MONASH University

Engineering

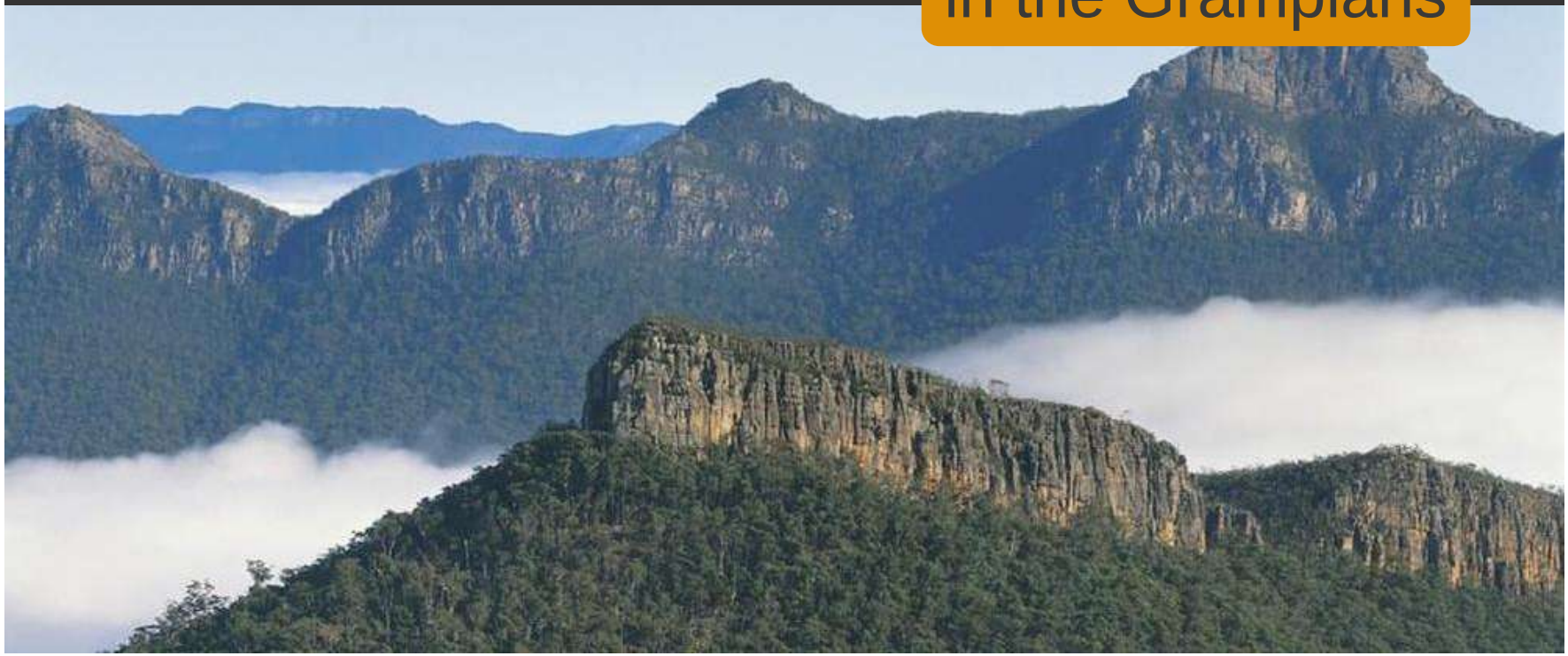
Groundwater and vegetation: Carbon and water fluxes from pasture

Samantha Grover, Edoardo Daly

Ozflux meeting, Methven

4-6 July 2012

in the Grampians



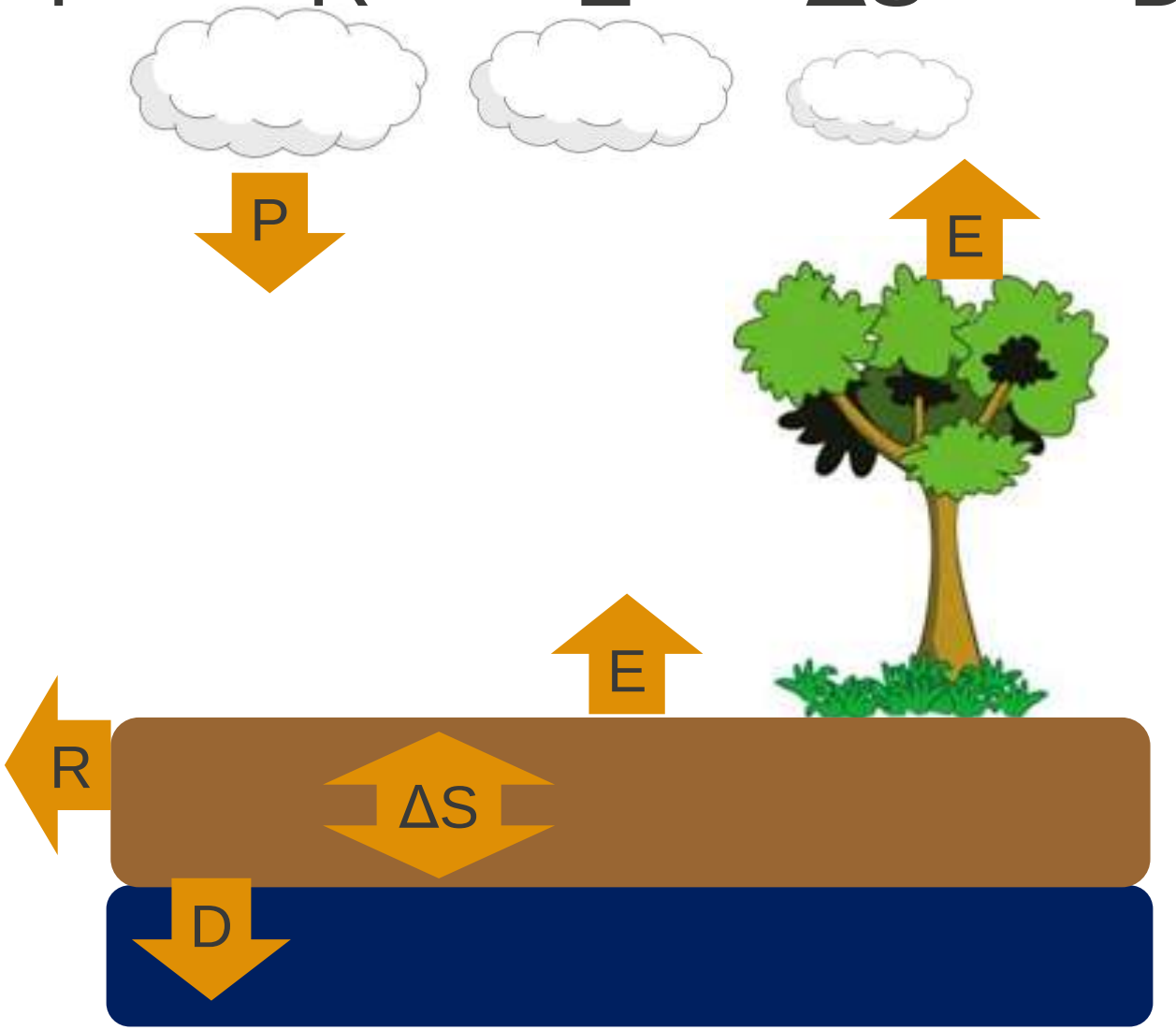
Talk outline

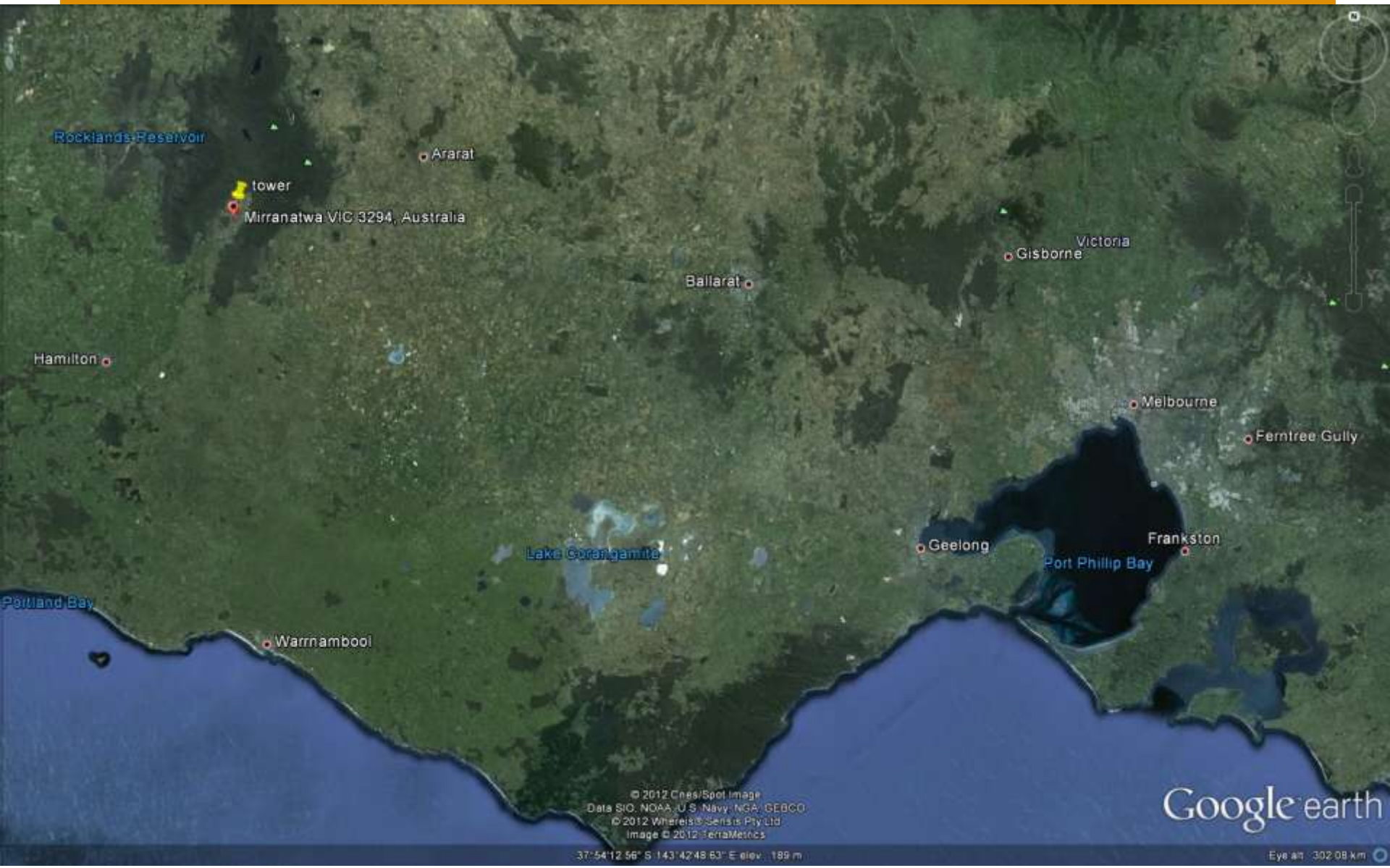
1. Groundwater-vegetation interaction
2. Paired catchments at the Grampians site
3. Eddy covariance (very early stage)

Groundwater-Vegetation-Atmosphere Interactions

Aim: to estimate how much groundwater disappears through evapotranspiration

$$P = R + E + \Delta S + D$$




Rocklands Reservoir
Ararat
tower
Mirranatwa VIC 3294, Australia
Victoria
Gisborne
Ballarat
Hamilton
Melbourne
Ferntree Gully
Geelong
Frankston
Lake Corangamite
Port Phillip Bay
Portland Bay
Warrnambool
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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Image © 2012 TerraMetrics
Google earth

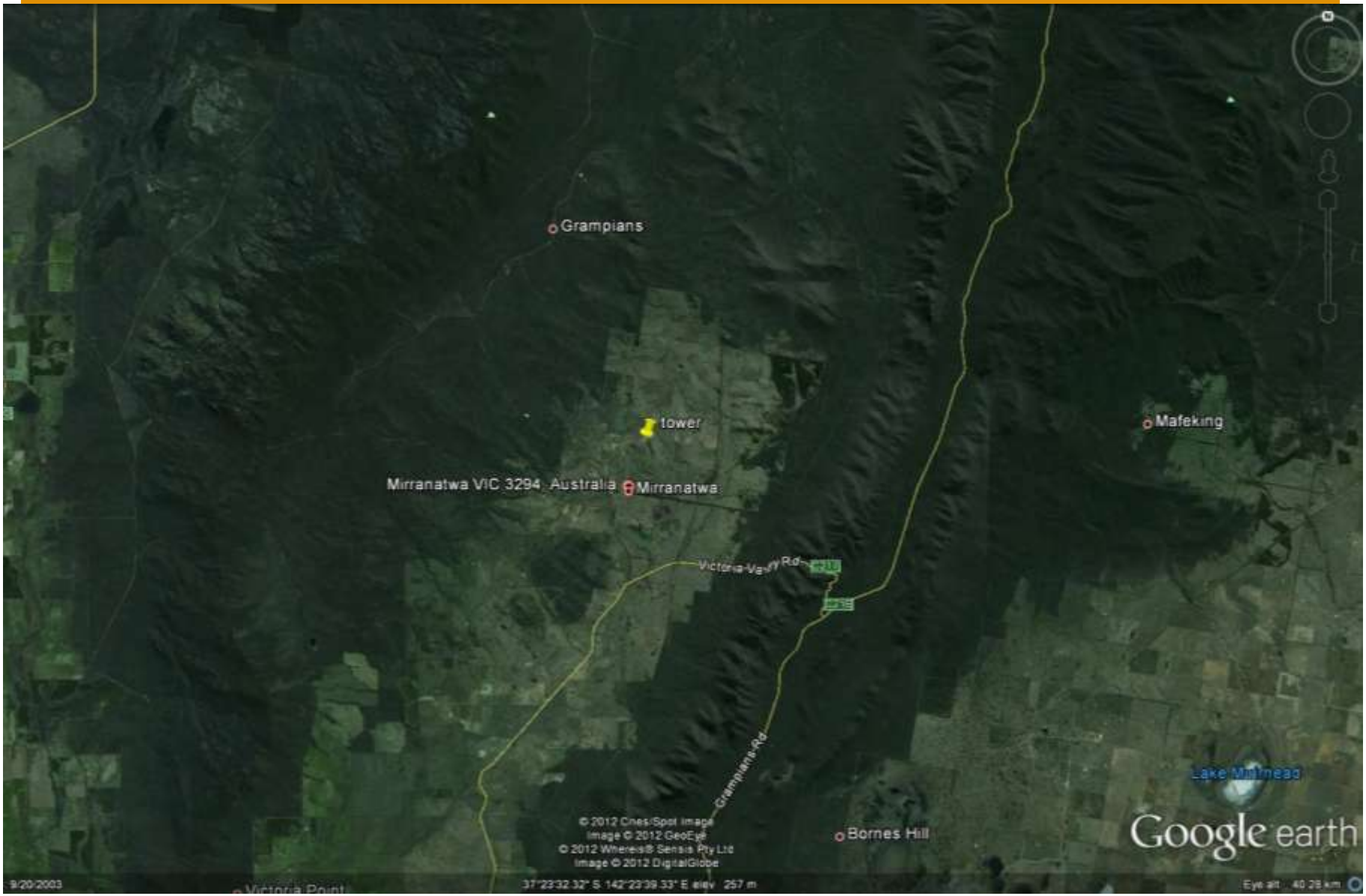
Grampians
tower
Mafeking
Mirranatwa VIC 3294, Australia
Mirranatwa
Victoria Valley Rd
Grampians Rd
Lake Mulnead
Bornes Hill
© 2012 Cnes/Spot Image
Image © 2012 GeoEye
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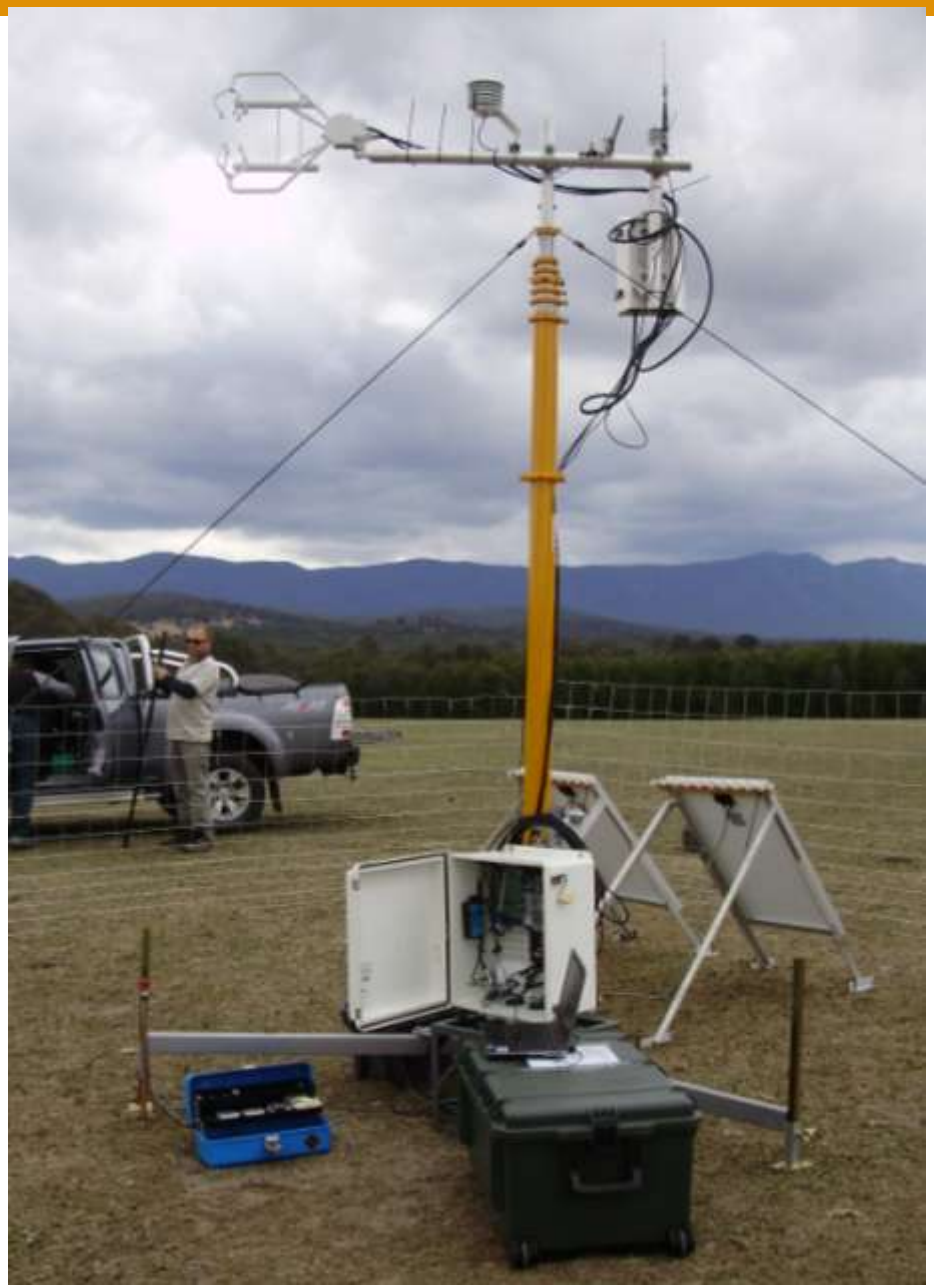
Image © 2012 DigitalGlobe
Google earth
9/20/2003
37°23'32.32" S 142°23'39.33" E elev 257 m
Eye alt 40.28 km

Groundwater research at the Grampians

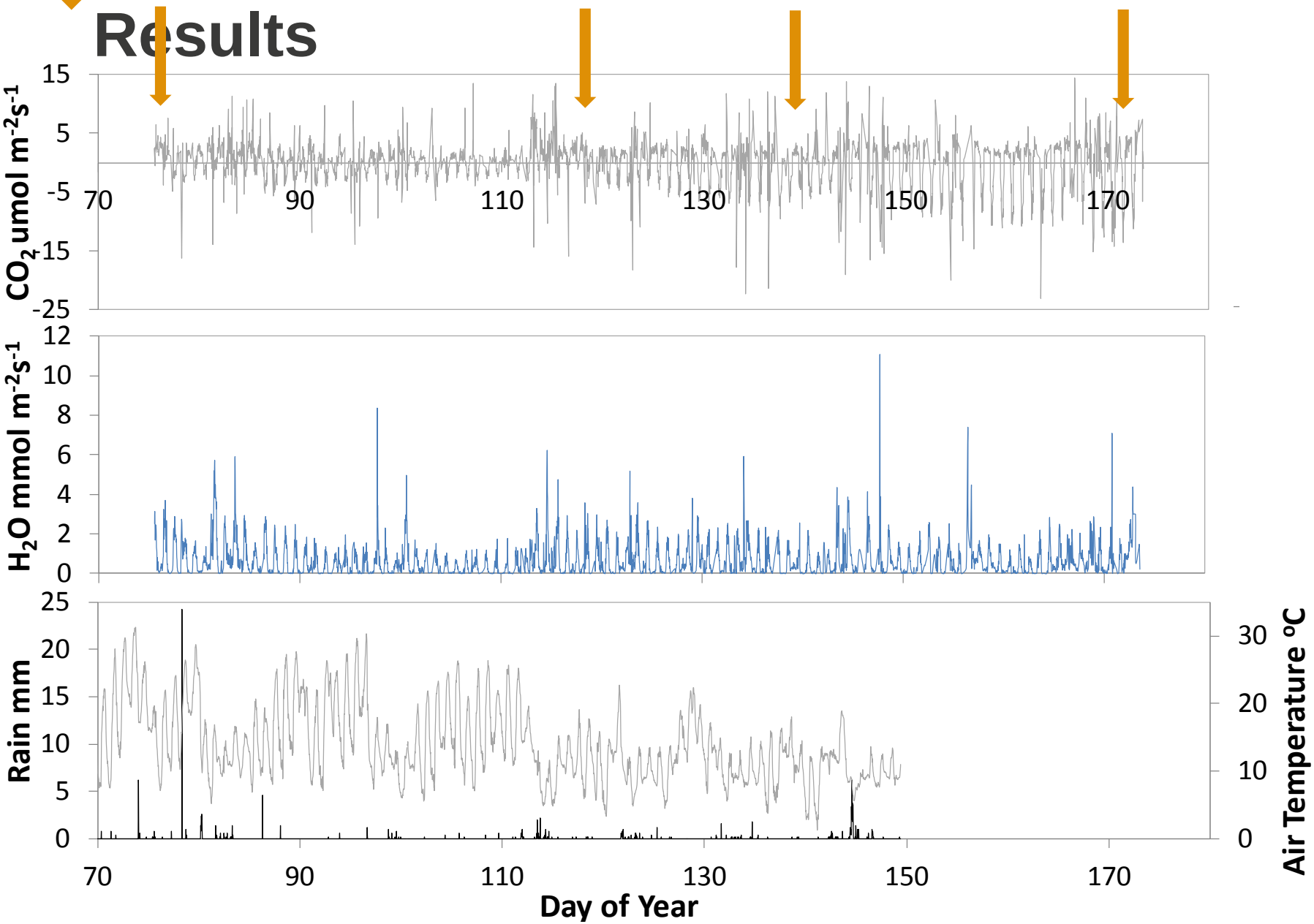
- Interaction between groundwater and vegetation
- Paired catchments, similar geology, one under pasture and one under blue gum plantation
- Measuring main components of the water balance in each catchment
- Model interaction between groundwater and plants under two very different land uses



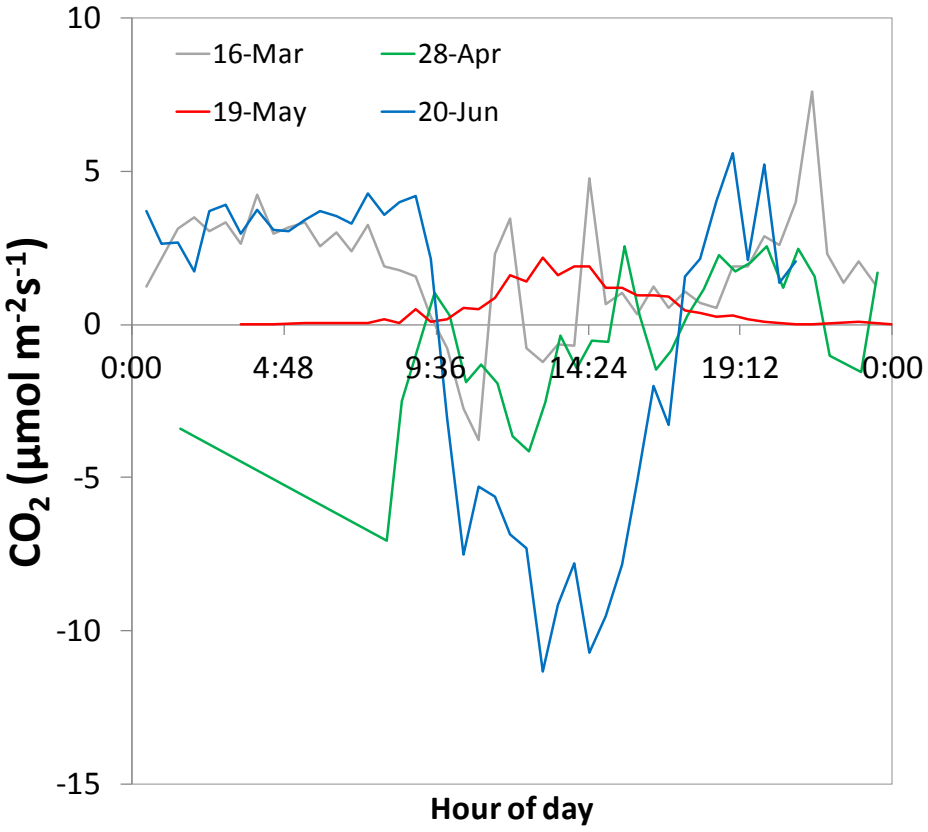
Progress

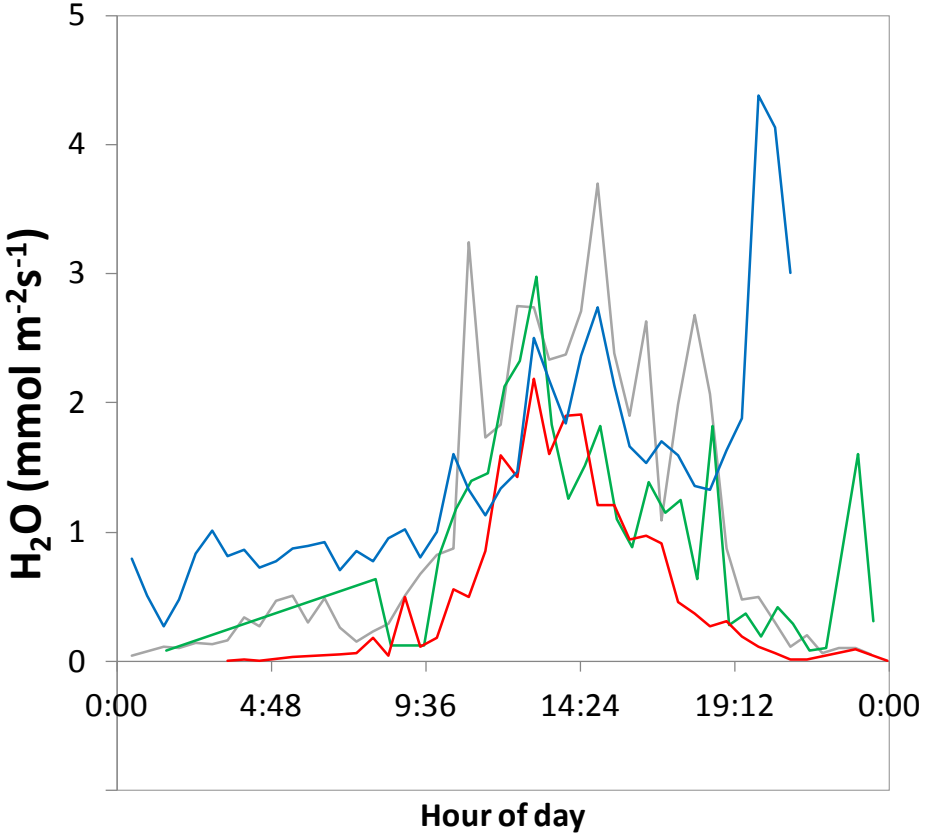
- Bores: ongoing monitoring since late 90's
- Stream gauges 2000's
- Soil water content, sapflow, weather station early 2011
- Eddy covariance tower March 2012

Results


15
5
-5
-15
-25
CO_2 umol $m^{-2}s^{-1}$
70
90
110
130
150
170
12
10
8
6
4
2
0
H_2O mmol $m^{-2}s^{-1}$
25
20
15
10
5
0
Rain mm
30
20
10
0
Air Temperature °C
Day of Year

Results


10
5
0
-5
-10
-15
16-Mar
28-Apr
19-May
20-Jun
0:00
4:48
9:36
14:24
19:12
0:00
CO_2 (µmol $m^{-2}s^{-1}$)
Hour of day


5
4
3
2
1
0
0:00
4:48
9:36
14:24
19:12
0:00
H_2O (mmol $m^{-2}s^{-1}$)
Hour of day

Where to from here?

- Move tower in to plantation
- Use EC water fluxes to upscale sapflow measurements
- Add soil respiration measurements
- Use EC CO_2 fluxes and groundwater quality to relate plant growth to groundwater depth and salinity
- Integrate evapotranspiration data into groundwater model
- Extend to other catchments

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