The effect of land use change on evaporation and fluxes of heat and CO2 in SW-Western Australia

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The Rabbit Fence – an ongoing story…. 

• 1991 – 1999: Six field campaigns Murdoch U & Flinders U  
• Dec 2005: joint campaign with U Alabama (funded by NSF)  
• Dec 2006: joint campaign with U Alabama (funded by ARC)  
• Winter 2007: joint campaign with U Alabama (funded by NSF & ARC)
• How does this discontinuity in the landscape affect fluxes?
• Does this discontinuity induce local circulation?
• Does this possibly lead to different cloud cover/types?
• Does this possibly lead to differences in rainfall?
• What about aerosols?
• Can all of this be properly modelled?
• Can the fluxes parameterised from satellite observations?
Tools:

• **NCAR GLASS** – 4 soundings per day on each side of the Fence
  NCAR mobile GPS/Loran Atmospheric Sounding System

• **ARA/Flinders U Small Research Aircraft (2 aircraft)**
  instrumented ECO-Dimonas

• **Surface Energy Balance Stations (Murdoch U)**

• **MODIS and other satellites**

• **CSU RAMS Mesoscale Model (U Alabama)**
“Getting there (and back) was half the fun”…or … “Taking the long way”

(Dec 2005 campaign)

Adelaide – Scone – Darwin - Lake King: 7,000km
....then home along the beaches & cliffs of the Great Australian Bight
“Getting there (and back) was half the fun”…or … “Taking the ‘short’ way”

(Dec 2006 campaign)

…we took the direct route, but we had 2 aeroplanes….and stopped for fuel here:

Cocklebiddy Roadhouse
Lake King Landscape

Video Clip
Dec 2005 Campaign

- Transects flown at 25m AGL with flux aircraft – Flinders U/ARA
- Aircraft ascents/descents – Flinders U/ARA
- Radiosondes (3-hrly) at marked locations - NCAR
- Energy Balance and automatic weather stations – Murdoch U
- MODIS satellite images – Murdoch U
Dec 2006 Campaign

- Transects flown at 25m AGL with flux aircraft – Flinders U/ARA
- Aerosol aircraft – ascents/descents at marked (and other) locations – W Junkermann
- ndvi-scan and lidar scan of all transects – Flinders U/ARA
- Energy Balance and automatic weather stations – Murdoch U
- MODIS satellite images – Murdoch U
9 Dec 2006

[Diagram showing various meteorological data including air temperature, specific humidity, vertical wind, horizontal wind, and fluxes averaged over 2000m. The diagram also includes laser altitude in m, trees and shrubs in m, and flying height above terrain (urtn).]
9 Dec 2006
Sensible heat flux

Higher over scrub
9 Dec 2006
Specific humidity

Note the steps – meso-scale features ??
Next step:

Combine atmospheric data with Remotely sensed data from aircraft

* Lidar – DTM, DSM
* NDVI
* photography
SERA
Small Environmental Research Aircraft

...probing the environment using the least intrusive and most cost-efficient airborne technology

FLINDERS UNIVERSITY
ADELAIDE • AUSTRALIA

Network of Airborne Environmental Research Scientists