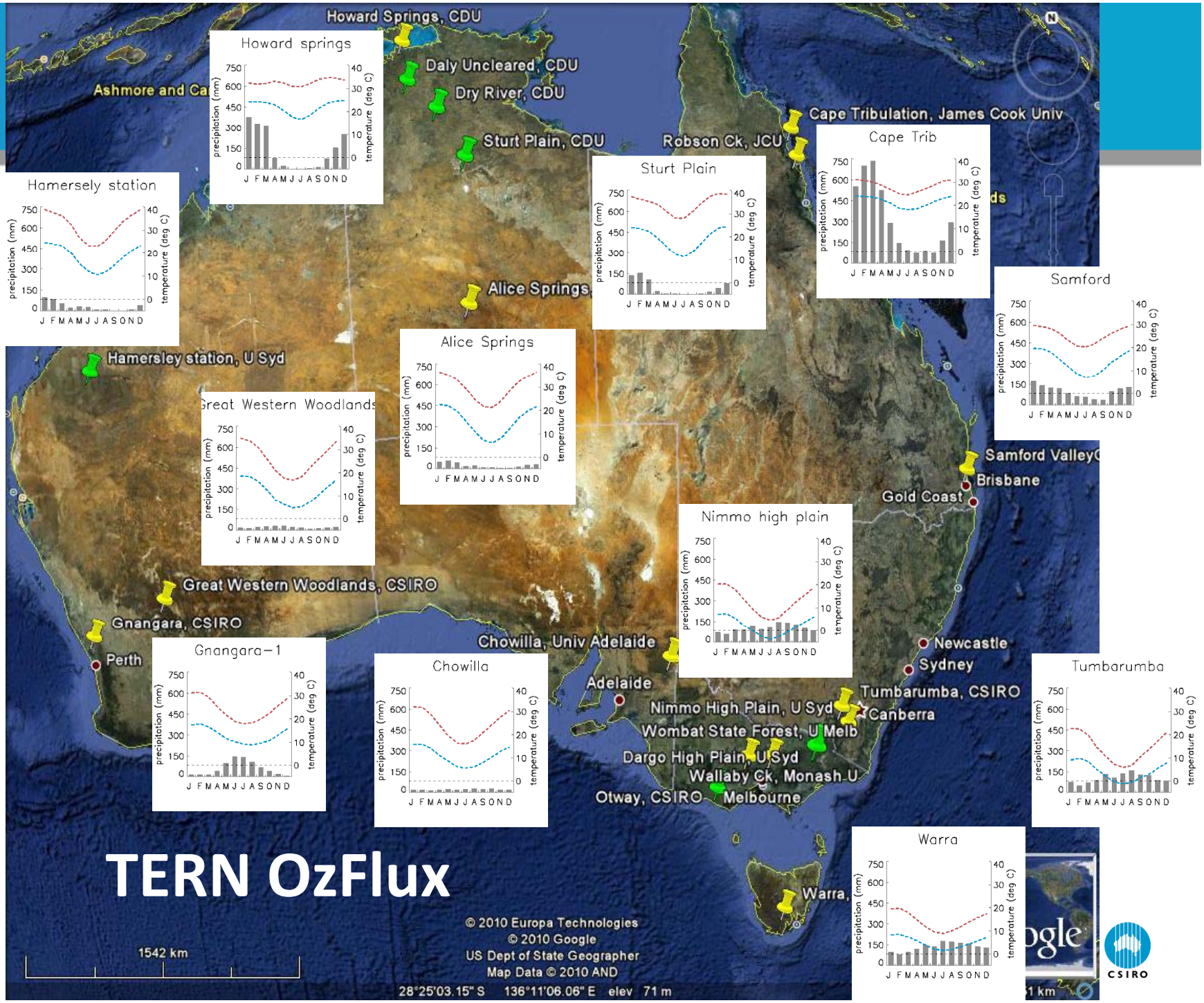


M. Williams et al.
www.***biogeosciences***.net/6/1341/**2009**/

OzFlux Achievements

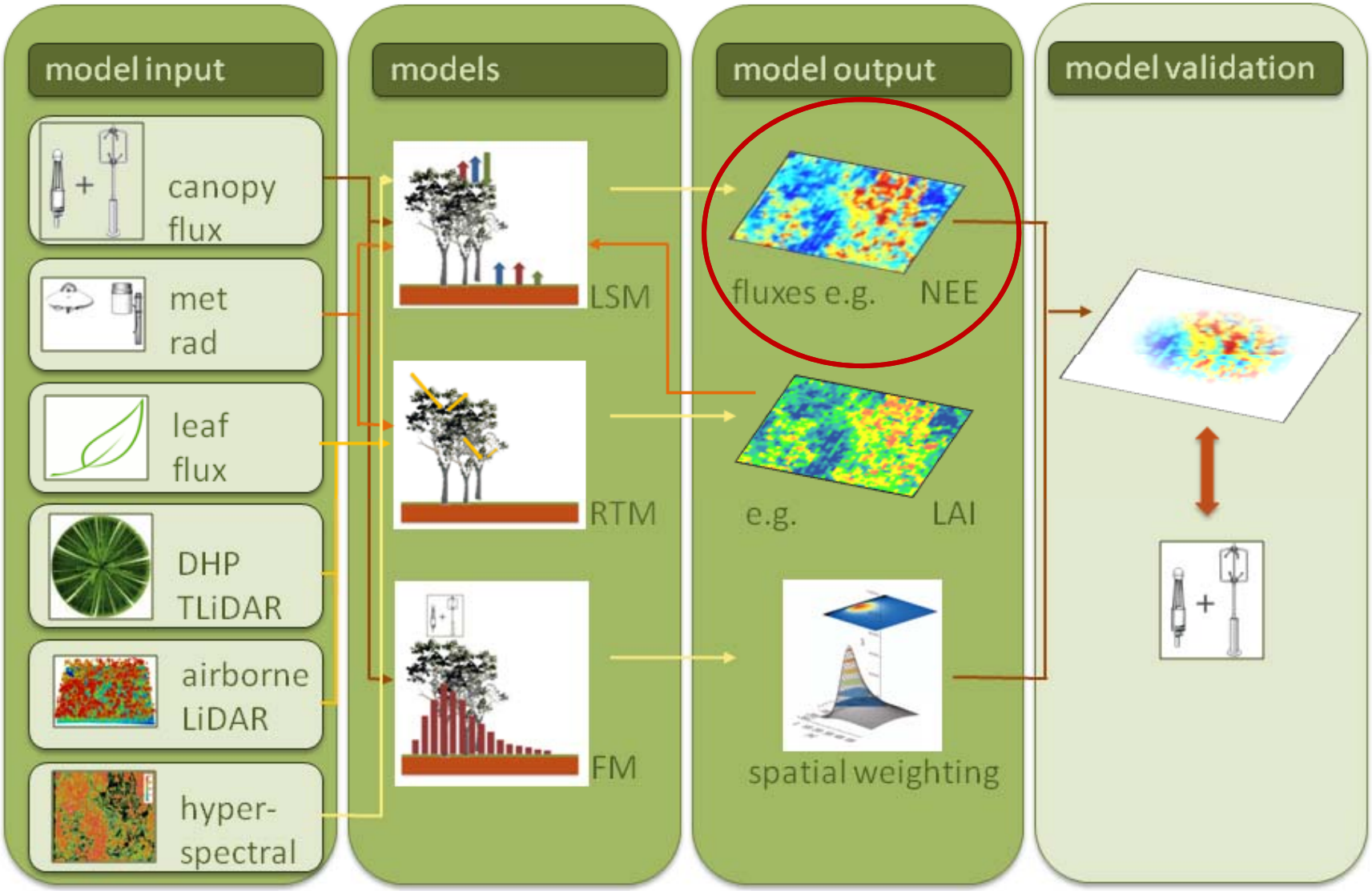
- OzFlux Facility and Central node established
  - Around 15 operational or soon-to-be operational (not all via TERN funding)
- TERN data portal and Information Infrastructure Group
- OzFlux data portal and Data Management System
  - Consistent data processing
  - Centralised data repository – fluxes and metadata
- Developing a calibration system and procedure
- Funding for OzFlux workshops
- Web site: http://www.ozflux.org.au/index.html
  - We need you!
- eMAST and GHG website

CSIRO


Howard Springs, CDU
Howard springs
Daly Uncleared, CDU
Dry River, CDU
Sturt Plain, CDU
Cape Tribulation, James Cook Univ
Robson Ck, JCU
Cape Trib
Sturt Plain
Hamersely station
Alice Springs
Hamersley station, U Syd
Alice Springs
Great Western Woodlands
Samford
Samford Valley
Brisbane
Gold Coast
Nimmo high plain
Great Western Woodlands, CSIRO
Gnangara, CSIRO
Perth
Gnangara−1
Chowilla, Univ Adelaide
Chowilla
Newcastle
Sydney
Adelaide
Tumbarumba, CSIRO
Tumbarumba
Nimmo High Plain, U Syd
Canberra
Wombat State Forest, U Melb
Dargo High Plain, U Syd
Wallaby Ck, Monash U
Otway, CSIRO
Melbourne
Warra
Warra,
TERN OzFlux
© 2010 Europa Technologies
© 2010 Google
US Dept of State Geographer
Map Data © 2010 AND
28°25'03.15" S 136°11'06.06" E elev 71 m
1542 km
precipitation (mm)
temperature (deg C)
J F M A M J J A S O N D
CSIRO

Site Name	Ecosystem	Location
1. Robson	Simple notophyll vine forest	Qld (Atherton Tablelands)
2. Cape Tribulation	Complex mesophyll vine forest	Qld (Daintree)
3. Samford	Peri-urban	Qld (Brisbane)
4. Tumbarumba	Alpine ash forest (E. delegatensis)	SE NSW
5. Wallaby Creek	Mountain ash forest (E. regnans)	SE Vic
6. Wombat	Dry sclerophyll Eucalypt forest (E. obliqua; E. radiata and E. rubida)	Central Vic
7. Warra	E. obliqua forest	Tasmania
8. Nimmo High Plains	Poa C_3 grassland	NSW alpine region
9. Chowilla	Mallee	SA (Lower Murray)
10. Gnangara	Coastal heath	Southern WA
11. Great Western Woodlands	Temperate woodland, heath and mallee	WA
12. Hamersley Station	Semi-arid C_4 grassland	NW WA
13. Weeli Wolli Creek	Semi-arid, riparian coolabah woodland	NW WA
NT Savanna Flux Transect 14. Howard Springs 15. Daly and 16. Dry River	Wet tropical savanna to rangelands	NT – N/S transect
17. Alice Springs	Mulga – arid rangelands	NT

OzFlux, TERN and the climate and ecosystem community



Partners

James Cook University
Monash University
University of Melbourne
Forestry Tasmania
University of Adelaide
Charles Darwin University
The University of Sydney
University of Technology, Sydney
Queensland University of Technology
University of Queensland

ARC
Australian Climate Change Science Program (DCCEE)
CSIRO
Bushfire CRC
TRaCK

TERN
Terrestrial Ecosystem Research Network

OzFlux

http://www.ozflux.org.au/

CSIRO

CSIRO Marine and Atmospheric Research

Helen Cleugh

Email: helen.cleugh@csiro.au
Web: www.cmar.csiro.au.

Thank you

Contact Us
Phone: 1300 363 400 **or** +61 3 9545 2176
Email: enquiries@csiro.au **Web:** www.csiro.au

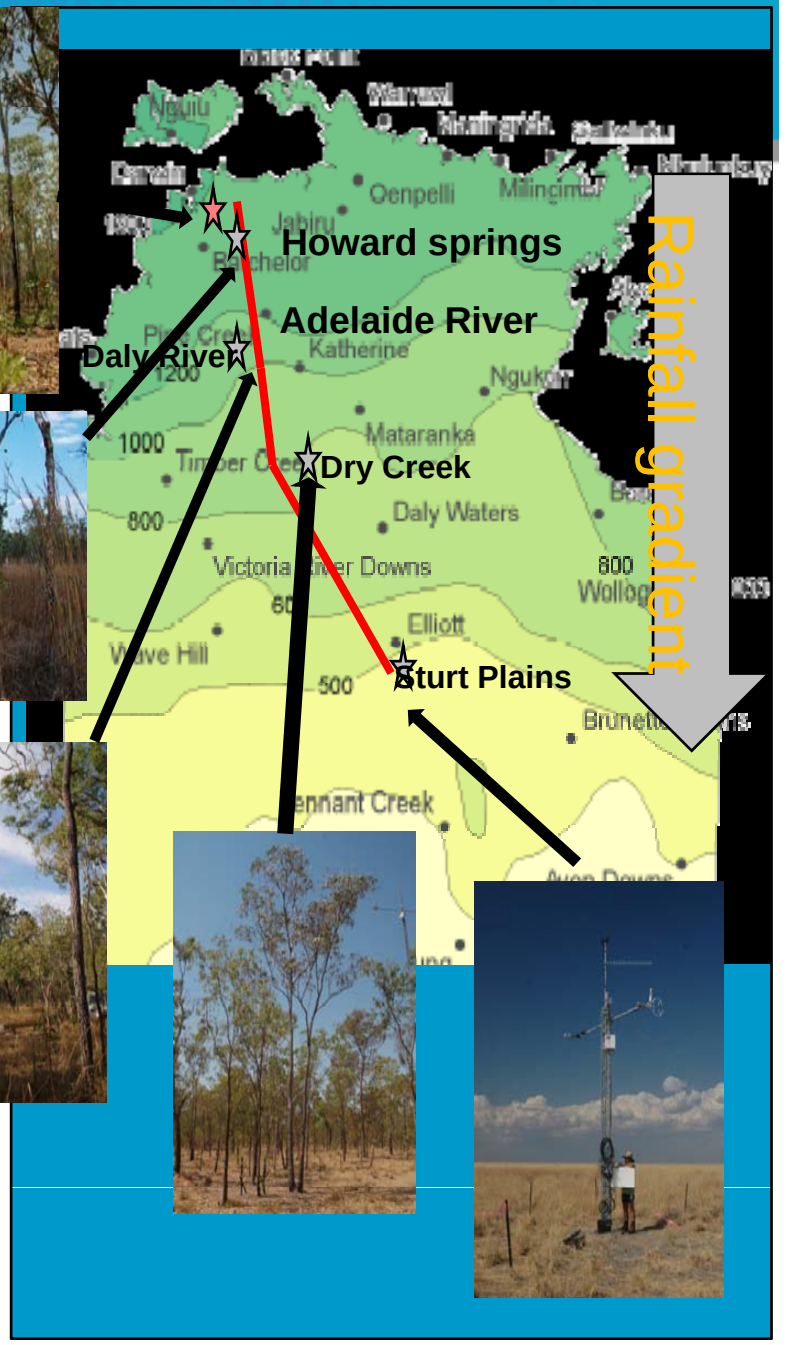
OzFlux sites

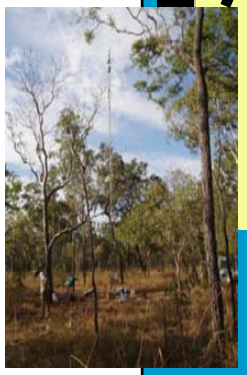
Tumbarumba
PIs: van Gorsel, Leuning (CSIRO)

- Carbon and water budgets in a mixed Eucalypt forest ecosystem
  - What is the role of climate and land management drivers?
- Scaling to regions via remote sensing
- Data for testing and improving land surface models
  - CABLE in ACCESS

OzFlux sites

Northern Tropical Savanna Flux Transect
PIs: Beringer, Hutley (Charles Darwin and Monash Universities)





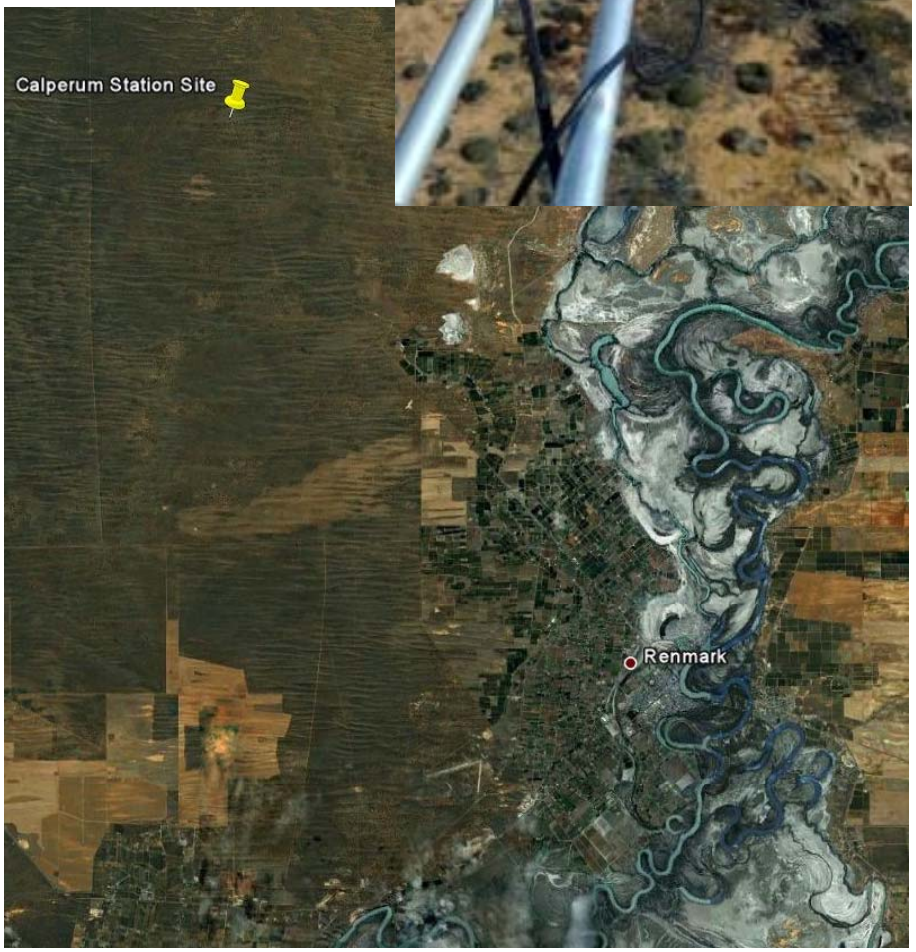
- Carbon and water balances
- Disturbance due to land clearing and fire
- Aerosols and trace gas emissions

OzFlux sites

Calperum – Chowilla

PIs: Meyer, Chittleborough (Univ. Adelaide)

- Cycles of carbon and water in a recovering mallee ecosystem
  - How do they respond to management?
  - What is the impact of a changing climate?
- Assess effectiveness of conservation management



Simple energy, water and carbon budgets in plant ecosystems

$$Q^* = \lambda E + H + \Delta Q_S$$

$$P + I = ET + D + \Delta S$$

$$GPP = [R_H + R_A] + \Delta C$$

$$\Delta C = NEE$$

ENERGY

Q^* = Net allwave radiation

λE = Latent heat

H = Sensible heat

ΔQ_S = Heat storage

WATER

P = Precipitation

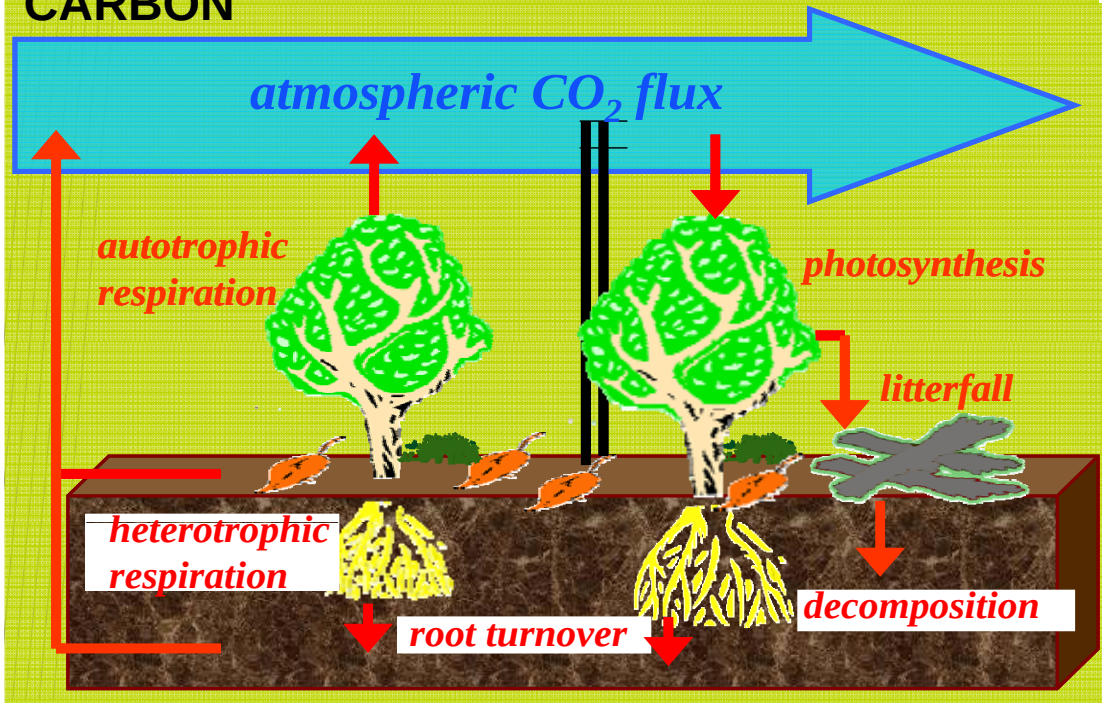
I = Irrigation

ET = Evapotranspiration

D = Runoff + Drainage

ΔS = Soil moisture

CARBON



CSIRO