Advanced processing update

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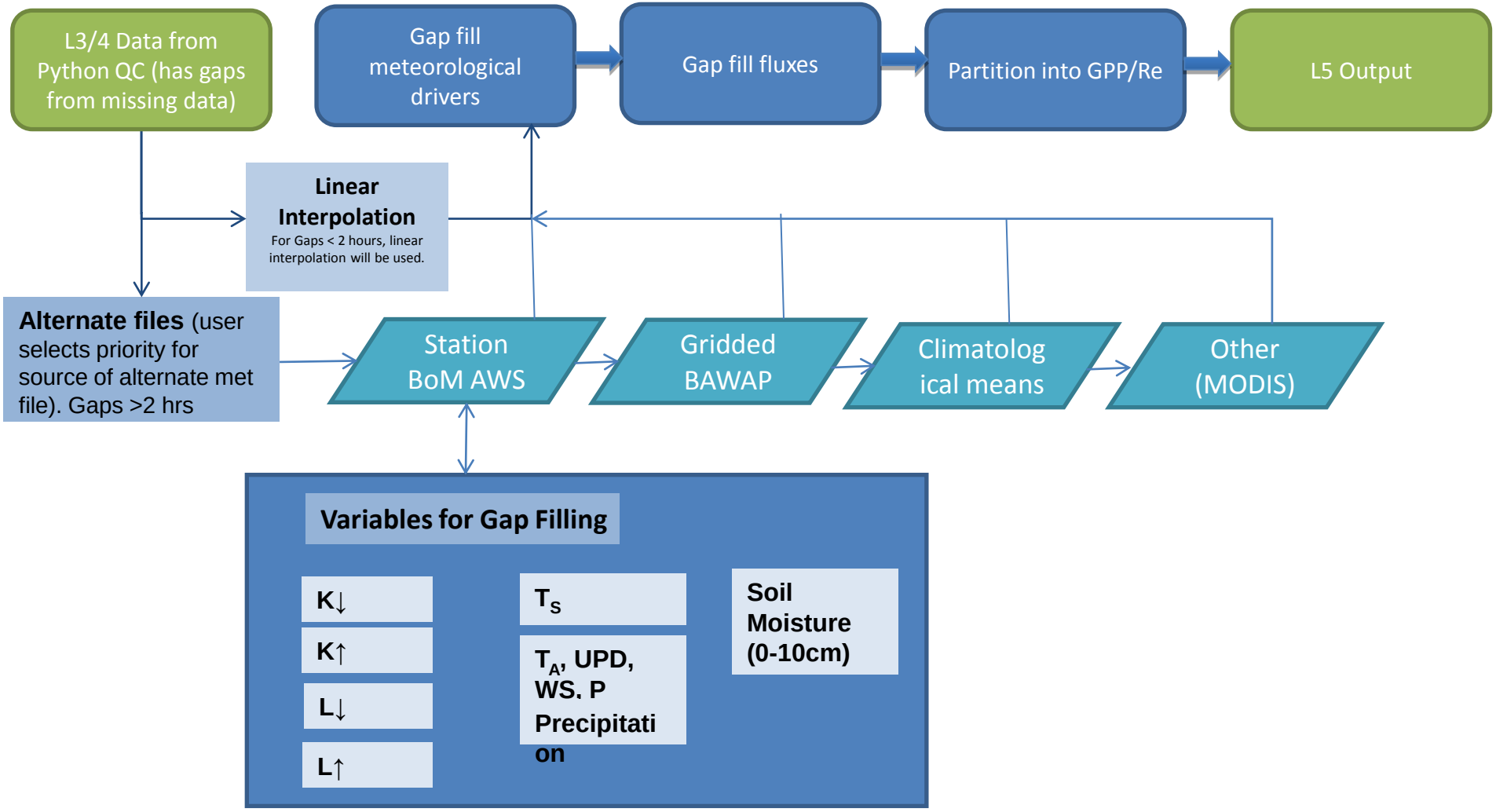

L3/4 Data from Python QC (has gaps from missing data)
Gap fill meteorological drivers
Gap fill fluxes
Partition into GPP/Re
L5 Output
Linear Interpolation
For Gaps < 2 hours, linear interpolation will be used.
Alternate files (user selects priority for source of alternate met file). Gaps >2 hrs
Station BoM AWS
Gridded BAWAP
Climatological means
Other (MODIS)
Variables for Gap Filling
K↓
K↑
L↓
L↑
T_S
T_A, UPD, WS. P Precipitation
Soil Moisture (0-10cm)

Getting AWS stations

- Use BoM list on WWW
- Use only stations when data is available (start and end dates)
- Get nearest 10 stations
- Deal with data formats ☹
- Deal with L3 NC files
- Import to Pandas. Do time management. Look for duplicates/missing. Deal with NaNs and QC flags
- Perform correlations with ALL stations
- Get the best 3 (r^2)

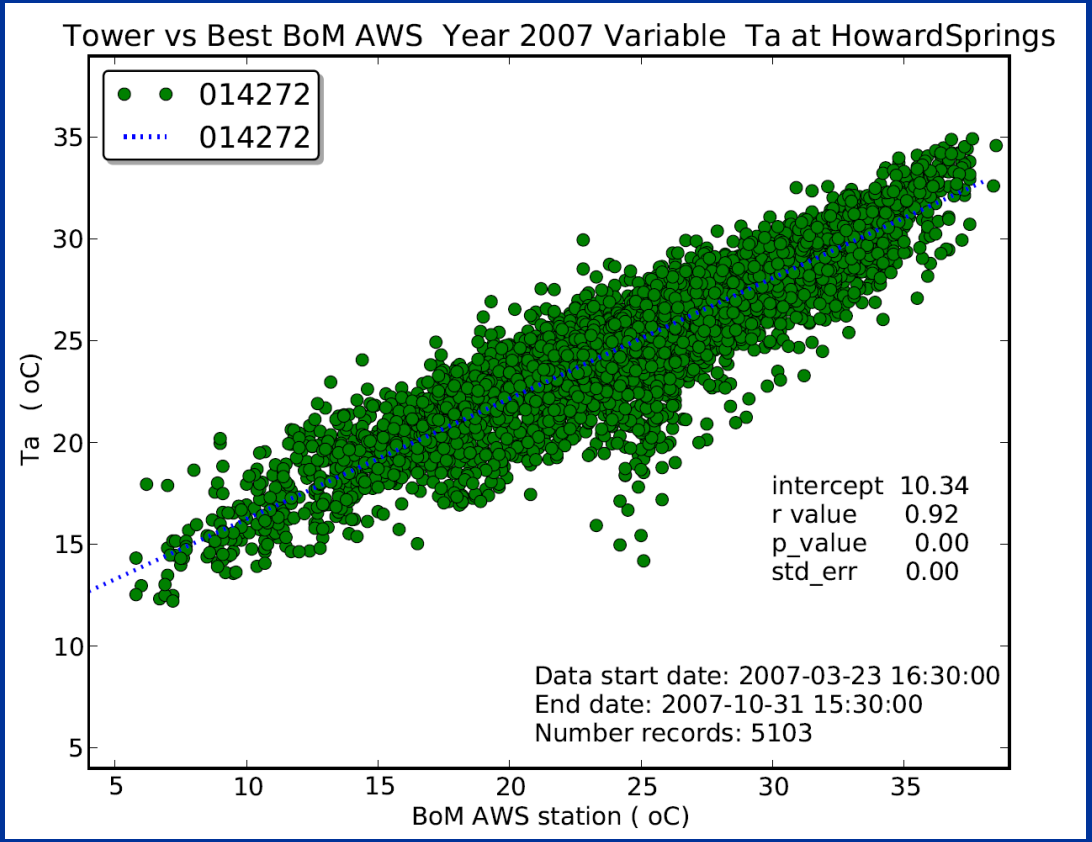
001000	01	KARUNJIE	1940	1983	-16.2919	127.1956
001001	01	OOMBULGURRI	1914	2012	-15.1806	127.8456
001002	01	BEVERLEY SP	1959	1967	-16.5825	125.4828
001003	01	PAGO MISSION	1908	1940	-14.1331	126.7158
001004	01	KUNMUNYA	1915	1948	-15.4167	124.7167
001005	01	WYNDHAM PORT	1886	1995	-15.4644	128.1000
001006	01	WYNDHAM AERO	1951	..	-15.5100	128.1503
001007	01	TROUGHTON ISLAND	1956	..	-13.7542	126.1485
001008	01	MOUNT ELIZABETH OLD SITE	1959	1978	-16.3017	126.1825
001009	01	KURI BAY	1961	2012	-15.4875	124.5222
001010	01	THEDA	1965	..	-14.7883	126.4964
001011	01	PANTA DOWNS	1966	1969	-16.0497	124.9500
001012	01	MITCHELL PLATEAU	1968	2002	-14.7925	125.8258
001013	01	WYNDHAM	1968	..	-15.4872	128.1247
001014	01	EMMA GORGE	1998	..	-15.9086	128.1283
001015	01	KING RIVER PUMPING STN	1923	1931	-15.6000	128.0833
001016	01	CARSON RIVER STATION	1970	1997	-14.4861	126.7664
001017	01	NULLA NULLA	1923	1926	-15.5000	127.8333
001018	01	MOUNT ELIZABETH	1973	..	-16.4181	126.1025
001019	01	KALUMBURU	1997	..	-14.2964	126.6453
001020	01	TRUSCOTT	1944	..	-14.0900	126.3867
001021	01	KALUMBURU MISSION	1941	2005	-14.2961	126.6431
001022	01	WYNDHAM SIX MILE HOTEL	1900	1917	-15.4997	128.1997
001023	01	EL QUESTRO	1967	..	-16.0086	127.9806
001024	01	ELLENBRAE	1986	..	-15.9572	127.0628
001025	01	DOONGAN	1988	..	-15.3797	126.3114
001026	01	DRYSDALE RIVER STATION	1988	..	-15.7025	126.3786
001027	01	DIGGERS REST	1971	..	-15.6394	128.0803
001028	01	HOME VALLEY	1991	..	-15.7231	127.8292
001029	01	WYNDHAM NORTH	1989	1996	-15.4467	128.1075
001030	01	KIMBERLEY COASTAL CAMP	1995	..	-14.5786	125.9133
001031	01	FARAWAY BAY	1996	..	-13.9600	127.1964
001032	01	MCGOWAN ISLAND	1997	2000	-14.1472	126.6483
001033	01	DRYSDALE RIVER AIRSTRIP	1999	2003	-15.7119	126.3817
001034	01	WEST BASTION	2001	..	-15.4533	128.1239
001035	01	PARRY CREEK FARM	2002	..	-15.5969	128.2781
001036		DOONGAN ASA	2012	..	-15.3792	126.3108
002000	02	ALICE DOWNS	1904	2004	-17.7569	127.9386

The data ALL data correlation stats for variable Ta at AWS site ID HowardSprings
Sites are 014041 014015 014272

slope	0.590744129668	0.911827670106	0.642725008709
intercept	10.9842750404	1.68492425896	9.45154581437
r_value	0.854725179168	0.853764376286	0.782289304324
p_value	0.0	0.0	0.0
std_err	0.00265423029123	0.00288572155465	0.00363013098216

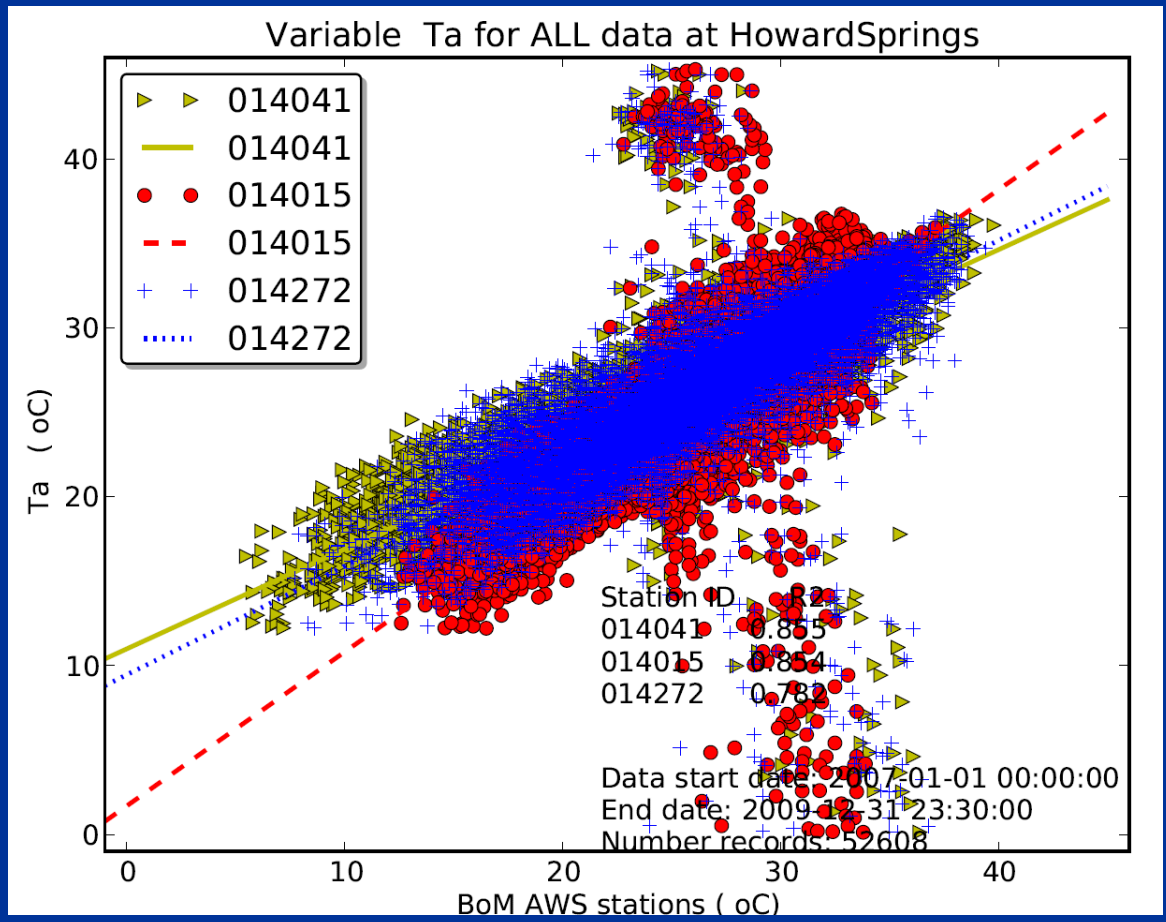
Getting AWS stations

- From best 3
- Create a fill series for all 3 stations based on regression b/w TWR and BoM
- Ability to apply correlation based on :
  - All series
  - Annual
  - monthly



Getting AWS stations

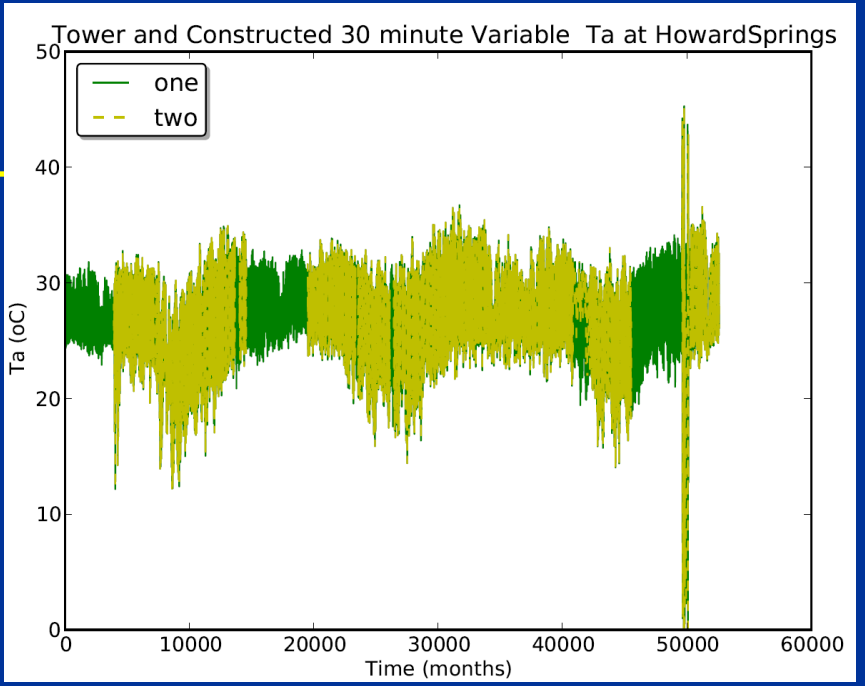
- Then fill L3 using best stations. If missing use 2nd and 3rd as required.
- Use freq as prescribed but if not available then use ALL data
- Add gapfill flags

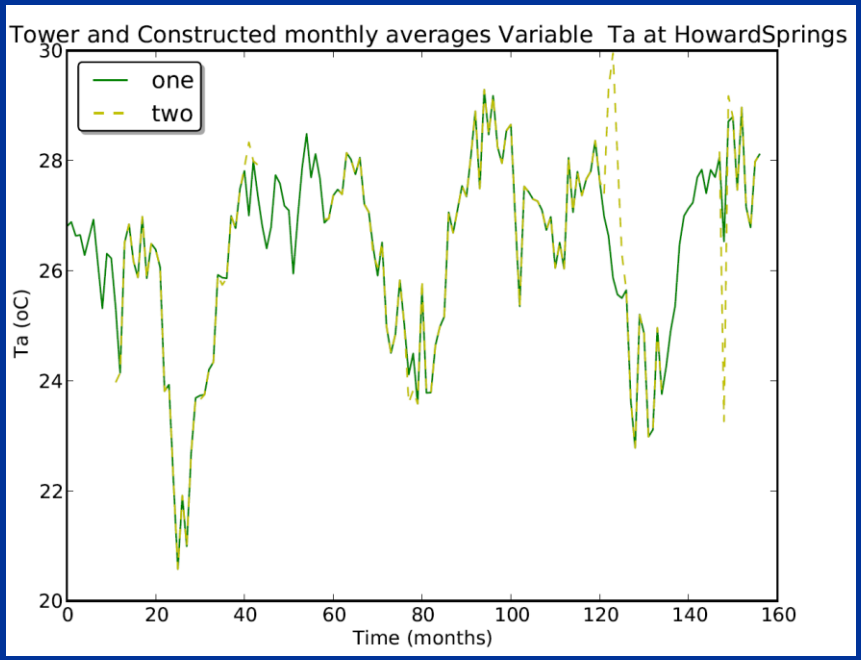


Getting AWS stations

- Output graphs and data
- Repeat for each meteorological variable
  - Air temperature (ta)
  - Specific humidity (Ah)
  - Precipitation (Rainfall)
  - Pressure (P)
  - Wind Speed (WS)
  - Wind direction (WD)

- Rainfall done on daily totals





Radiation

K↓

- *Daily (MJ m^{-2}) integral*
  - From satellite. Now have daily streams for 19k sites plus historical from AWAP
  - *Site Corrected*
  - *I_0 to solve the area under the curve*
    - Need 'K'
    - Investigate alternates
    - Generalisable
    - Ian Mc Hugh has coded

K↑

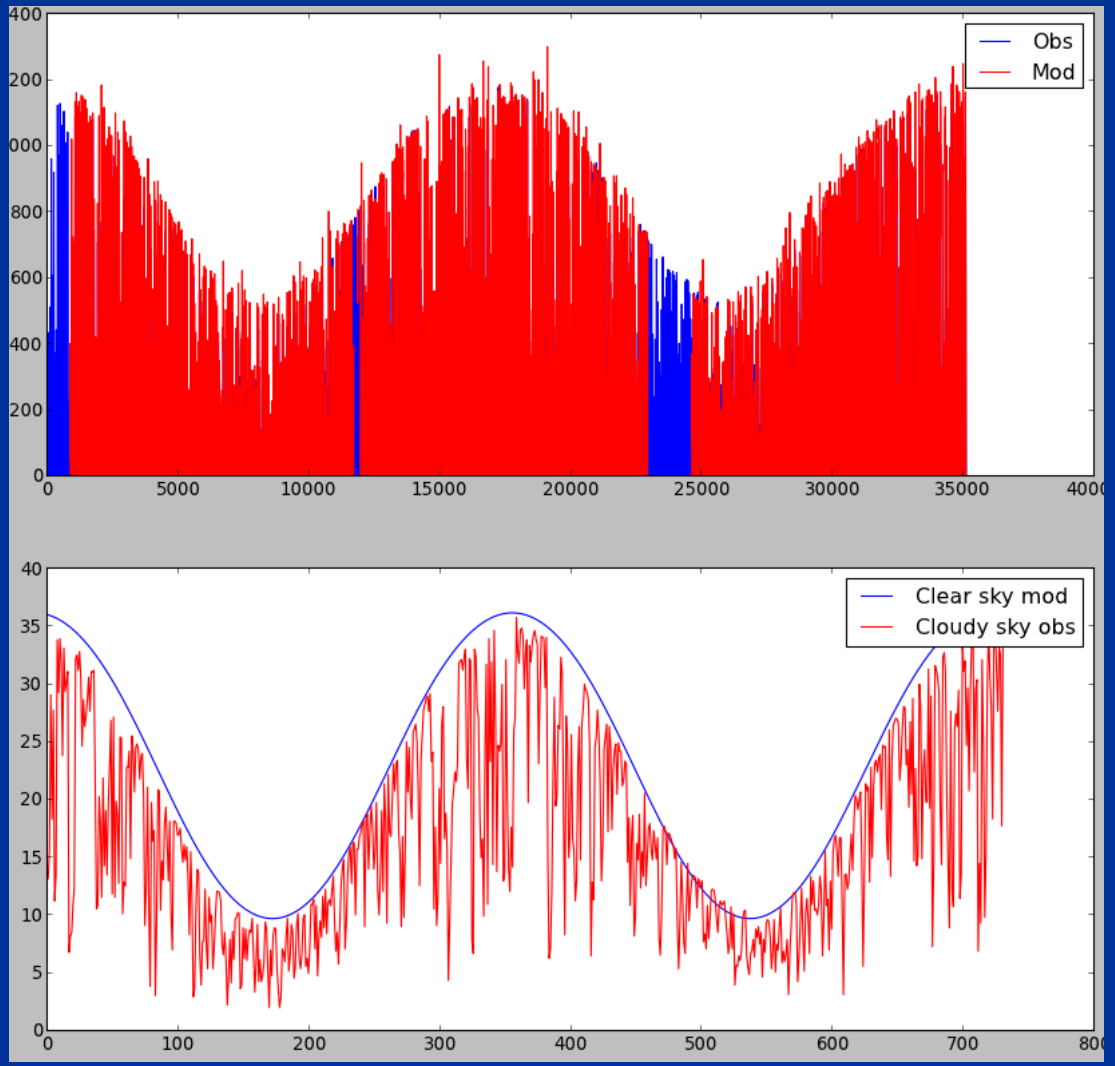
  - K↓ α
    - Modis
    - Climatological

L↓

  - Modified Brutsaert equation – with cloud (Ian)

L↑

  - $T_{SURFACE}$ - follow up Ian McHugh
- Later try (ANN)



Others…. The hard ones

Soil Moisture (0-10cm)

- < 1 week – interpolate daily
- > 1 week – (B)AWAP

- Problem with data only weekly available from AWAP. Not current either.

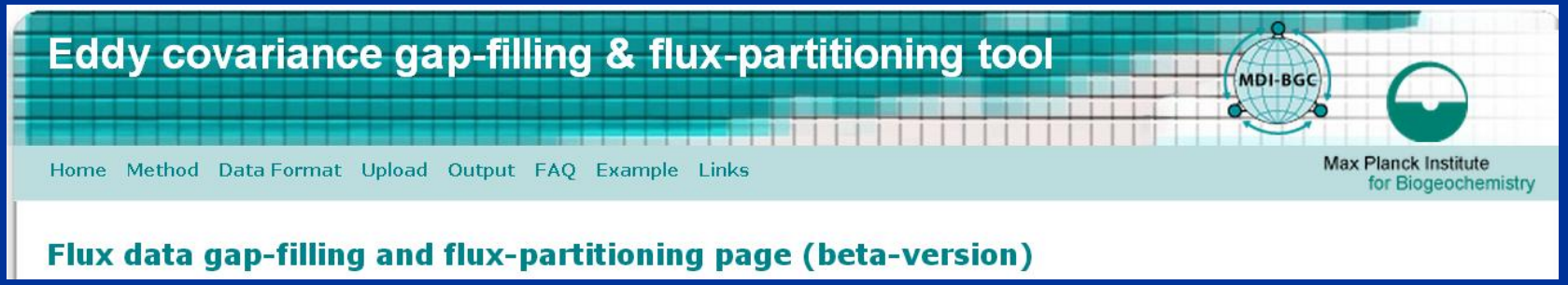
Soil Temperature (0-10cm)

Flux gap filling

- Use ANN.
- Easy enough ☺

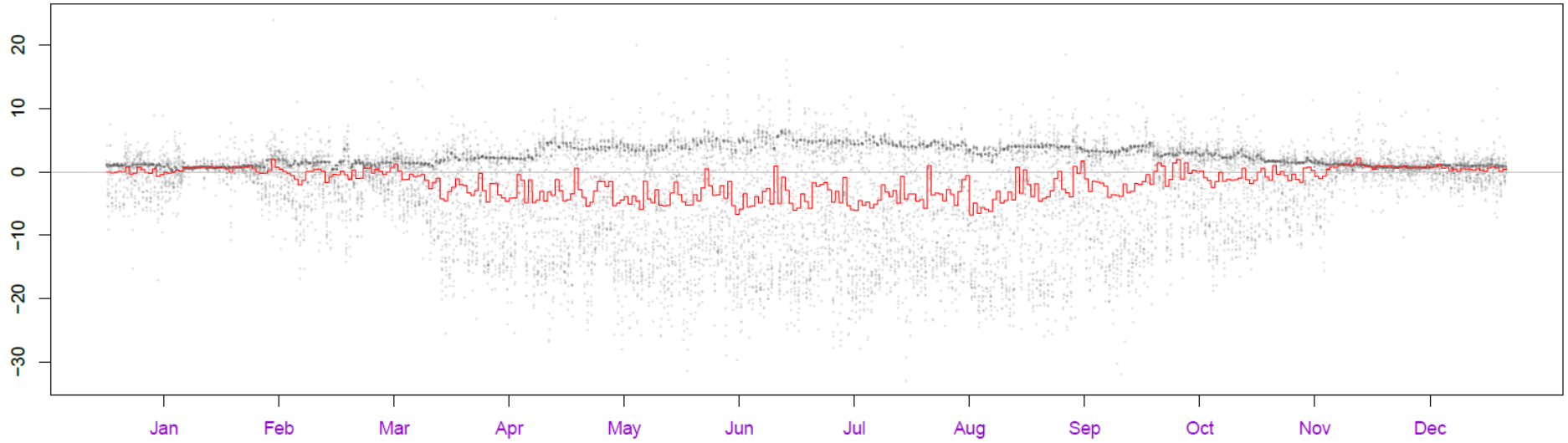
Partitioning

- Use CarbonEuro tools as ‘standard’

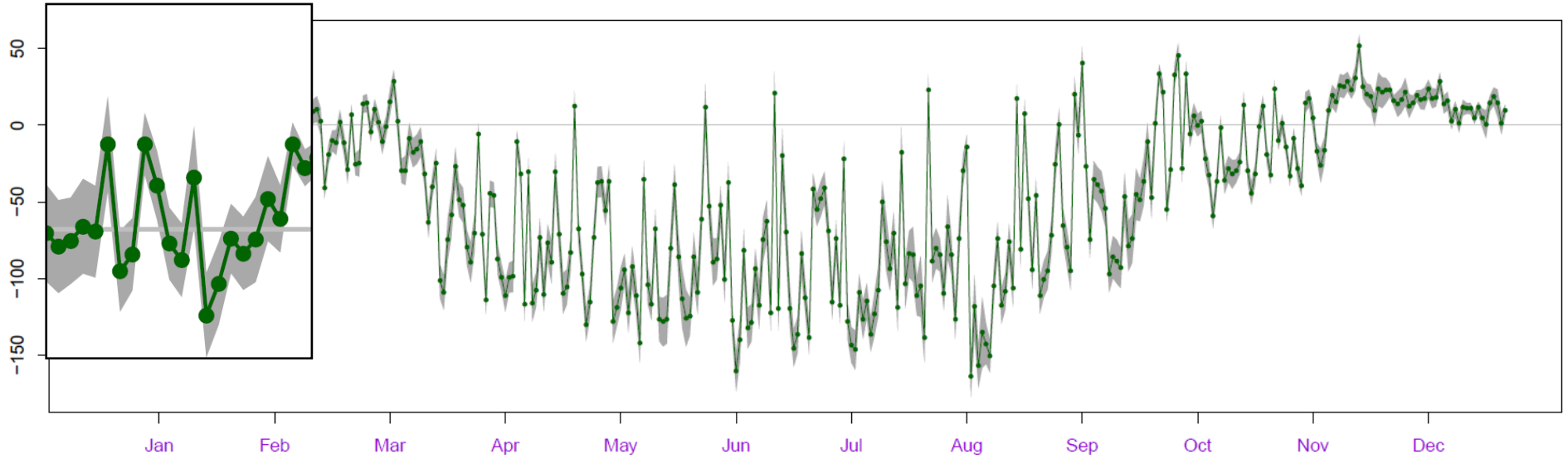


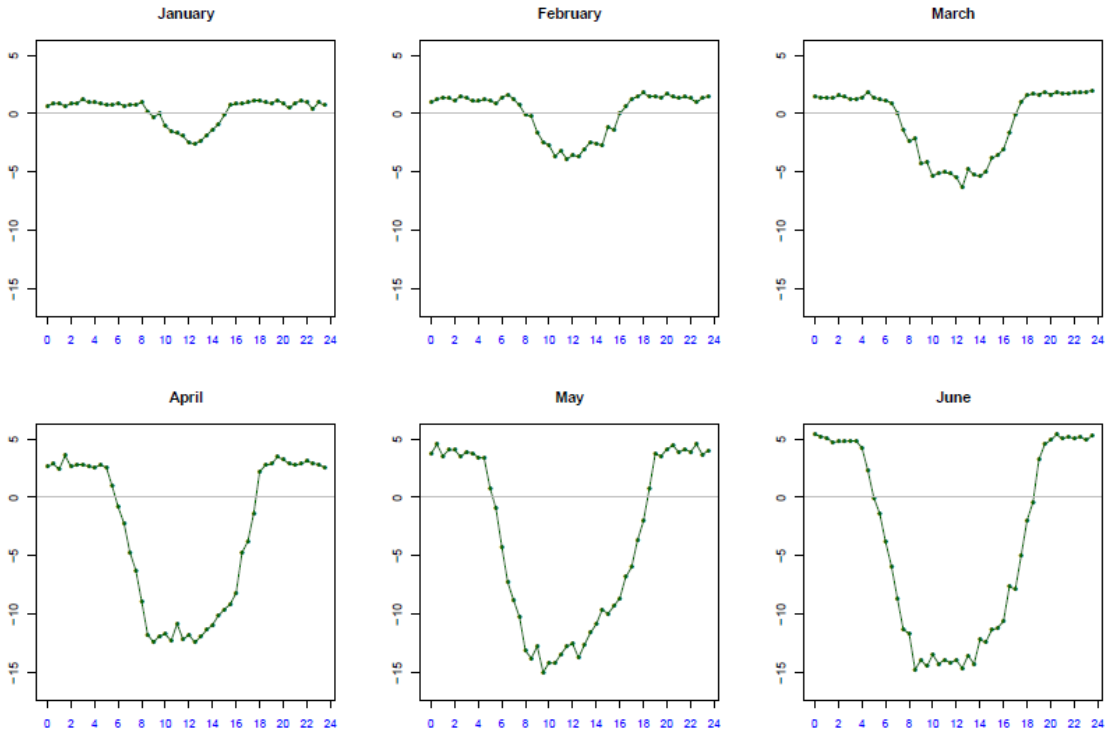
- REddyProc - R package contains several tools for the processing of half-hourly site-level eddy data. The marginal distribution sampling (MDS) gap filling algorithm, ustar filtering, and flux partitioning are based on PV-Wave source code from Markus Reichstein. Released March 31.
- Still need what we have done. CarboEurope use ECMWF
- Could call this from Python using RPy

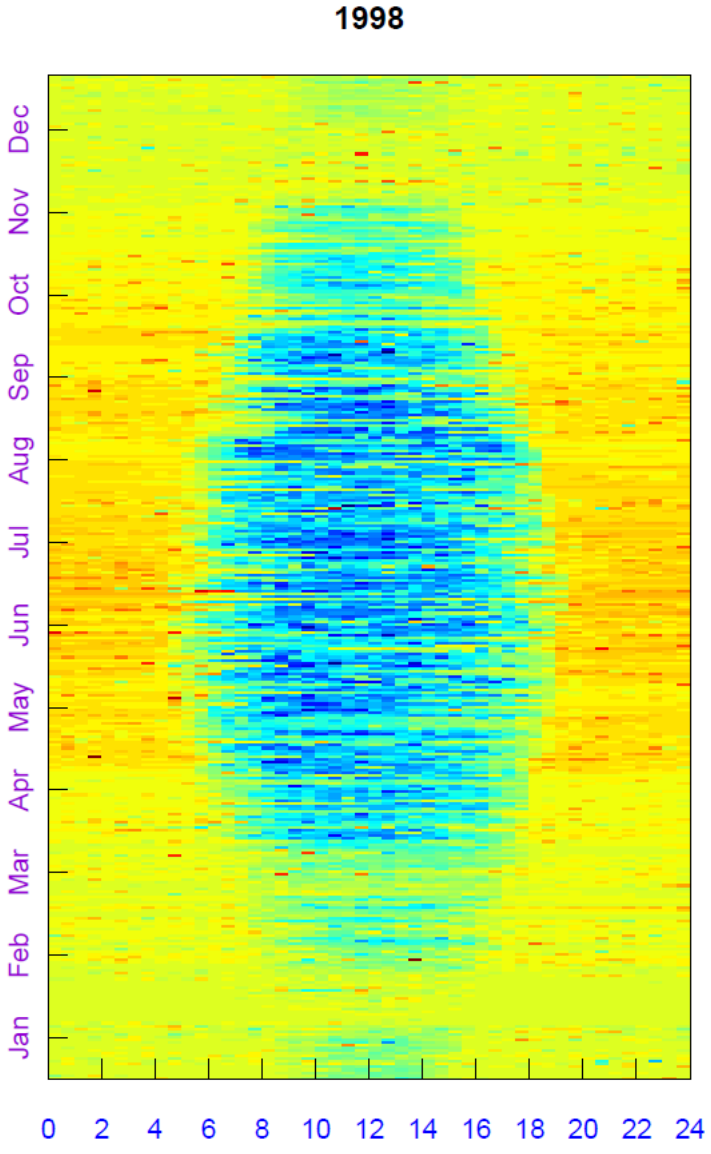
30 minute and Daily NEE



Daily NEE with uncertainties




January
February
March
April
May
June
5
0
−5
−10
−15
0 2 4 6 8 10 12 14 16 18 20 22 24


1998
Dec
Nov
Oct
Sep
Aug
Jul
Jun
May
Apr
Mar
Feb
Jan
0 2 4 6 8 10 12 14 16 18 20 22 24

Ancillary data/info database