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The Wombat Forest Long-Term Ecosystem Research Site

First experience in Processing EC-Data

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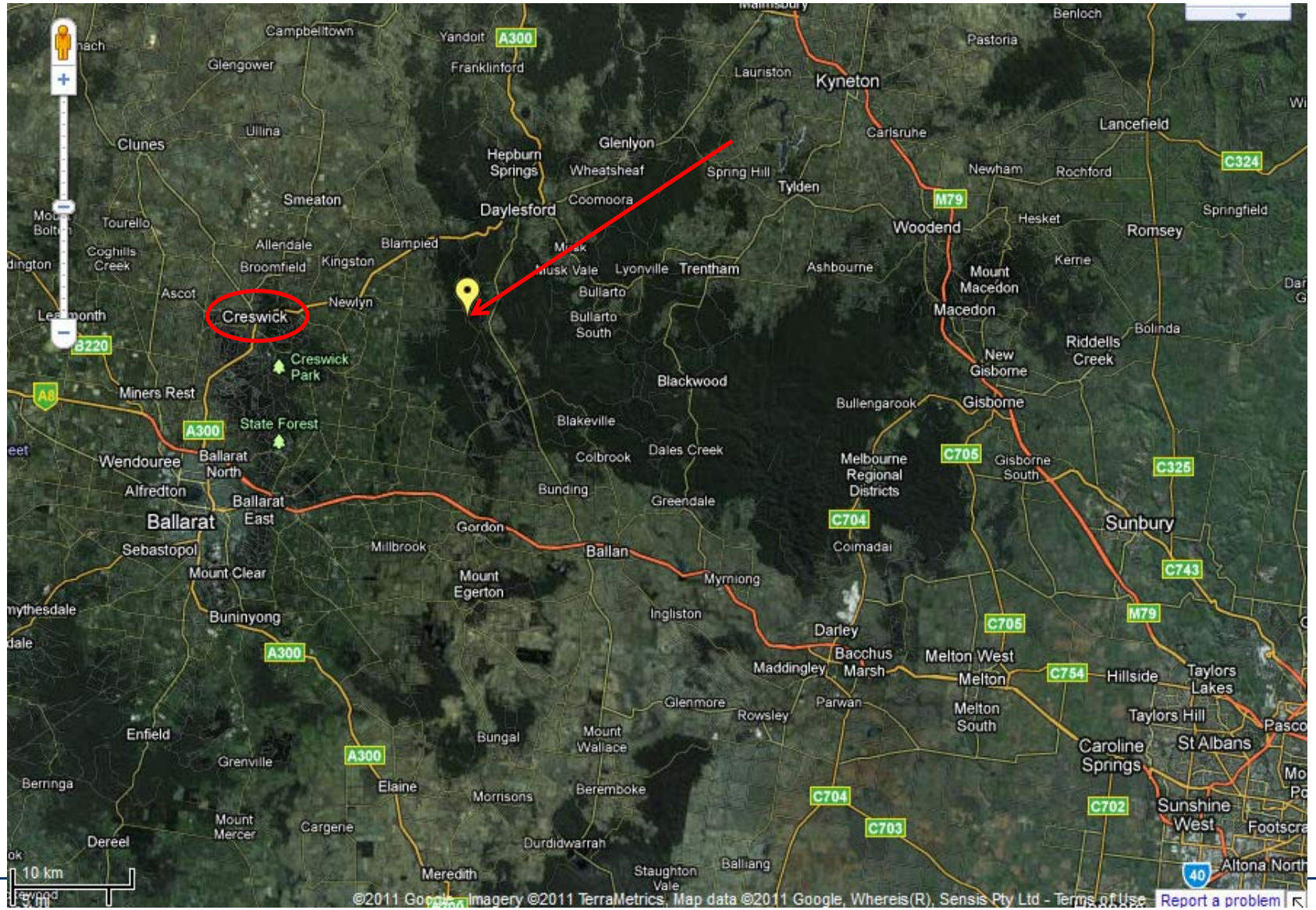
Location



Site Characteristics

- temperate dry sclerophyll Eucalypt forest

- 3 dominant species:
  E. obliqua (messmate stringybark)
  E. rubida (candlebark gum)
  E. radiata (narrow-leafed peppermint)

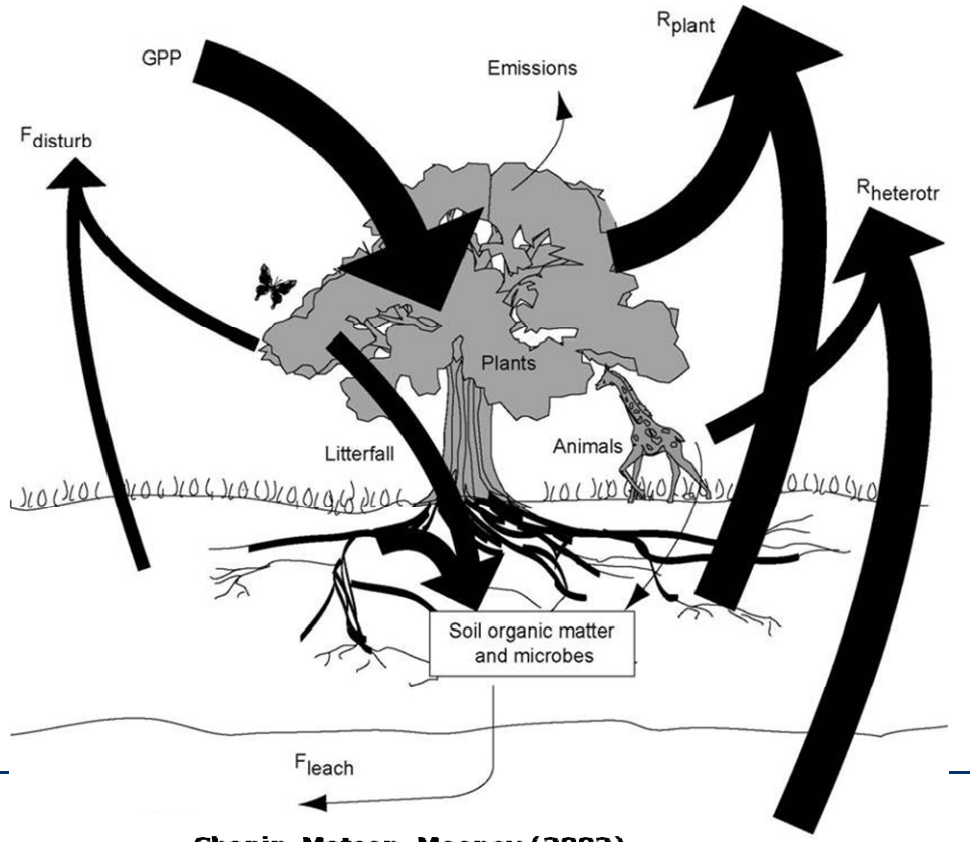
- soil: silty-clay overlying clay

Climate Characteristics:

- cool temperate to Mediterranean
- warm & dry summers
- cold & wet winters
- mean annual rainfall: ~ 650 mm

Objectives Wombat LTRS

- Greenhouse gas balance of a dry temperate sclerophyll forest & its strength as carbon sink / source
- Quantification of NEE, R_{eco}, GPP & estimate of NEP of the Wombat State Forest
- Quantification and contribution of soil CO_2 emissions to overall R_{eco}
- Quantification of non-CO_2 GHG emissions / uptake
- seasonal, inter-daily, inter-annual variations
- database carbon and water models



Chapin, Matson, Mooney (2002)

Sites – Overview & Equipment

Wombat LTRS

MONASH University

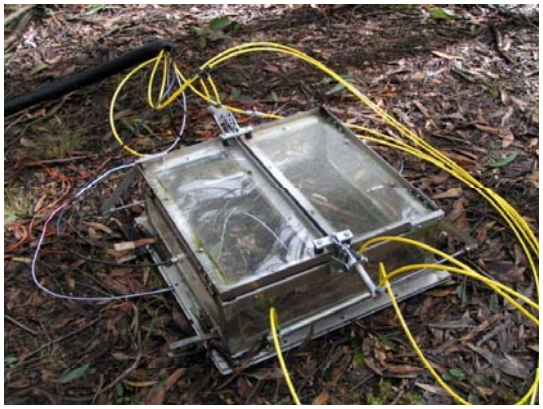
- EC tower (35m)
  Net C Ecosystem Exchange (NEE)
- MEGA-chamber system
  soil derived greenhouse gases
  CO_2, CH_4 and N_2O
- automated measurements at high temporal resolution

3 Satellite sites

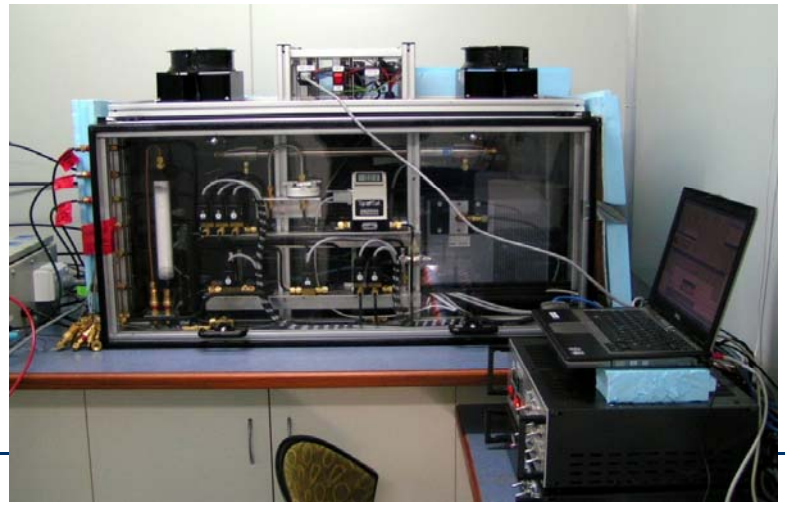
- in proximity of 500 to 800m to the main research site
- soil GHG: CO_2, CH_4
- effects of drought on soil GHG
- monthly measurements
  (dynamic closed chamber system with FGGA)

Soil GHG MEGA-chamber system

Mobile Ecosystem Greenhouse Gas Analyser ’ (MEGA) – chamber system:



- 6 automated soil respiration chambers
- Fourier Transform Infra Red (FTIR)-spectrometer
- mobile field laboratory
- automated remote area power system
- internet access



First experience in Processing EC-Data

EC-Data Processing Levels

- **Real Time Monitoring Control:**
  http://www.arts.monash.edu.au/ges/research/climate/wombat/index.php

- **Data collection: data logger, CF-cards and downloads via modem (Monash University)**

- **program: Python 2.7 (Enthought)**

- **quality checks (L1-L3) with specific scripts from Peter Isaac**

- **Level 1 – raw data spreadsheet from 30min data files: 'slow_rad', 'slow_flux', 'slow_met', 'slow_extras', 'slow_core'**

- **Level 2 – Rejection of bad data (range checks, diagnostics CSAT,-7500, exclusion of dates/hours)**

- **Level 3 – correction for 2D coordinate rotation, calculation of fluxes from covariances (Fc_wpl, Fe_wpl), calculation of net radiation, merge series Ta and Ah from CSAT and HMP45, WPL-correction**

EC-Data 2010 and 2011

2010

days: 345

Level	values	%
L1	existing	**83.72**
L1	missing	**16.28**
L2	used	**70.49**
L2	rejected/missing	**29.51**
L2	rejected	**13.23**
L3	used	**72.04**
L3	rejected/missing	**27.96**
L3	rejected	**0.00**

2011

days: 150 (until May 2011)

Level	values	%
L1	existing	**92.20**
L1	missing	**7.80**
L2	used	**77.47**
L2	rejected/missing	**22.53**
L2	rejected	**14.35**
L3	used	**82.48**
L3	rejected/missing	**17.52**
L3	rejected	**0.01**

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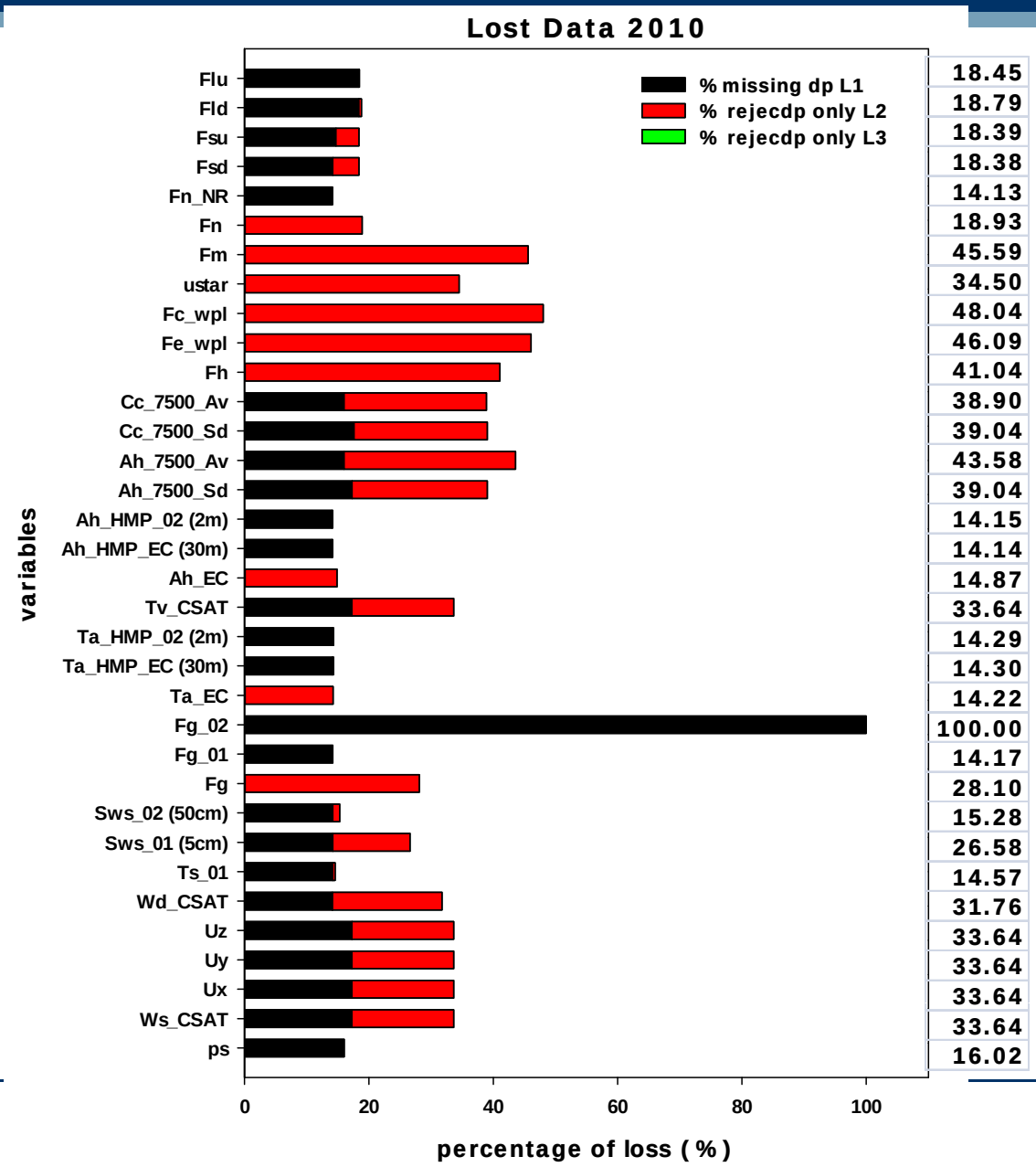
Lost Data 2010



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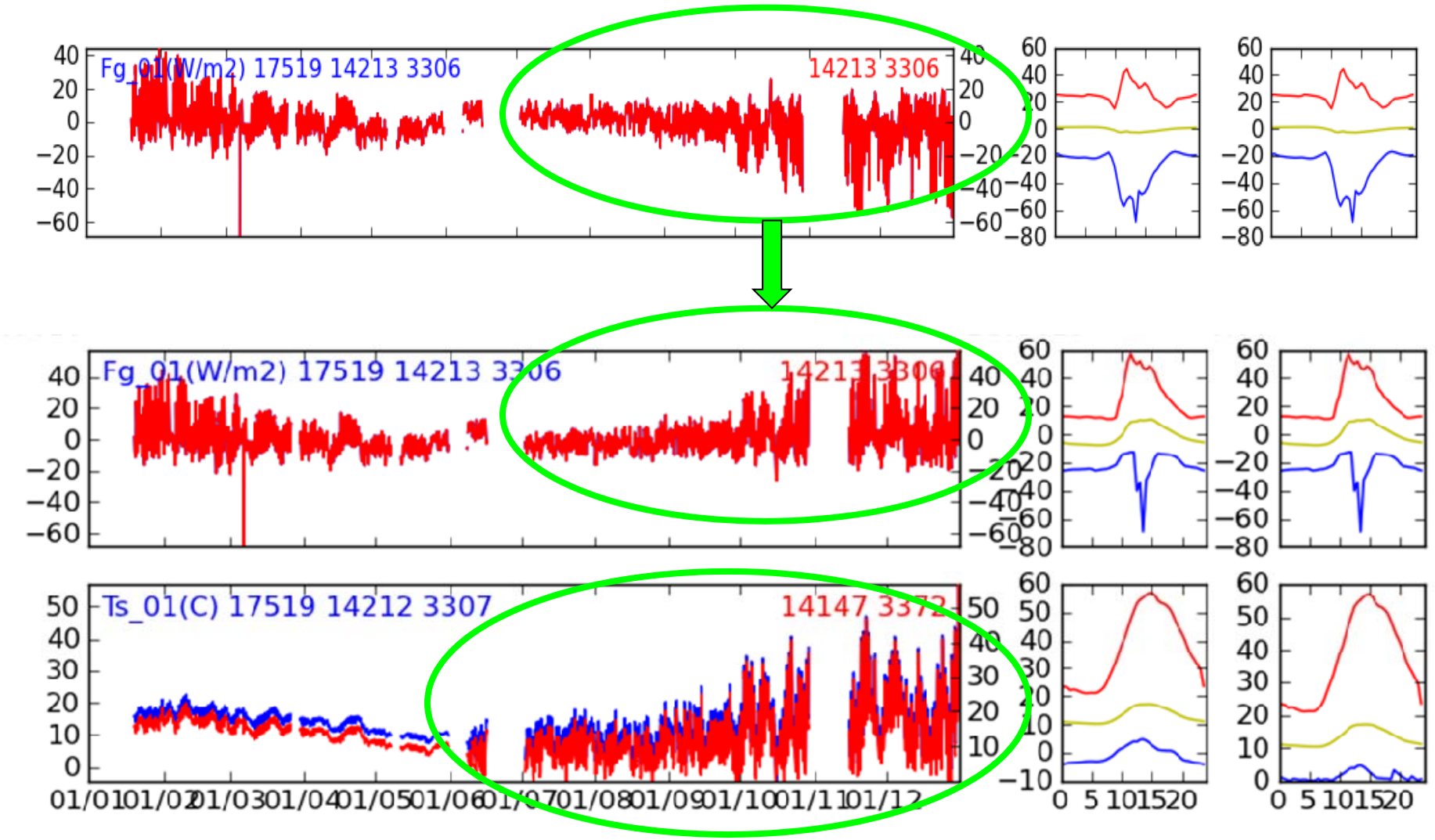
2010 L1-L2 soil



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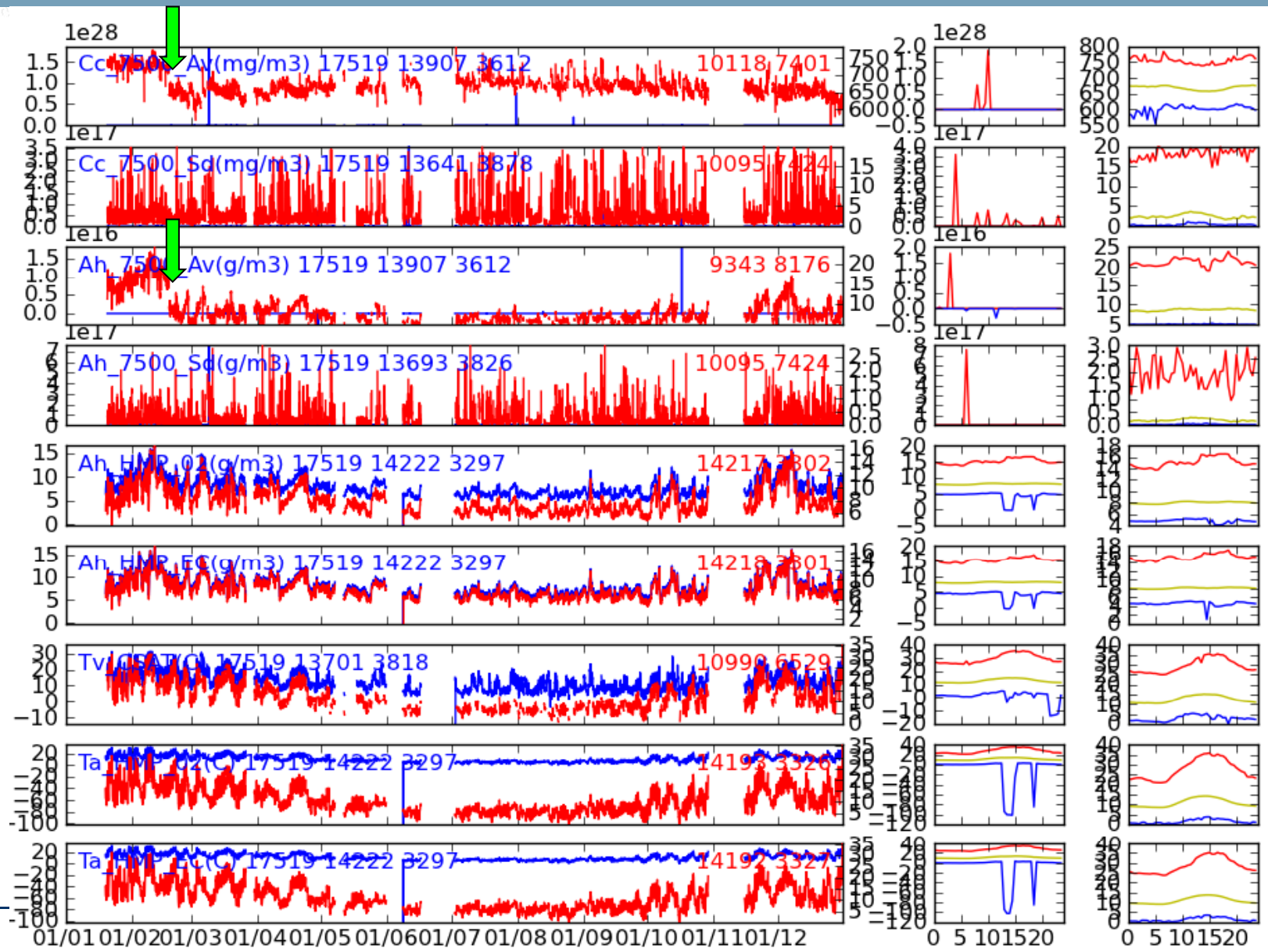
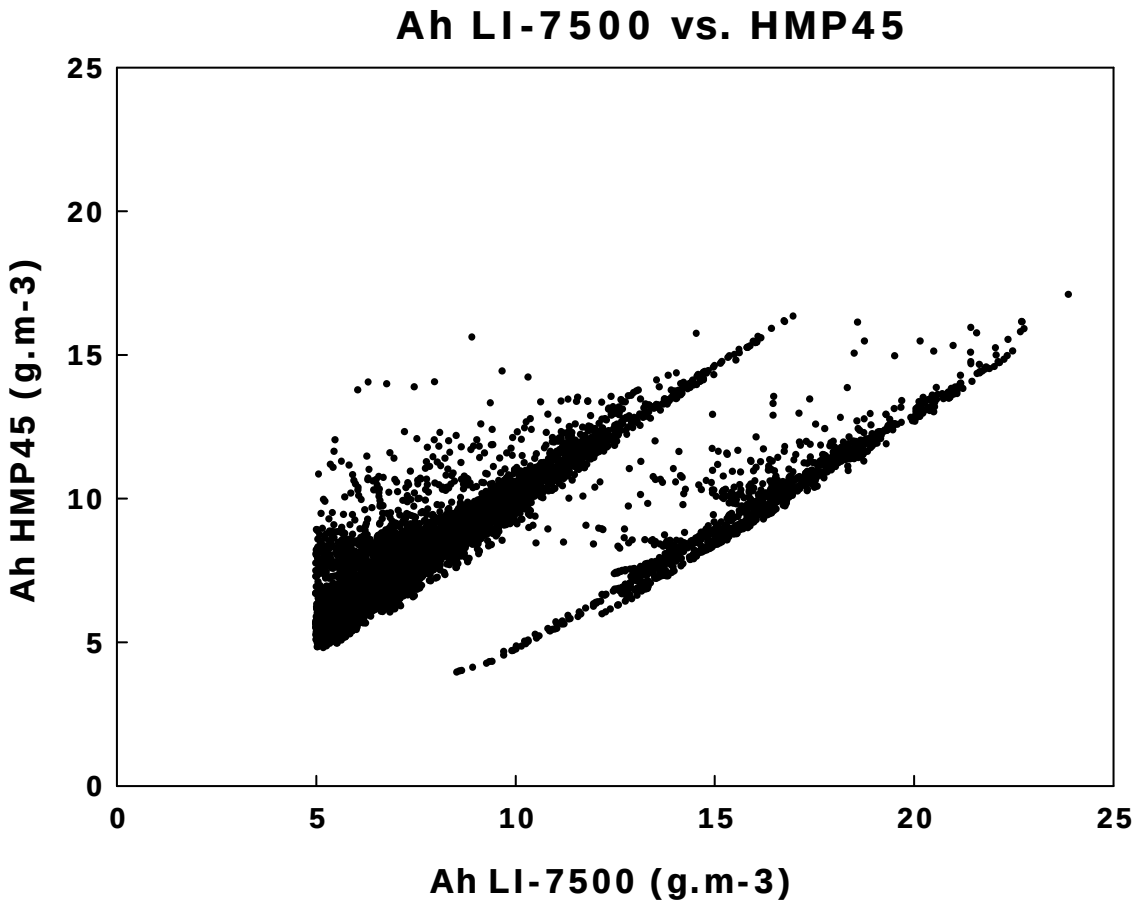
2010 L1-L2 CO_2, Ah and Ta



calibration of LI-7500

2010



‘To Do’ before:

submission of data to Ozflux/Tern:

- **correct or retrieve data from Ts from June 2010 until Jan 2011**
- **correct calibration issues of LI-7500**

thinking of gap-filling and partitioning of GPP and R_{eco}:

- **night-time CO_2 flux – issues with draining, compare Fc with Ws, Wd and get a outline about terrain (slopes, vegetation cover within range of tower)**

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Conclusions - experience

- underestimation of time needed to analyse data
  ⇒ handling with huge data amount
- run data through QC is not enough ⇒ evaluation of data manually is necessary
- knowledge of your site is essential
- real time data check is very useful to detect early errors
- ‘processing of data’ more frequently to detect errors and faults quickly
- quality of calibration of sensors important
- standardization of variable names in log-sheets

Thank you

for your attention!

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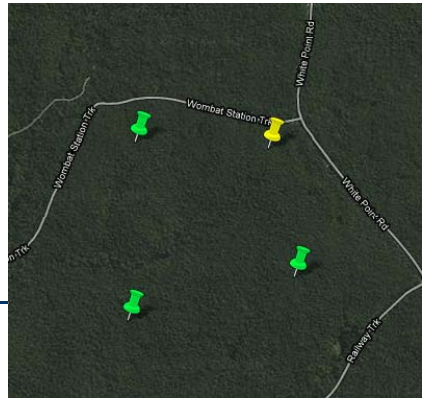
Satellite sites

- general aims:
    a. spatial replication
    b. impact of drought on forest C balance

- manual measurements of soil greenhouse gases CO_2 and CH_4 , soil temperature and soil moisture on a monthly basis with a FGGA-chamber system

- partitioning of soil respiration in its component fluxes
    1. root respiration
    2. microbial respiration
    3. microbial respiration of decomposing litter (dead leaves, twigs, fruits on the forest floor)

- each site comprises one control plot and one rainfall reduced plot and one weather station



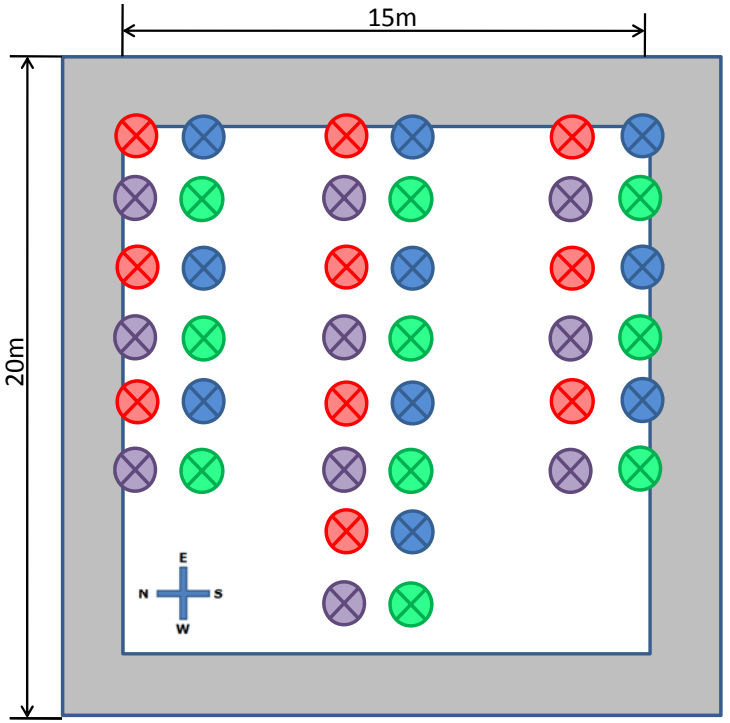
Satellite sites

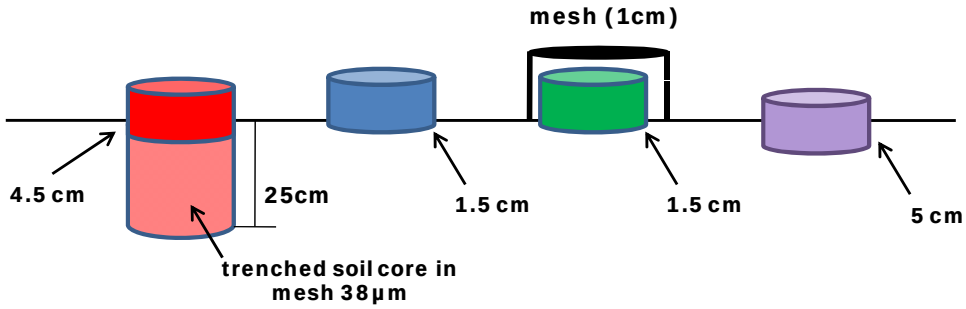
Rainfall reduction treatment

reduction of rainfall by 40% to intensify drought event

Satellite sites

- 10 chambers per treatment within the plot
  - total soil respiration
  - microbial respiration
  - total soil respiration without microbial respiration from decomposing litter
  - methane





Satellite sites

Fast Greenhouse Gas Analyser (FGGA) – chamber system