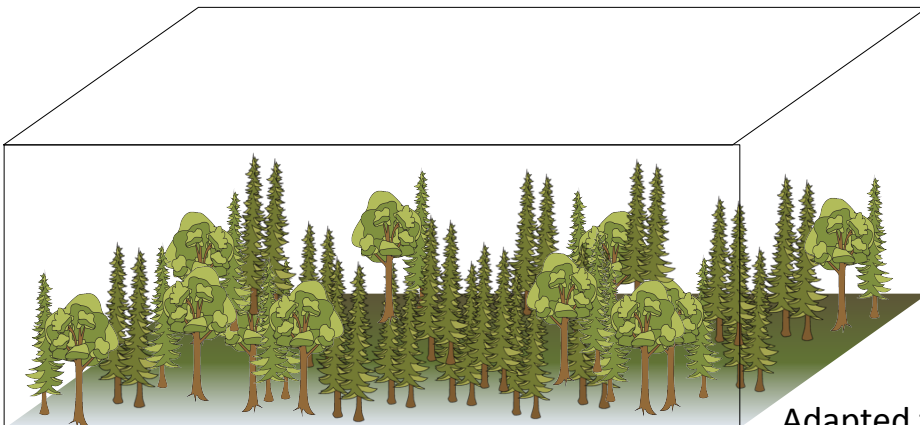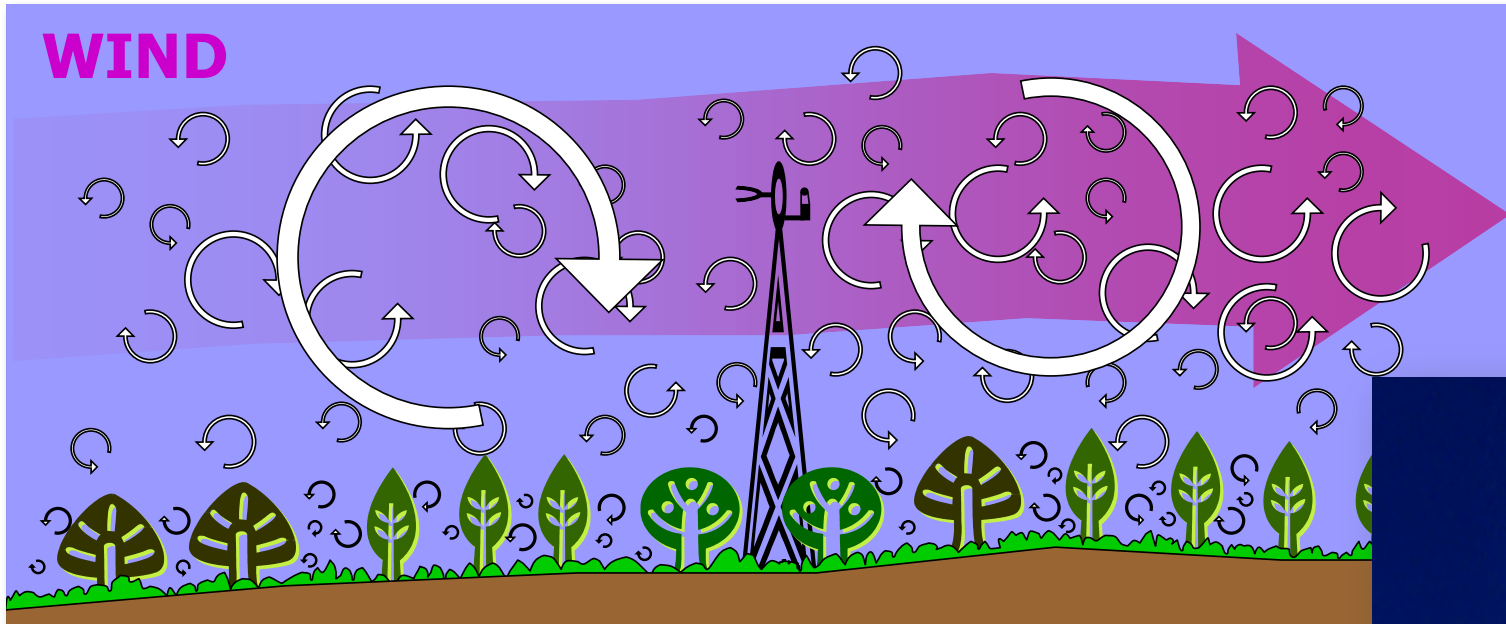# AmeriFlux Post-Processing
Data QA/QC Activities

Gilberto Pastorello, Deb Agarwal, Dario Papale, Carlo Trotta, Eleonora Canfora, et al.

Berkeley, CA

2014-02-12

Eddy Covariance Method for Measuring Fluxes

Adapted from: Dario Papale (U. Tuscia)

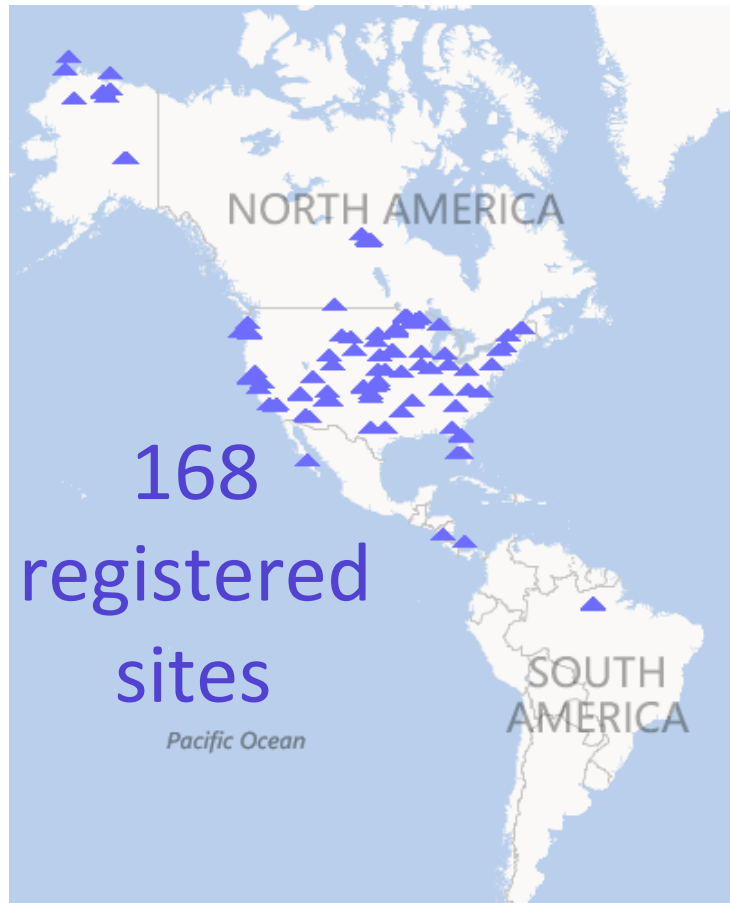# The AmeriFlux Network and the AmeriFlux Management Project
http://ameriflux.lbl.gov/

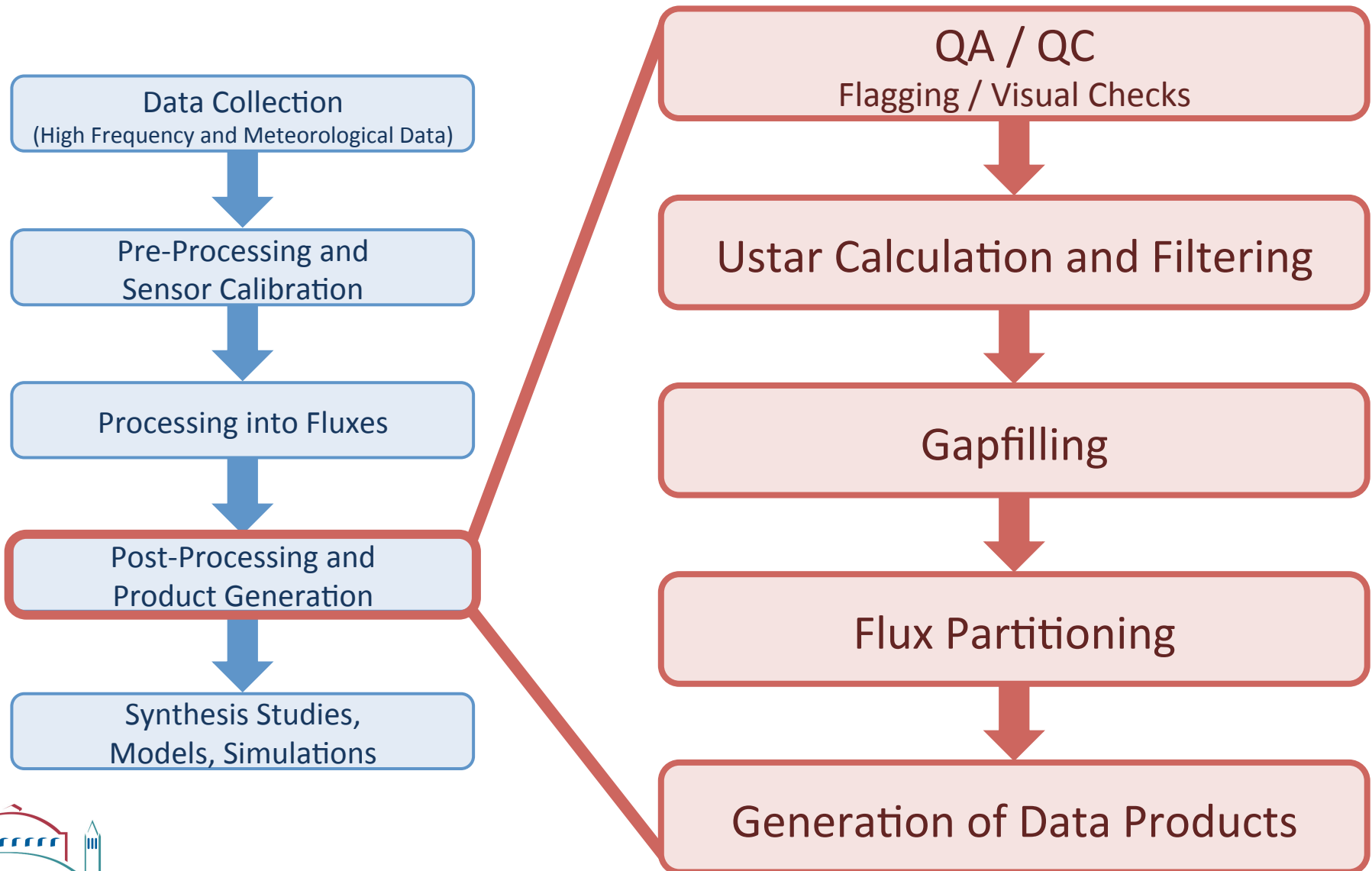168 registered sites
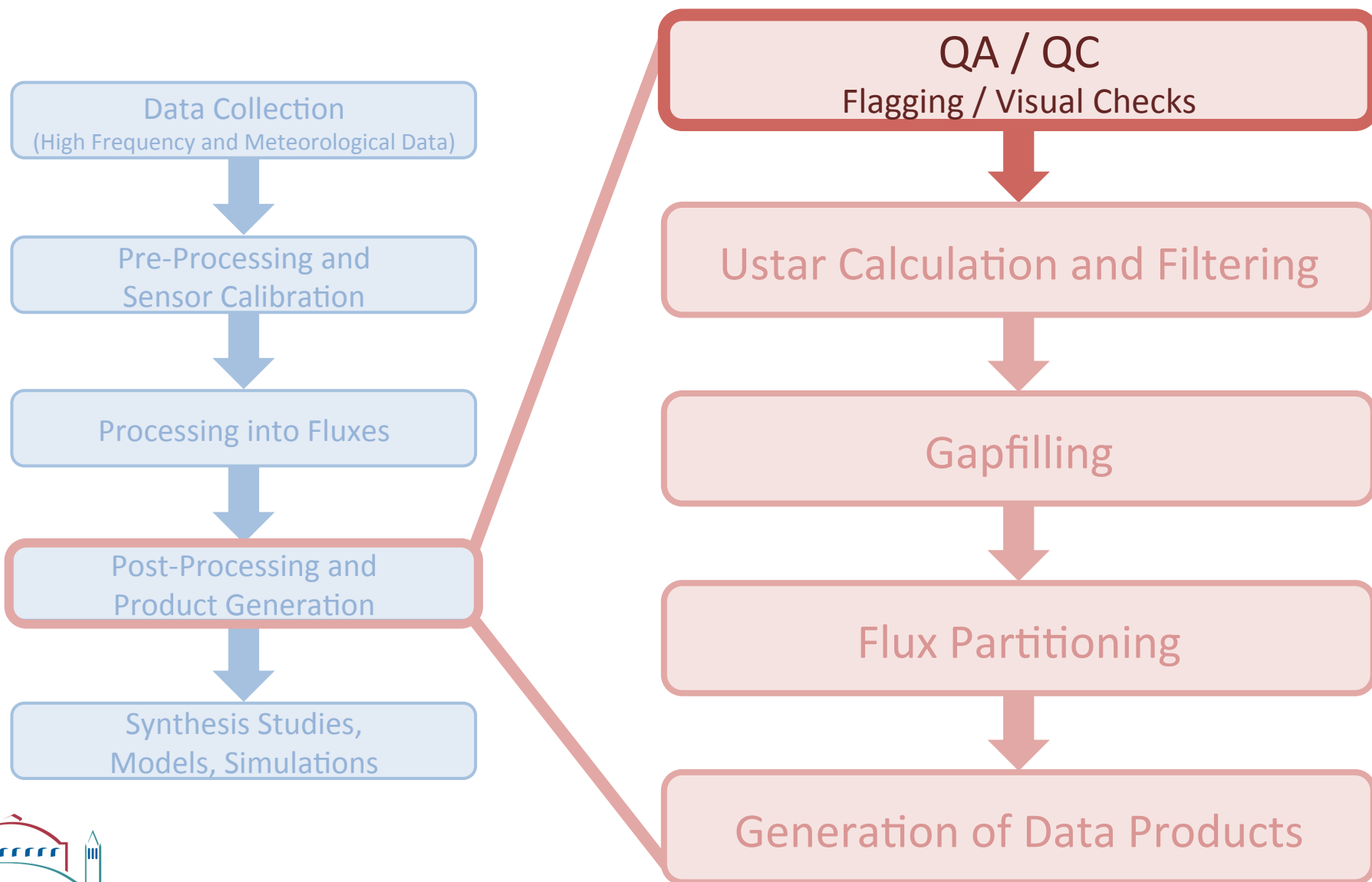

photo:
D. Baldocchi Lab

AMP
Funded
by DOE

Coordinated at
Berkeley Lab

*Collaboration with institutions
across the globe* - **FLUXNET**

# Data Flow – Data Processing Pipeline for NEE

Data Collection
(High Frequency and Meteorological Data)

↓

Pre-Processing and Sensor Calibration

↓

Processing into Fluxes

↓

Post-Processing and Product Generation

↓

Synthesis Studies, Models, Simulations

QA / QC
Flagging / Visual Checks

↓

Ustar Calculation and Filtering

↓

Gapfilling

↓

Flux Partitioning

↓

Generation of Data Products

Berkeley Lab

Data Processing Pipeline (carbon exchange)

Visual QA/QC – Precipitation

Visual QA/QC – Precipitation

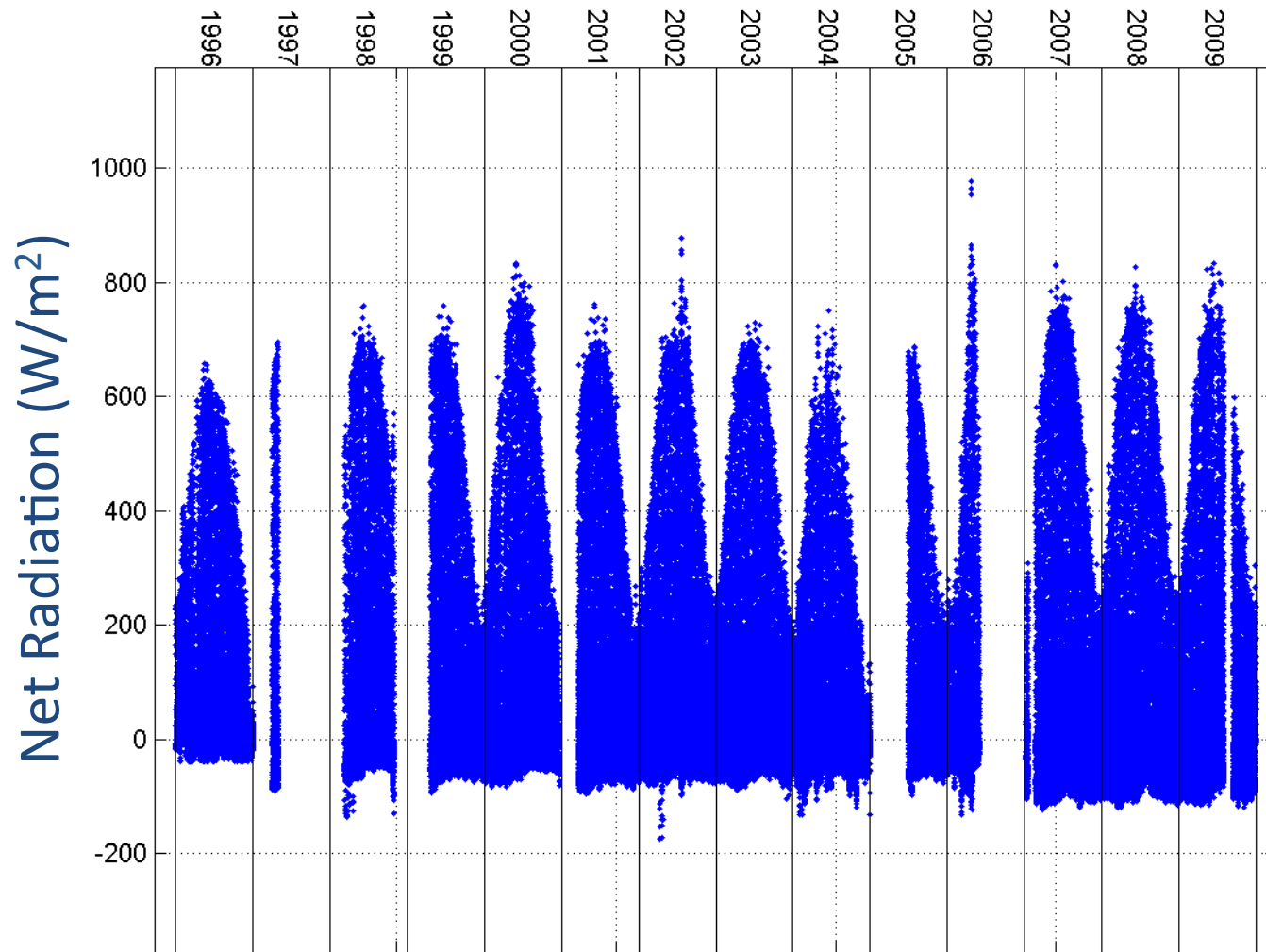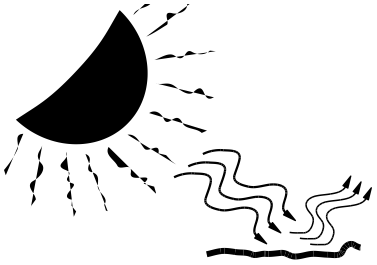# Visual QA/QC – Precipitation
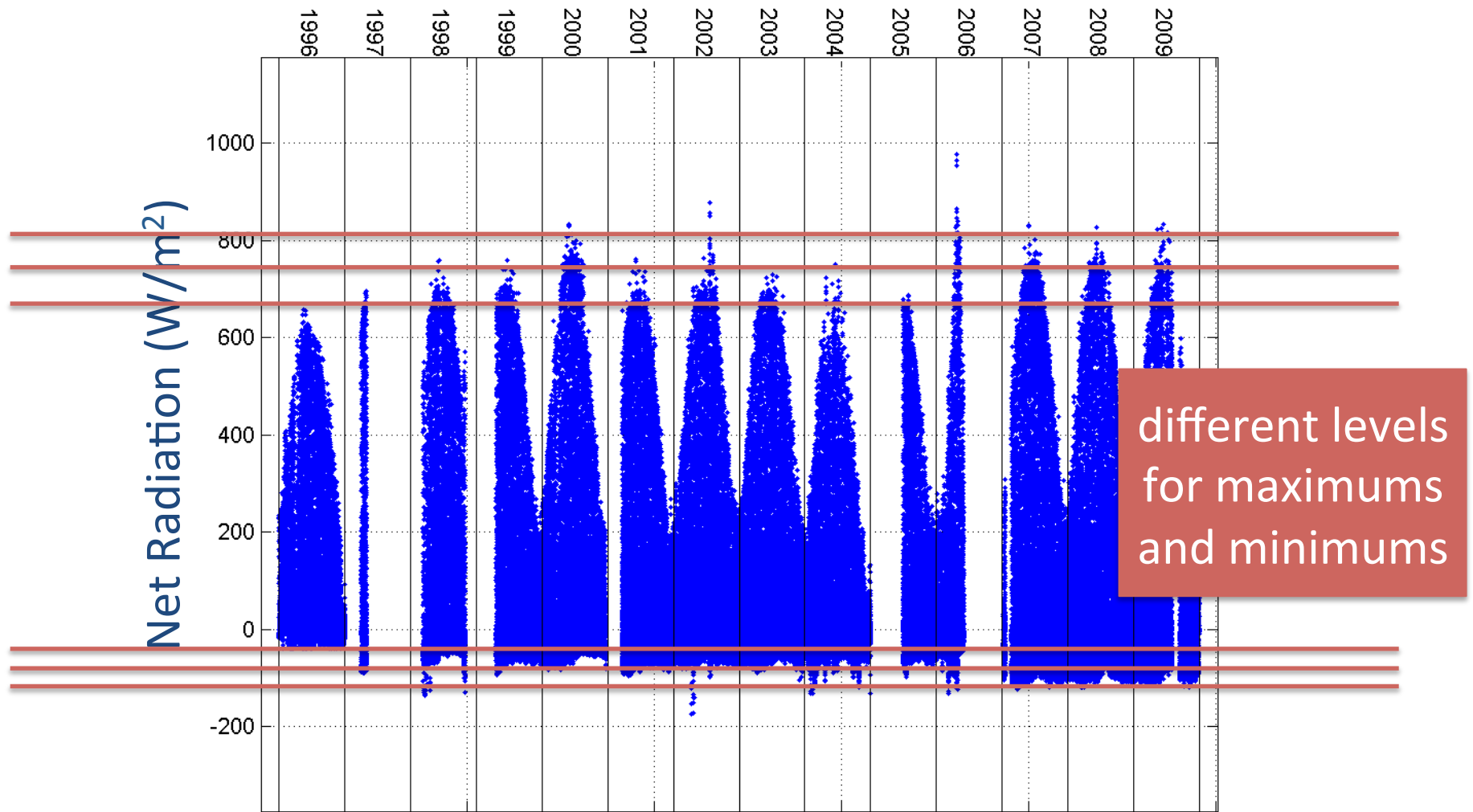

different sampling resolution

2005
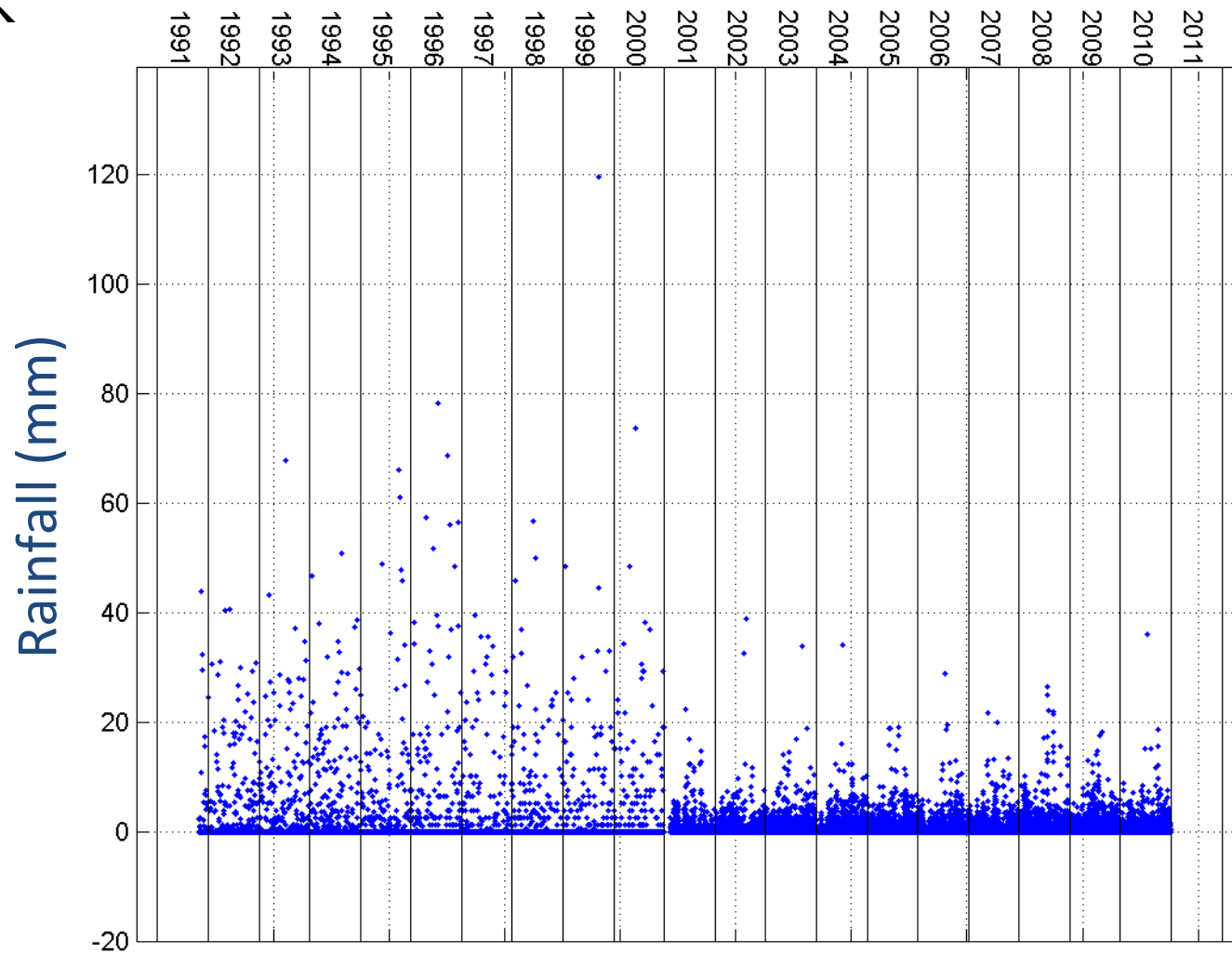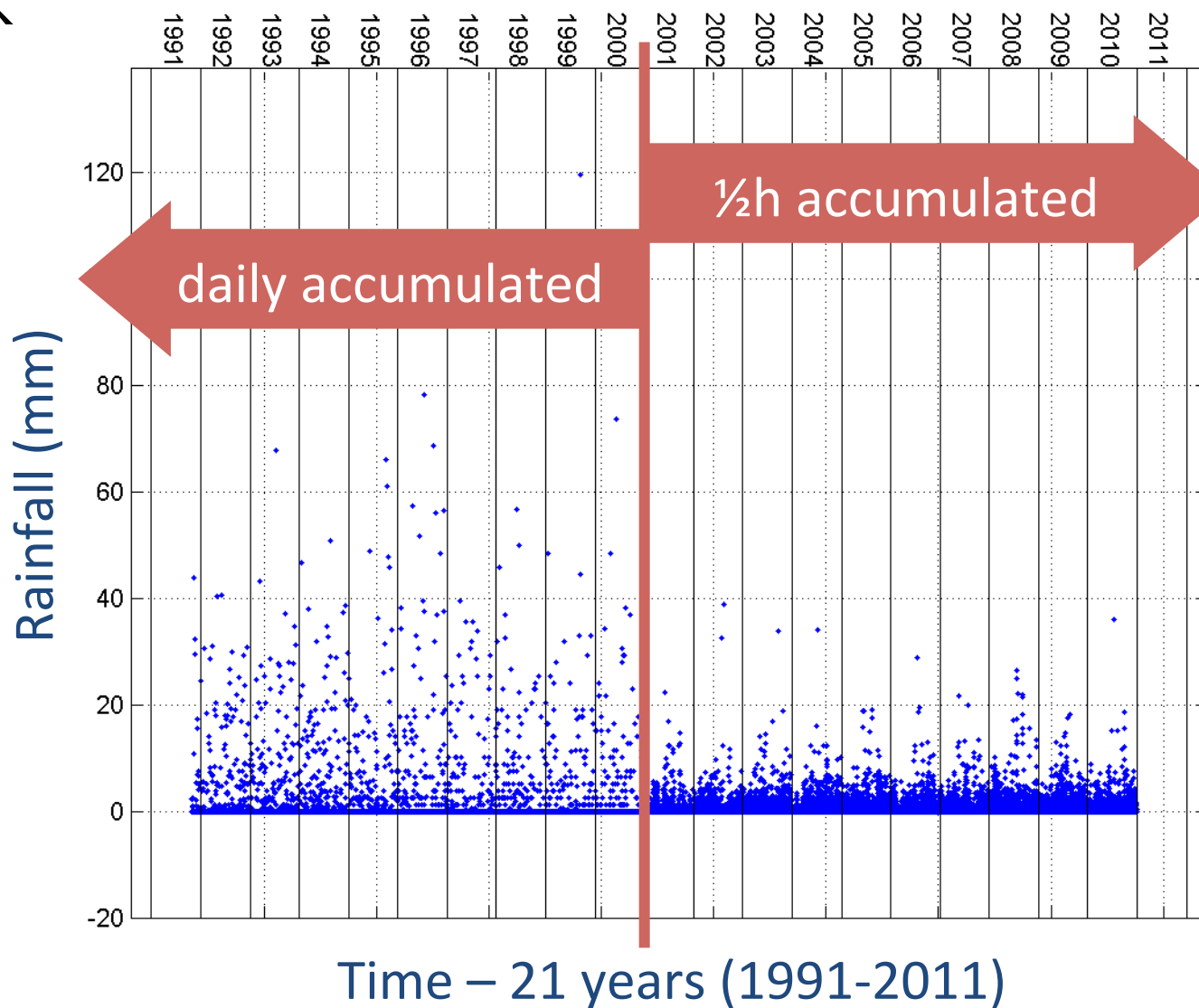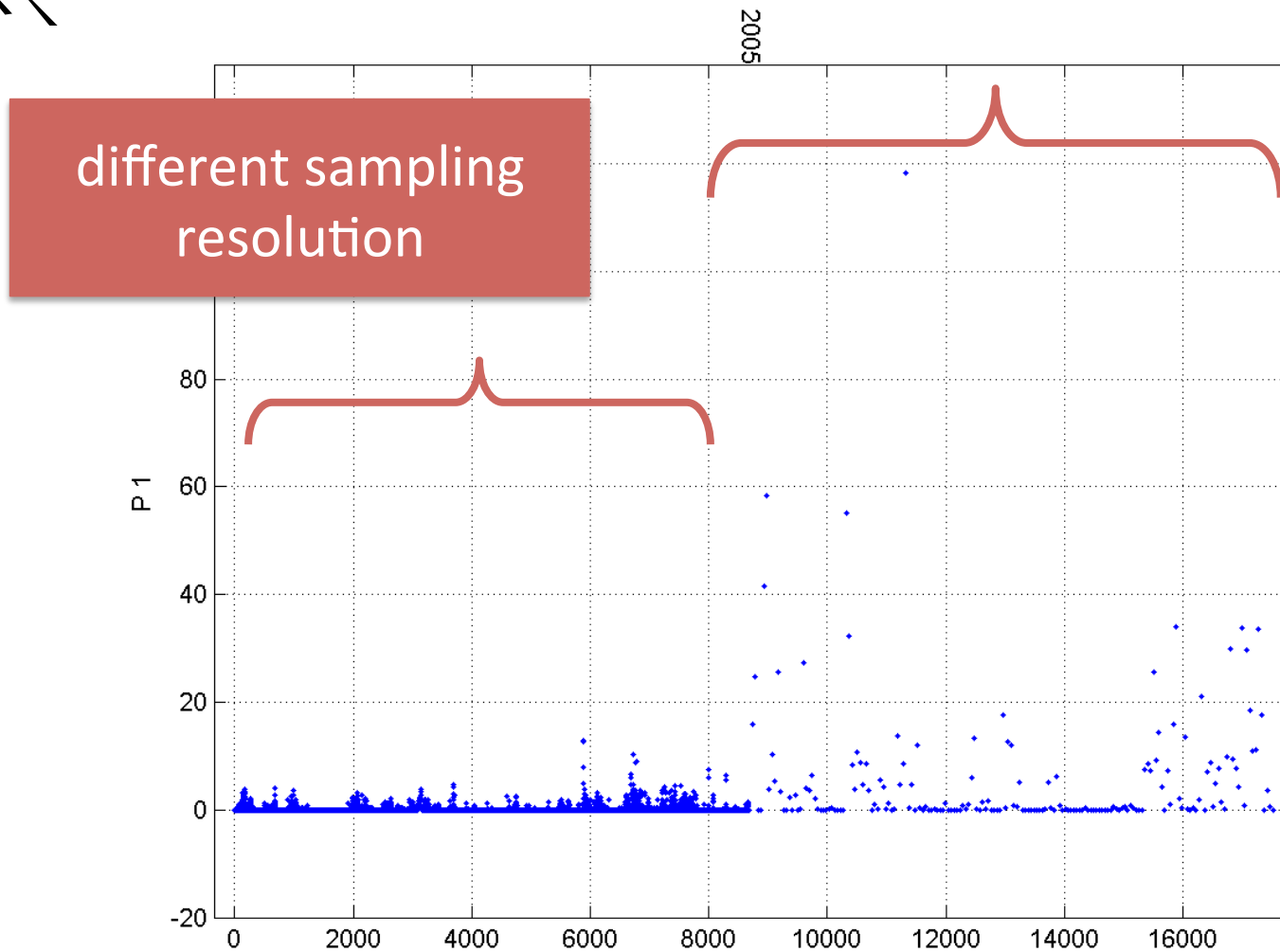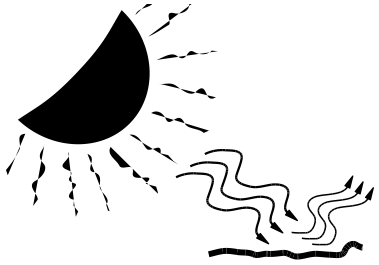
Visual QA/QC – Net Solar Radiation
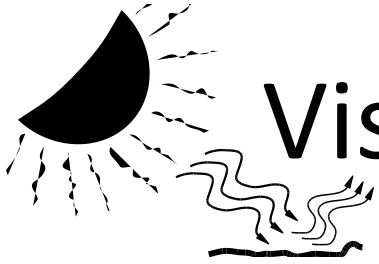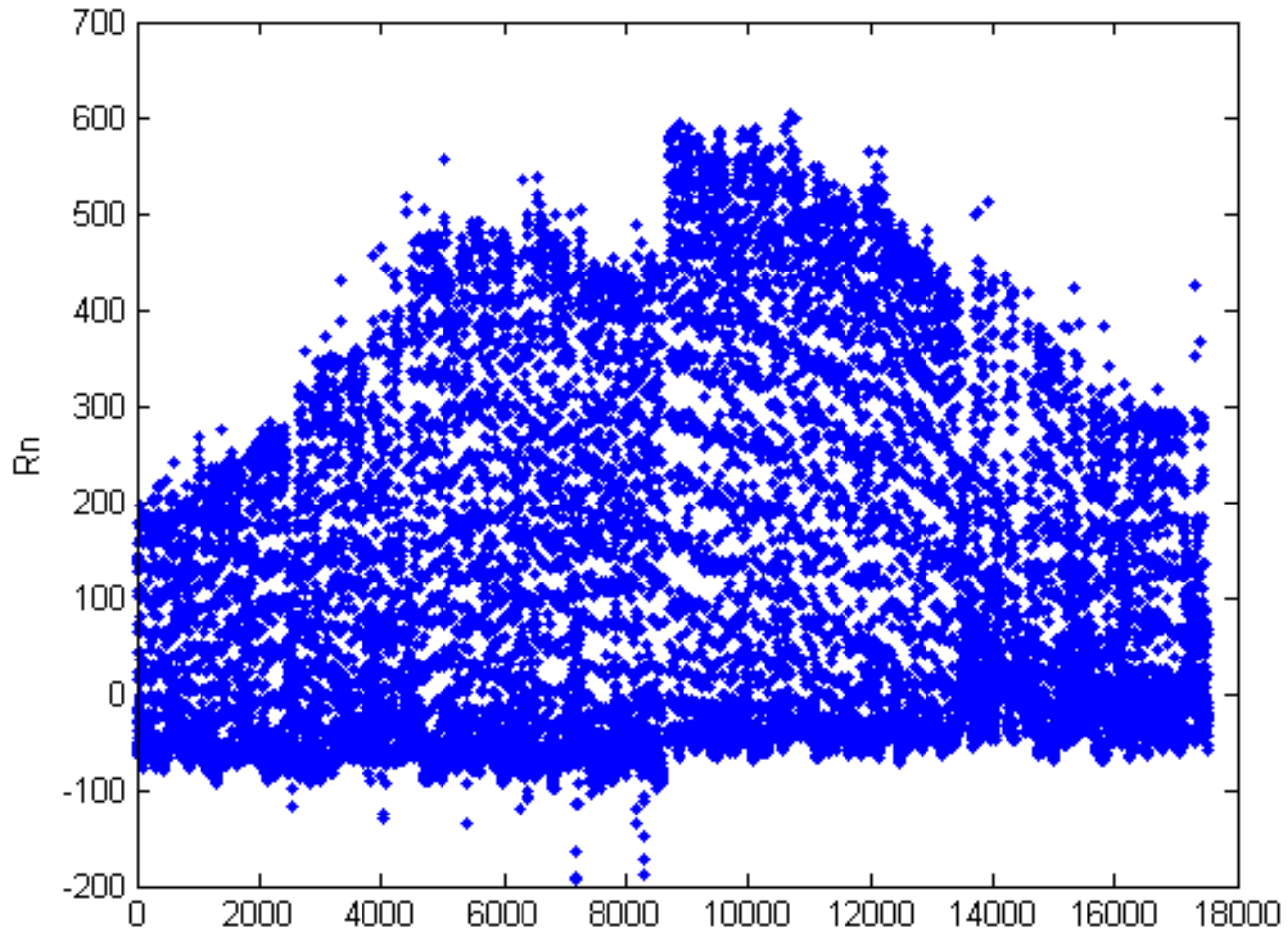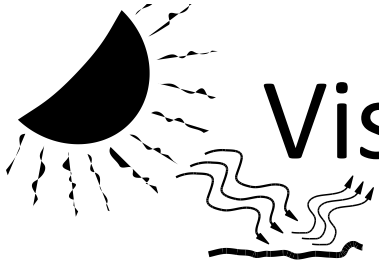

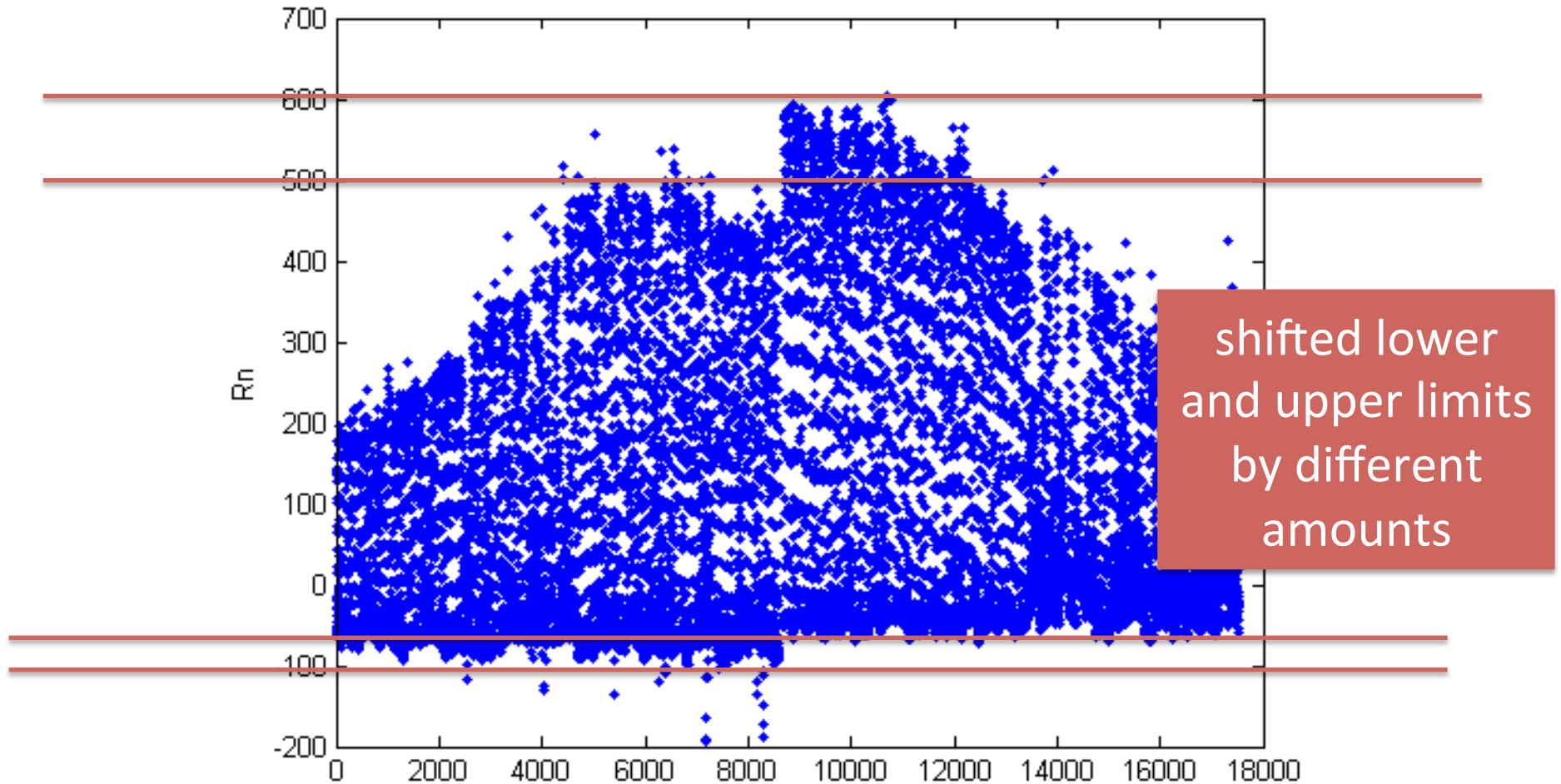Time – 14 years (1996-2009)

Visual QA/QC – Net Solar Radiation

Net Radiation (W/m^2)

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009

different levels
for maximums
and minimums

Time – 14 years (1996-2009)

Visual QA/QC – Net Radiation

Visual QA/QC – Net Radiation

shifted lower and upper limits by different amounts

Visual QA/QC – Soil Heat Flux
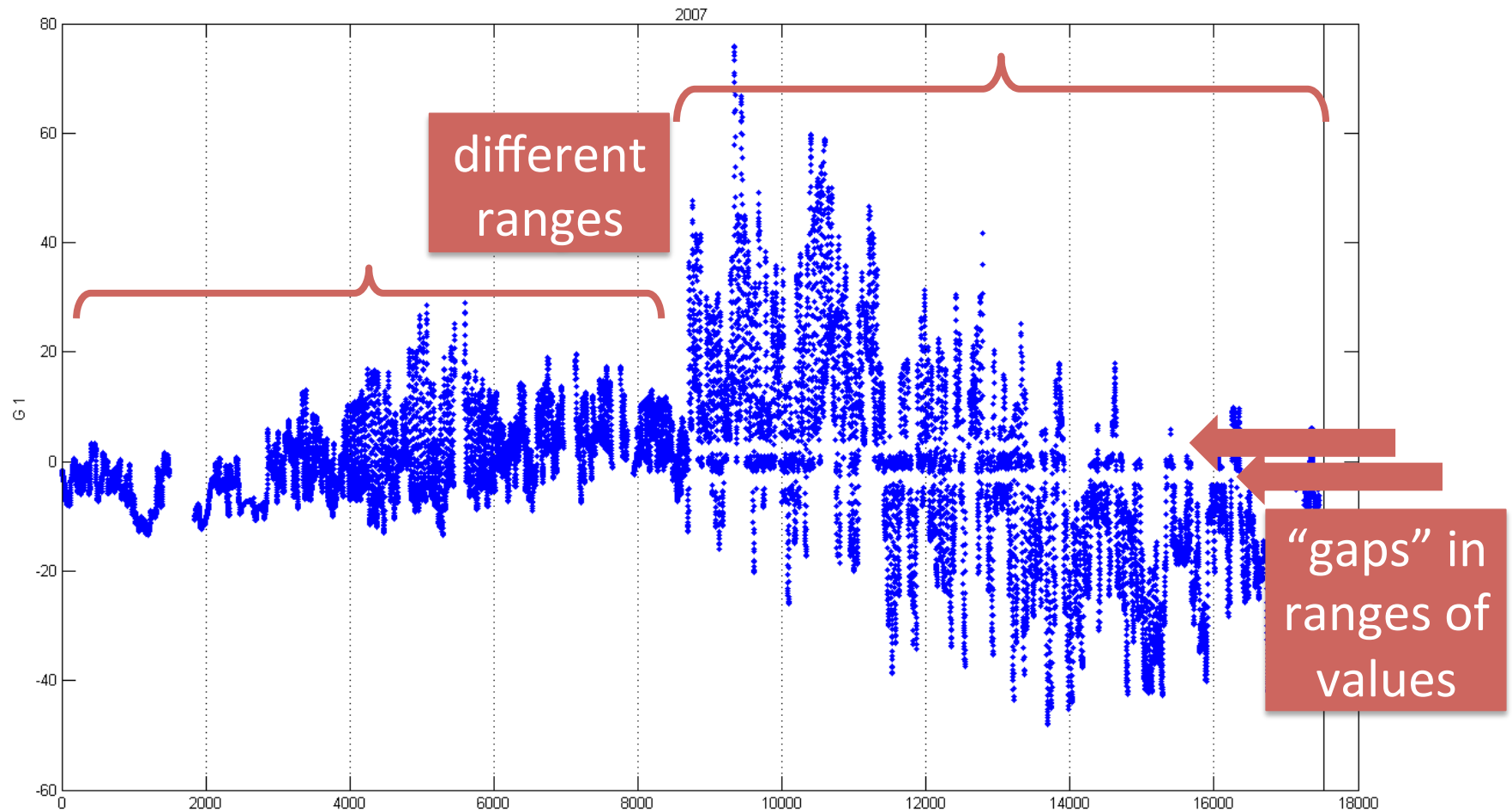
Visual QA/QC – Air Pressure

Visual QA/QC – Wind Speed

changes in sensors (model or height)
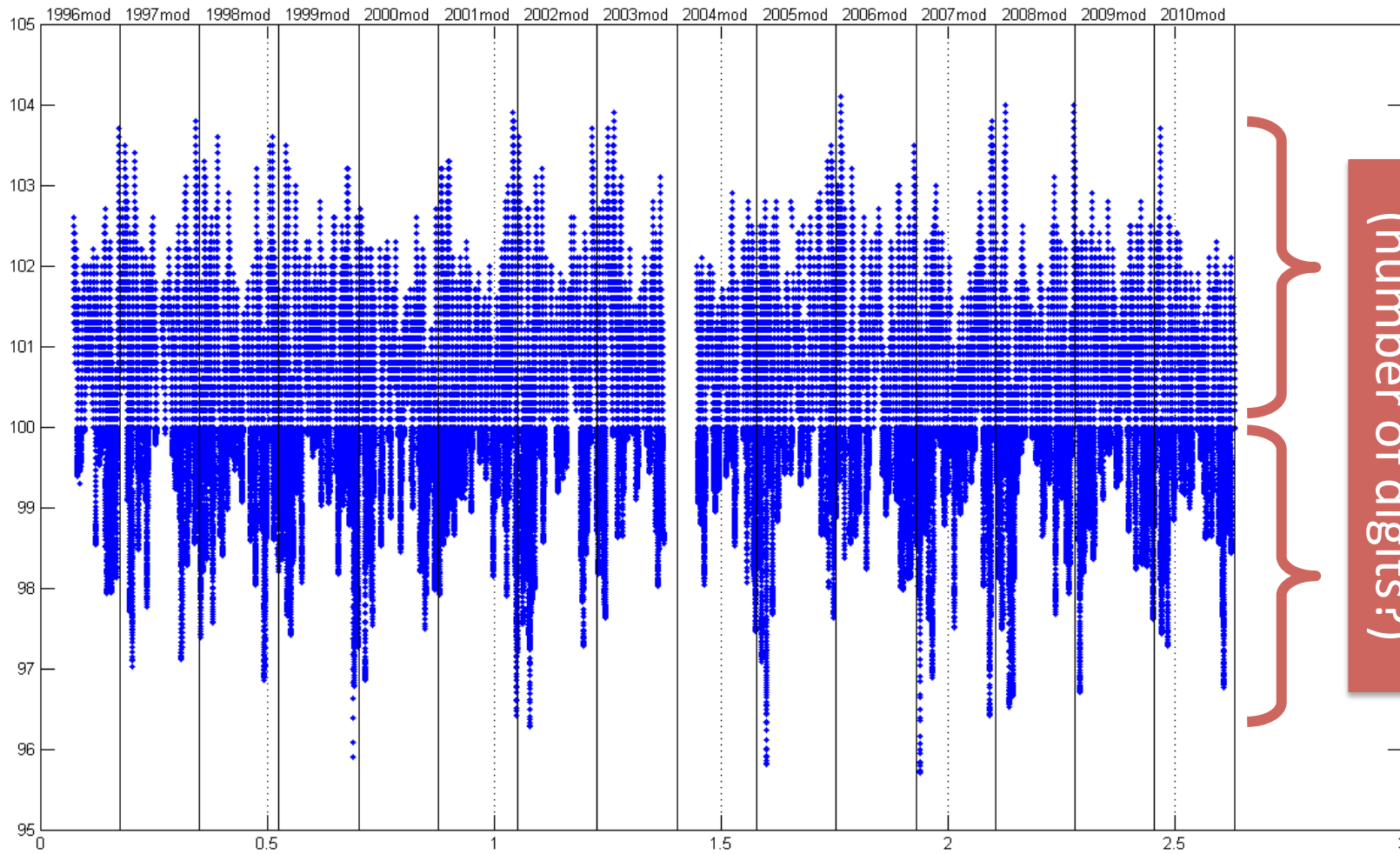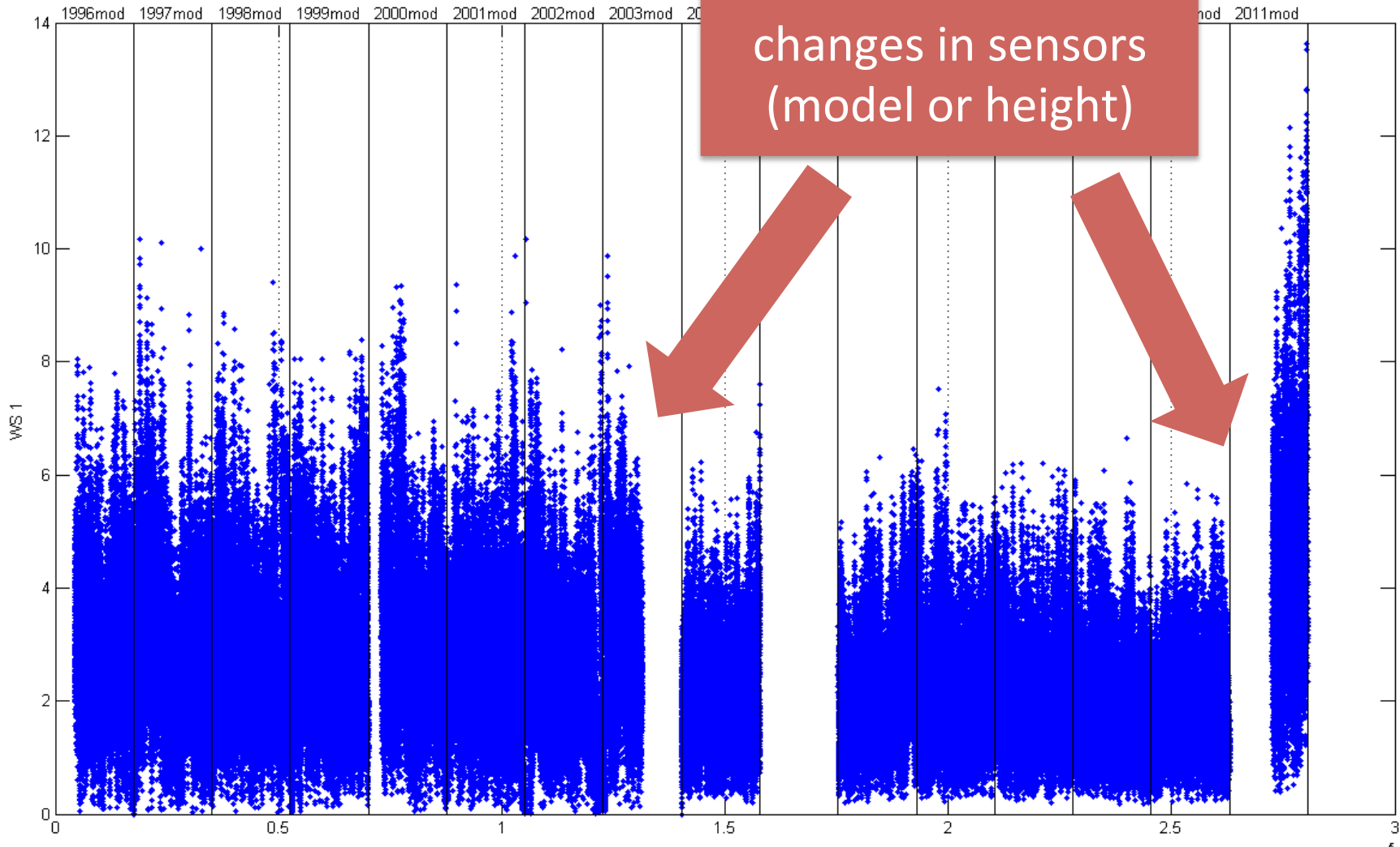
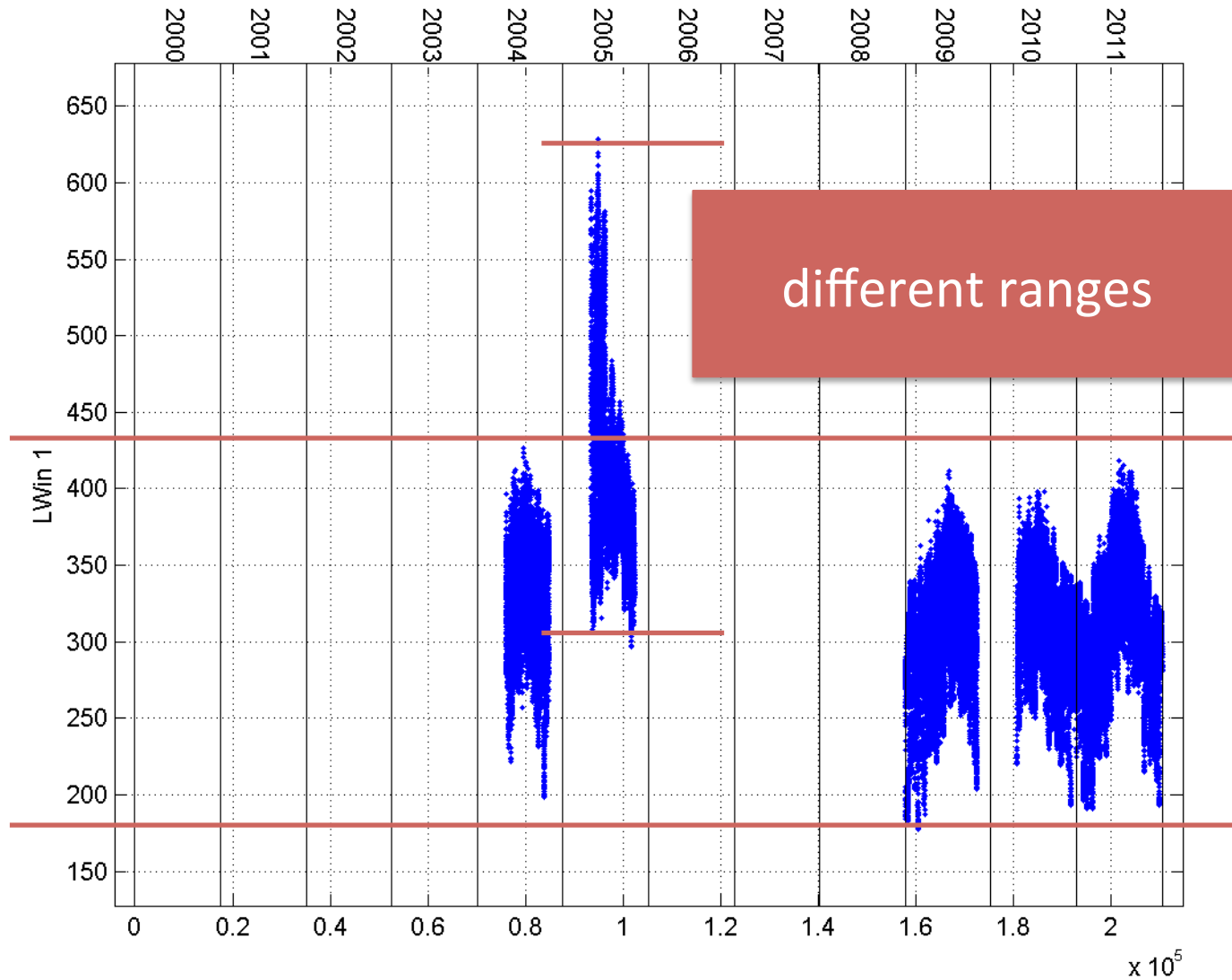# Visual QA/QC – Latent Heat
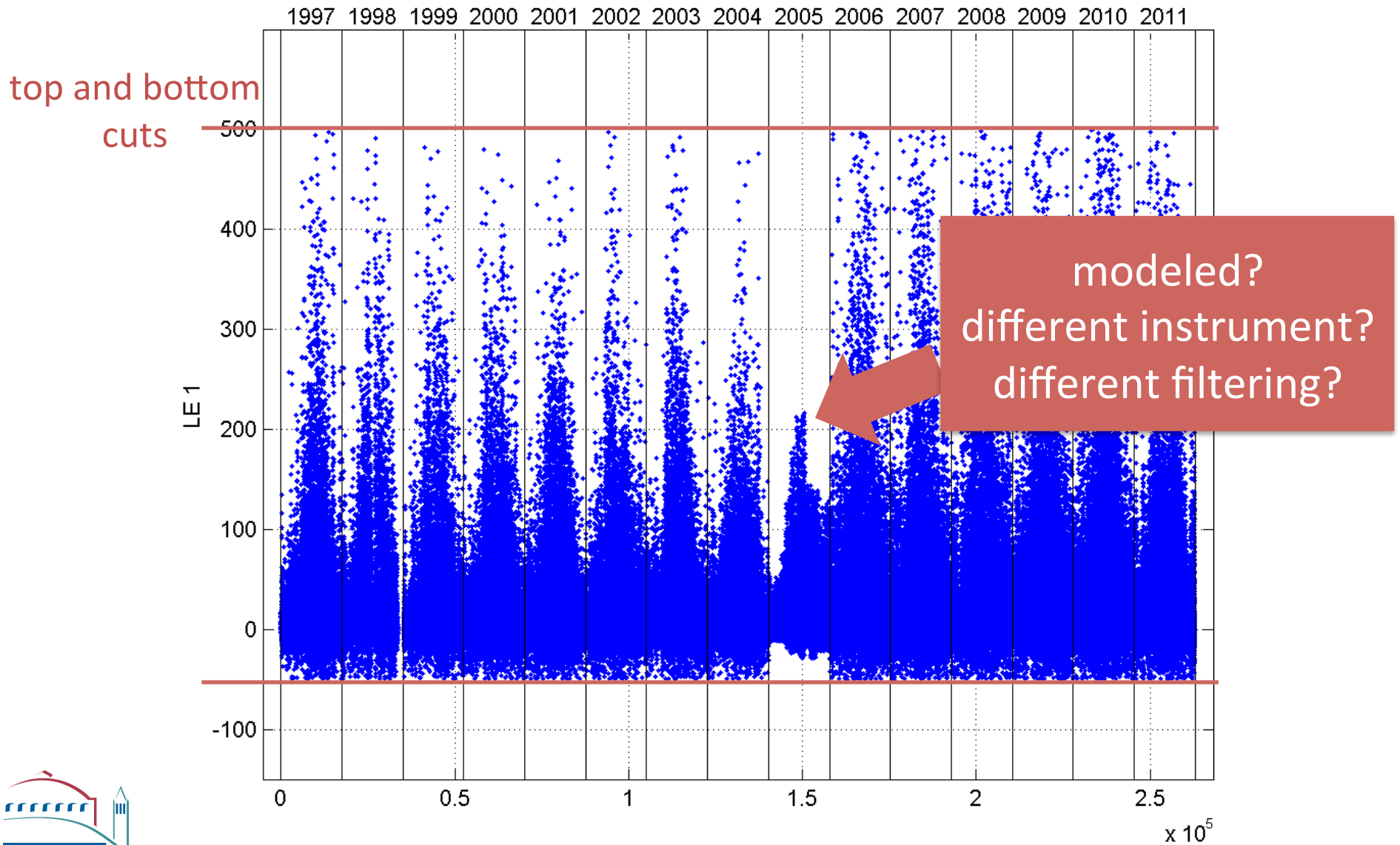
Visual QA/QC – Latent Heat

varying maximums and minimums
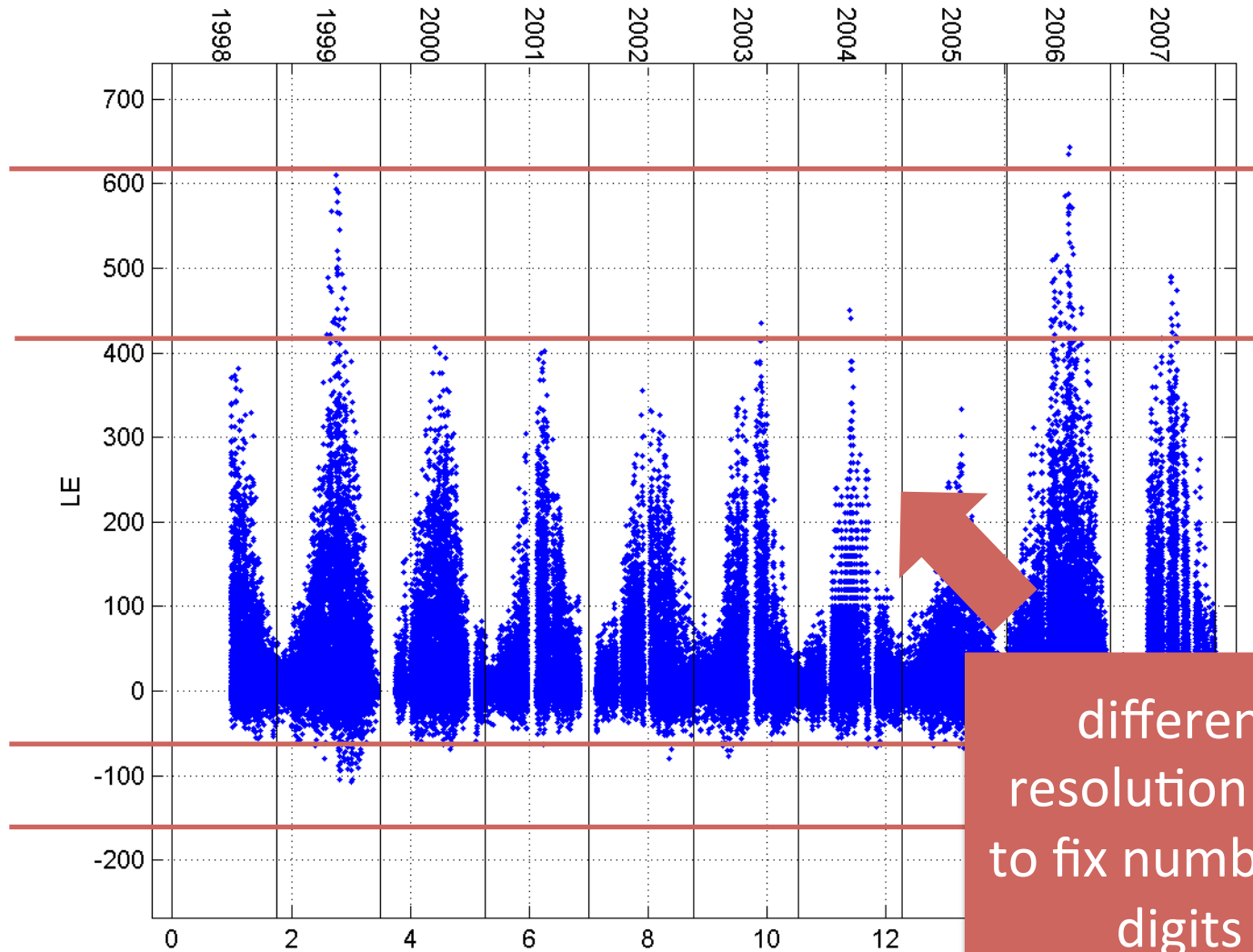
different resolution due to fix number of digits
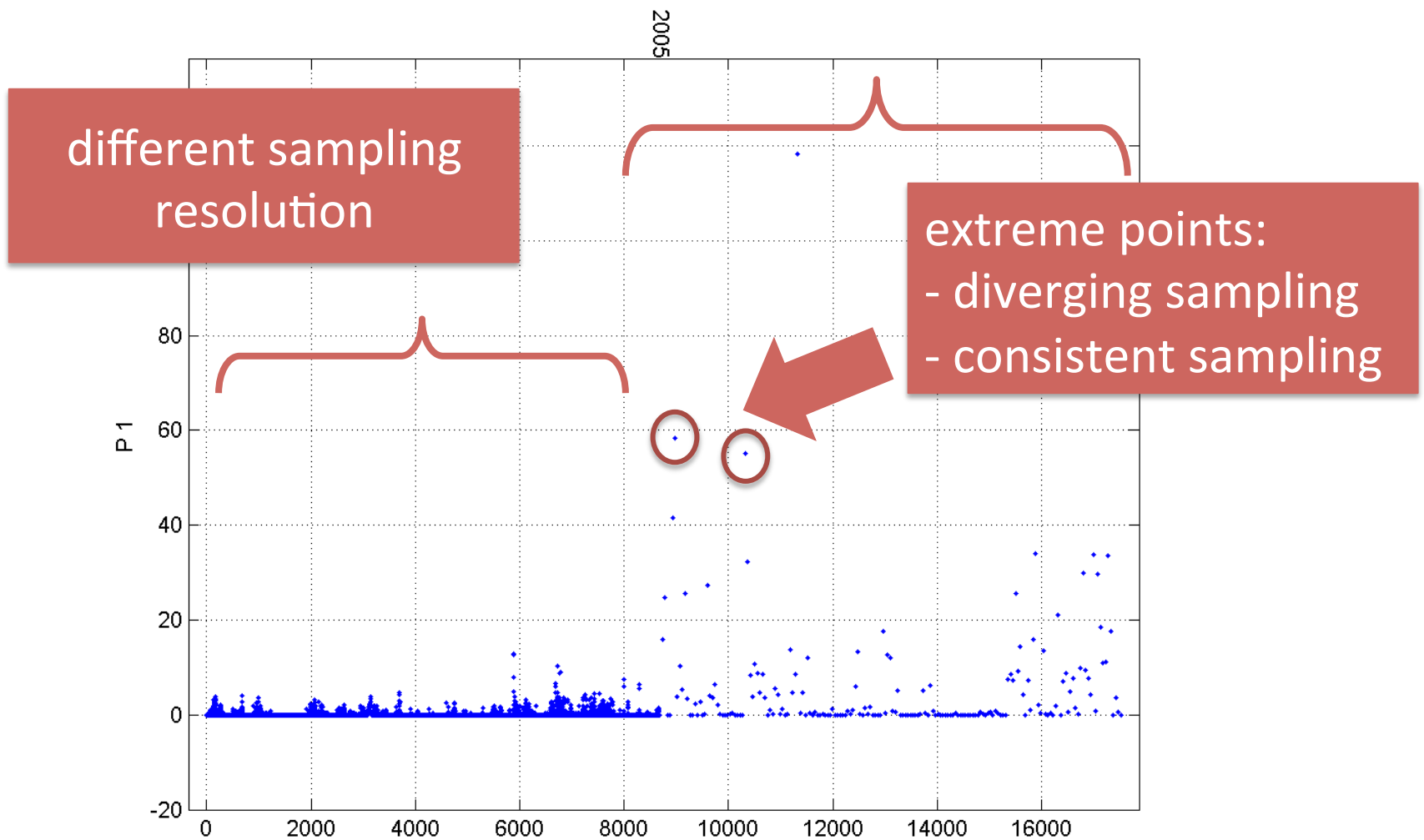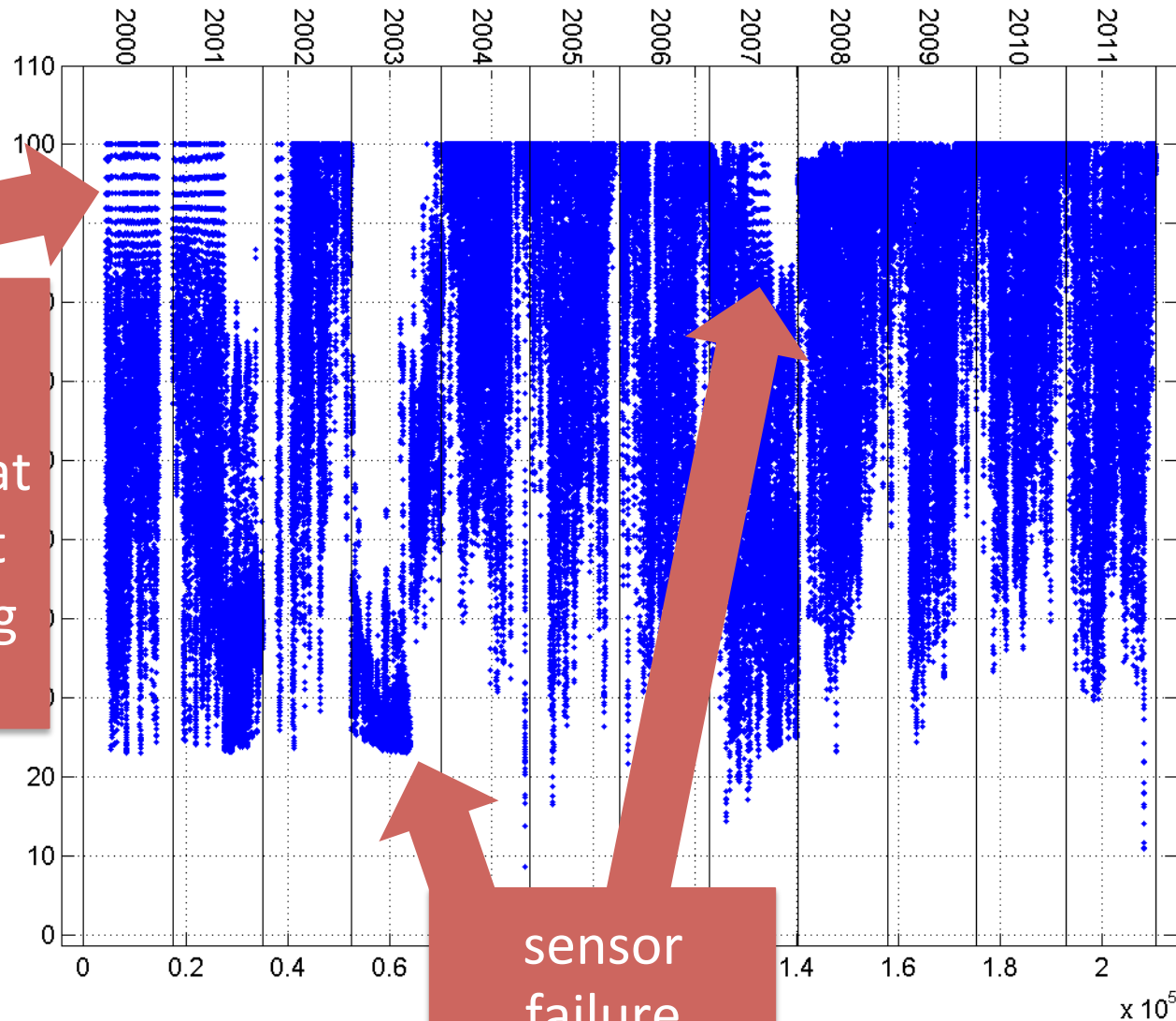
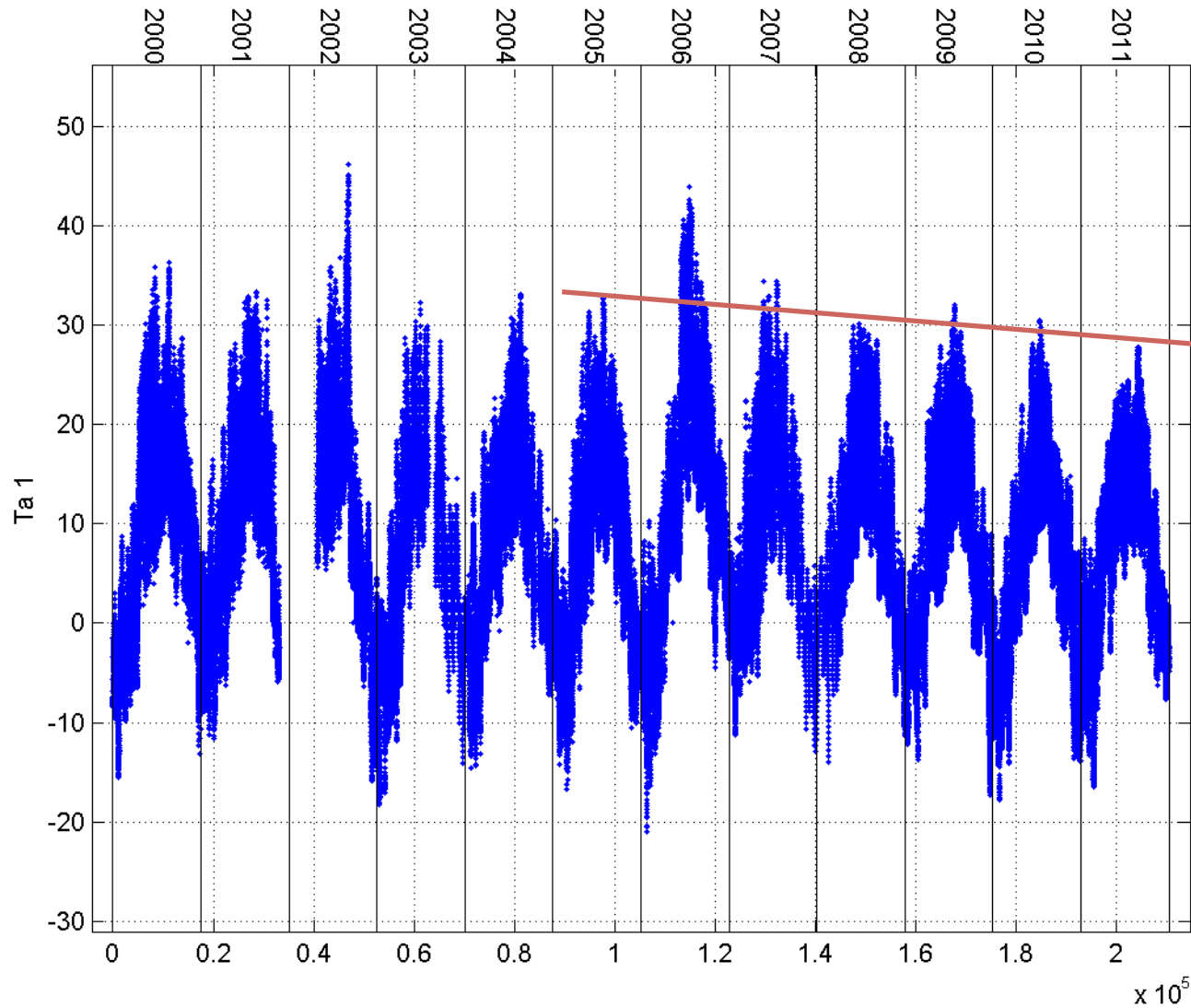# Visual QA/QC – CO₂ Turbulent Flux
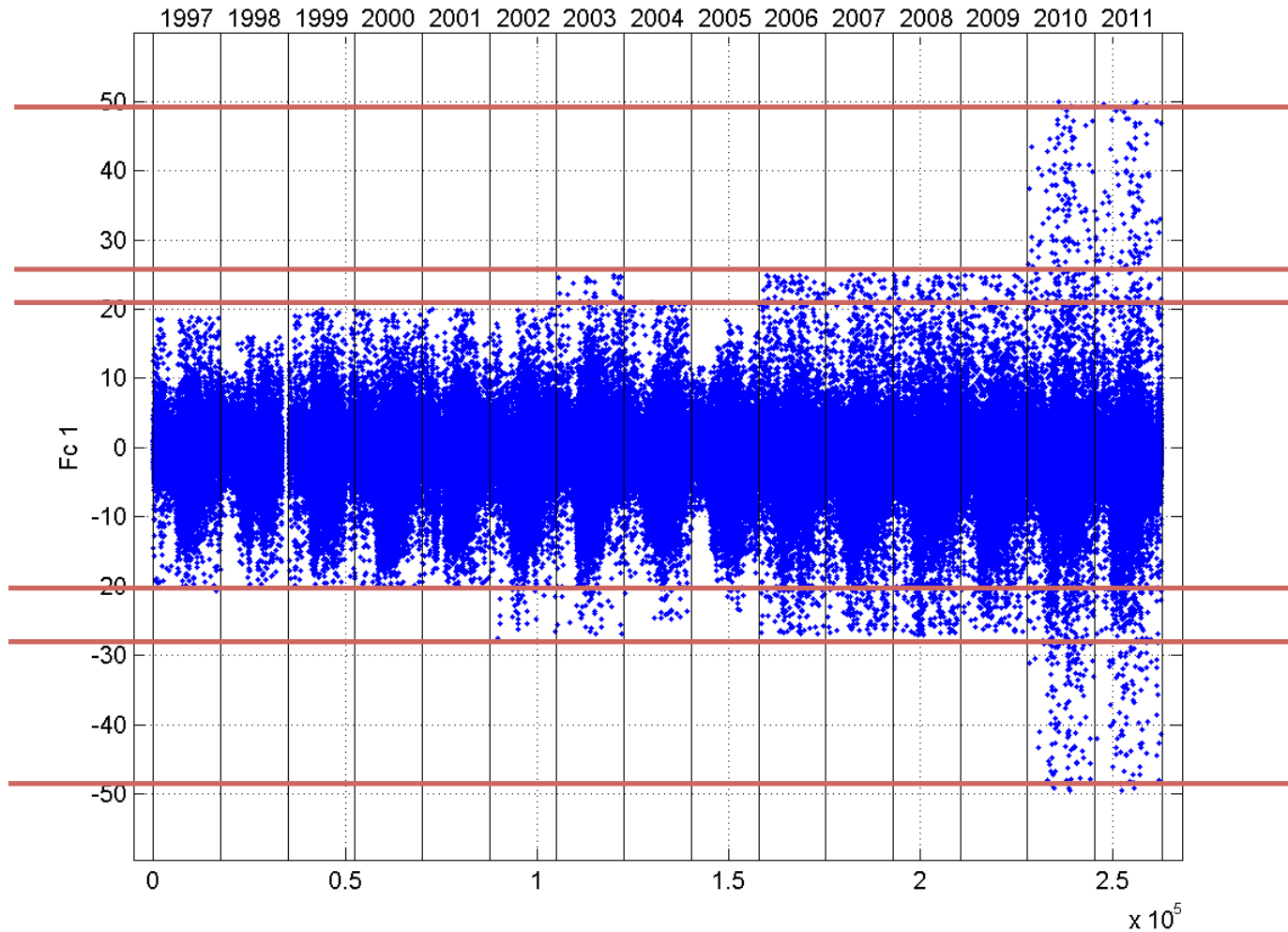
Visual QA/QC – Long Wave Radiation

different ranges

Visual QA/QC – Precipitation

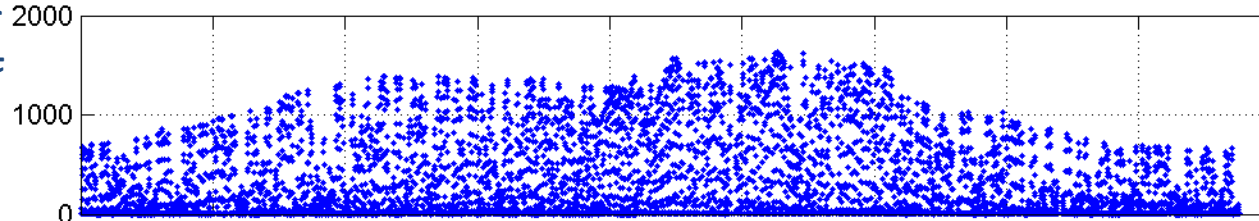# Visual QA/QC – Relative Humidity

Visual QA/QC – Air Temperature

apparent small trend in maximums: real?

Visual QA/QC – PPFD vs SW_IN
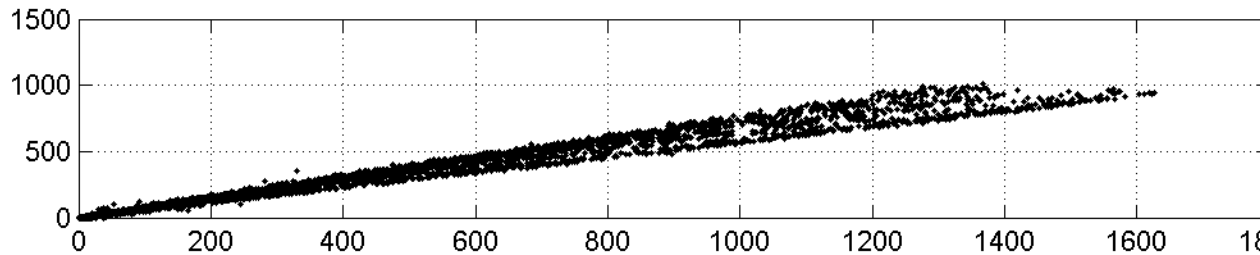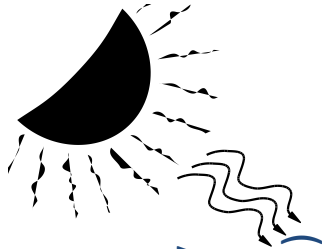
Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – PPFD vs SW_IN

SWin vs PPFD: JPTak 2000

Visual QA/QC – PPFD vs SW_IN

"perfect" match: derived data
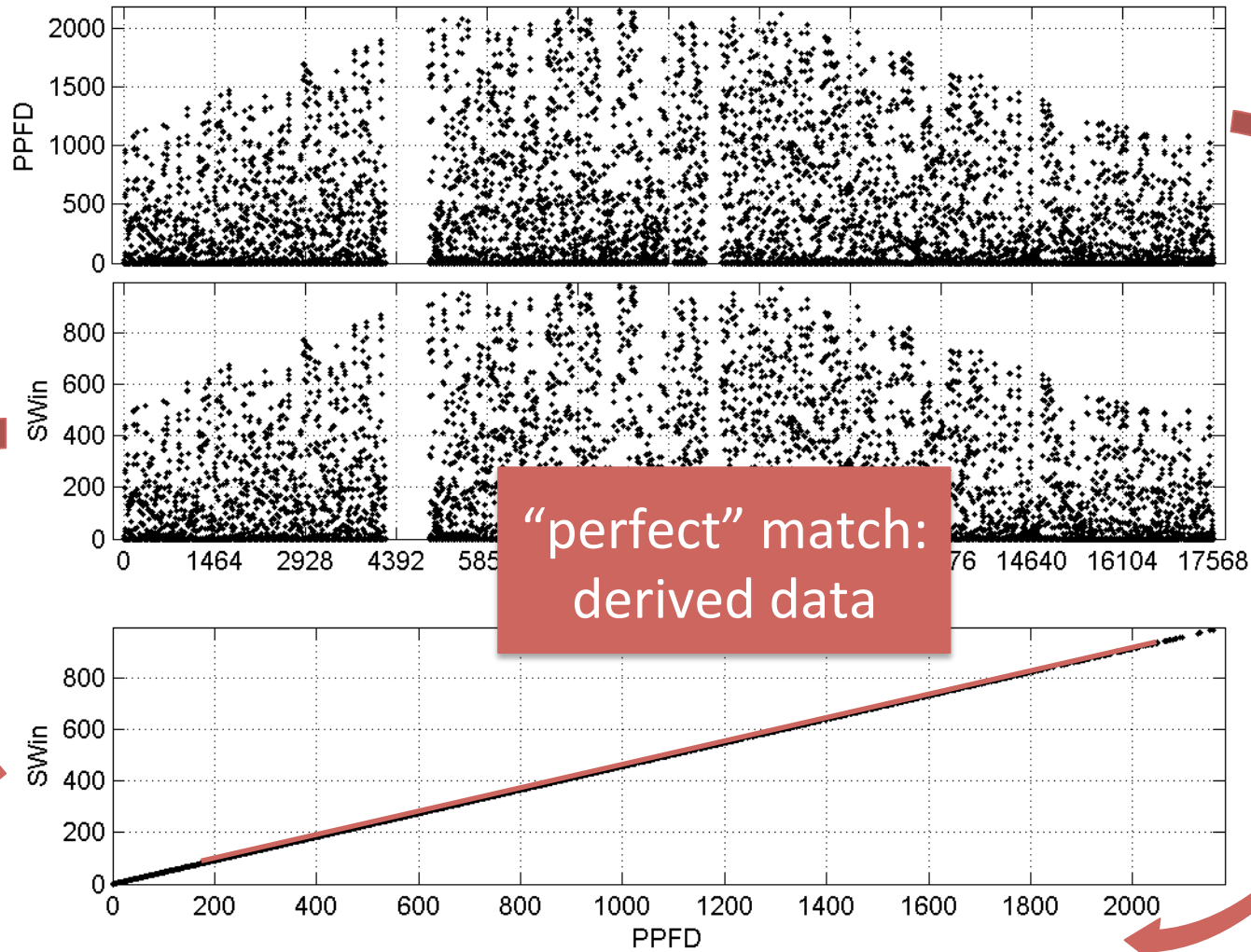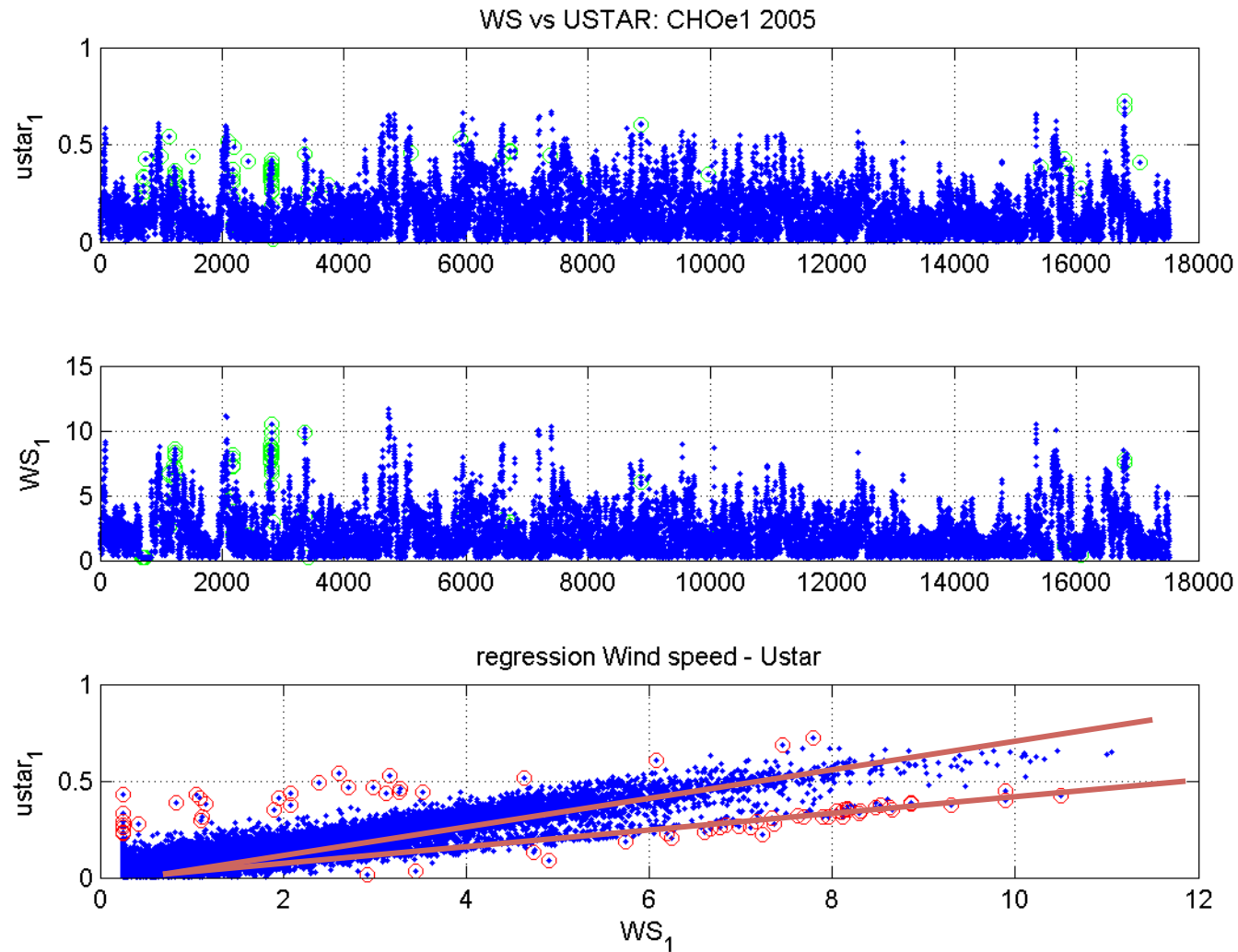
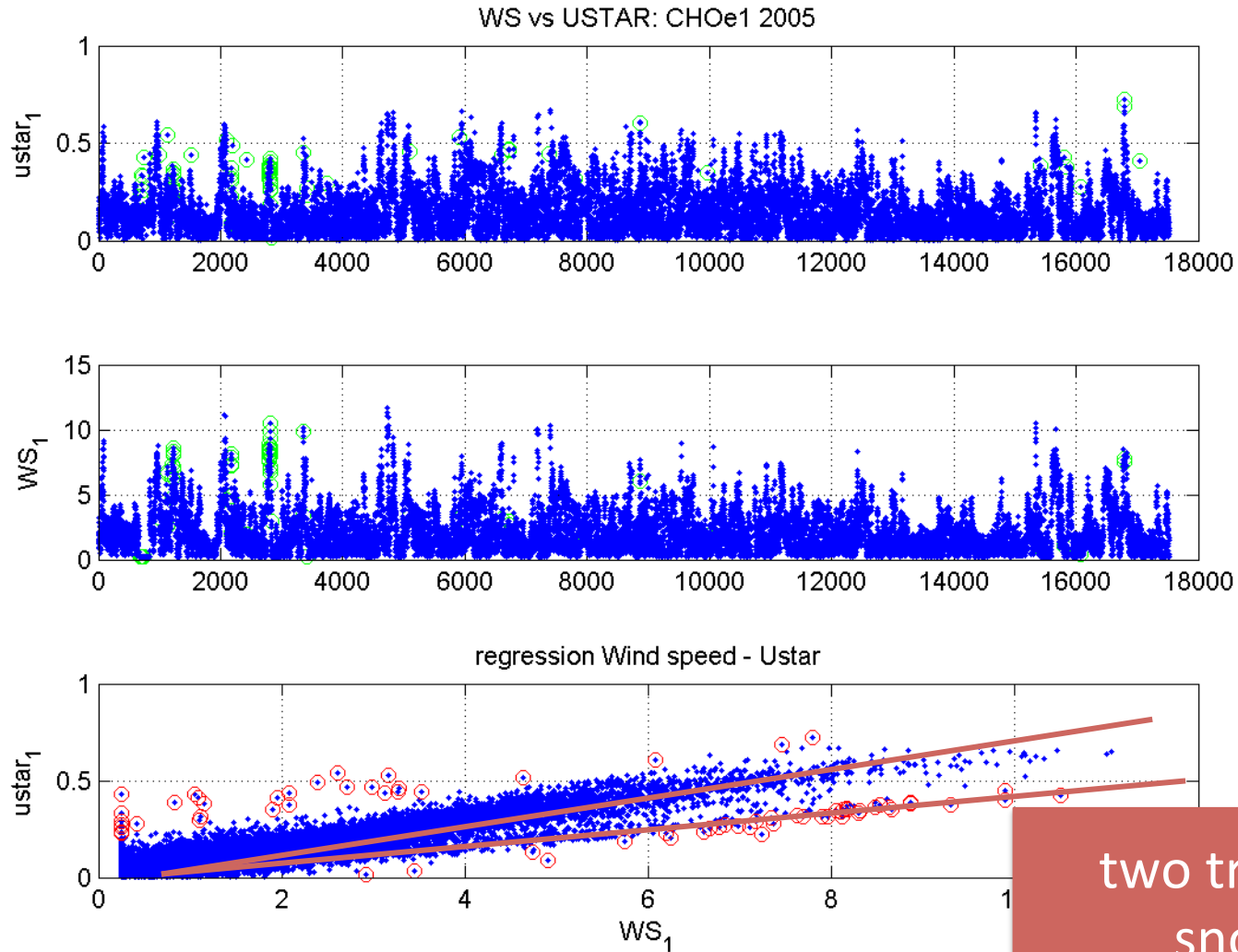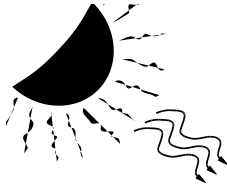# Visual QA/QC – Wind Speed vs U*
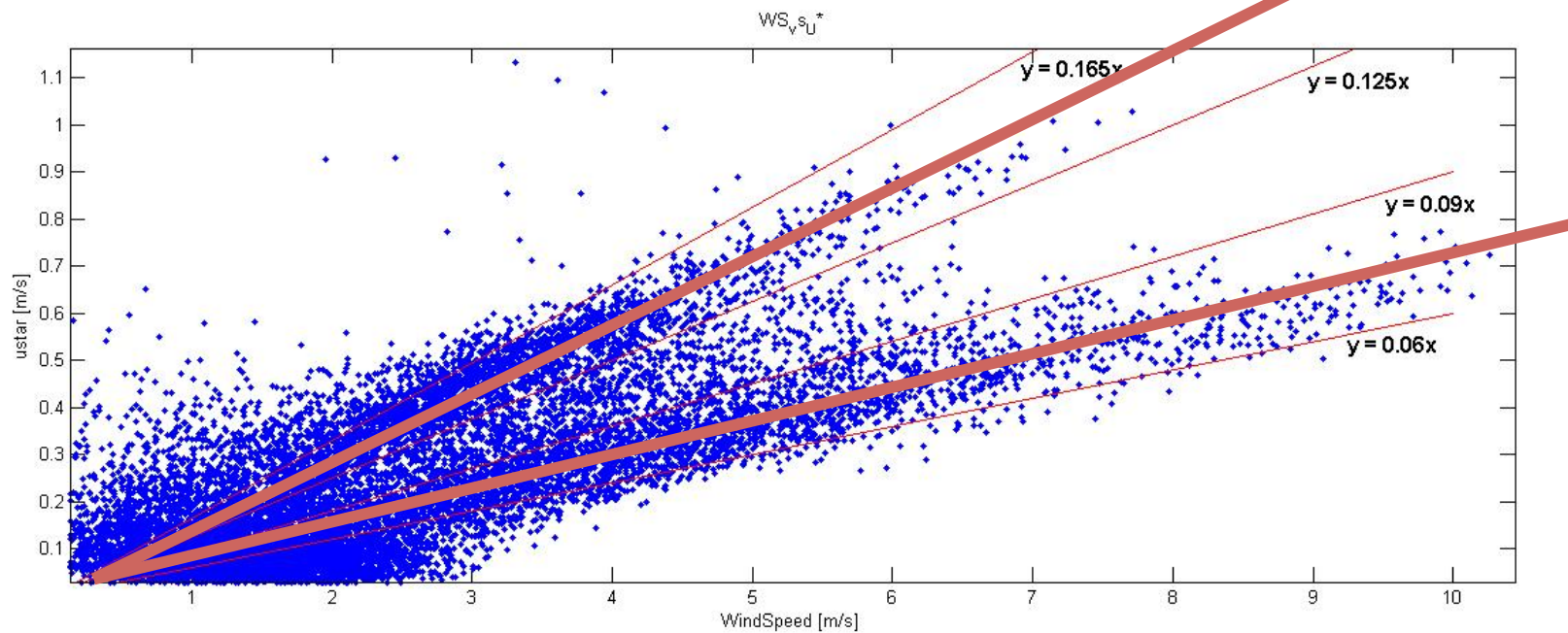
Visual QA/QC – Wind Speed vs U*
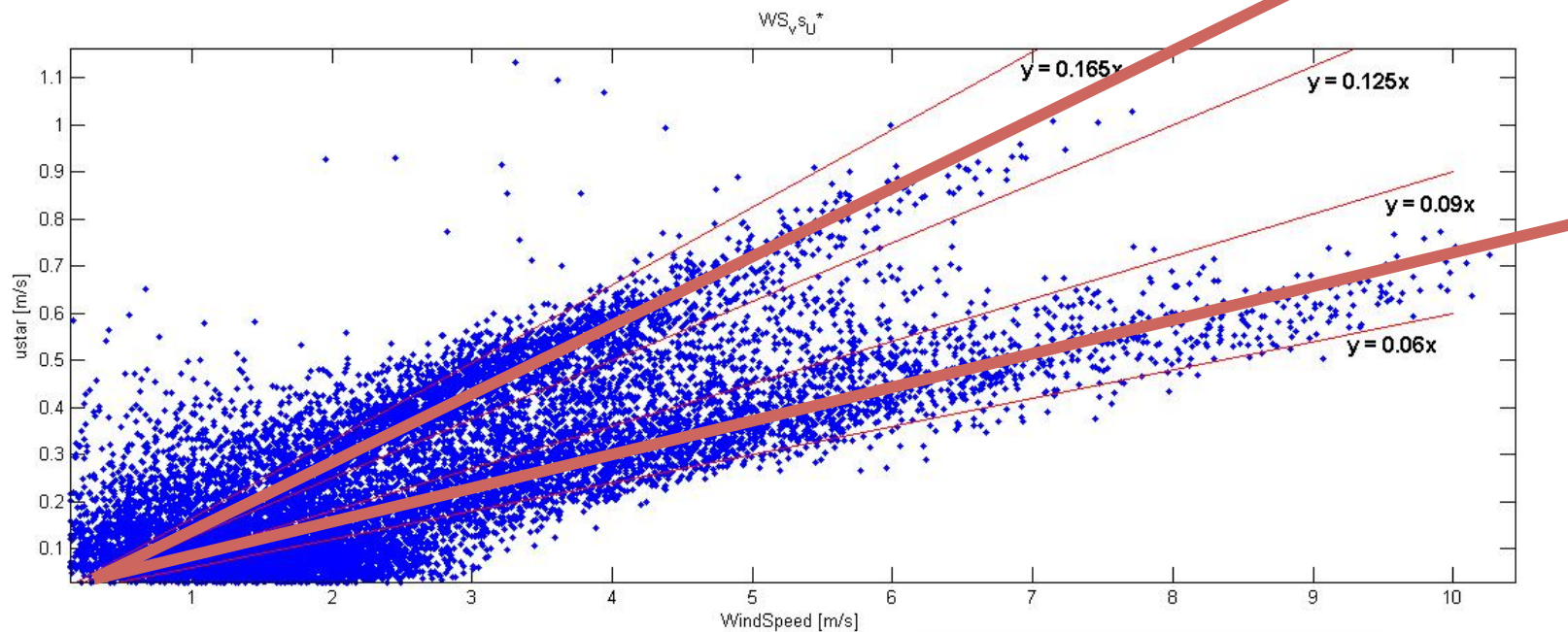
two trends:
leaf budding

Visual QA/QC – Wind Speed vs U*
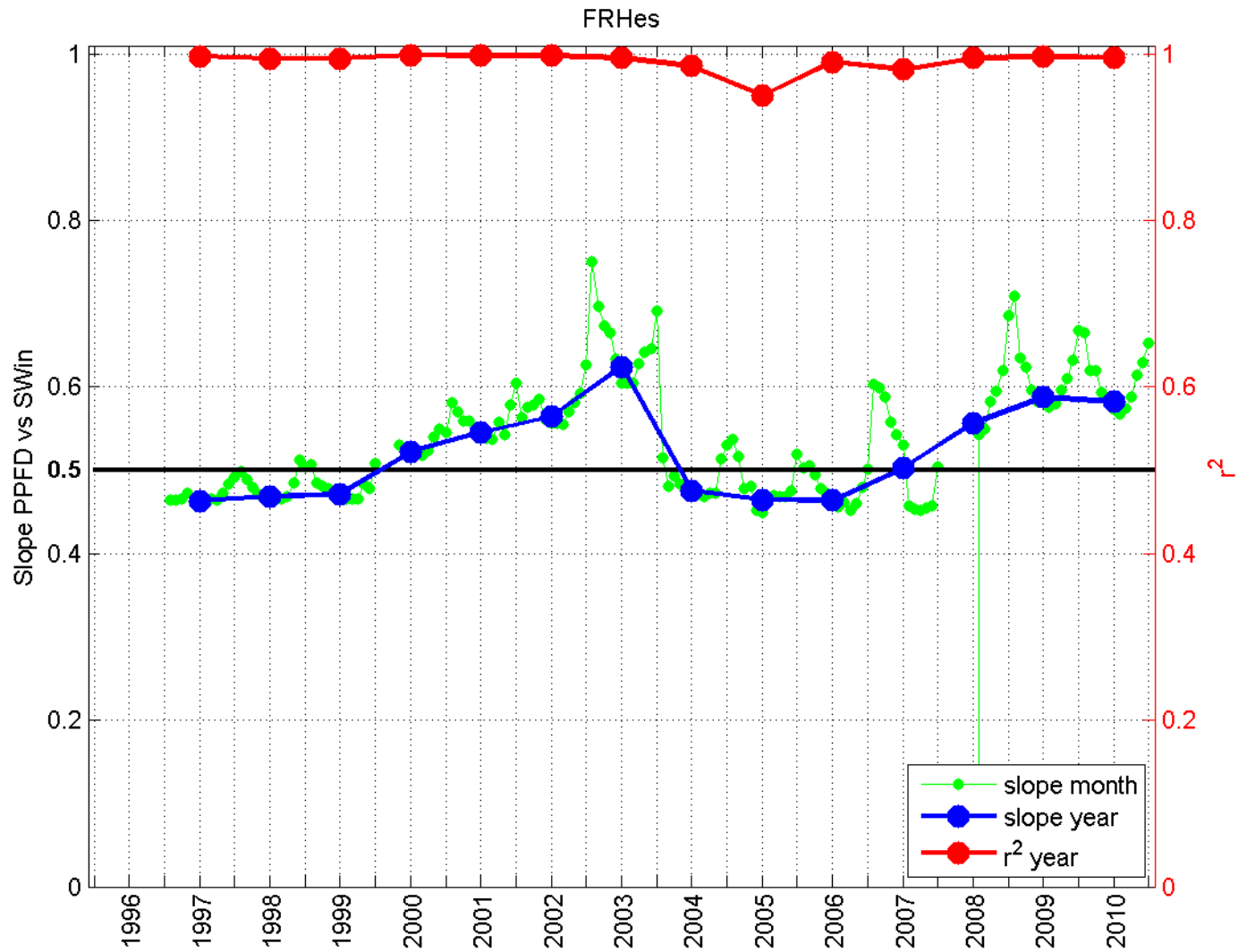
Visual QA/QC – Wind Speed vs U*

WS vs USTAR: CHOe1 2005

regression Wind speed - Ustar

two trends: snow

Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – PPFD vs SW_IN

FRHes

- green: monthly variation
- seasonal variation on sun angle
- sensor cosine response

Visual QA/QC – PPFD vs SW_IN

FRHes

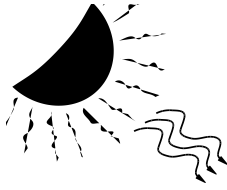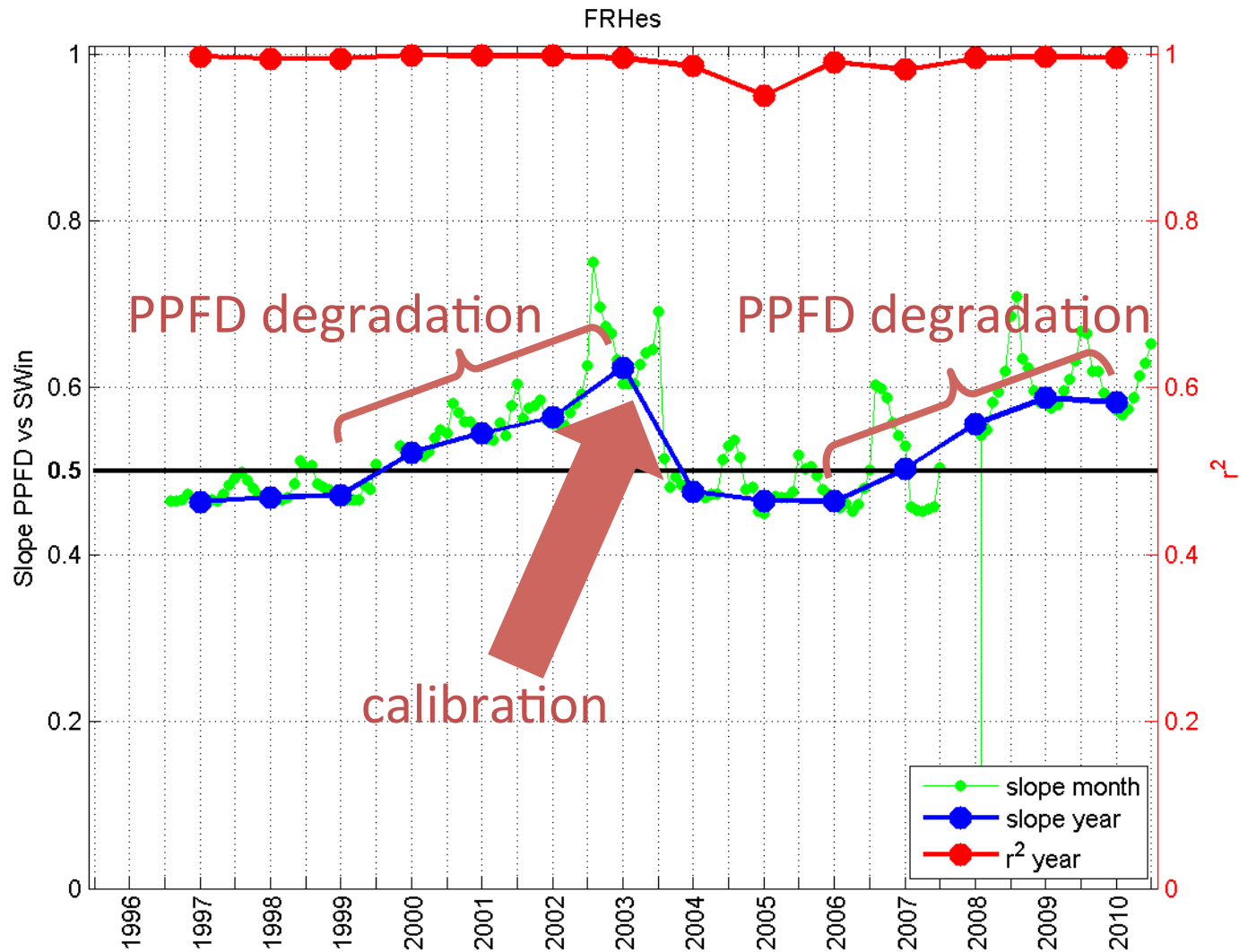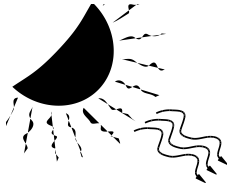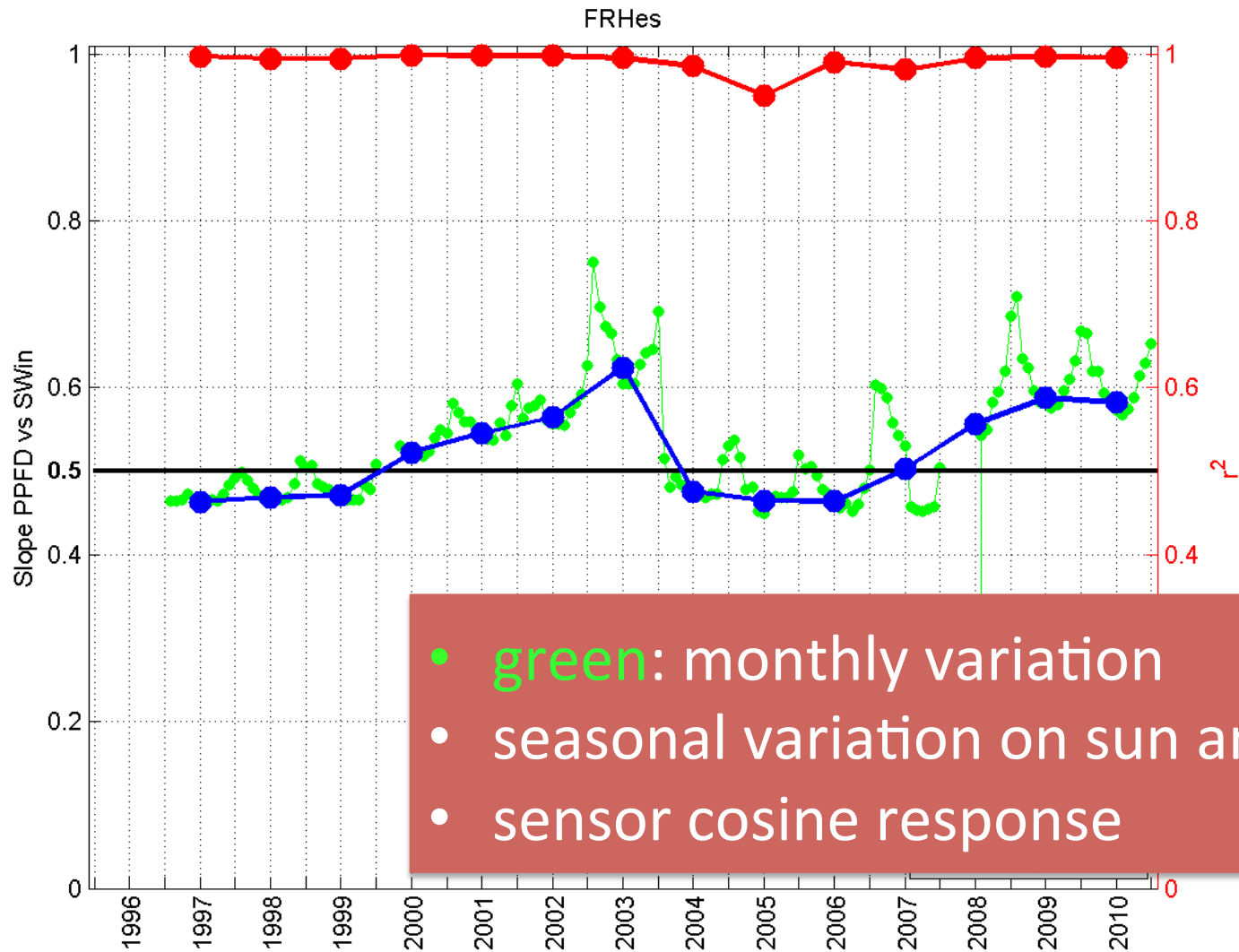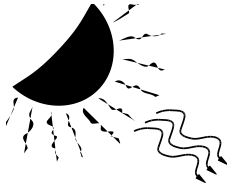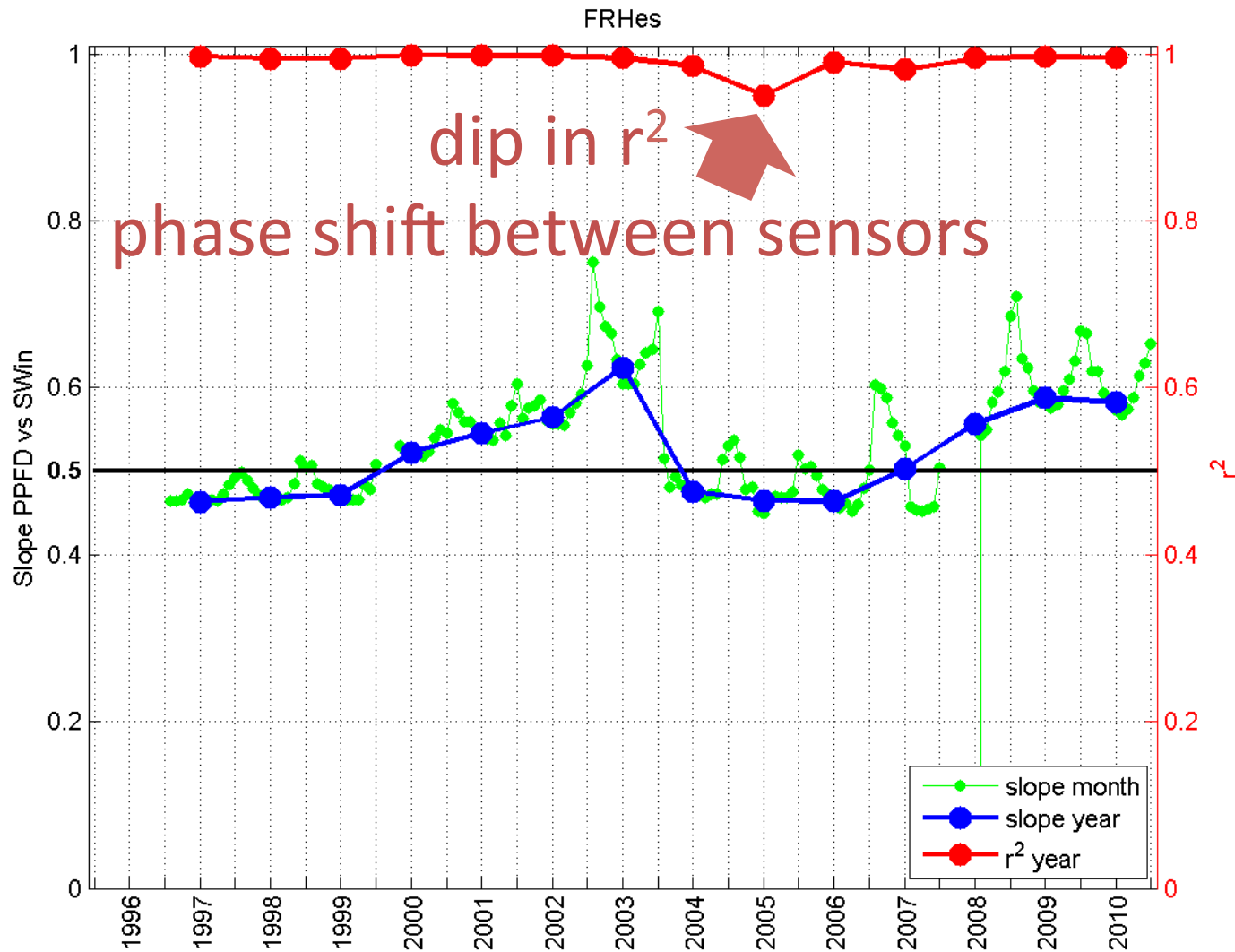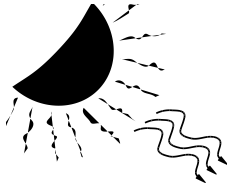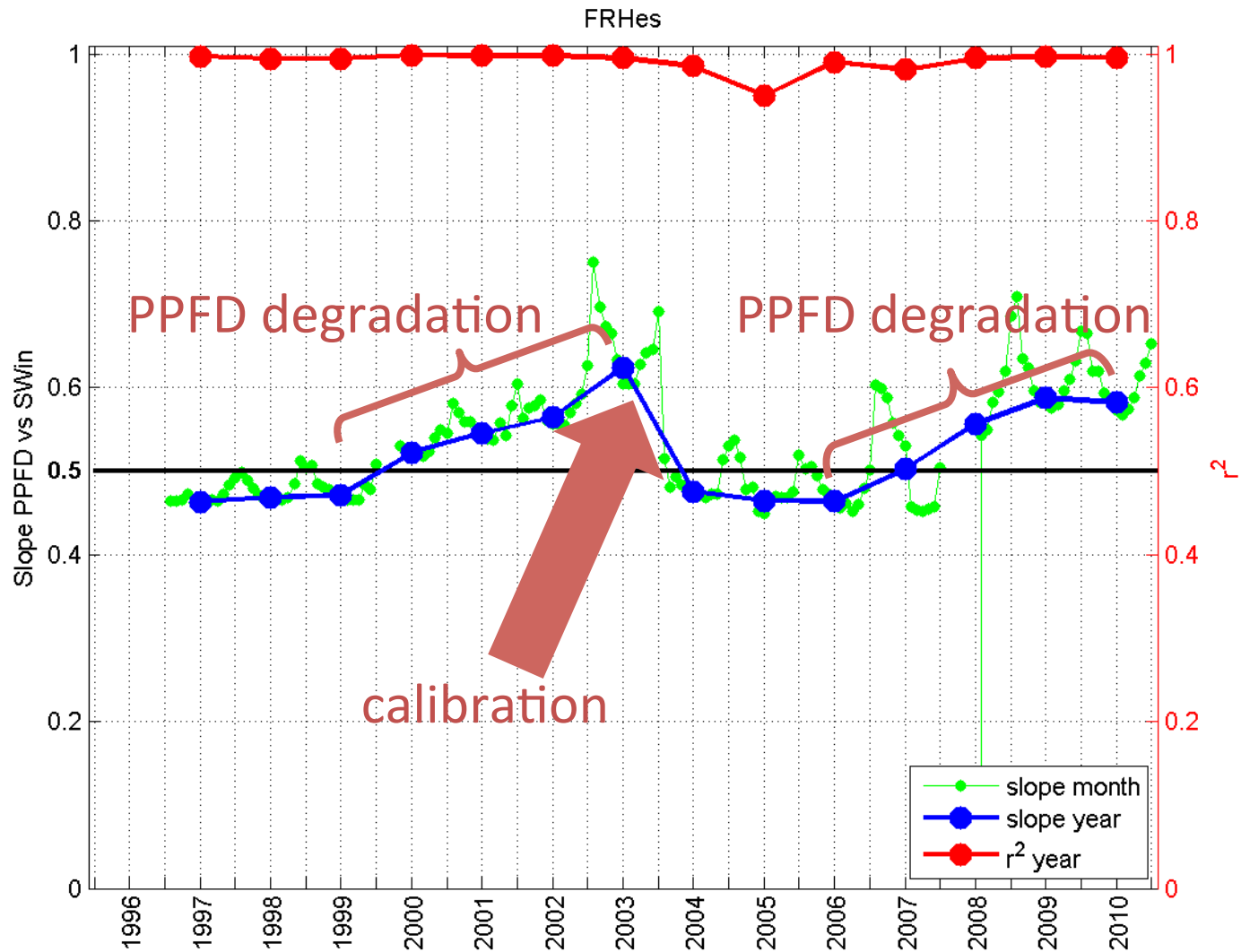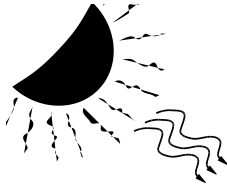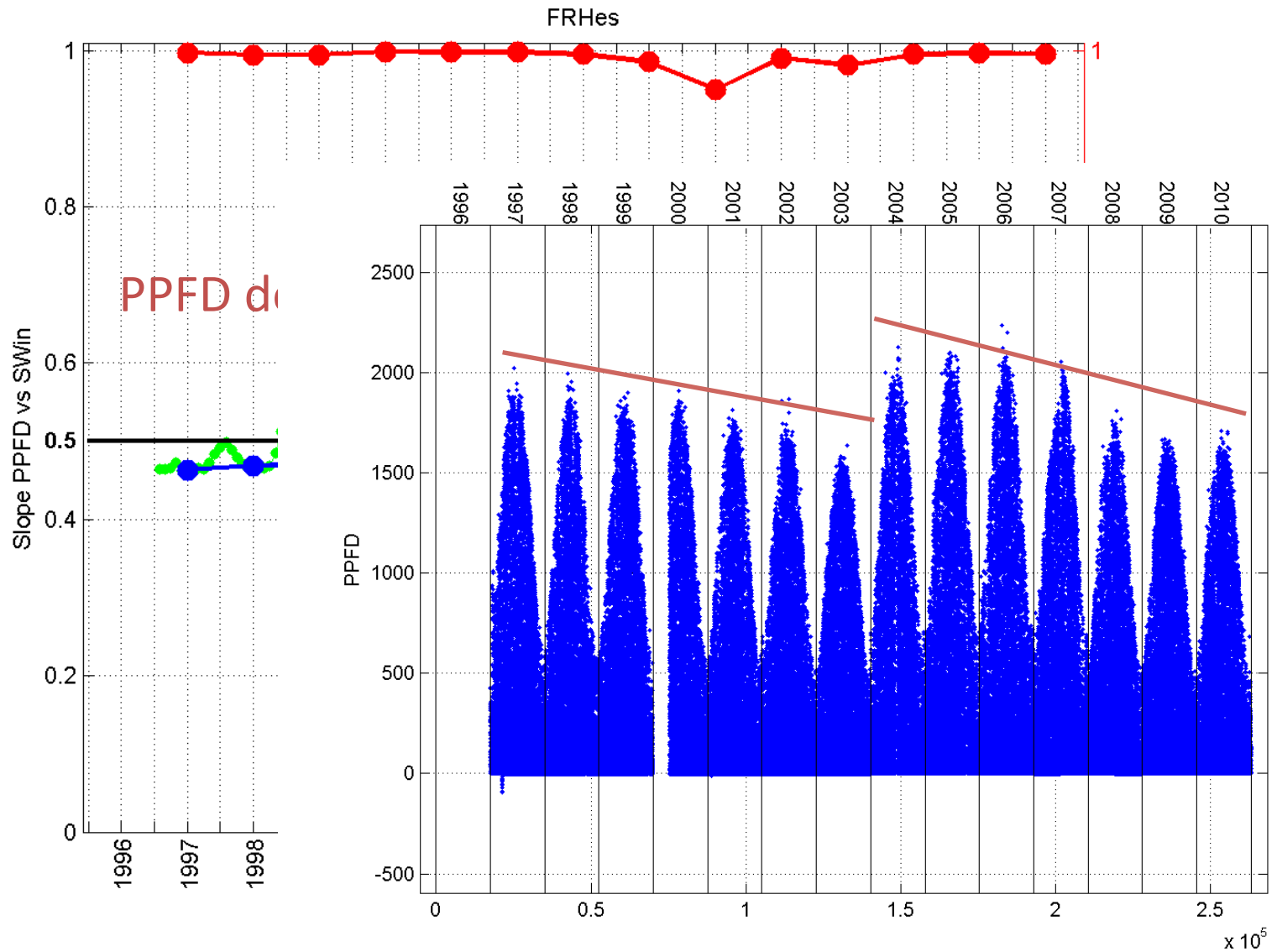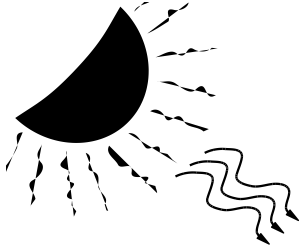dip in r^2

phase shift between sensors
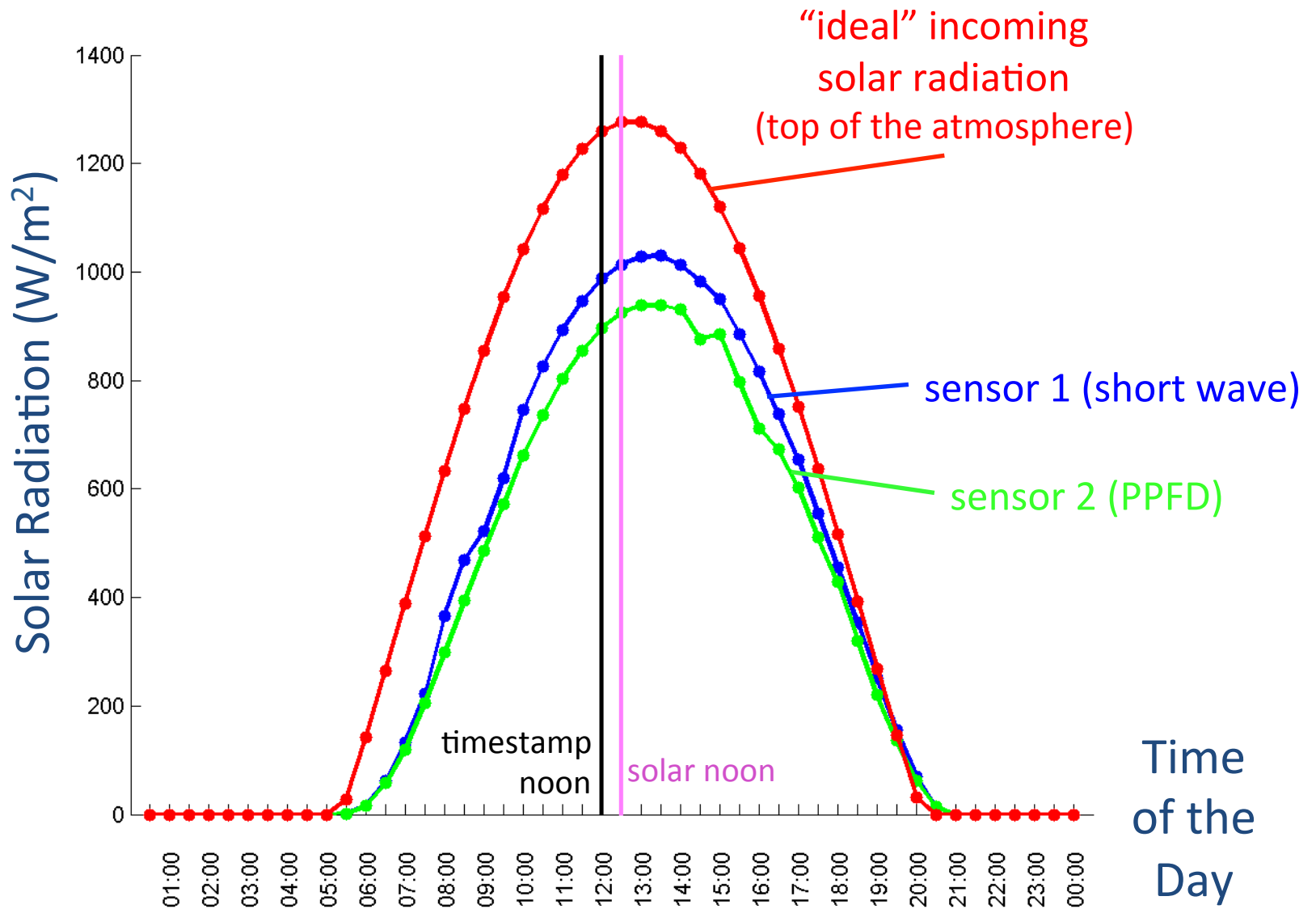
slope month
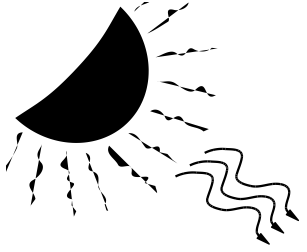slope year
r^2 year

Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – PPFD vs SW_IN

Visual QA/QC – Timestamps through Radiation and Solar Noon

Visual QA/QC – Timestamps through Radiation and Solar Noon

Visual QA/QC – Timestamps through Radiation and Solar Noon

Visual QA/QC – Timestamps through Radiation and Solar Noon

ITMBo 2005

"flat top" caused by partial shifts in timestamp

Legend:
- SWin (blue)
- SWin_PPFD (green)
- SWin_pot (red)
- 12:00 (black)
- S noon (12:19) (pink)

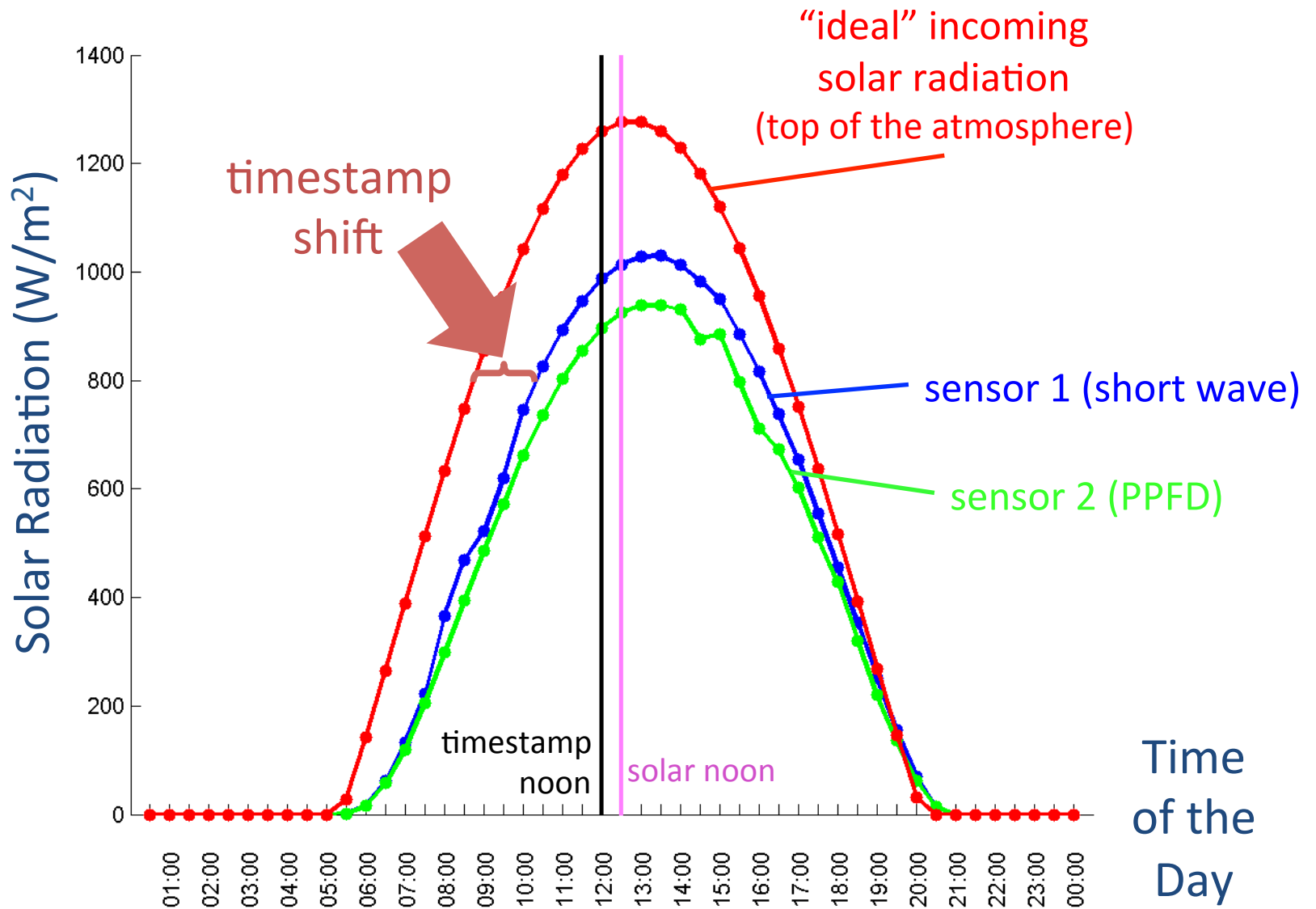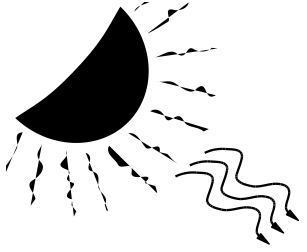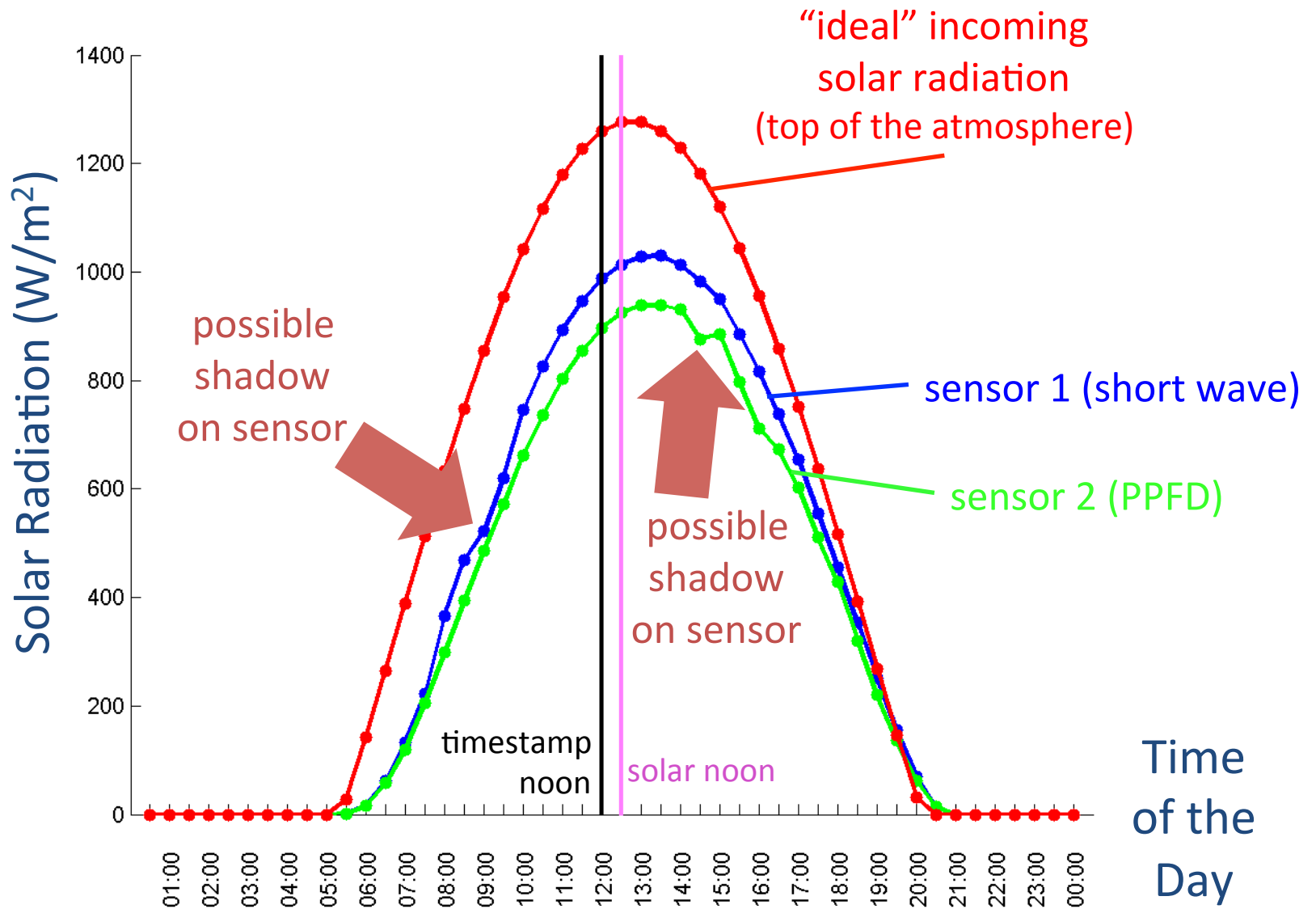Y-axis: Radiation W m^{-2}

X-axis: Hour

Visual QA/QC – Timestamps through Radiation and Solar Noon

Visual QA/QC – Timestamps through Radiation and Solar Noon

ITRen 2005

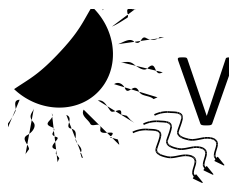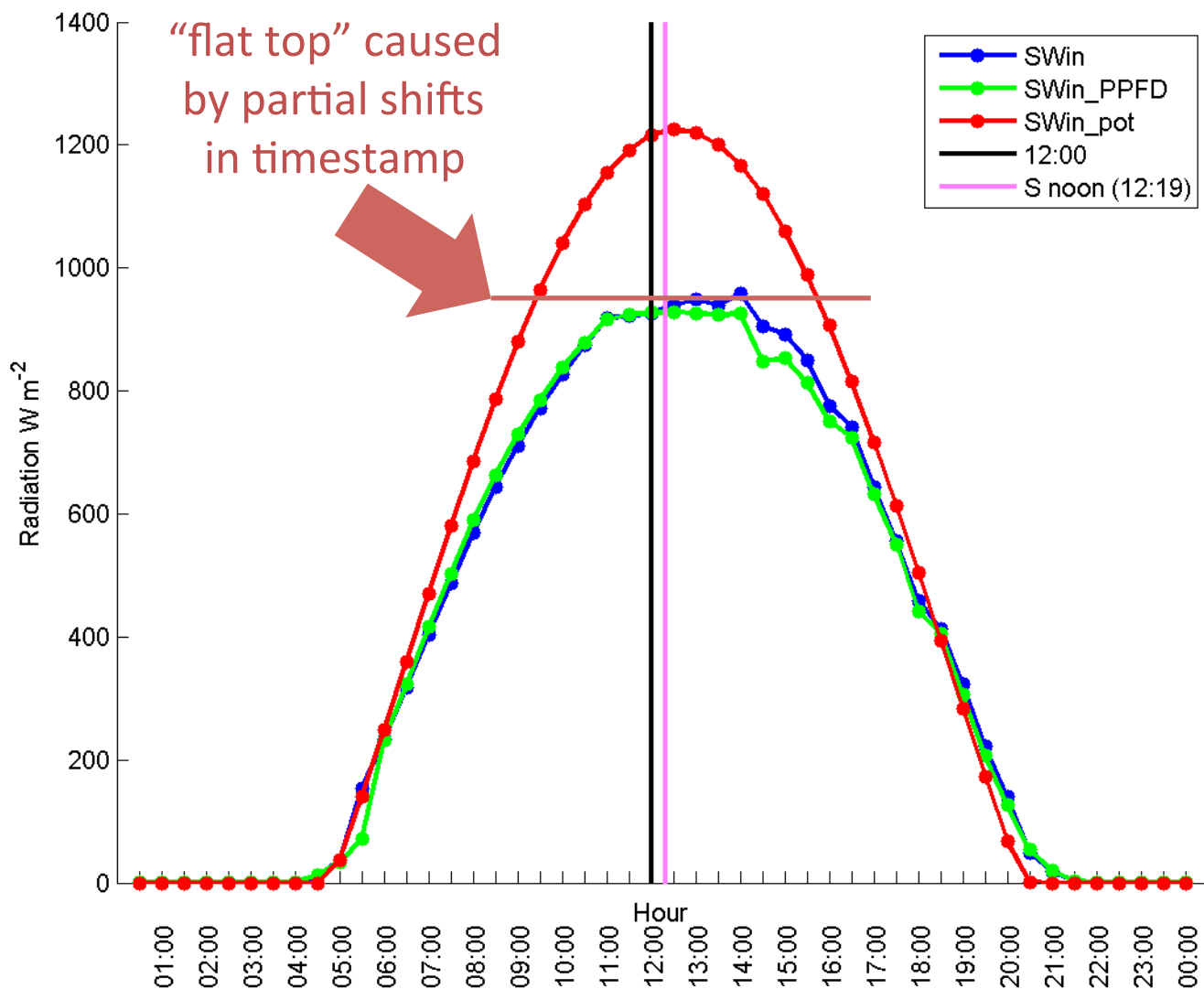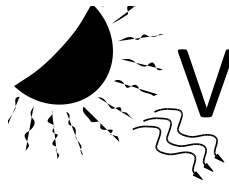shadow on both sensors in the afternoon

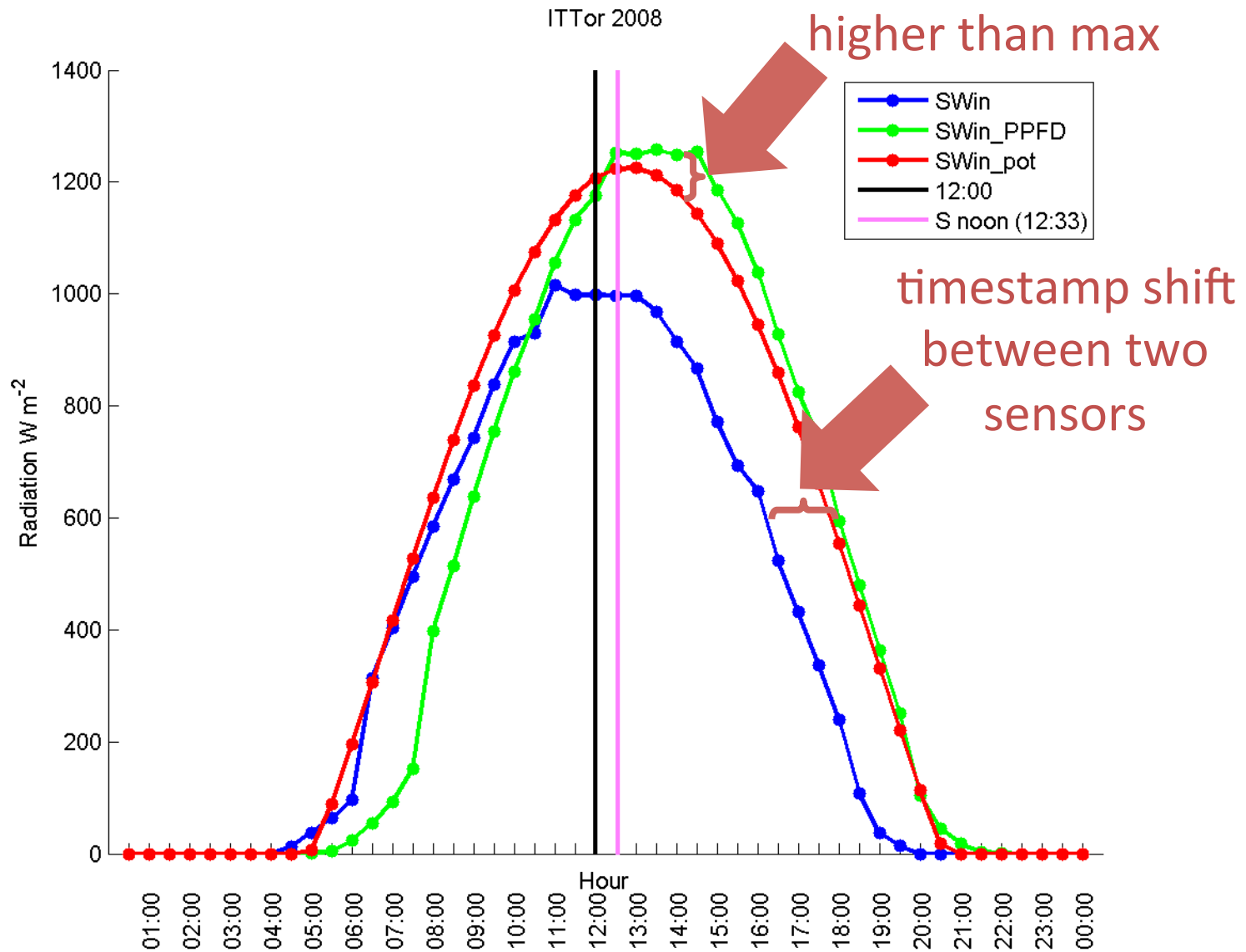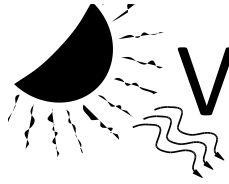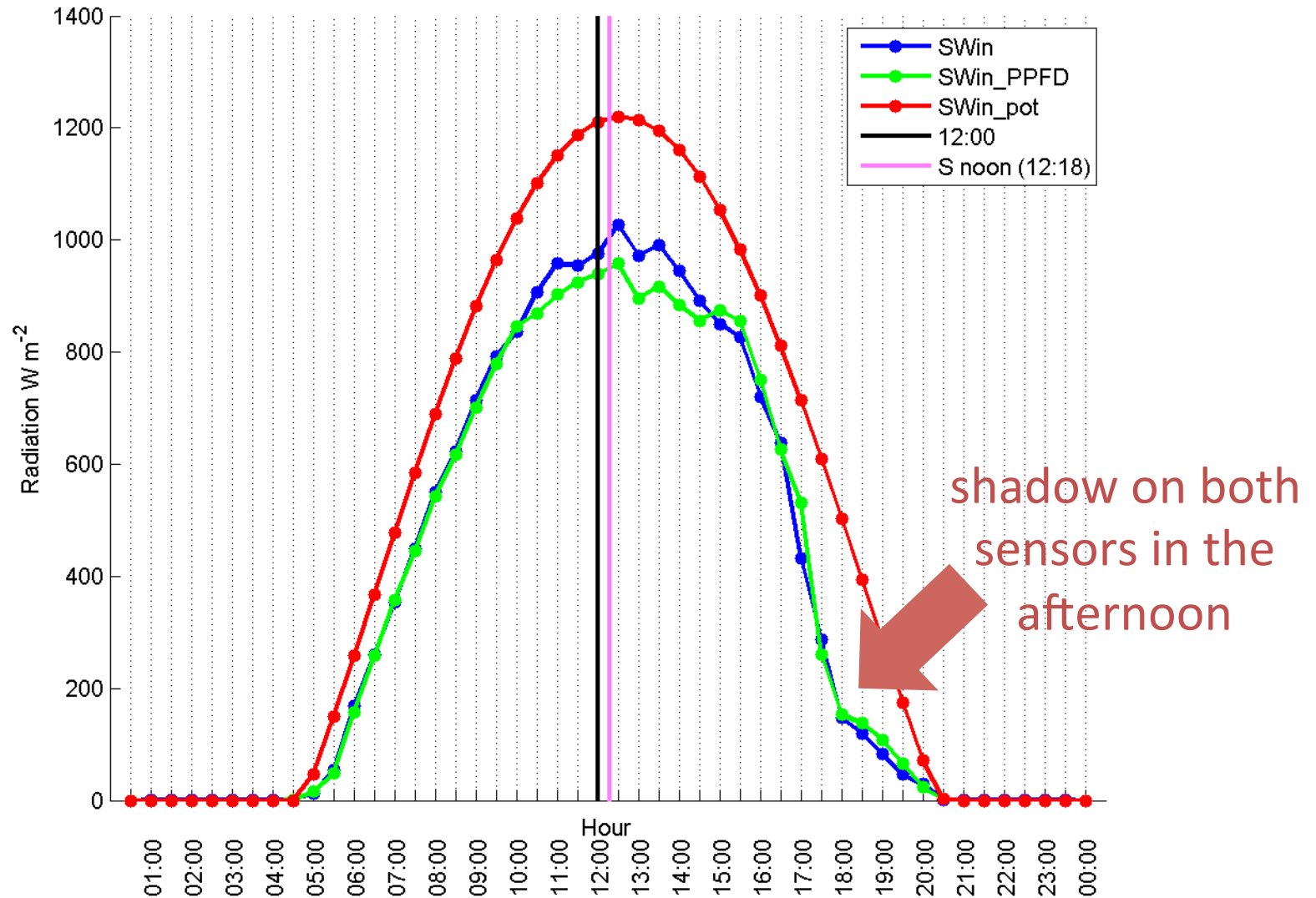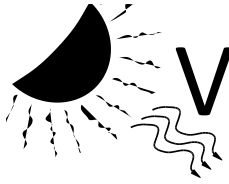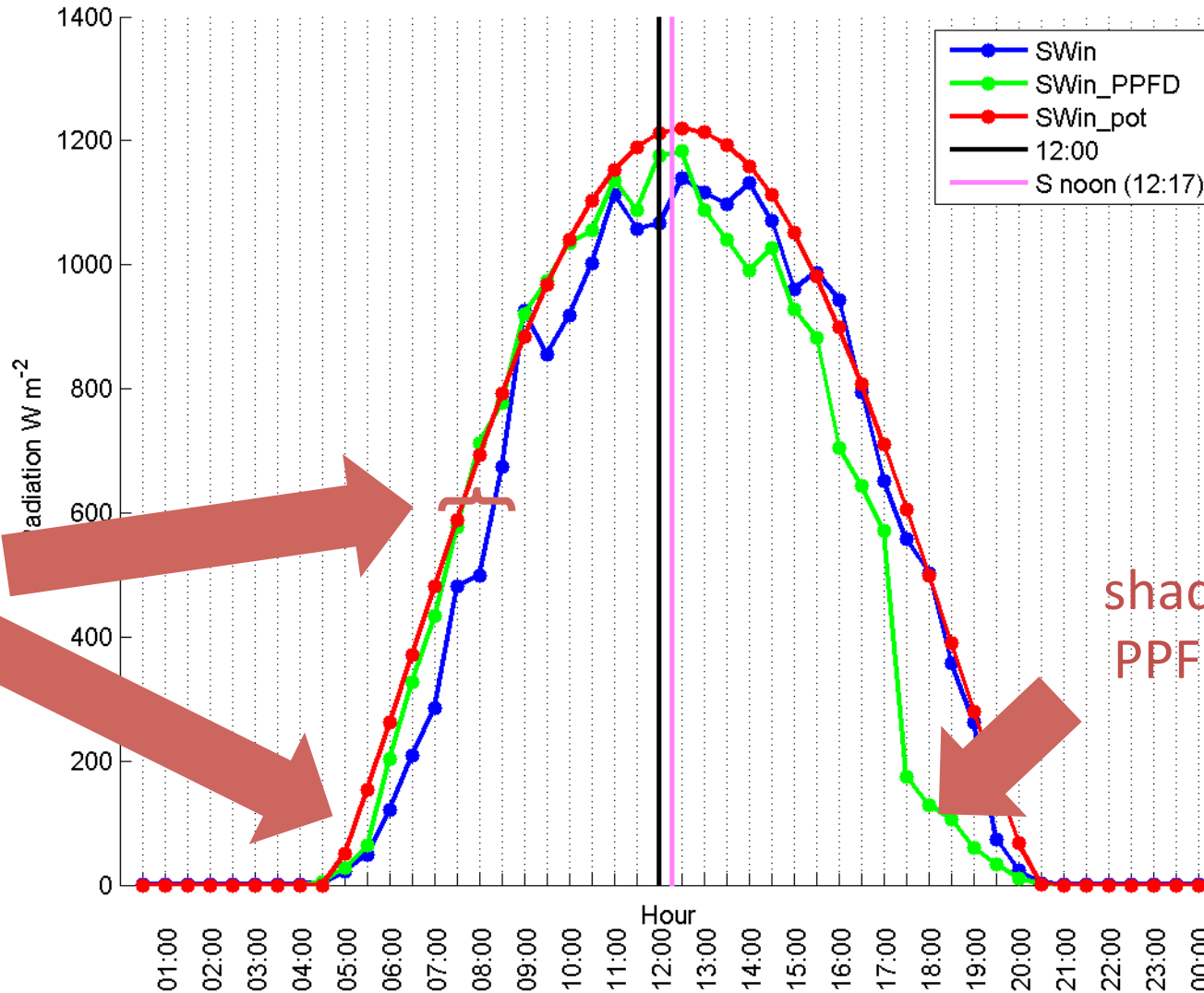# Visual QA/QC – Timestamps through Radiation and Solar Noon

ITRen 1999

looks like shift, but sunrise is correct: not horizontal PPFD sensor

shadow on PPFD only

Visual QA/QC

- Visual inspection to clarify (and potentially correct) data collection and processing issues

- Some tests can be automated to give more direct feedback, but many cannot be predicted beforehand

- Interaction with data managers for each site is essential: things that look like errors can be real and possibly the most interesting (extremes)

Thank You