HadISD:
Sub-daily data for studying extreme events

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C20C, 7th November 2013

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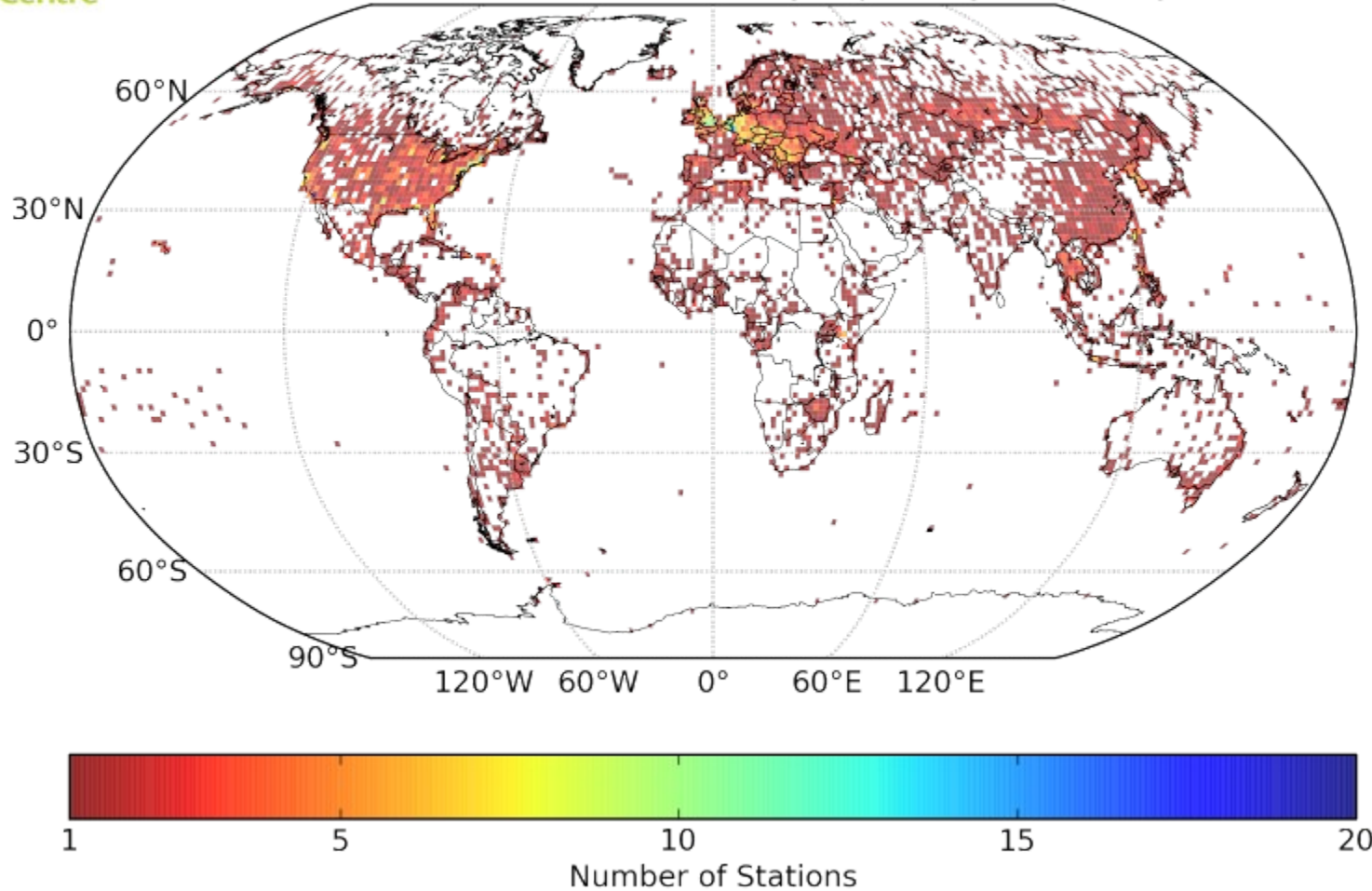
  - HadISDH

  - Winds

  - Heat Stress

What is HadISD?

- HadISD is based on NCDC's Integrated Surface Dataset (ISD)
  - Hourly and 3-hourly station data
  - 6103 stations worldwide
  - Data from 1973-2012
    - Annual update cycle (current=v1.0.1.2012p, next=v1.0.2.2013p)
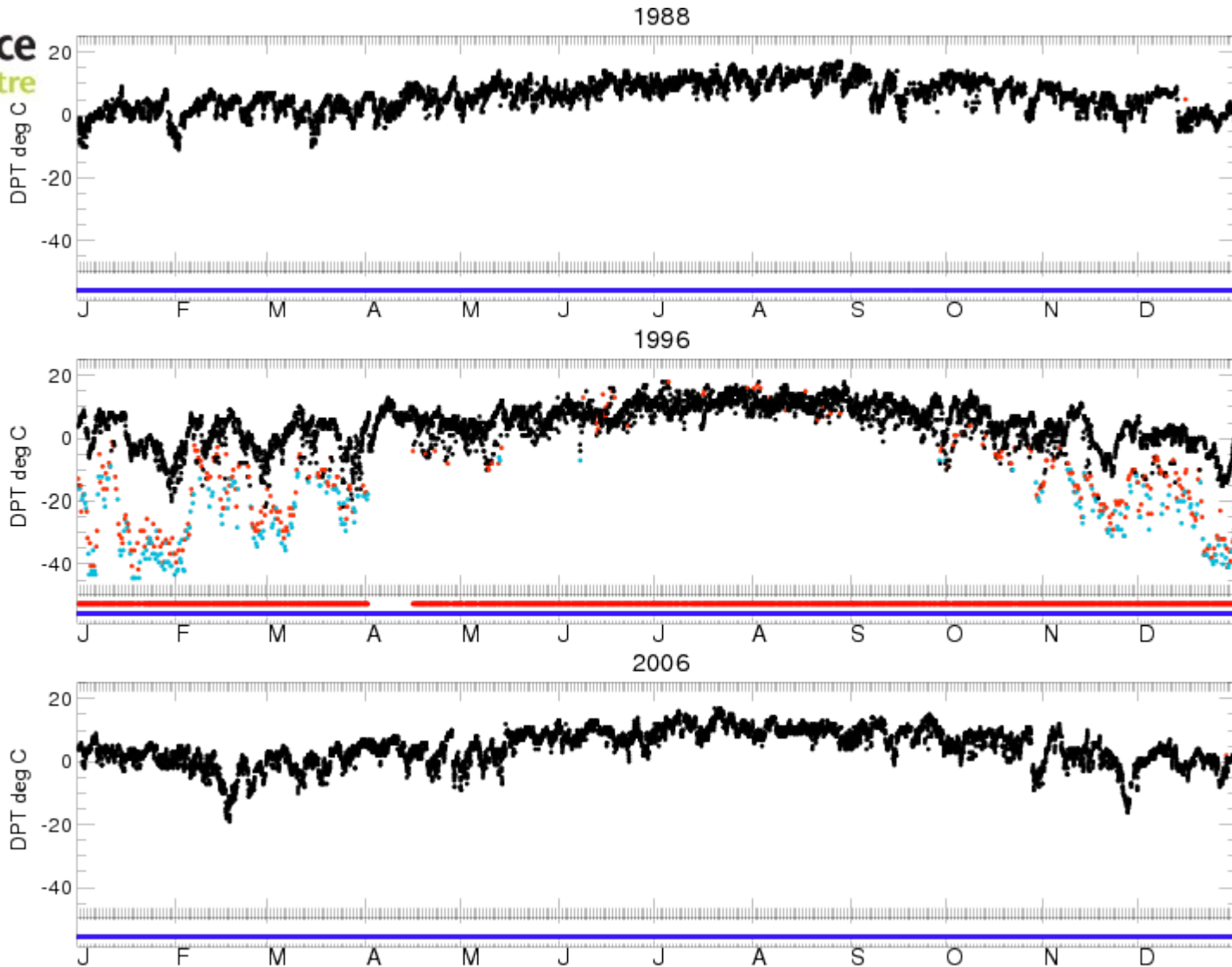 - Temperature, Dewpoint, Wind speed, SLP and Clouds

Dunn, Willett, Thorne, et al, 2012 Climate of the Past (8, 1649-1679)
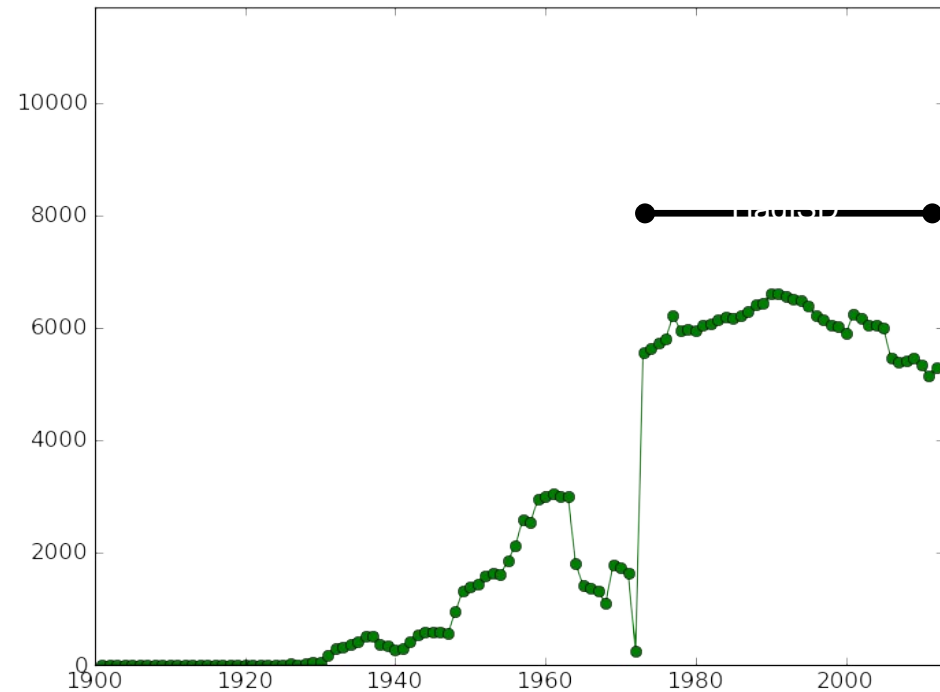
Station Coverage

Station distribution for 3 hourly reporting frequency

Why we need to QC

718936-99999, Campbell River, Canada

Celsius or Fahrenheit?

476960-43323, Yokosuka, Japan

Inhomogeneities

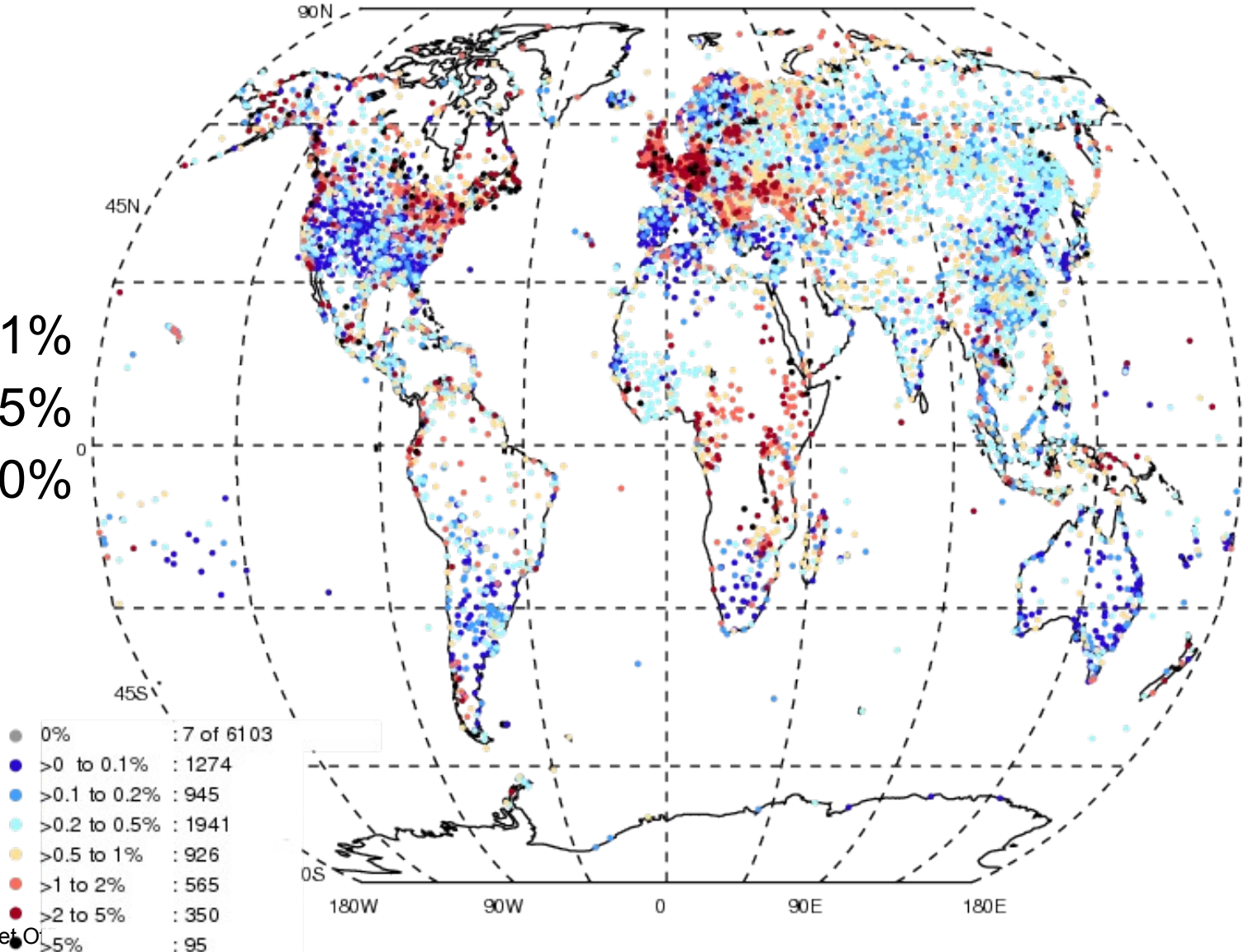714740-99999, Clinton, Canada
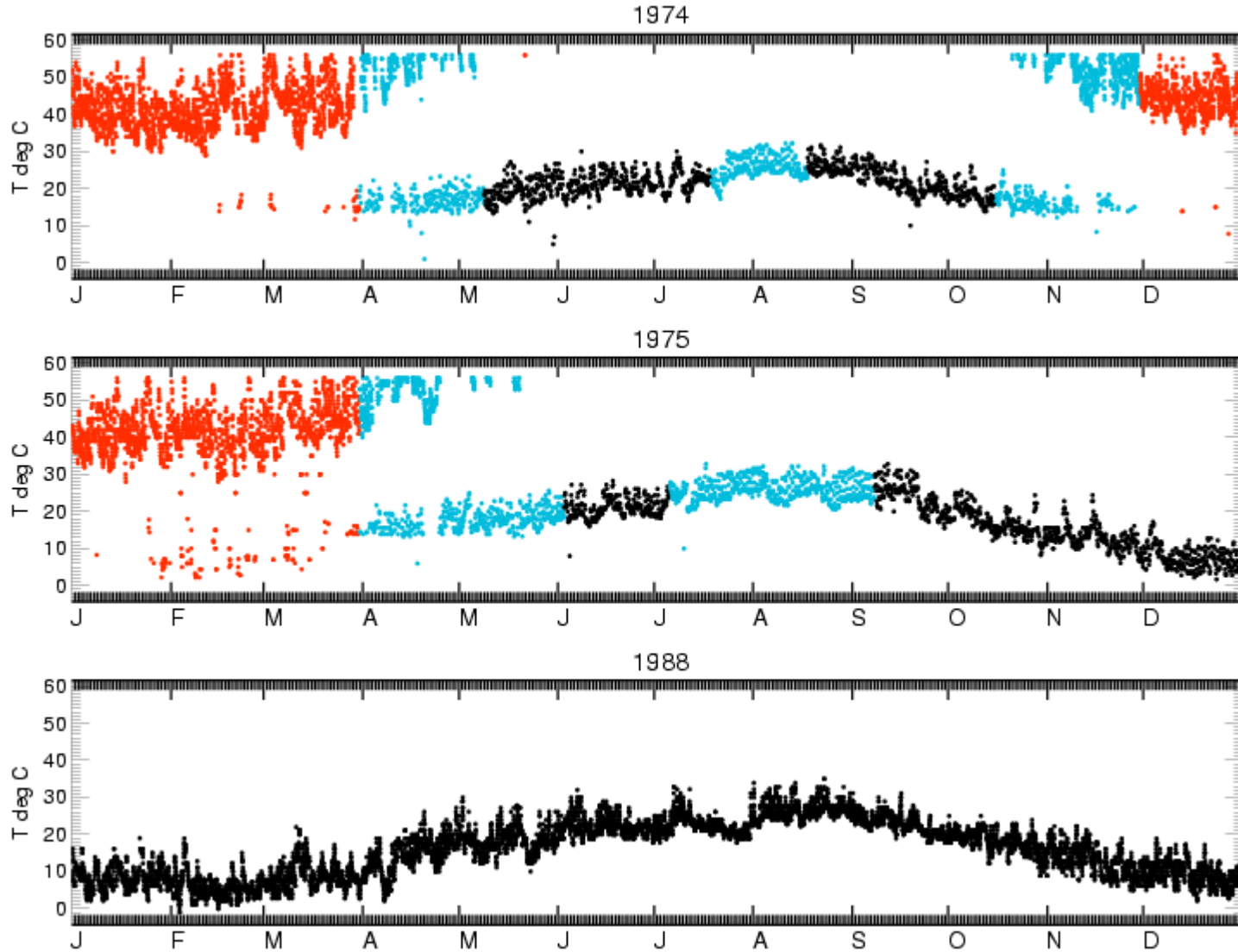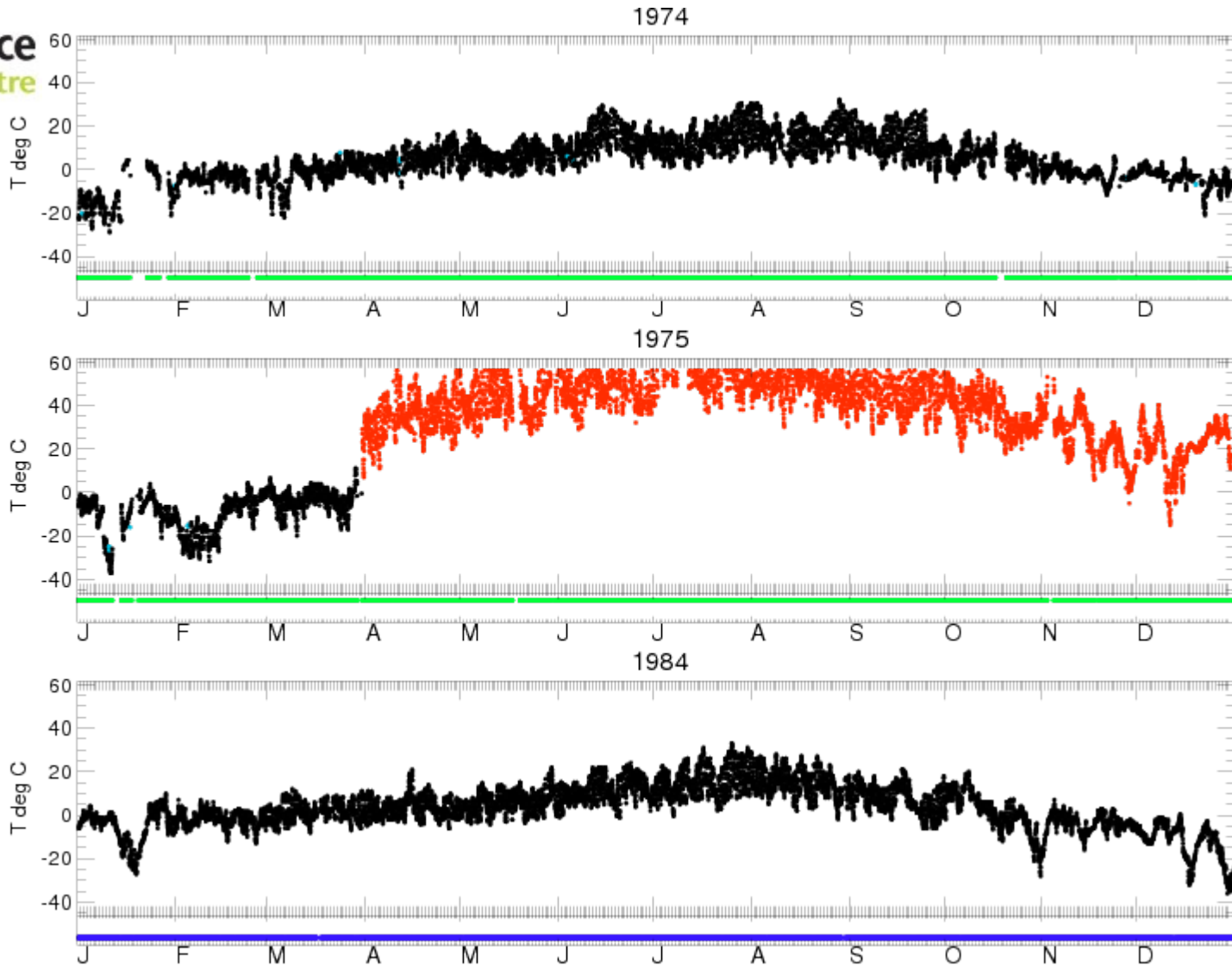
The QC tests

1. Duplicate Stations
2. Duplicate months
3. Short Isolated Clusters
4. Frequent Values
5. Diurnal Cycle
6. Distributional Gaps
7. World Records
8. Repeated Values

9. Climatological Outlier
10. Spike Check
11. Humidity Cross Check
12. Clouds Consistency
13. Excess Variance
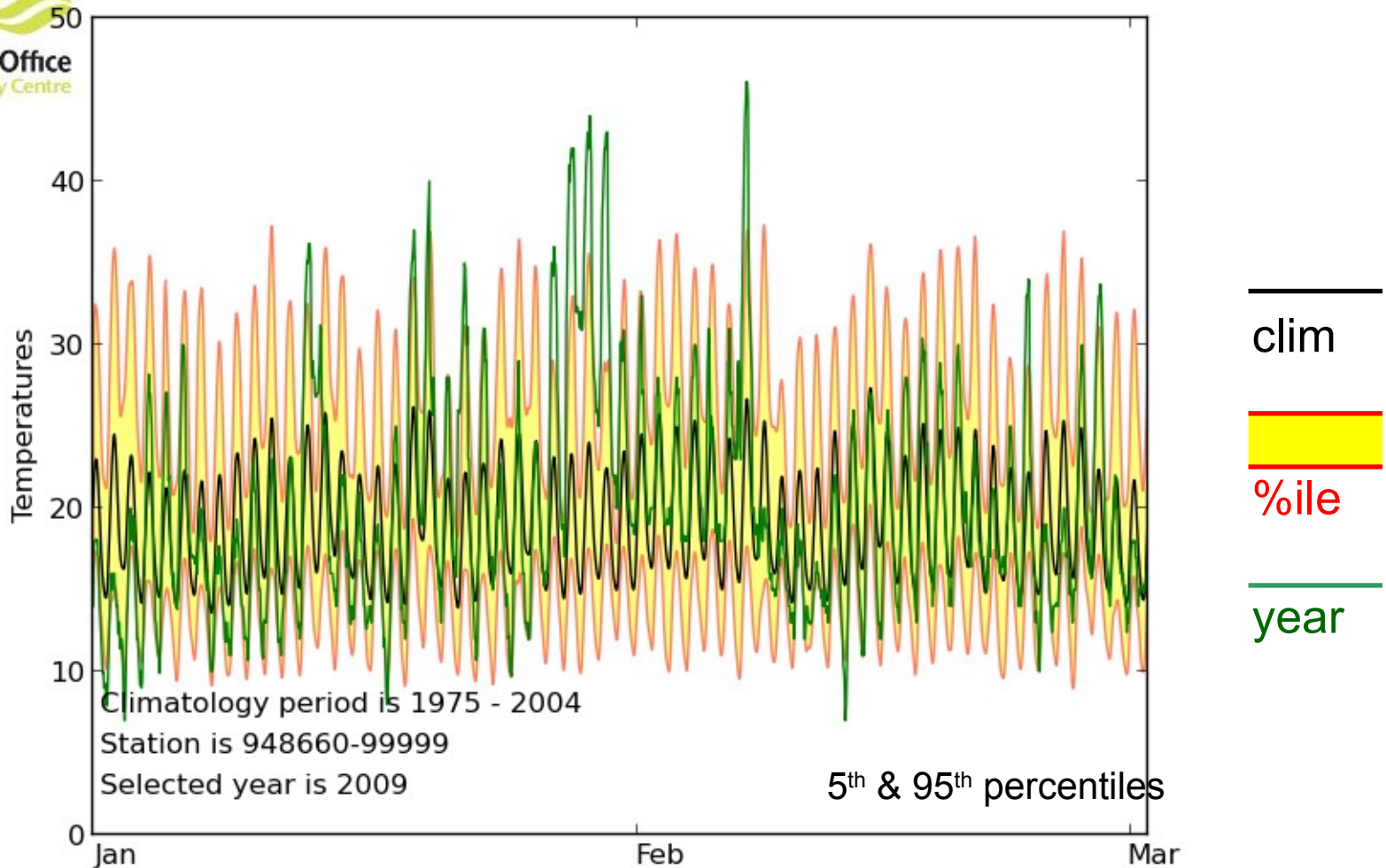
14. Neighbour Comparison

15. Clean Up

QC code is available [IDL]

Global Temperature Flags

20% ≤0.1%
68% ≤0.5%
83% ≤1.0%

0%	: 7 of 6103
>0 to 0.1%	: 1274
>0.1 to 0.2%	: 945
>0.2 to 0.5%	: 1941
>0.5 to 1%	: 926
>1 to 2%	: 565
>2 to 5%	: 350
>5%	: 95

Verification

Climatology period is 1975 - 2004
Station is 948660-99999
Selected year is 2009

5th & 95th percentiles

clim

%ile

year

HadISD/analyses/general/trunk/climatology_plot.py   04-Oct-2013 10:26

- Australian Heatwave – early 2009
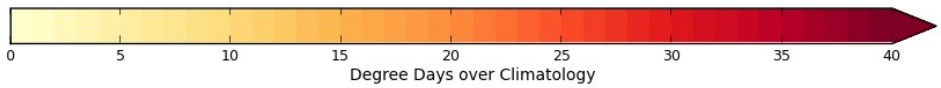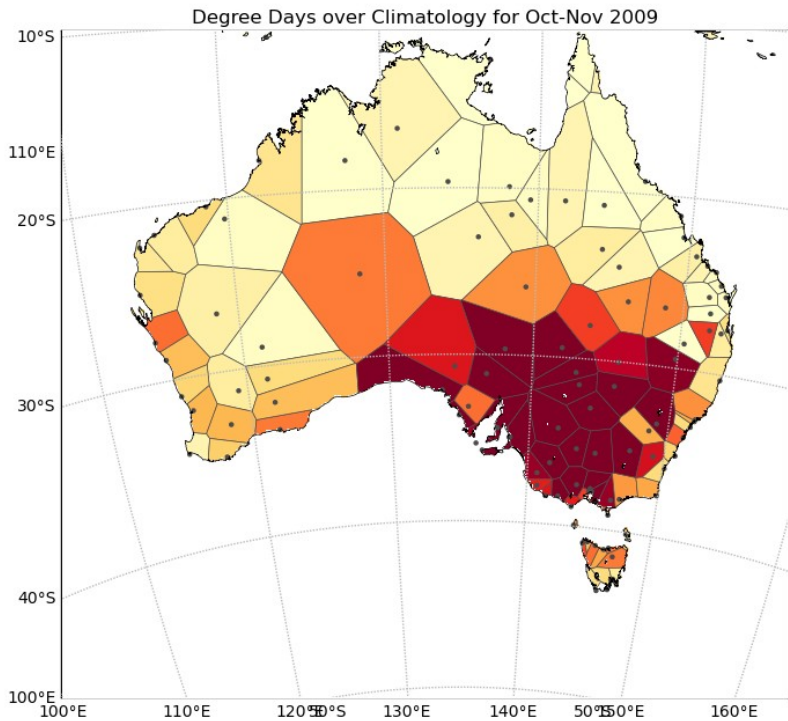- Melbourne: Observed Max=46.4°C, HadISD Max=46.1°C

Example Applications & Highlights

Degree Days over Climatology for Jan-Feb 2009

Degree Days over Climatology for Oct-Nov 2009

Degree Days over Climatology

Degree Days over Climatology
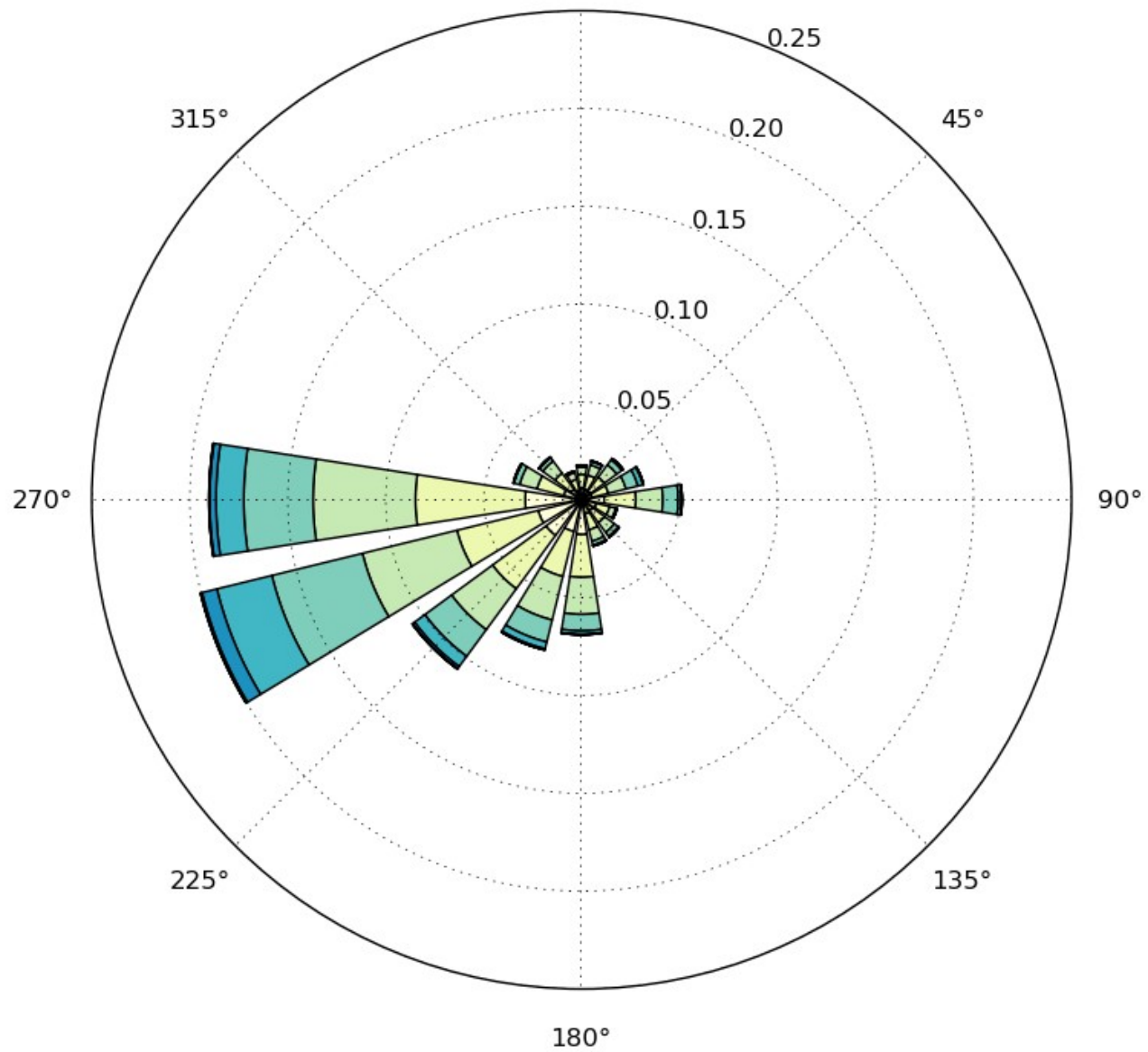
2013 14:33

/plot_heatmap_voronoi.py   15-Oct-2013 14:37
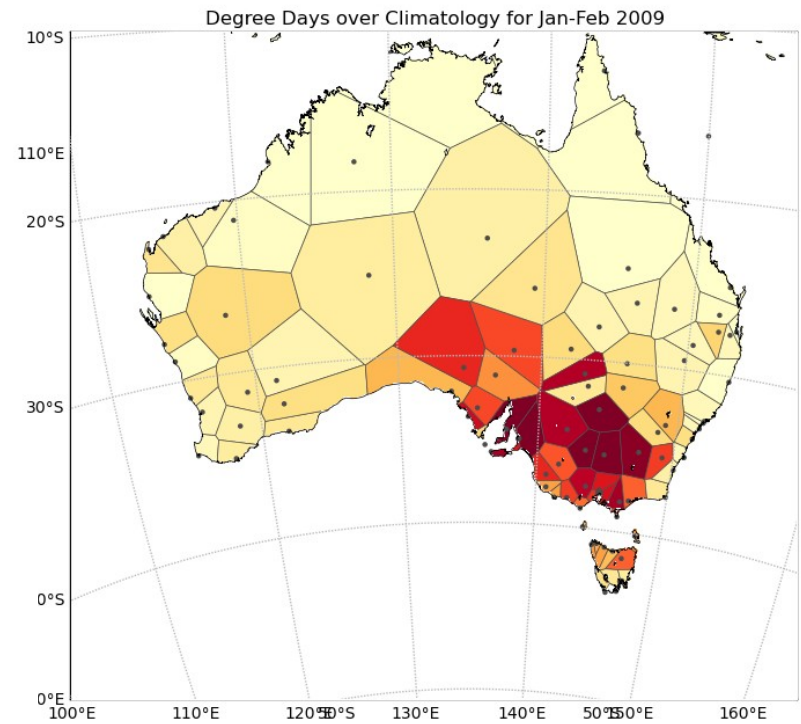
Winds

Only simple QC
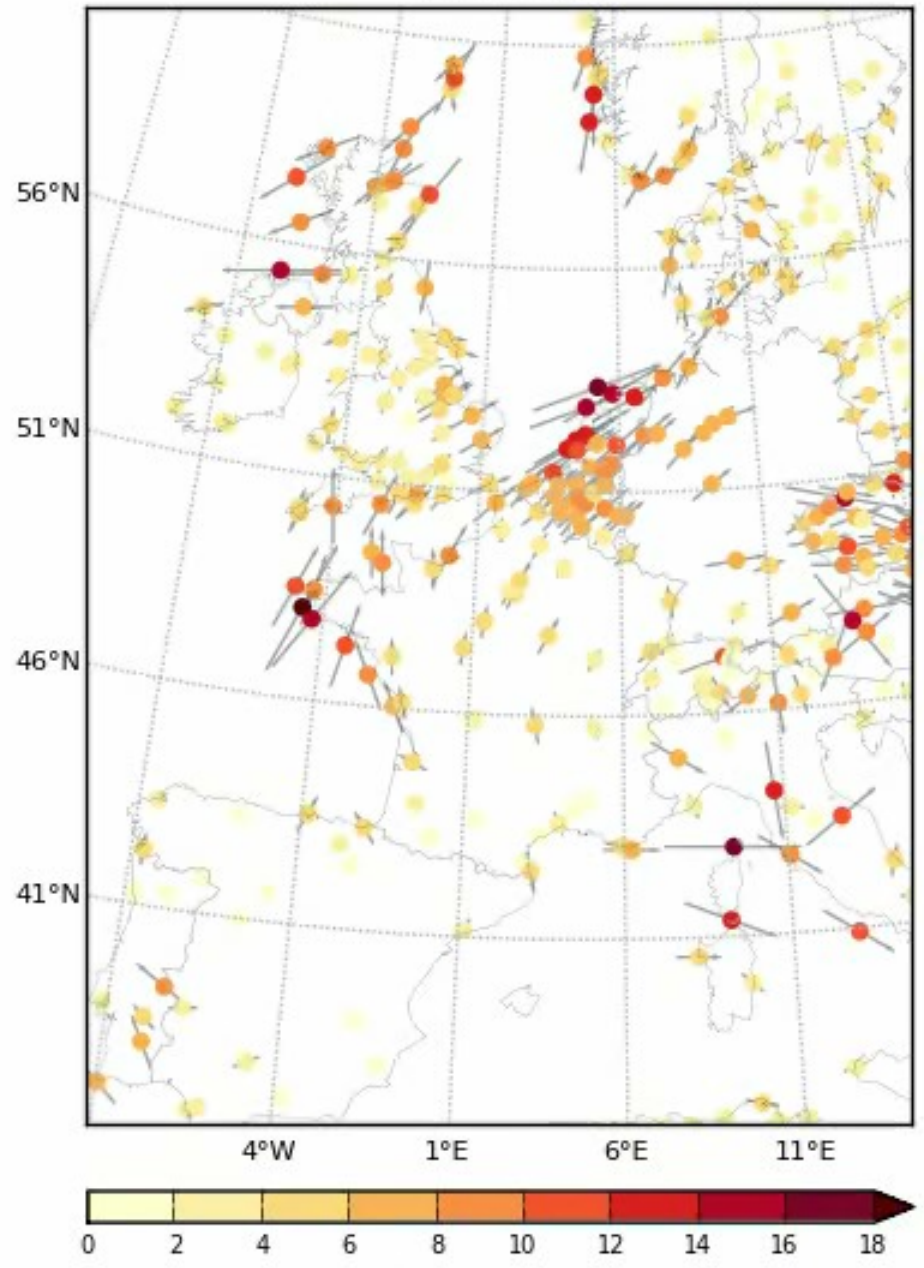checks applied

Säntis
(Switzerland,
066800-99999)

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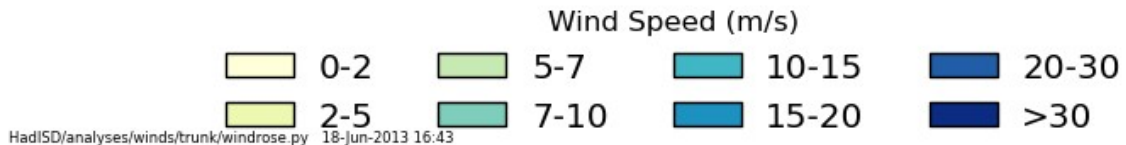
2010 February 27, 00:00 UT — Xynthia

SLP / Windspeed maps over Western Europe

SLP (hPa): 960 970 980 990 1000 1010 1020

Windspeed (m/s): 0 2 4 6 8 10 12 14 16 18

Met Office Hadley

HadISD/analyses/general/trunk/make_video_frames_hours_slp_wind.py   15-Jan-2013 16:21
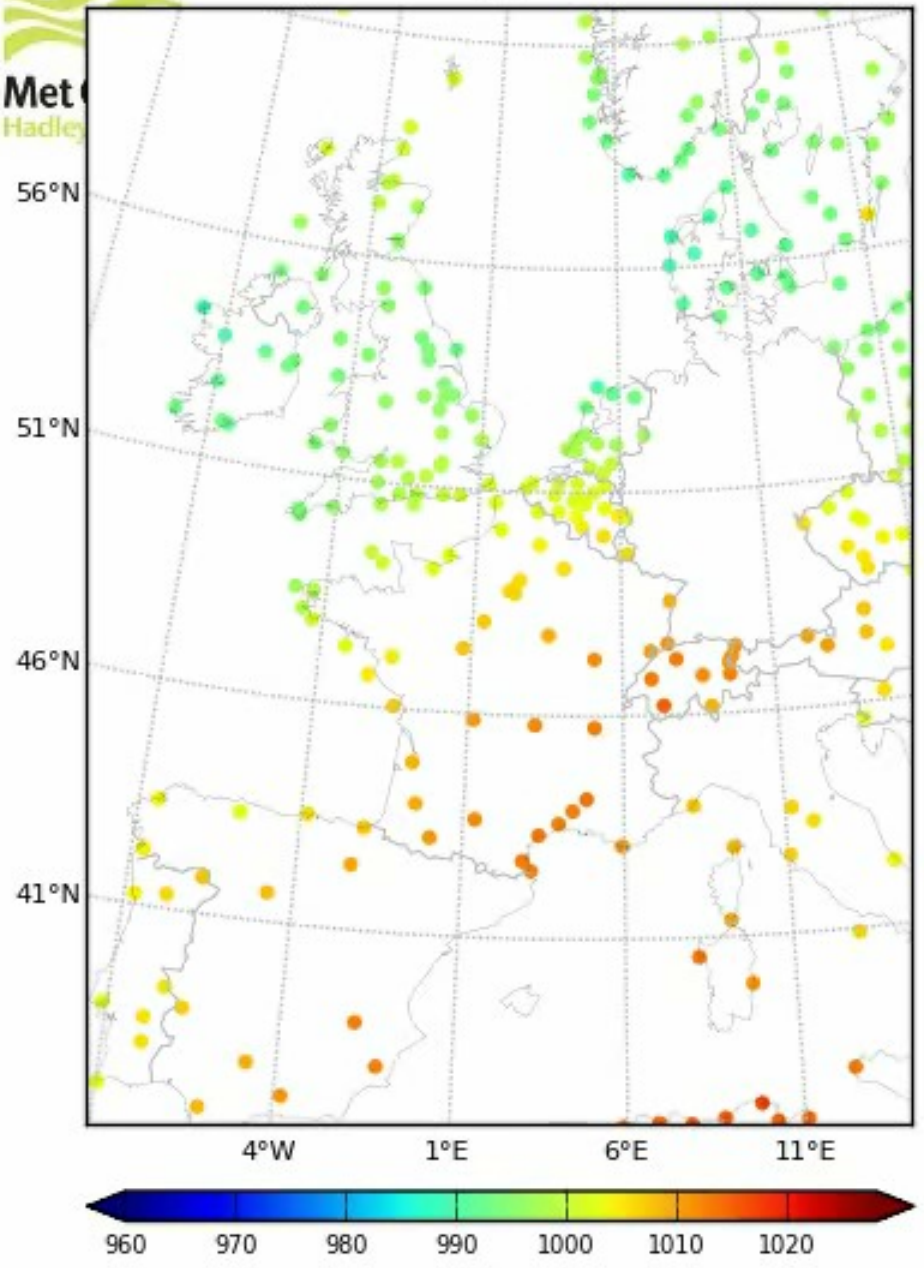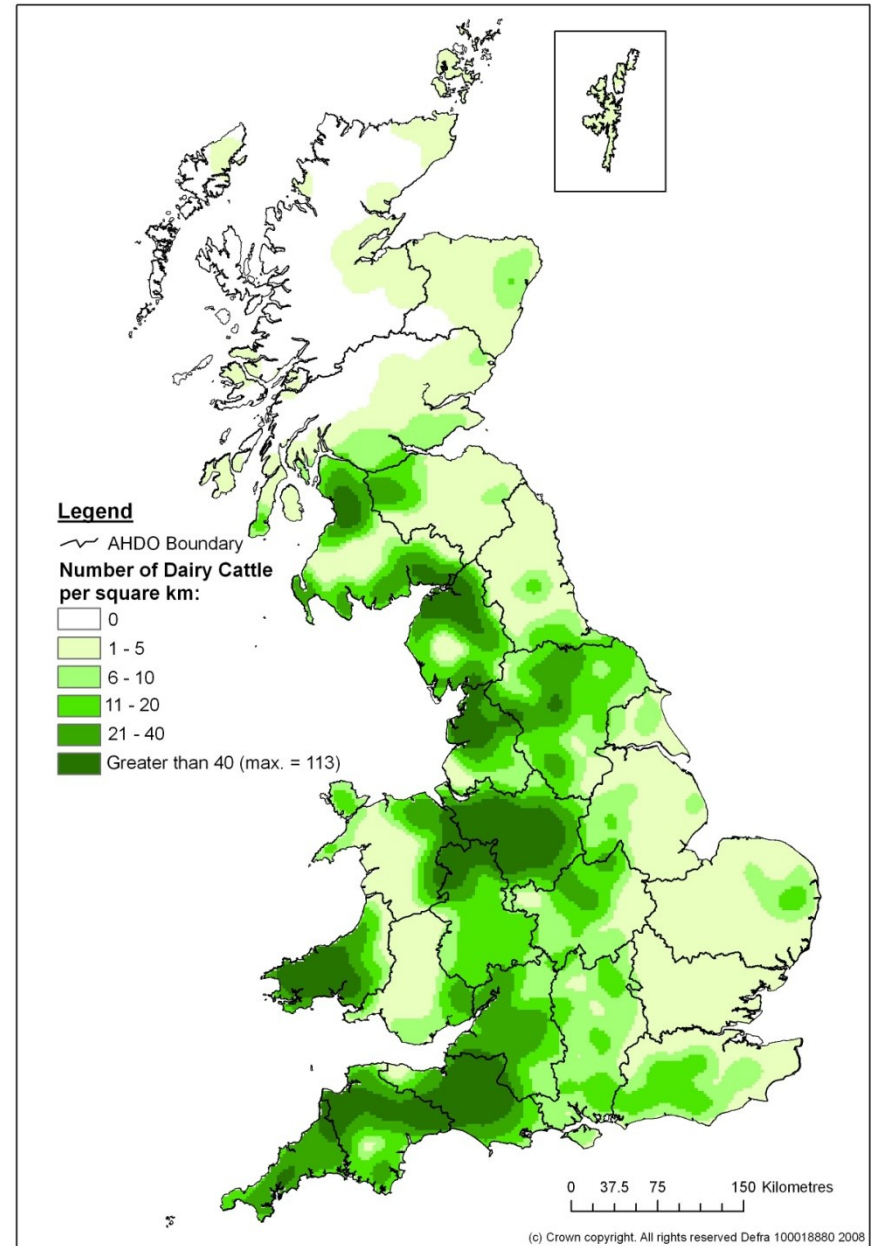
Global Wind Patterns

Average Wind Speed (m/s)
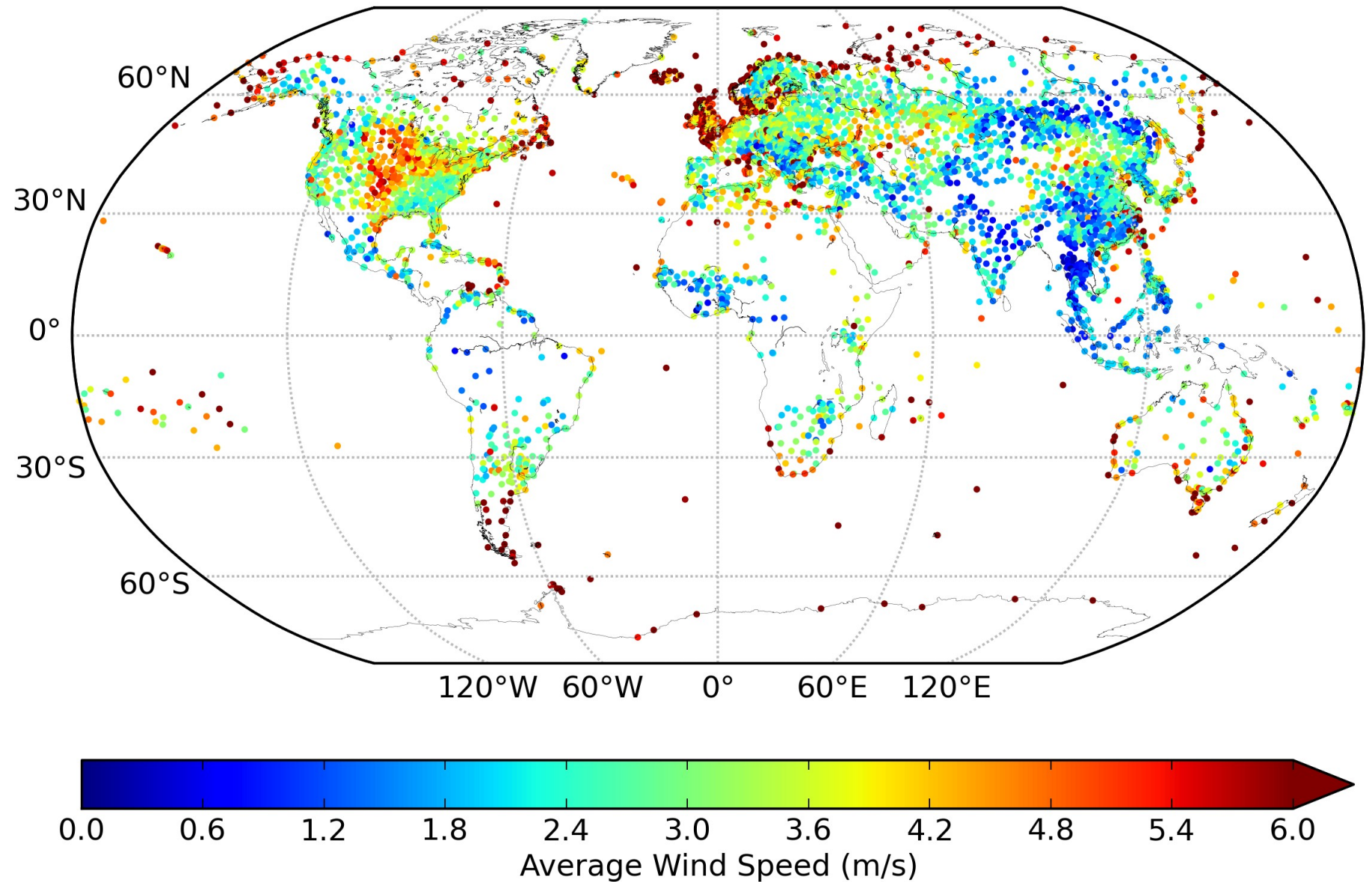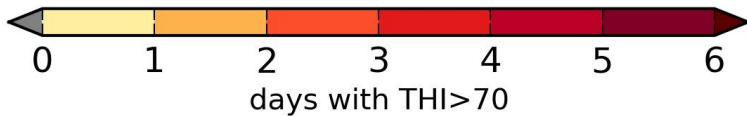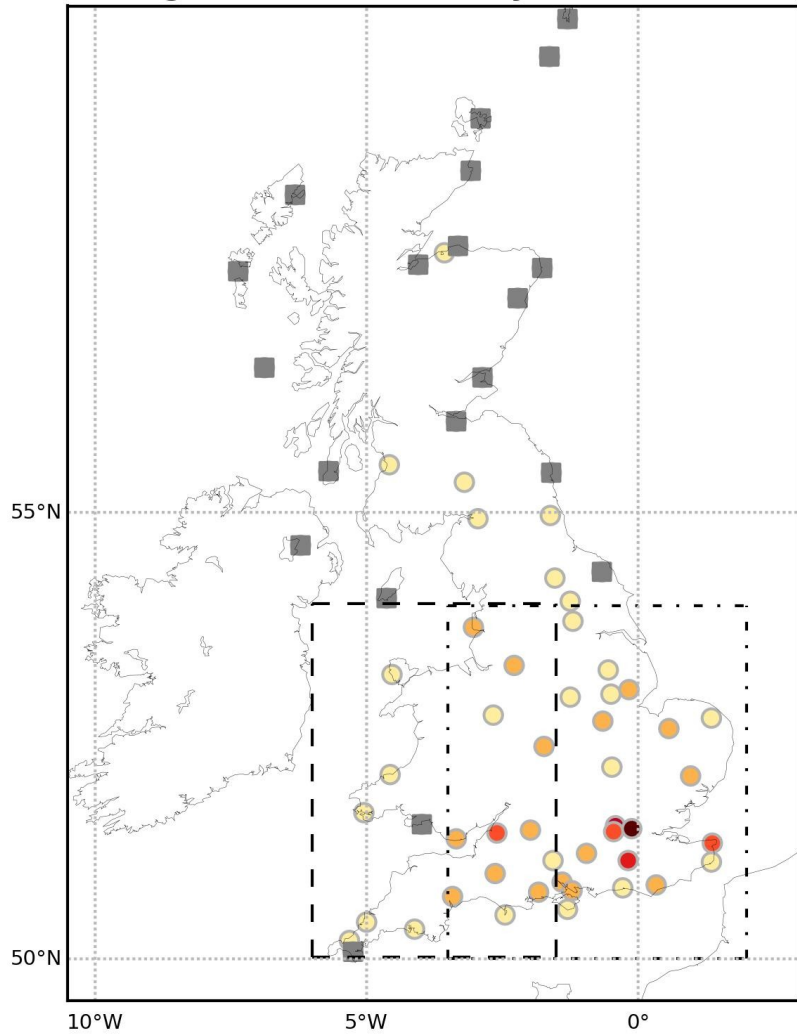
Heat Stress in UK Cattle

- Most dairy cattle are Holstein/Friesians & ~30% of cattle population

- Cattle breeds with high milk yields are under higher biological stress.

- Temperature-Humidity Index (*THI*) used for cattle
    - Function of *T* & *RH*

- Onset of heat-stress around *THI*=70-72
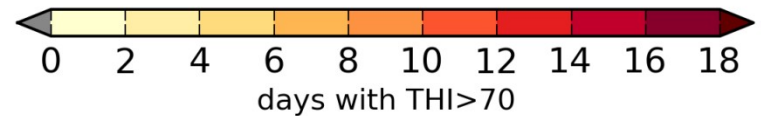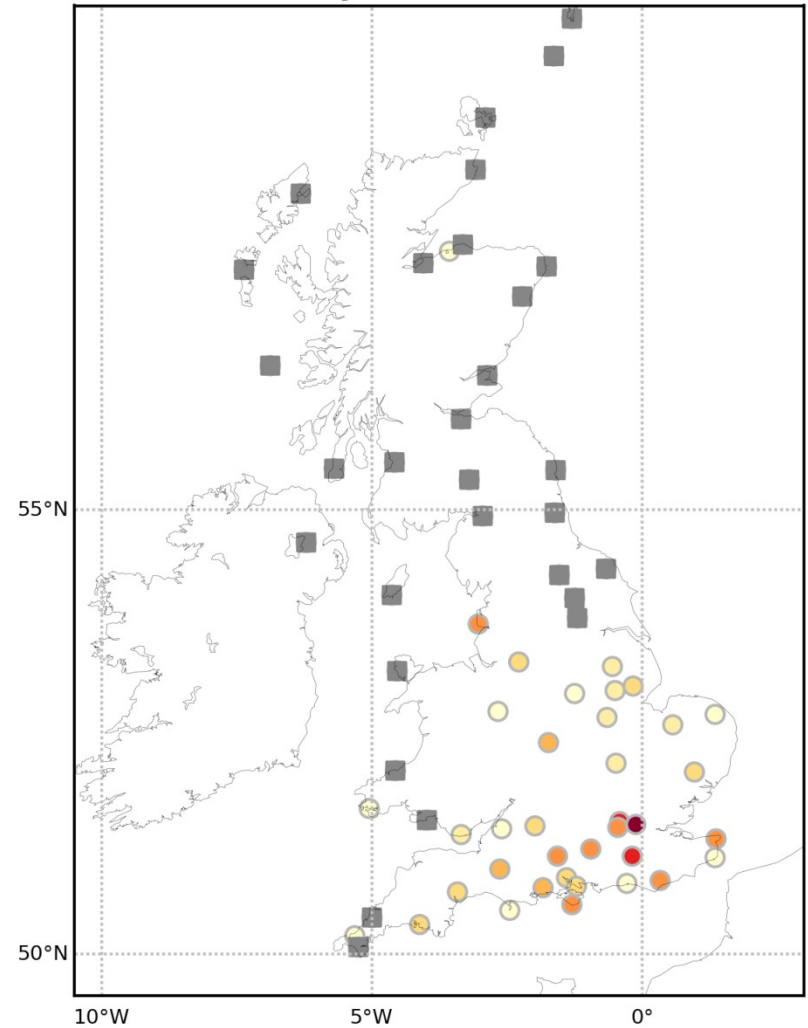   - As measured by panting, milk yields and food intake

Legend
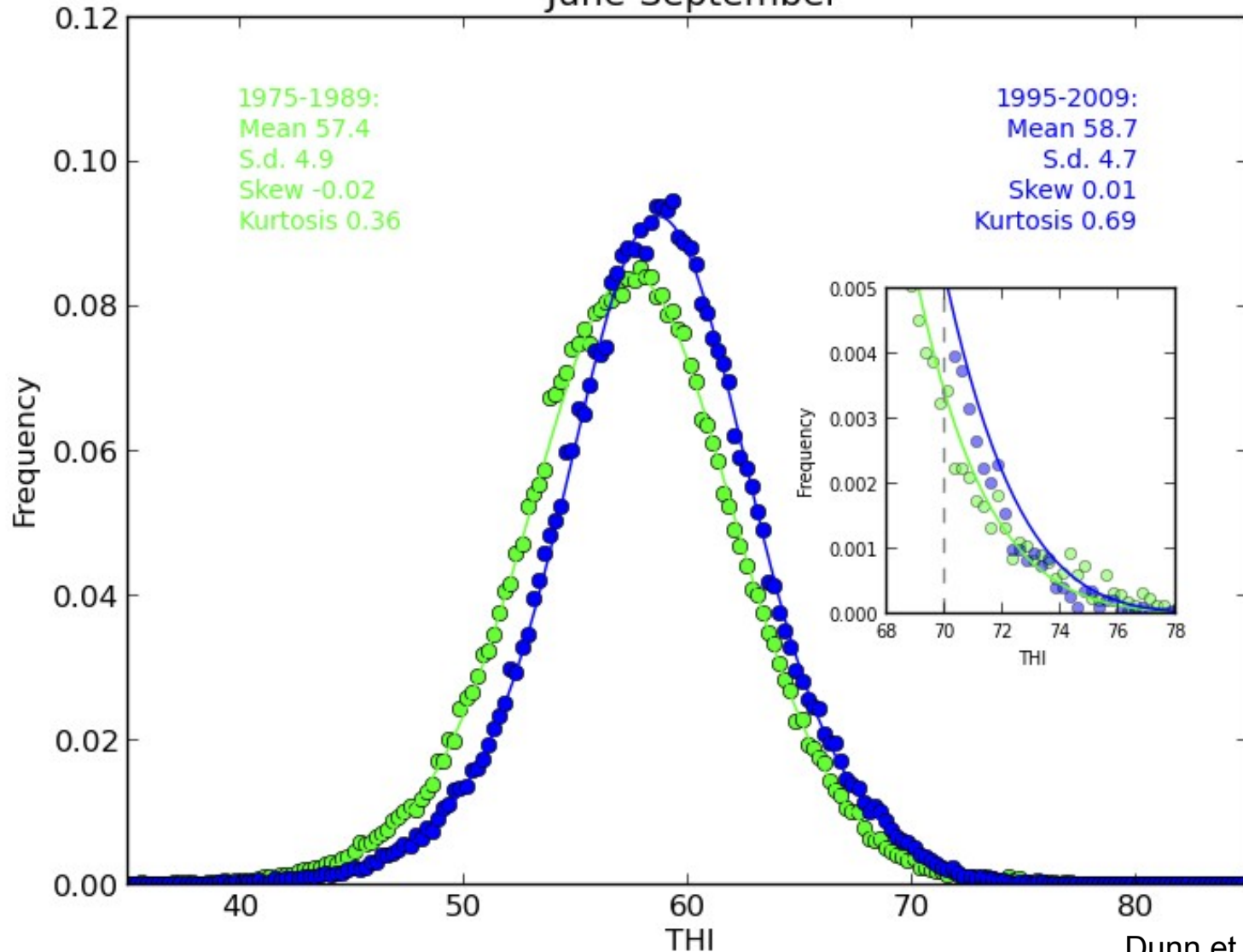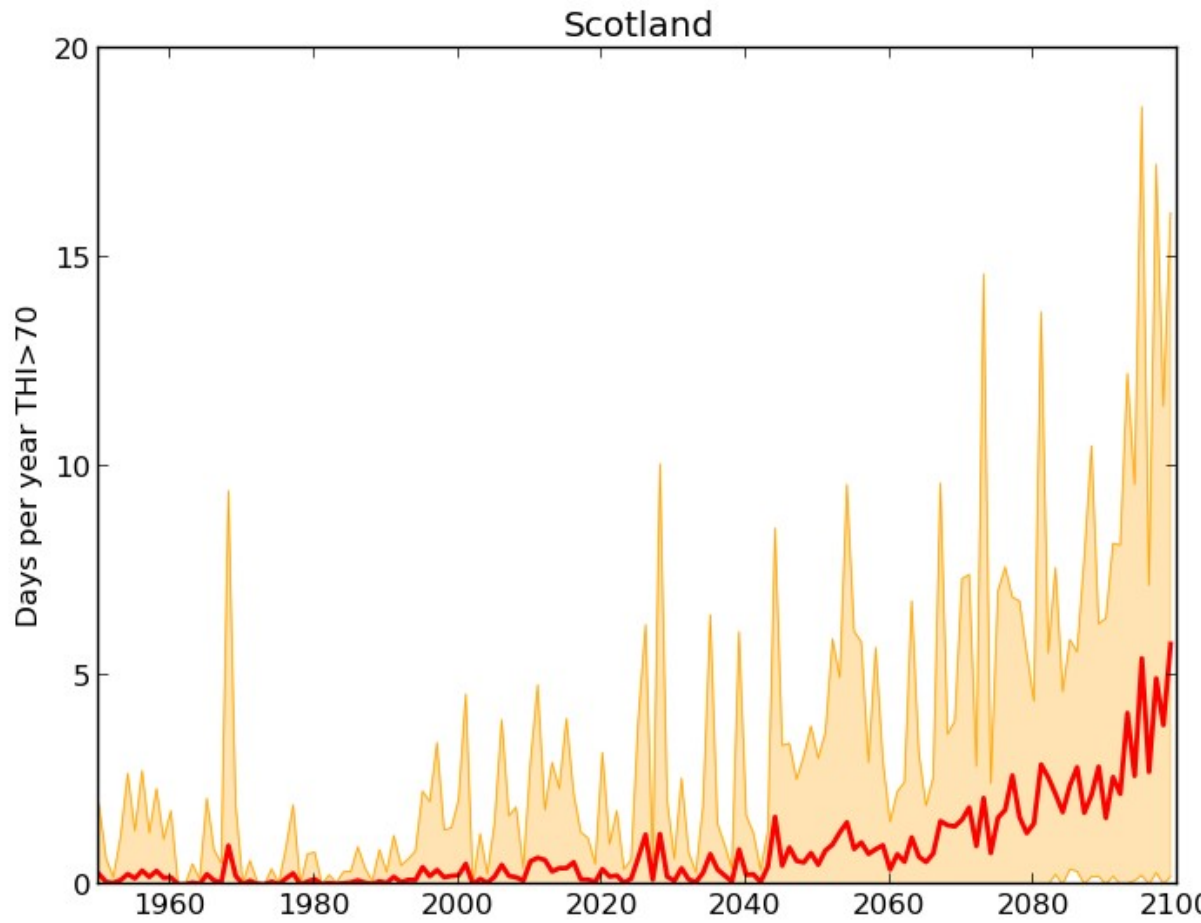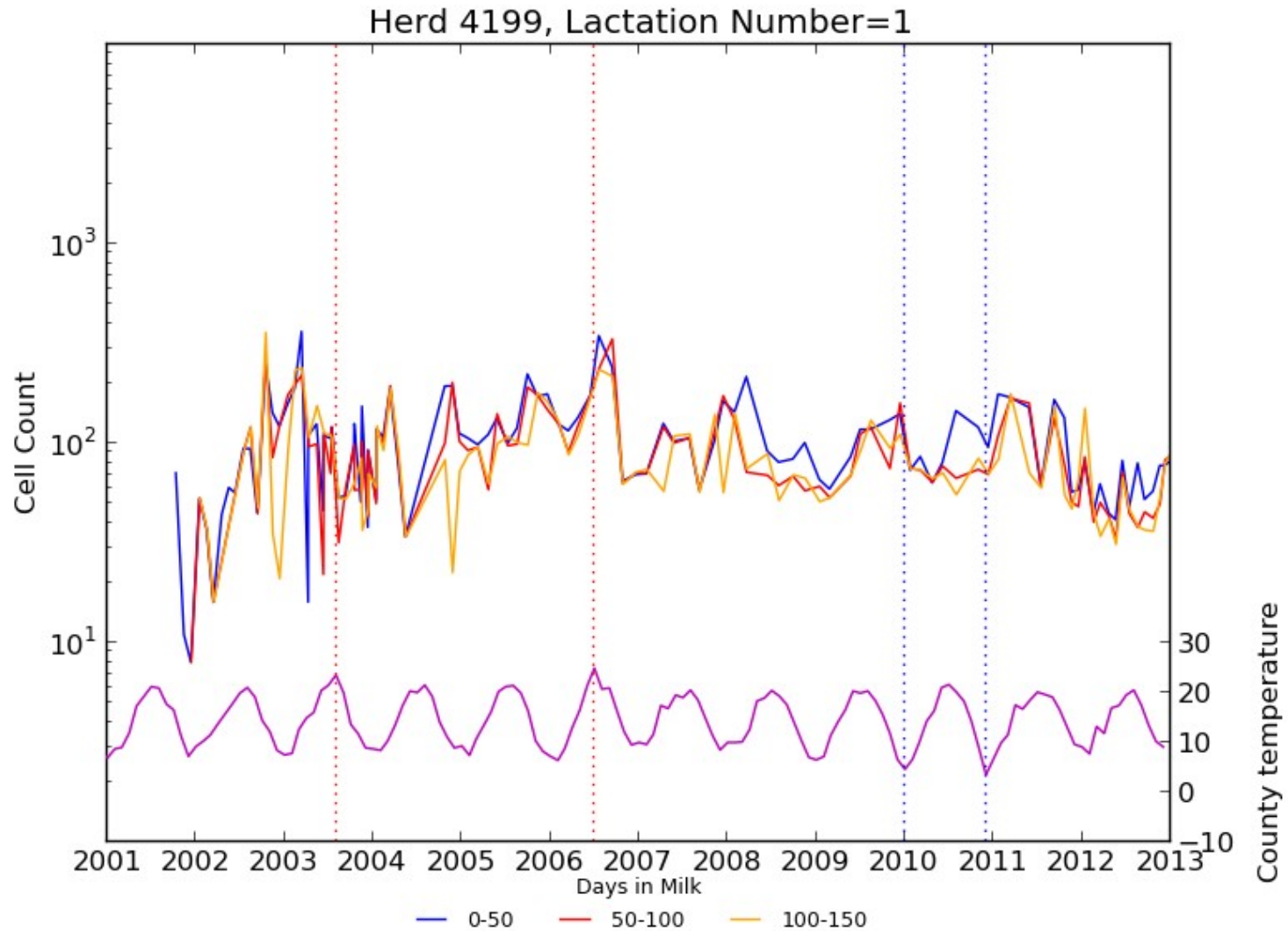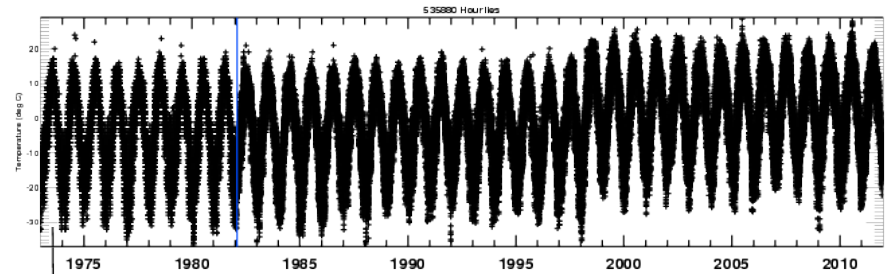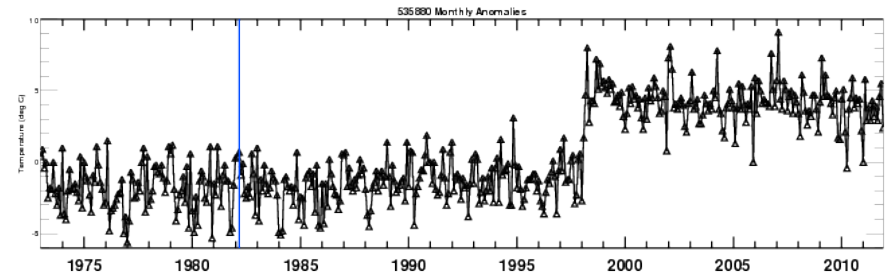
~~~ AHDO Boundary

Number of Dairy Cattle per square km:
- 0
- 1 - 5
- 6 - 10
- 11 - 20
- 21 - 40
- Greater than 40 (max. = 113)

0   37.5   75   150 Kilometres

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Defra Cattle Book, 2009

Temperature Humidity Index

Average number of days with THI>70

Number of days with THI>70 in 2003

days with THI>70

days with THI>70

Dunn et al, submitted

Distribution Shift

Distribution of Daily THI: June-September
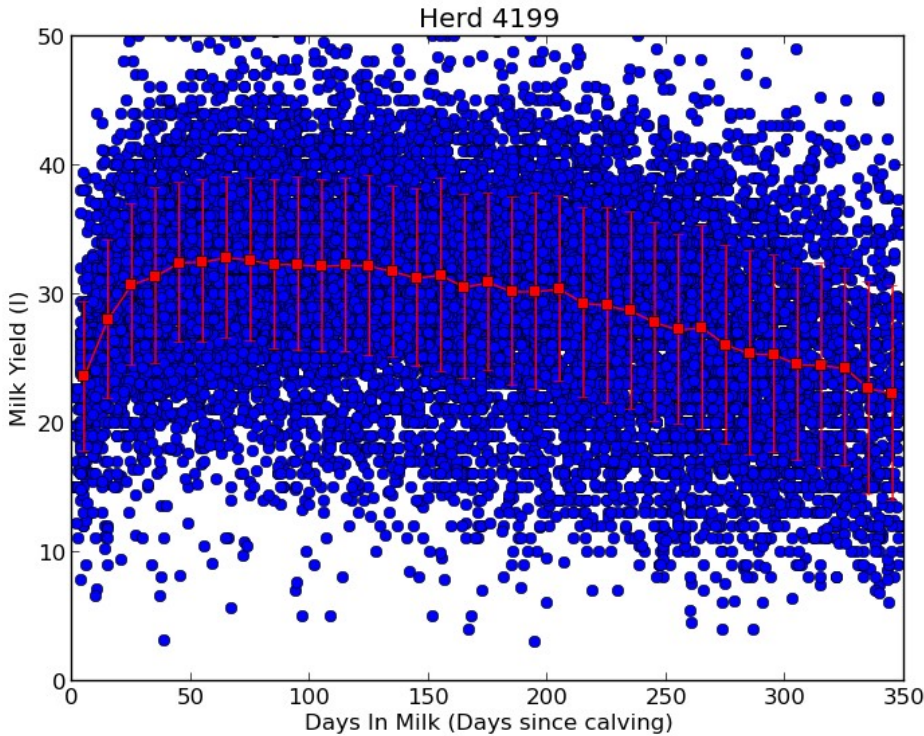
Dunn et al, submitted

UKCP09 RCMs

- UKCP09 11 member RCM ensemble

- A1B medium emissions scenario
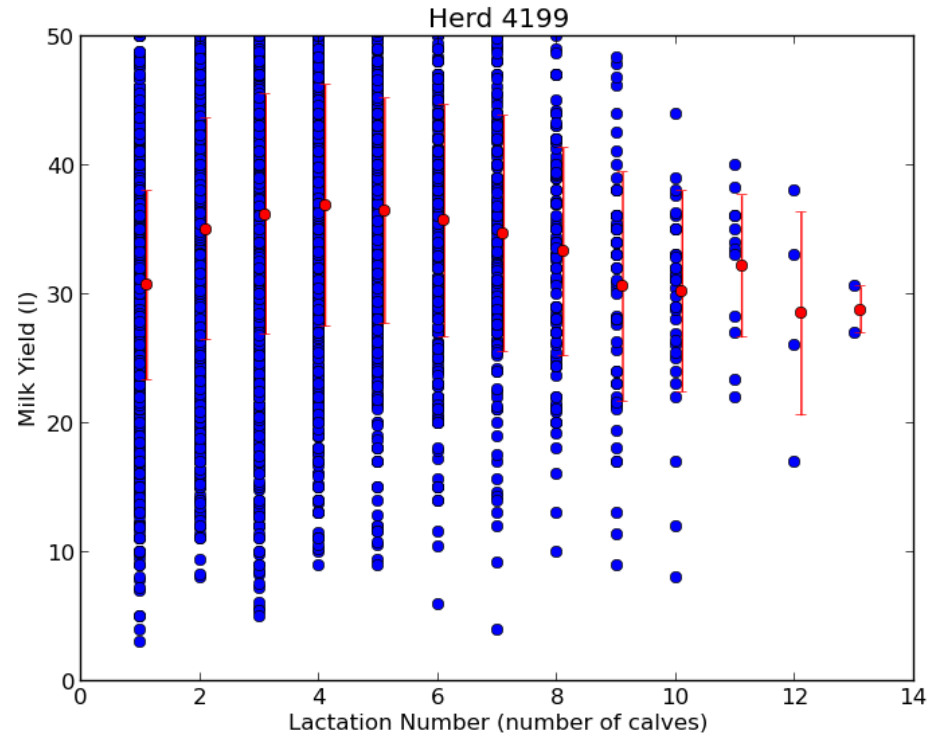
- Calculate days with THI>70 for 7 UK regions

Scotland

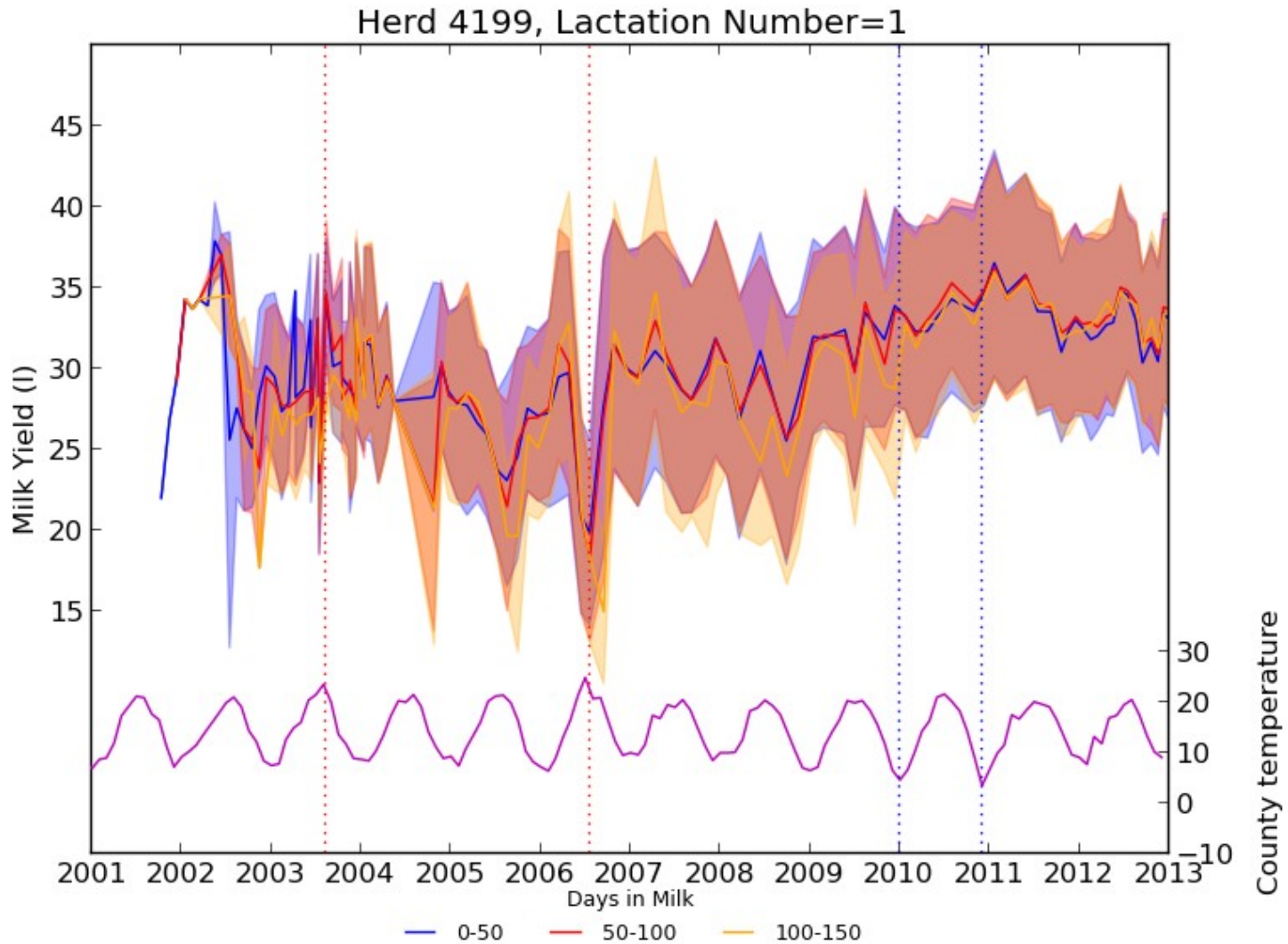ead/rjhd_weather_writeup/plot_regional_ensembles.py   17-Jun-2013 15:18

Dunn et al, submitted

Cattle Yield Data

A number of complicating factors need to be assessed

Thanks to CIS for the data

Cattle Yield Data
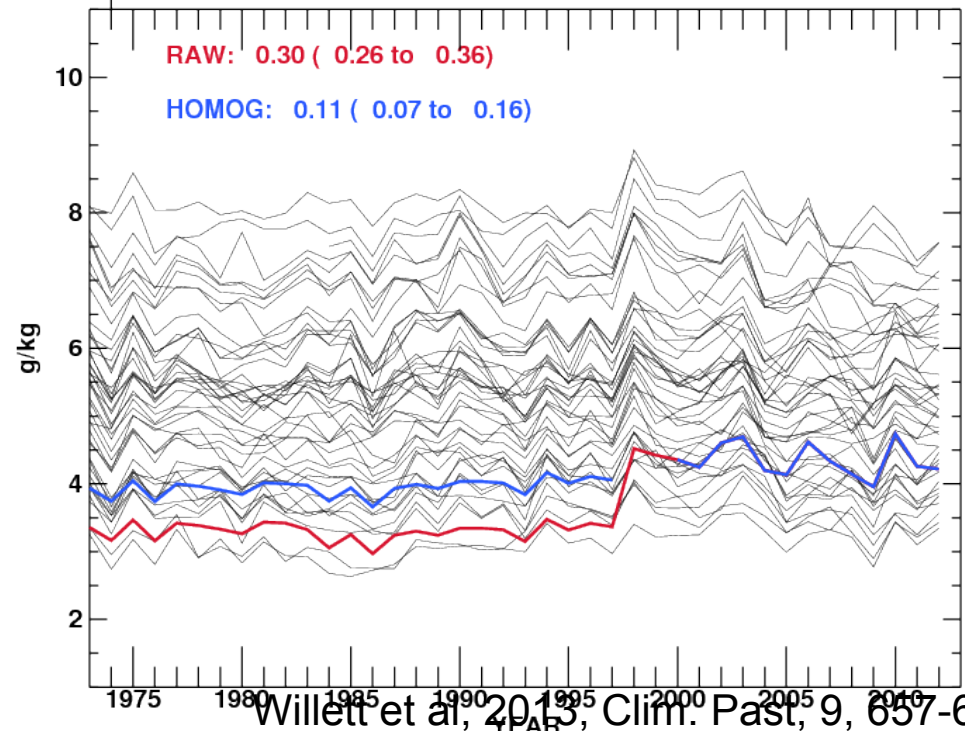

Herd 4199, Lactation Number=1

cow_data_means.py   08-Aug-2013 16:58

A number of complicating factors need to be assessed

Thanks to CIS for the data

Cattle Yield Data

Herd 4199, Lactation Number=1

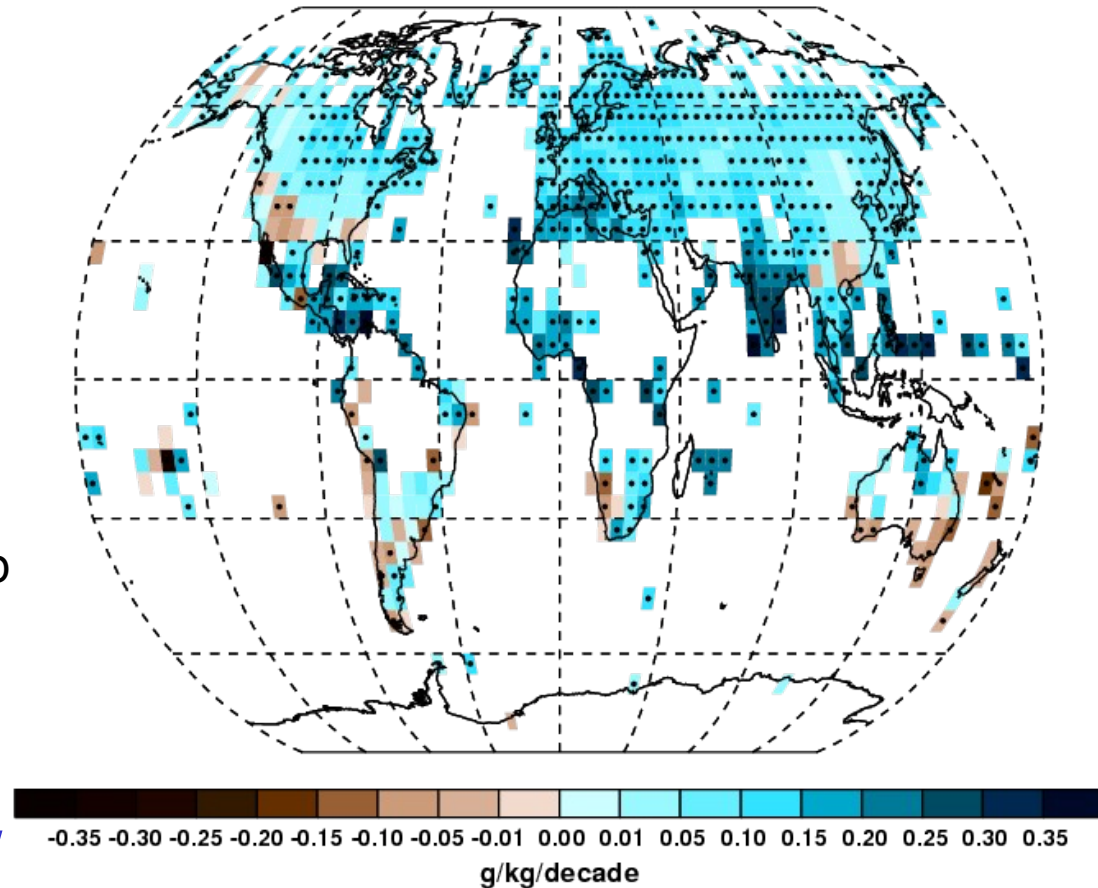A number of complicating factors need to be assessed

Thanks to CIS for the data

HadISDH

- First update to HadCRUH

- Based on HadISD

- Monthly specific humidity (q) anomalies

- Homogenised using PHA (Menne & Williams 09)

RAW: 0.30 (0.26 to 0.36)

HOMOG: 0.11 (0.07 to 0.16)

Willett et al, 2013, Clim. Past, 9, 657-677

HadISDH

- First update to HadCRUH
- Based on HadISD
- Monthly specific humidity (q) anomalies
- Homogenised using PHA (Menne & Williams 09)
- Annual updates
  - Current version v1.0.0.2012p
- RH, e and other humidity variables planned.
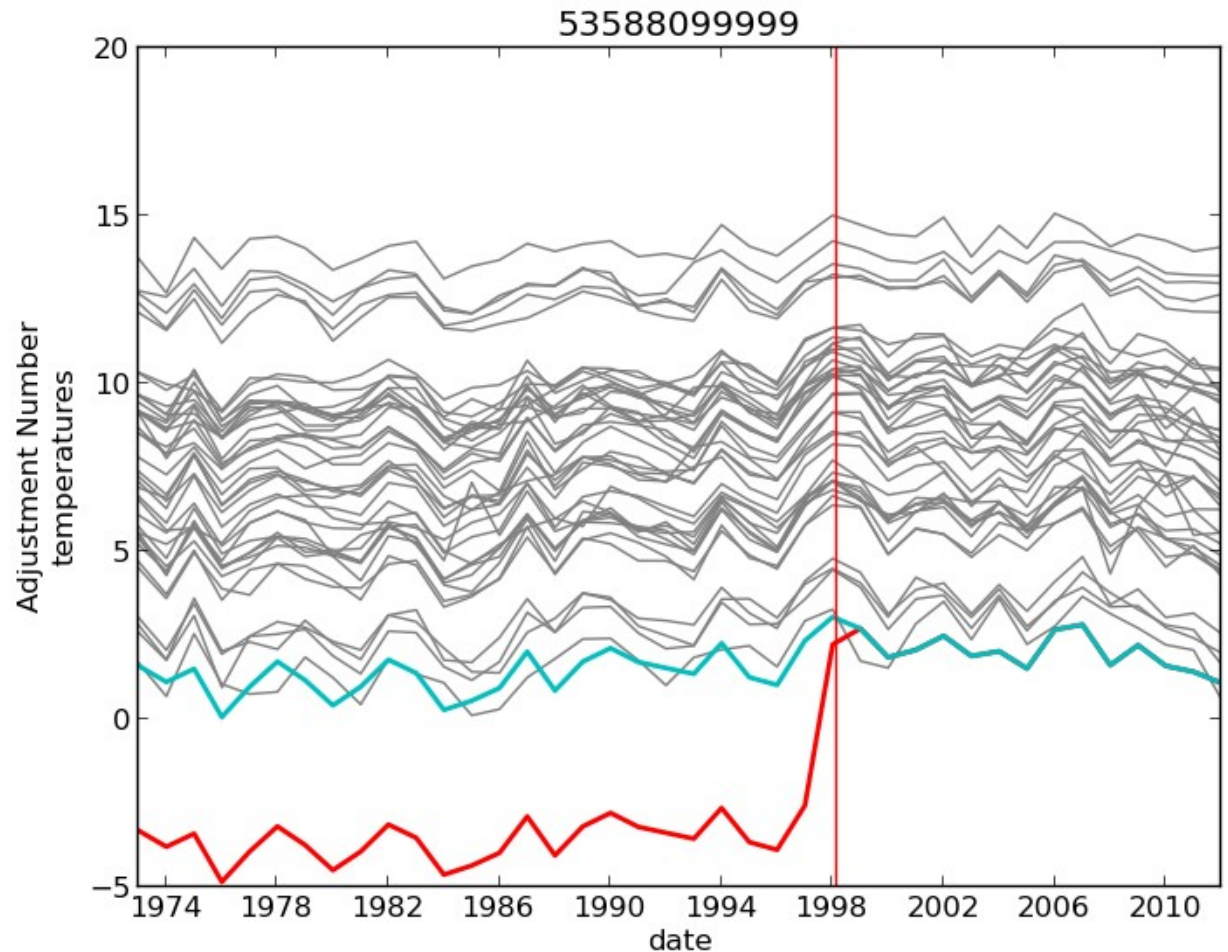- Data blog for updates:
  http://hadisdh.blogspot.co.uk/

-0.35 -0.30 -0.25 -0.20 -0.15 -0.10 -0.05 -0.01 0.00 0.01 0.05 0.10 0.15 0.20 0.25 0.30 0.35

g/kg/decade

Willett et al, 2013, Clim. Past, 9, 657-677

Homogenisation

Homogenising hourly data is difficult

Initially will release list of homogenous sub-periods

Using PHA code from Menne & Williams as in HadISDH.

Work in progress

Wutai Shan, 535880-99999, China

Future plans

- Dataset is updated annually
  - v1.0.1.2012p was released in January 2013
  - Data blog [hadisd.blogspot.co.uk] and Twitter [@metofficeHadOBS] used to pass on information

Future plans
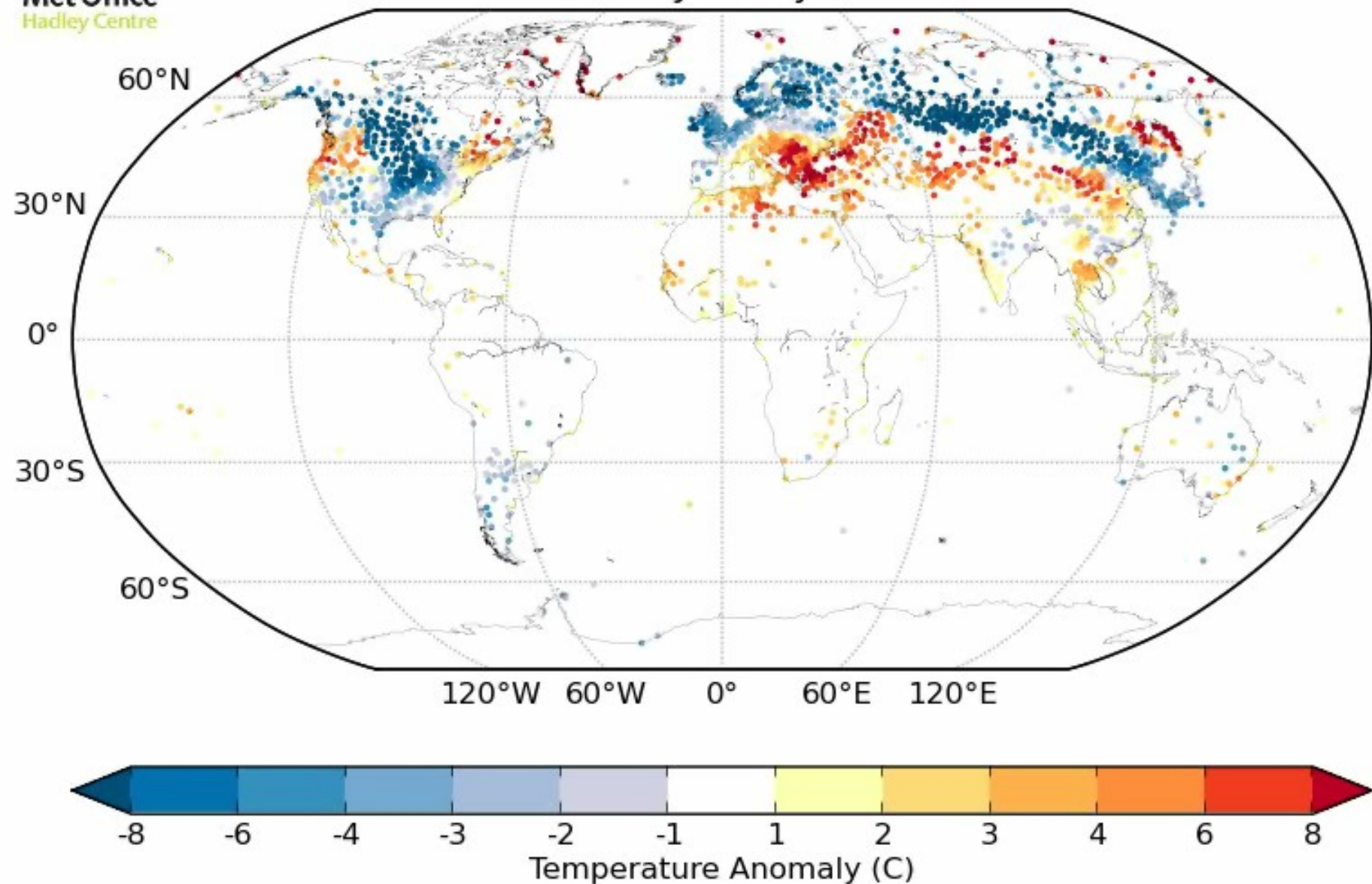
- Dataset is updated annually
  - v1.0.1.2012p was released in January 2013
  - Data blog [hadisd.blogspot.co.uk] and Twitter [@metofficeHadOBS] used to pass on information
- Encourage user feedback on the data
- Quality control code has been released
  - Using BSD licence, so freely available
- Intend to expand and improve dataset over time
  - Extend to before 1973
  - Improve the QC in light of user comments
  - Include more stations and variables
  - Homogenisation & homogeneous sub-periods

www.metoffice.gov.uk/hadobs/hadisd

Anomalies above and below climatological daily mean
2010 January 01

Temperature Anomaly (C)

HadISD/analyses/general/trunk/make_video_frames_days.py   22-Jan-2013 17:41

Questions and answers