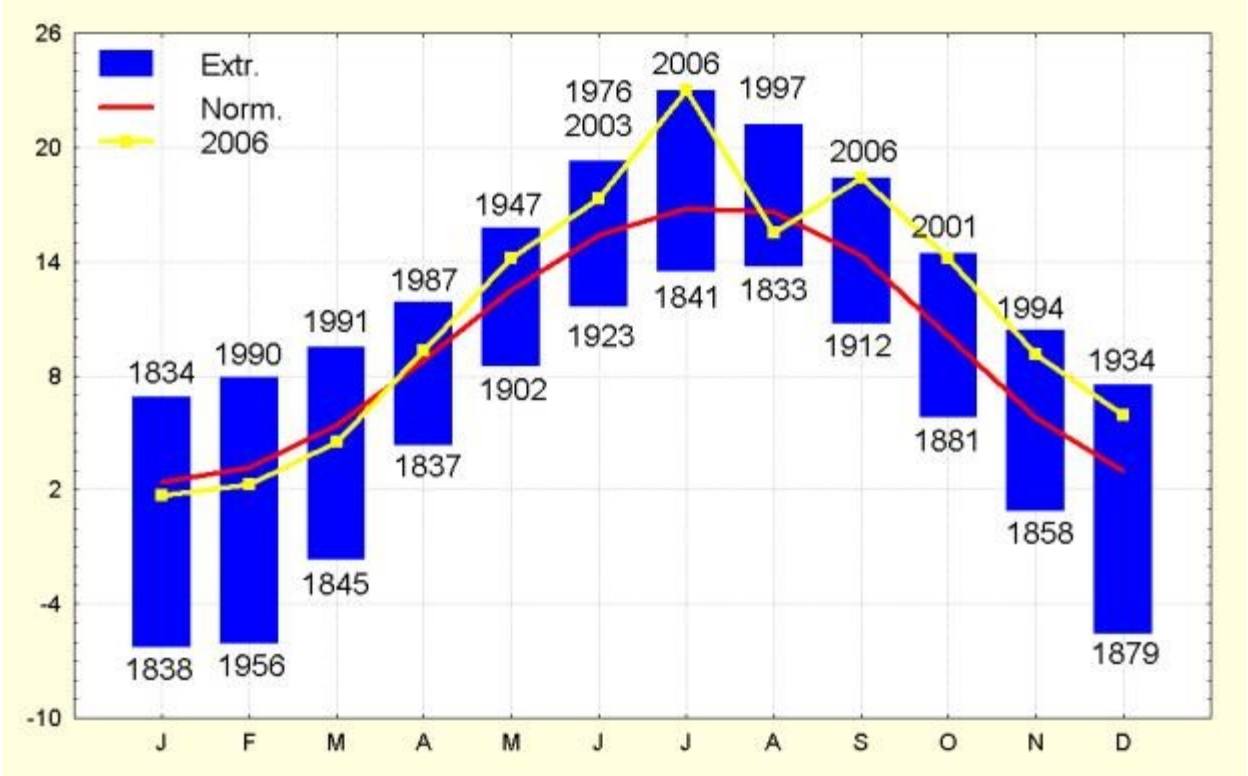
Climate change in Belgium: What we can conclude from long term meteorological measurements.

S. Dewitte,

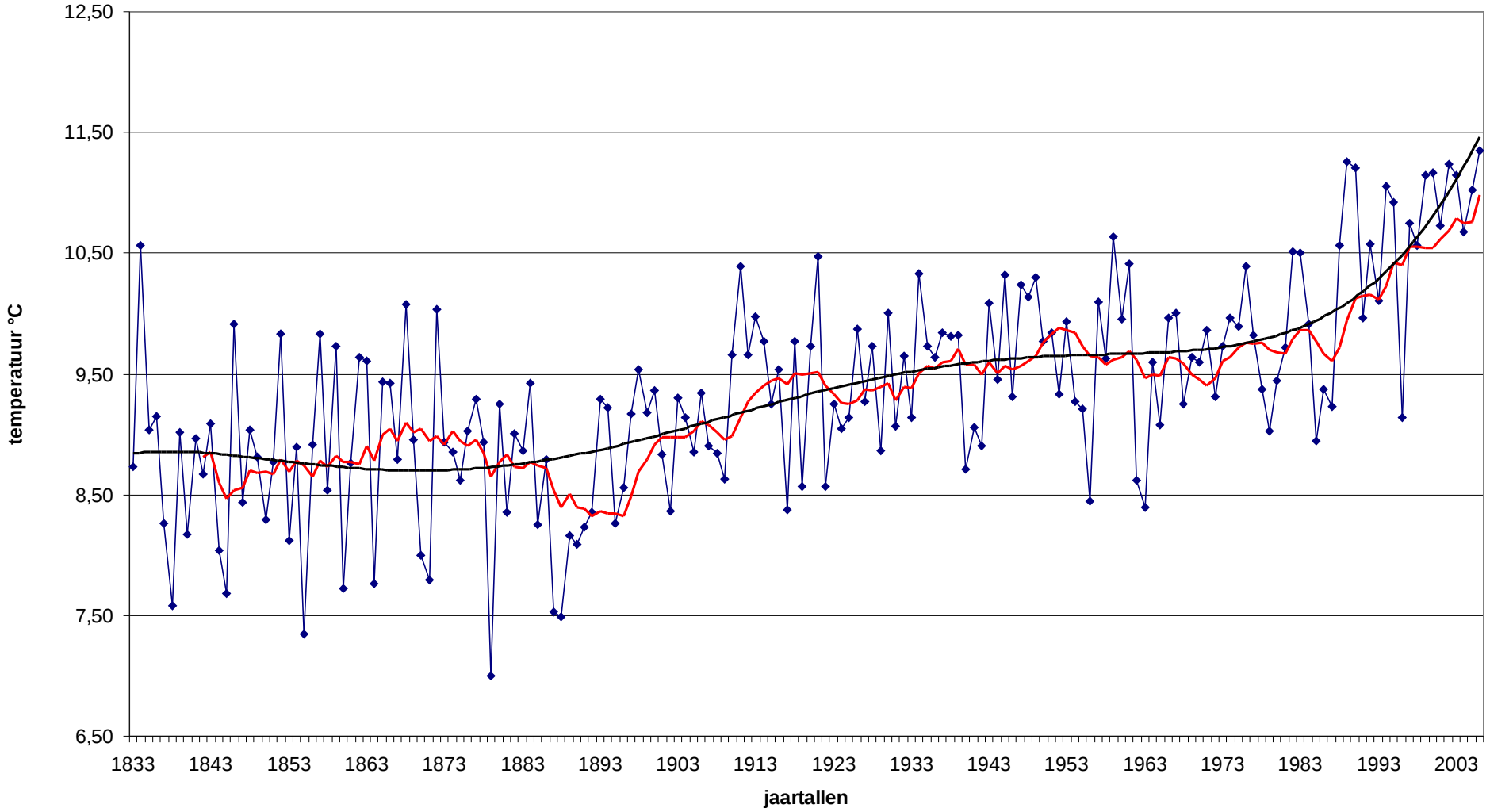
Royal Meteorological Institute of Belgium

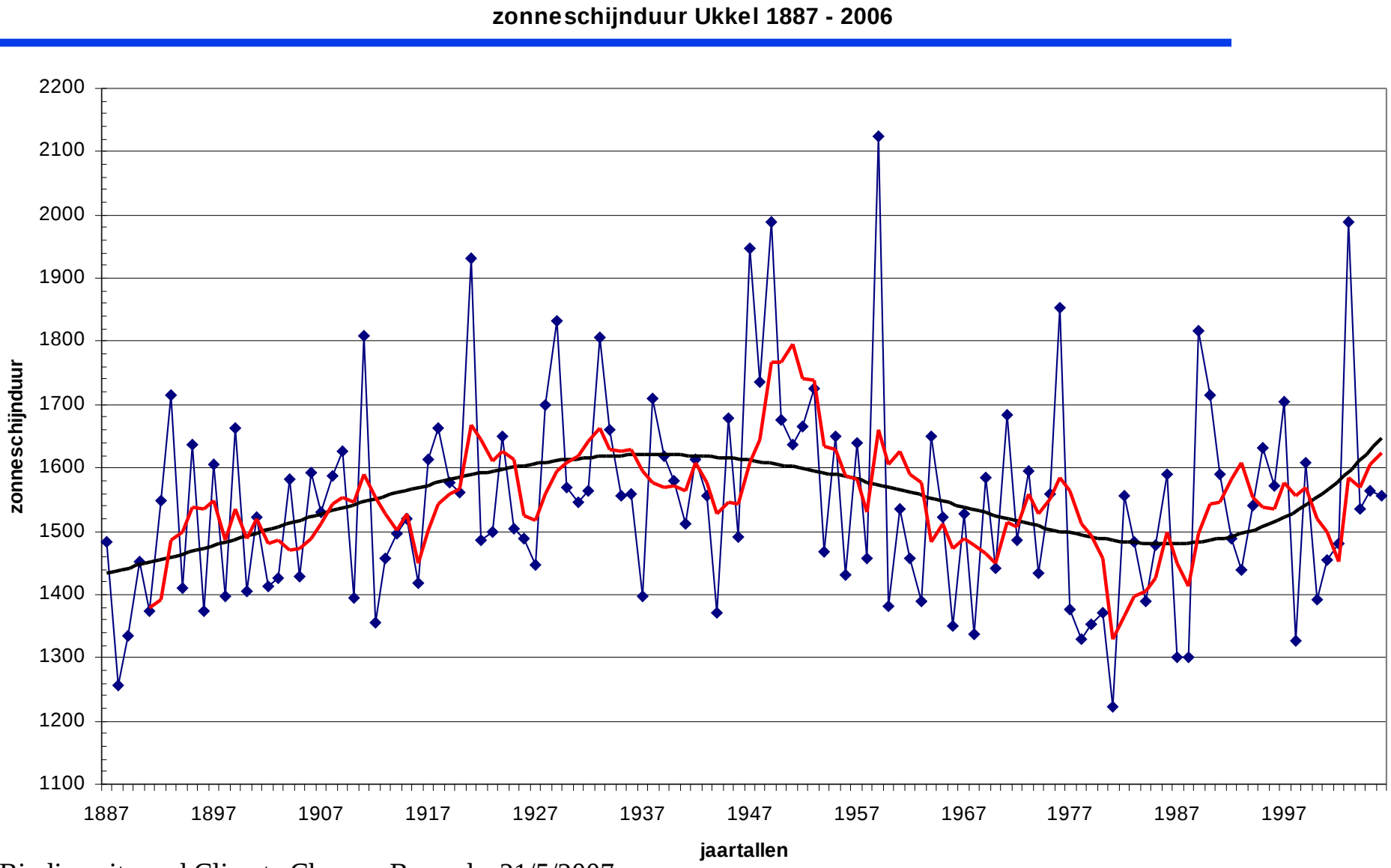
Biodiversity and Climate Change, Brussels, 21/5/2007

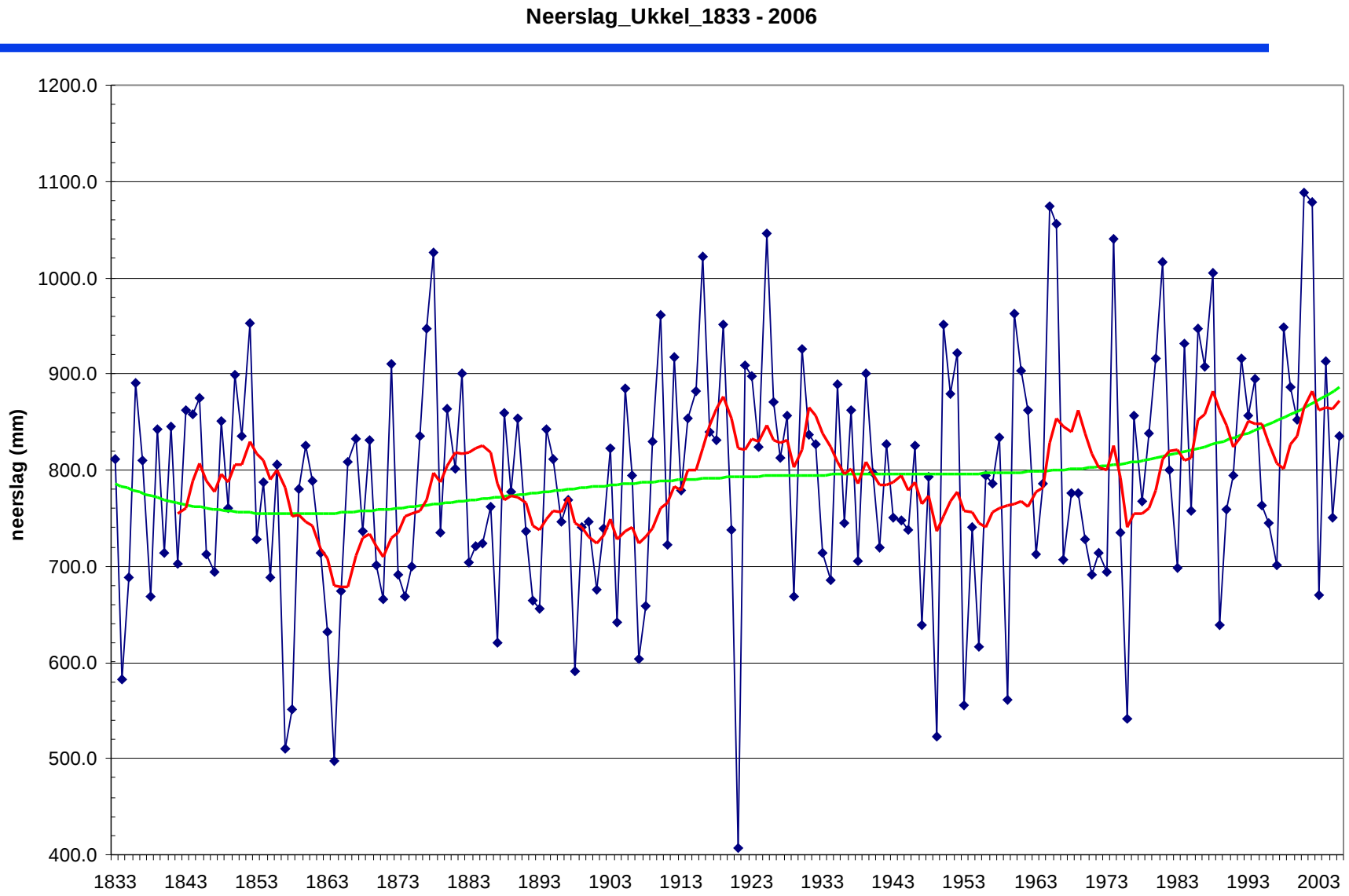
Temperatures Ukkel

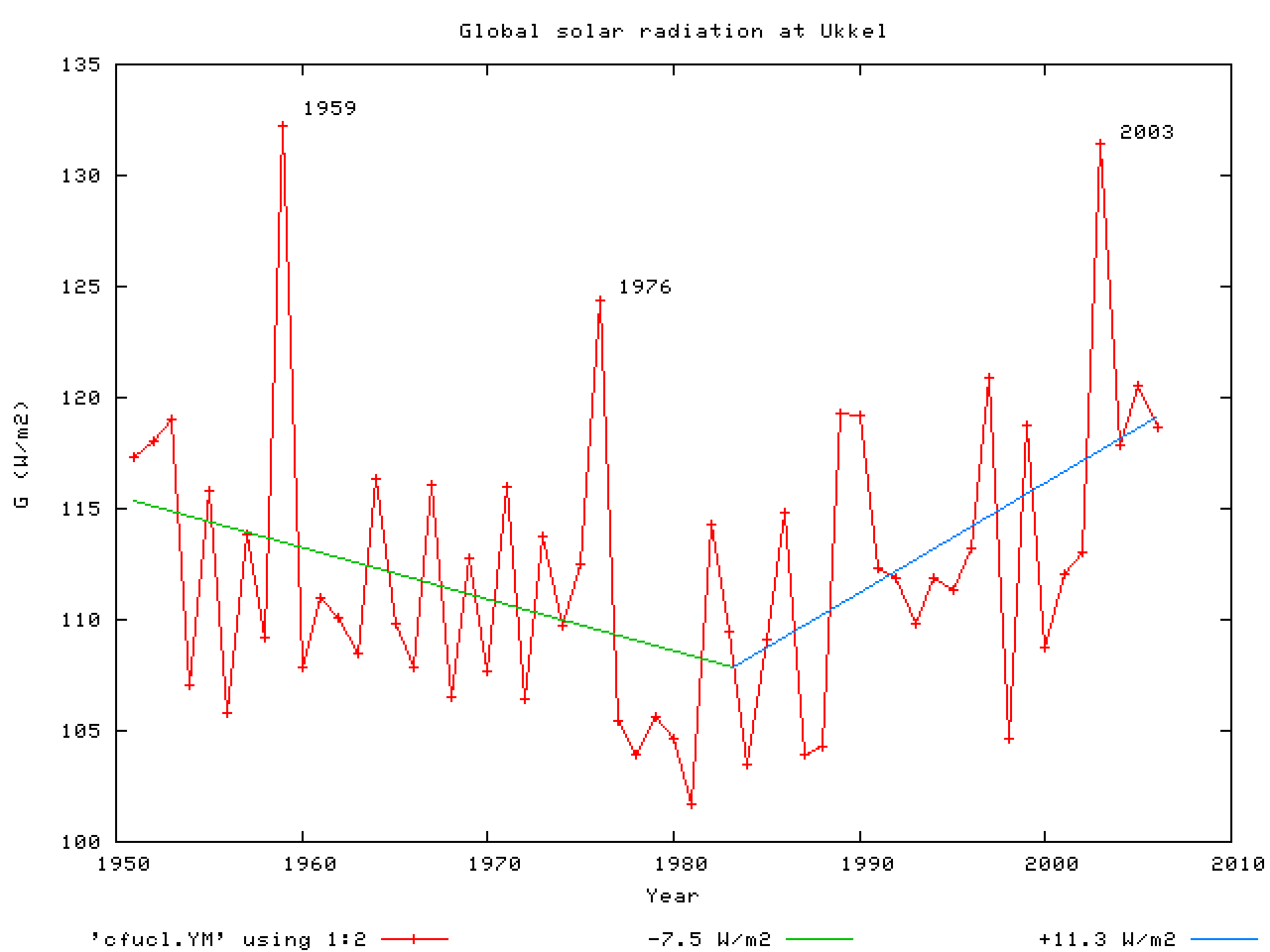


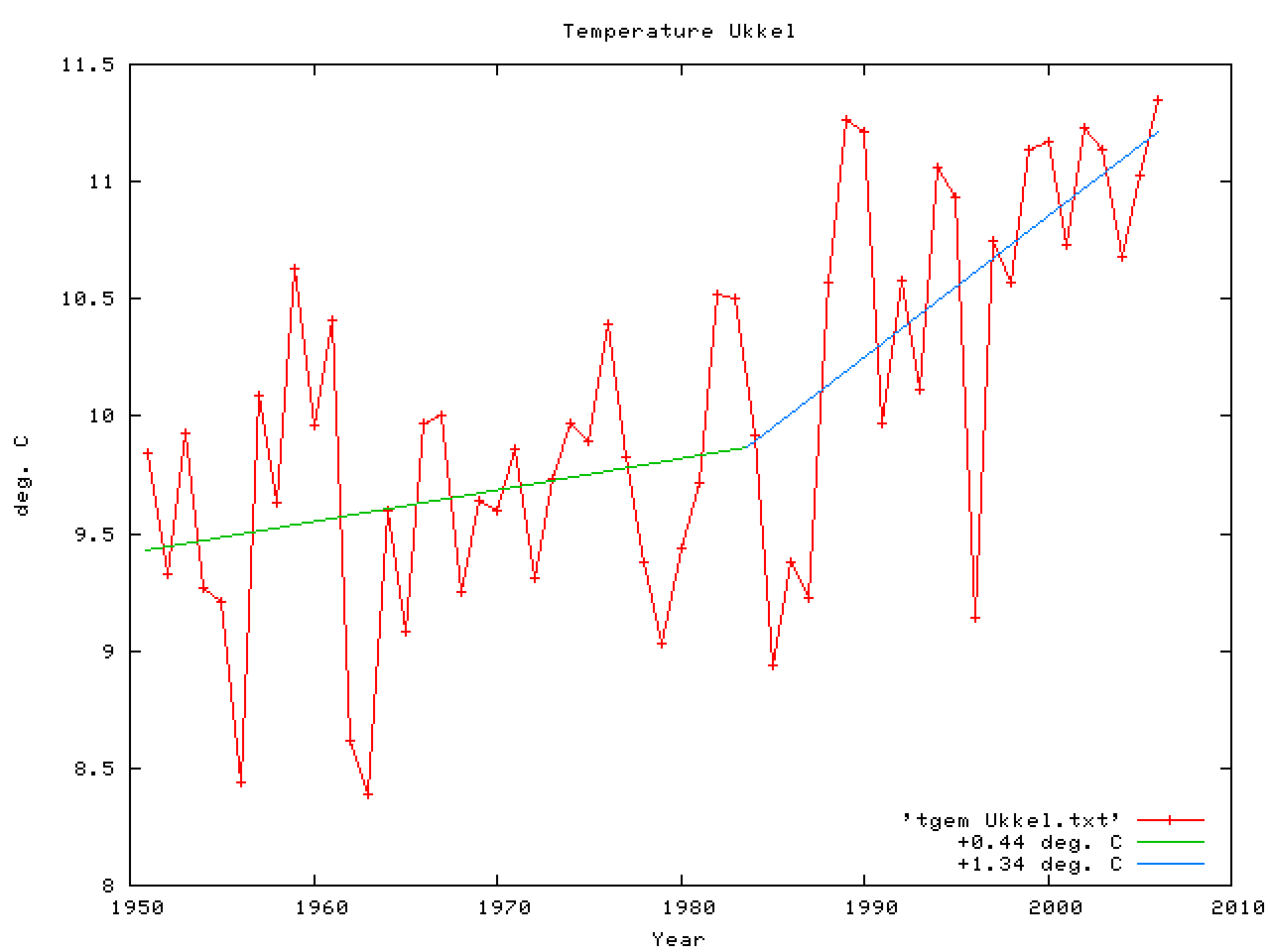
Gemiddelde temperatuur Ukkel 1833 - 2006

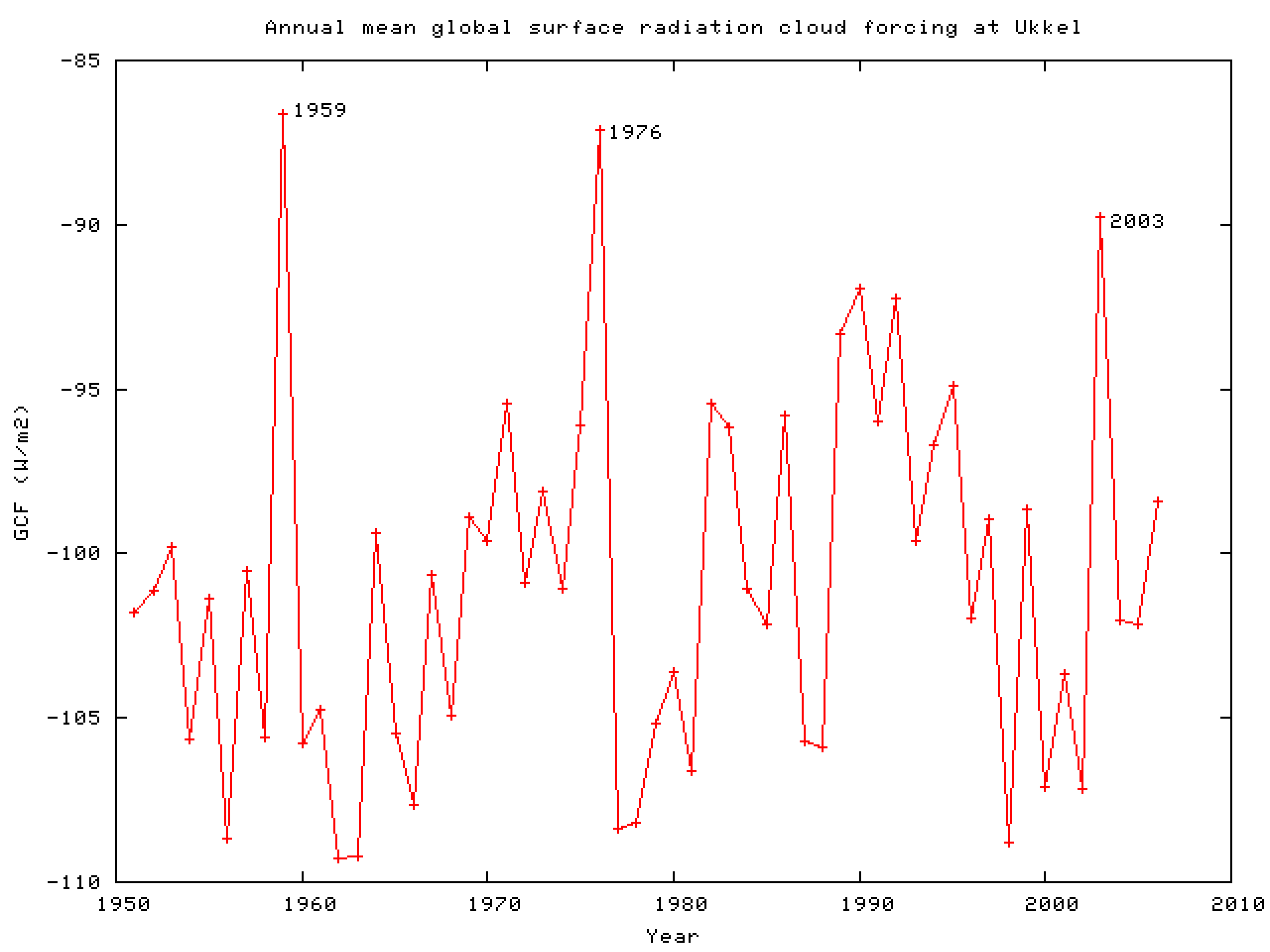


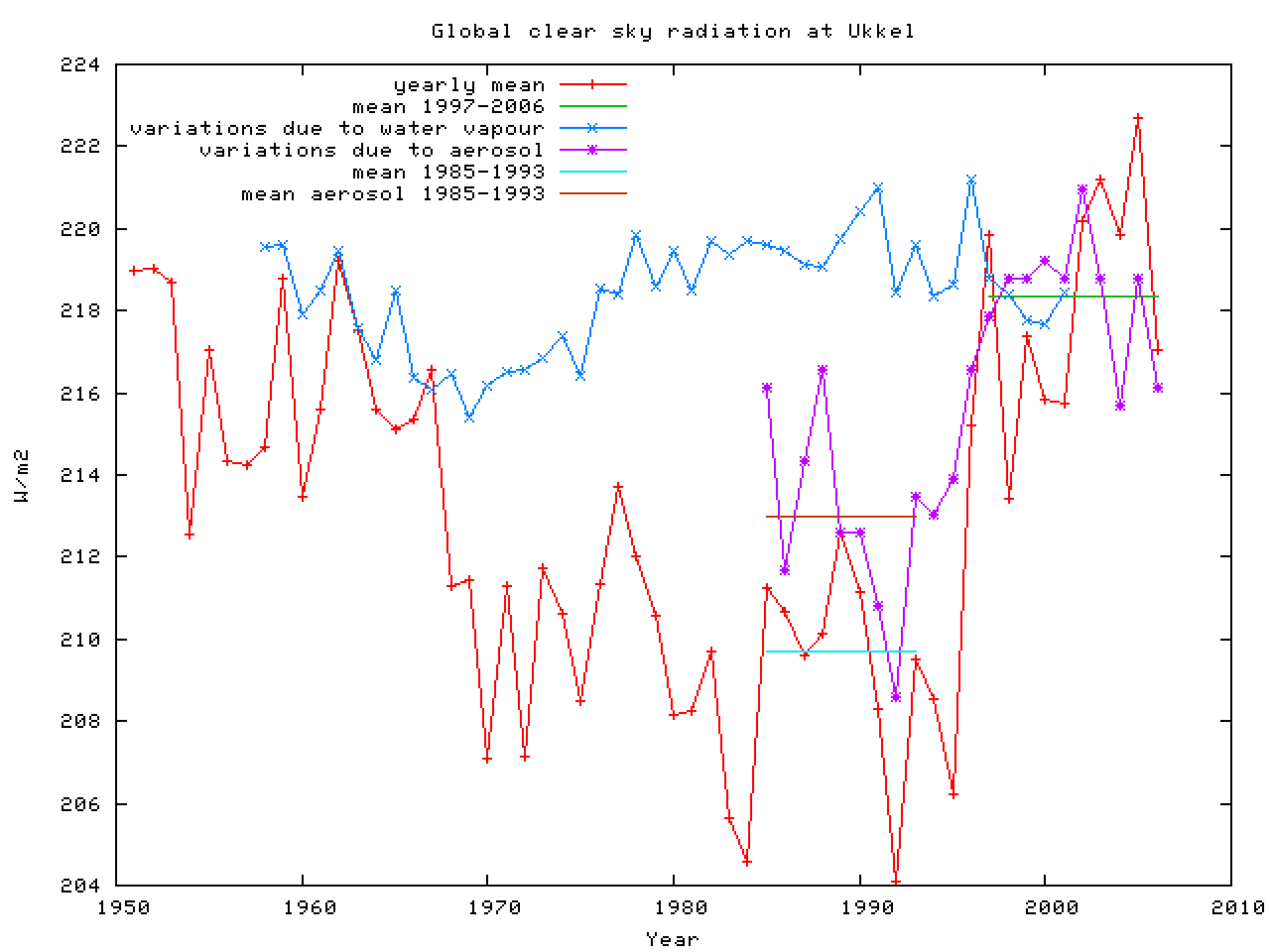

zonneschijnduur Ukkel 1887 - 2006
zonneschijnduur
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1887
1897
1907
1917
1927
1937
1947
1957
1967
1977
1987
1997
jaartallen


Neerslag_Ukkel_1833 - 2006
neerslag (mm)
1200.0
1100.0
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
1833
1843
1853
1863
1873
1883
1893
1903
1913
1923
1933
1943
1953
1963
1973
1983
1993
2003
jaartallen

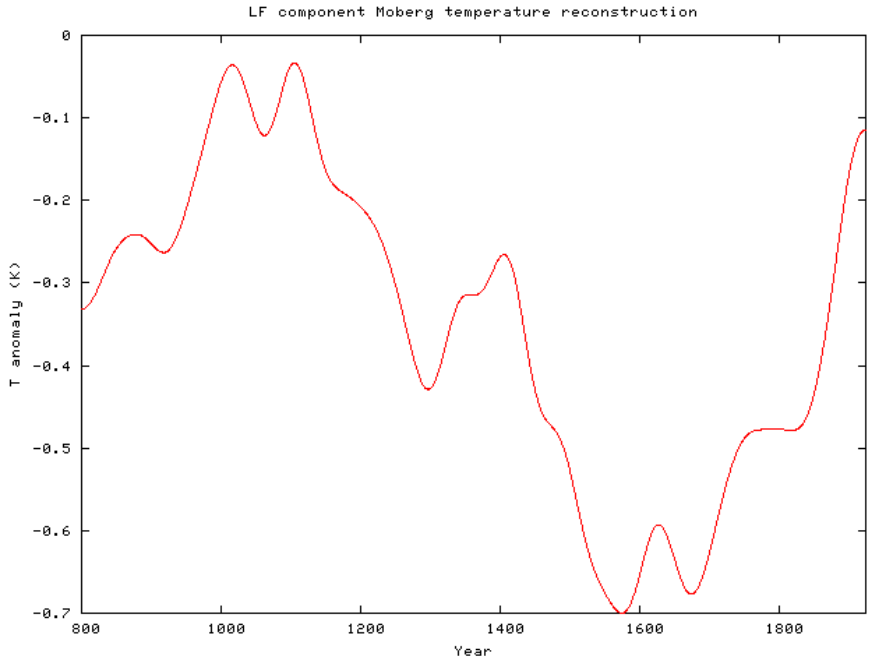

Global solar radiation at Ukkel
1959
1976
2003
G (W/m2)
Year
135
130
125
120
115
110
105
100
1950
1960
1970
1980
1990
2000
2010
'cfucl.YM' using 1:2
-7.5 W/m2
+11.3 W/m2

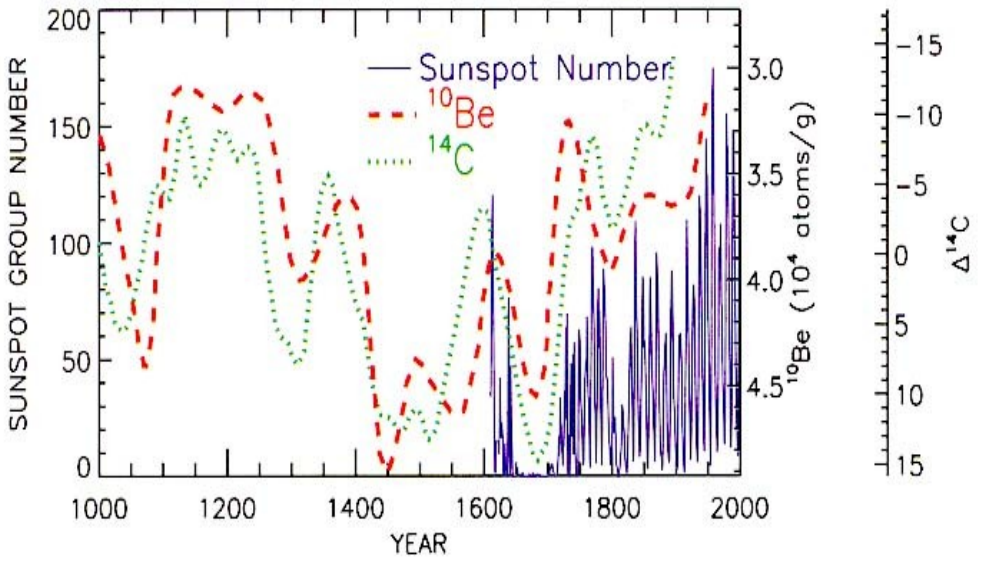

Temperature Ukkel
deg. C
Year
11.5
11
10.5
10
9.5
9
8.5
8
1950
1960
1970
1980
1990
2000
2010
'tgem Ukkel.txt'
+0.44 deg. C
+1.34 deg. C


Annual mean global surface radiation cloud forcing at Ukkel
GCF (W/m2)
Year
-85
-90
-95
-100
-105
-110
1950
1960
1970
1980
1990
2000
2010
1959
1976
2003


Global clear sky radiation at Ukkel
yearly mean
mean 1997-2006
variations due to water vapour
variations due to aerosol
mean 1985-1993
mean aerosol 1985-1993
W/m2
Year
224
222
220
218
216
214
212
210
208
206
204
1950
1960
1970
1980
1990
2000
2010

Long term solar influence.

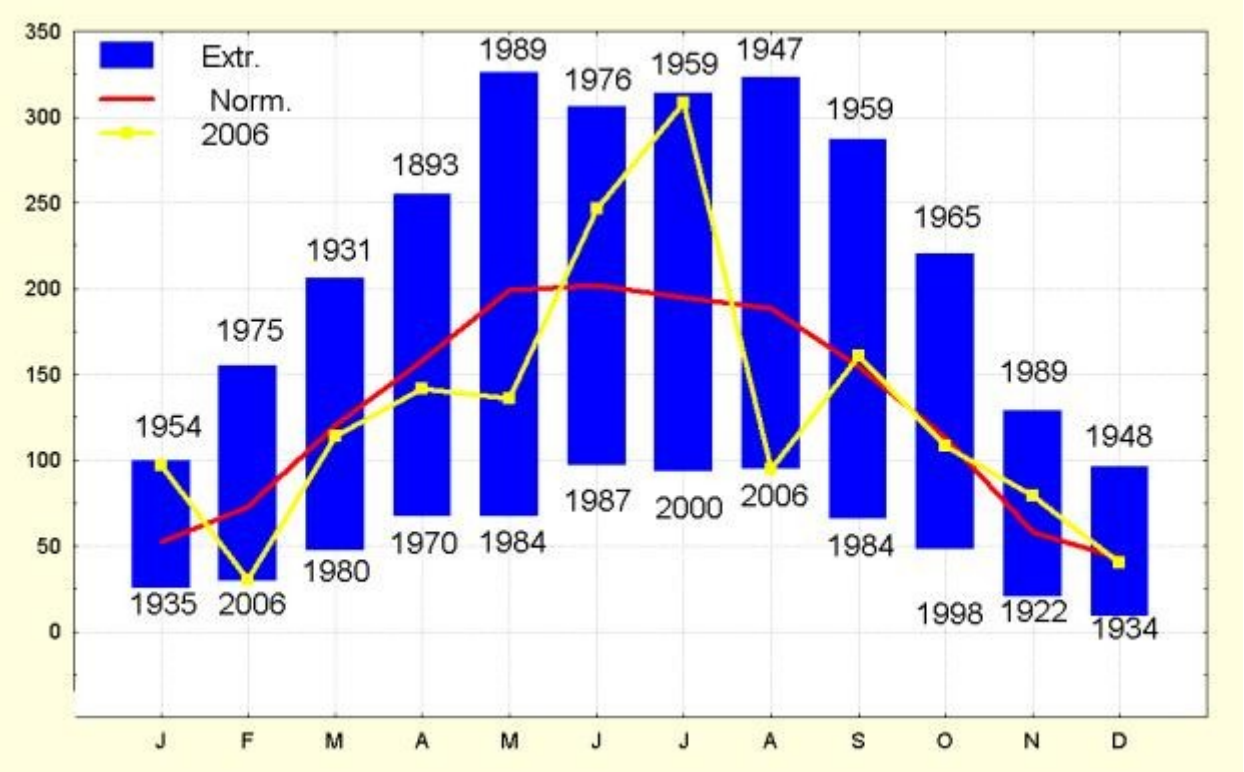




Conclusions

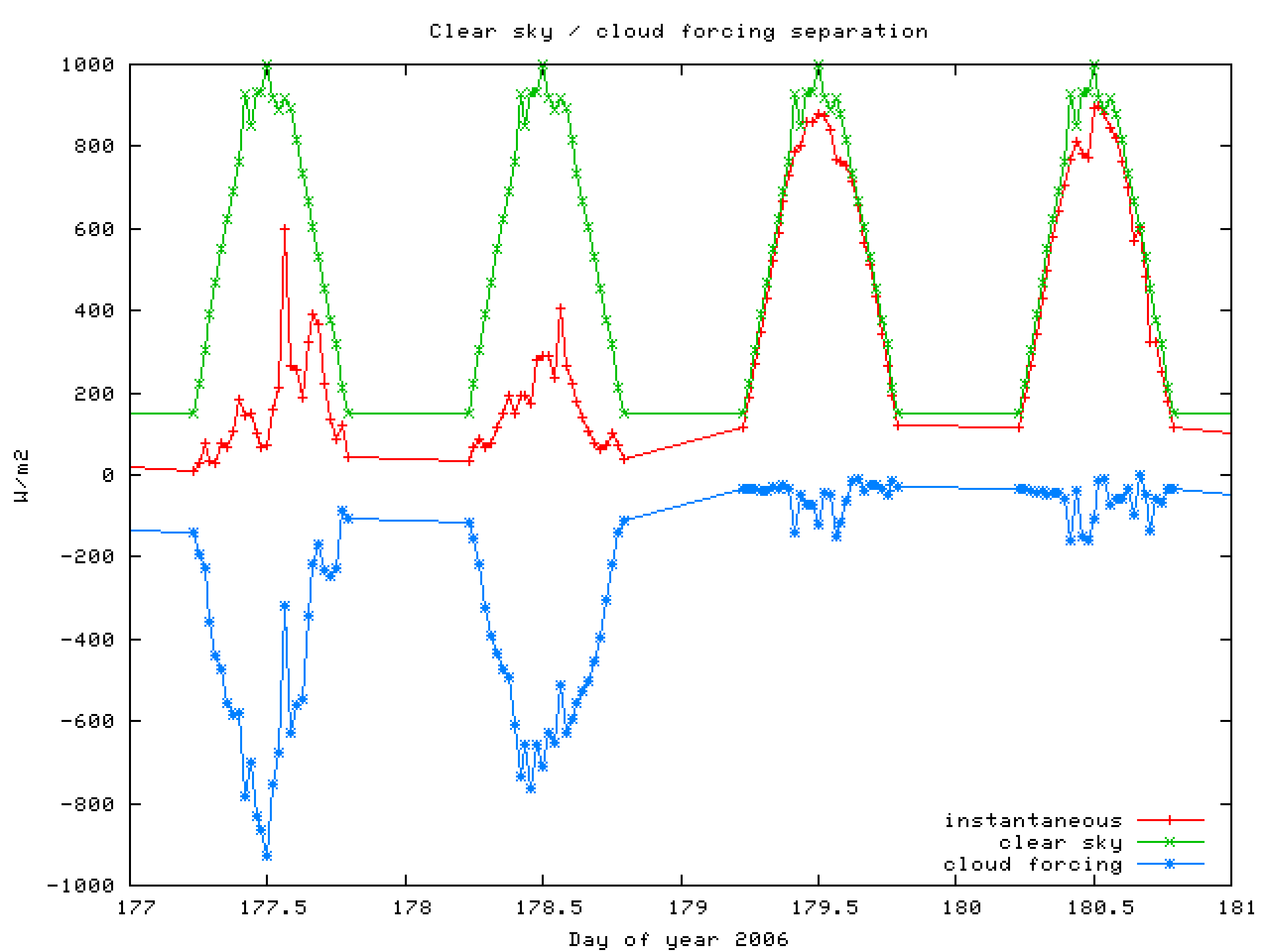
- Long term T increase 1833-2006 by about 2° C
  - Discontinuities 1909, 1987, 2006 ?
- Correlation with solar radiation
  - 1984-2006: brightening due to decreasing aerosols
  - 1951-1983: dimming due to increasing aerosols ?
  - 1887-1950: brigthening due to Sun ?
- No strong trend precipitation

Sunshine duration Ukkel



Clear sky/cloud forcing separation

- Global radiation G(d,h)
- Clear sky global radiation $G_{cs}(d,h)$=max G(d',h) for d' in 31 day interval around d
- Cloud forcing = G(d,h) - $G_{cs}(d,h)$


Clear sky / cloud forcing separation
1000
800
600
400
200
0
-200
-400
-600
-800
-1000
W/m2
177
177.5
178
178.5
179
179.5
180
180.5
181
Day of year 2006
instantaneous
clear sky
cloud forcing

Global and Continental Temperature Change