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The Irish Meteorological Service

Climate Change in Ireland and the Impact on Soft Fruit Production

Dr. Sarah O'Reilly

Teagasc National Soft Fruit Conference, 28 April 2010

OVERVIEW

- What is Climate?
- How has Ireland's climate changed
  → Impact on soft fruit
- How do we predict future climate?
- What will the future bring?
  → Possible impacts on soft fruit

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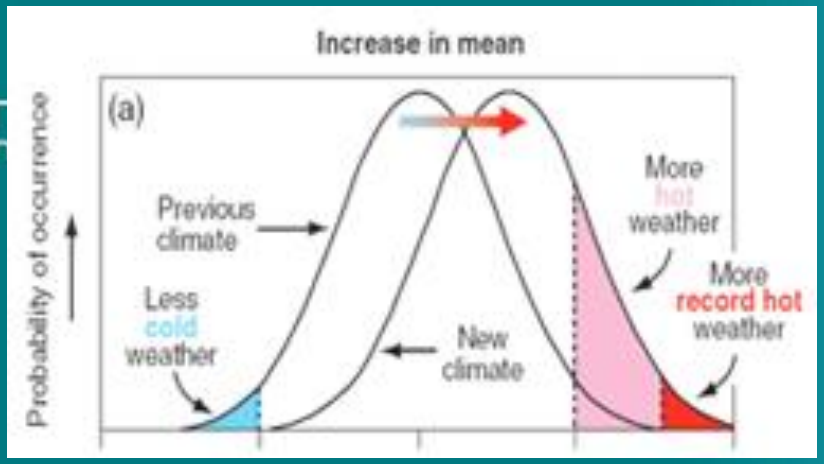
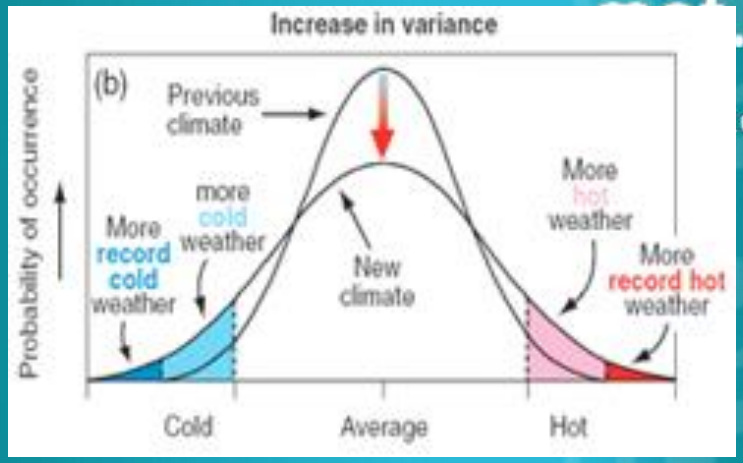
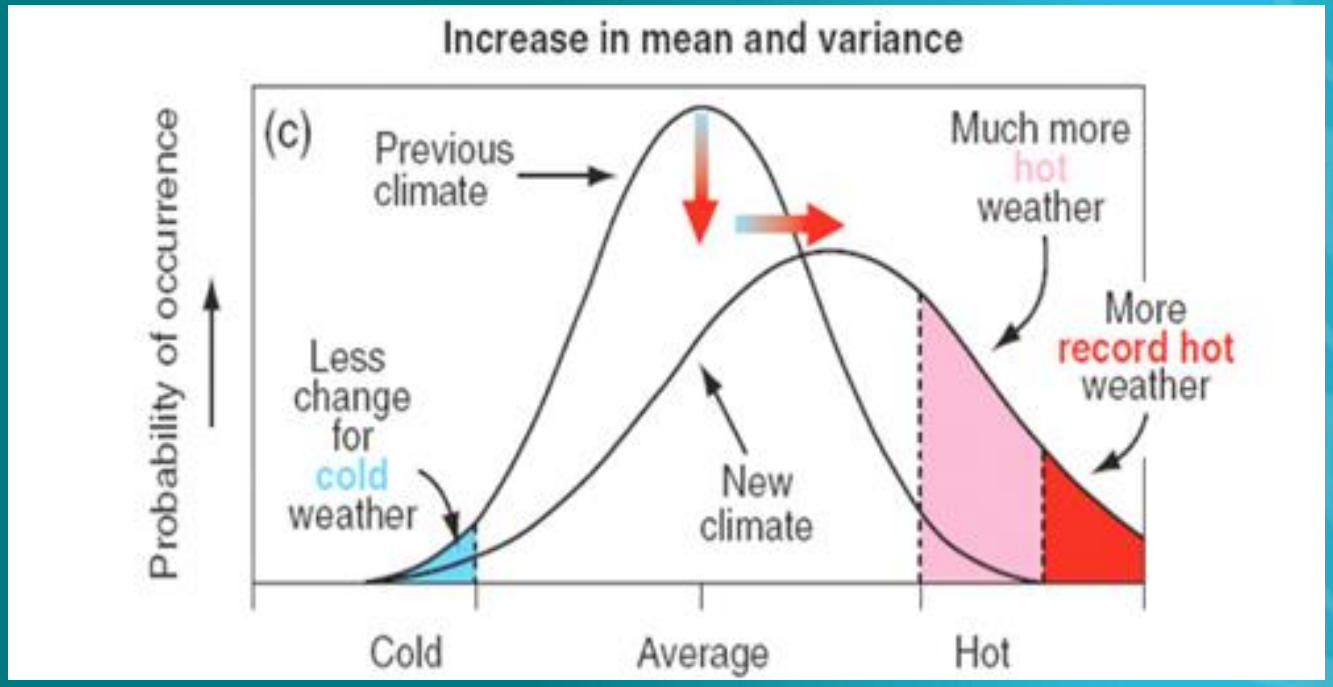
What is Climate?

Weather - the fluctuating state of the atmosphere around us

Climate - the average, variations and extremes of weather in a region over long periods of time (statistics)


Increase in mean
(a)
Probability of occurrence
Previous climate
Less cold weather
New climate
More hot weather
More record hot weather


Increase in variance
(b)
Probability of occurrence
Previous climate
More record cold weather
more cold weather
New climate
More hot weather
More record hot weather
Cold
Average
Hot


Increase in mean and variance
(c)
Probability of occurrence
Previous climate
Much more hot weather
More record hot weather
Less change for cold weather
New climate
Cold
Average
Hot

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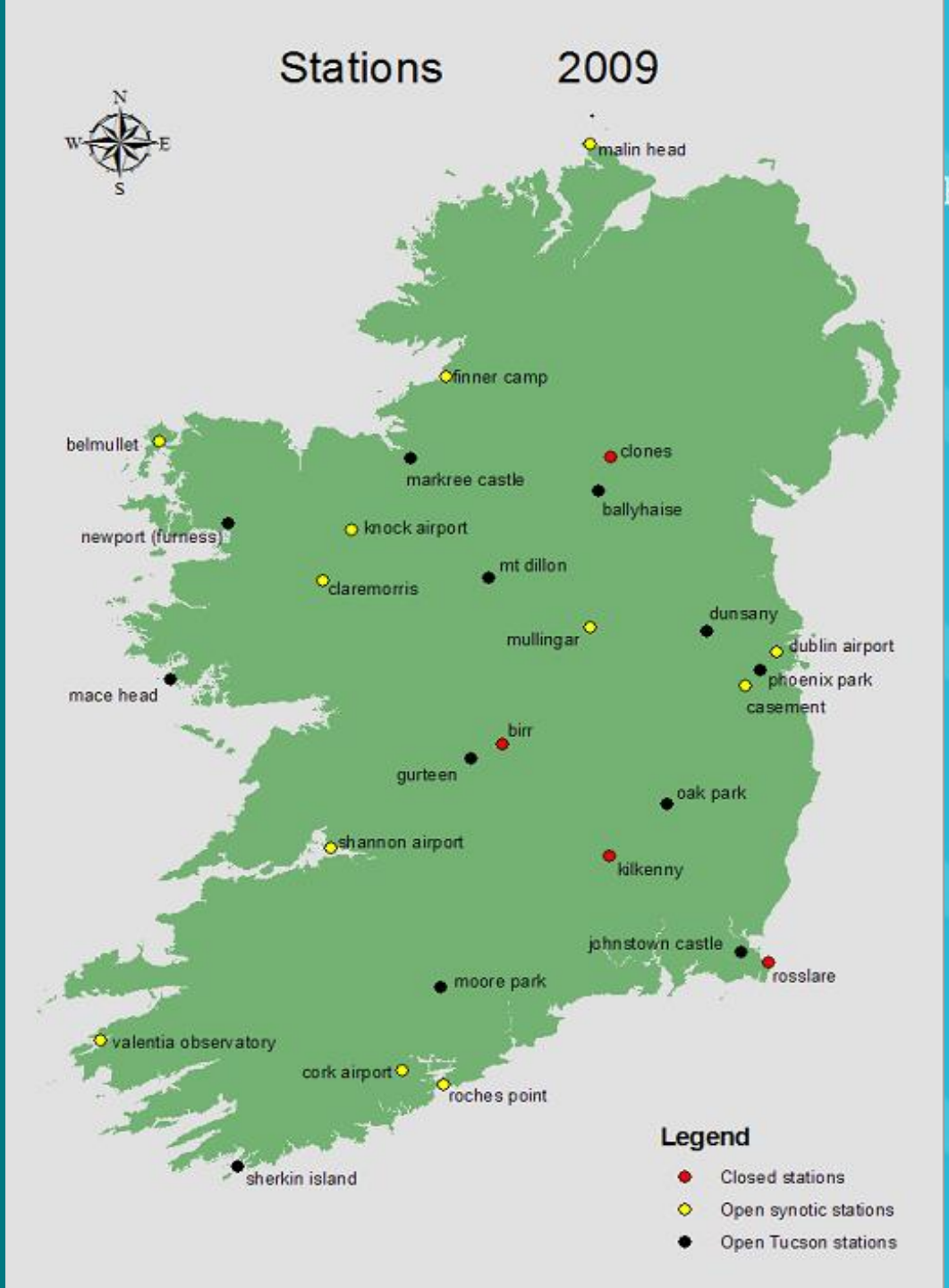
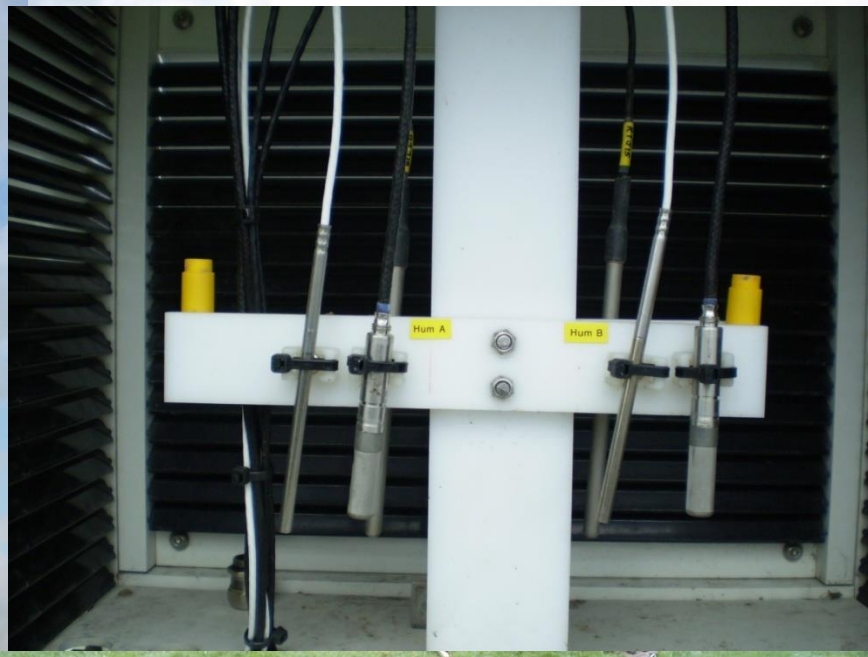
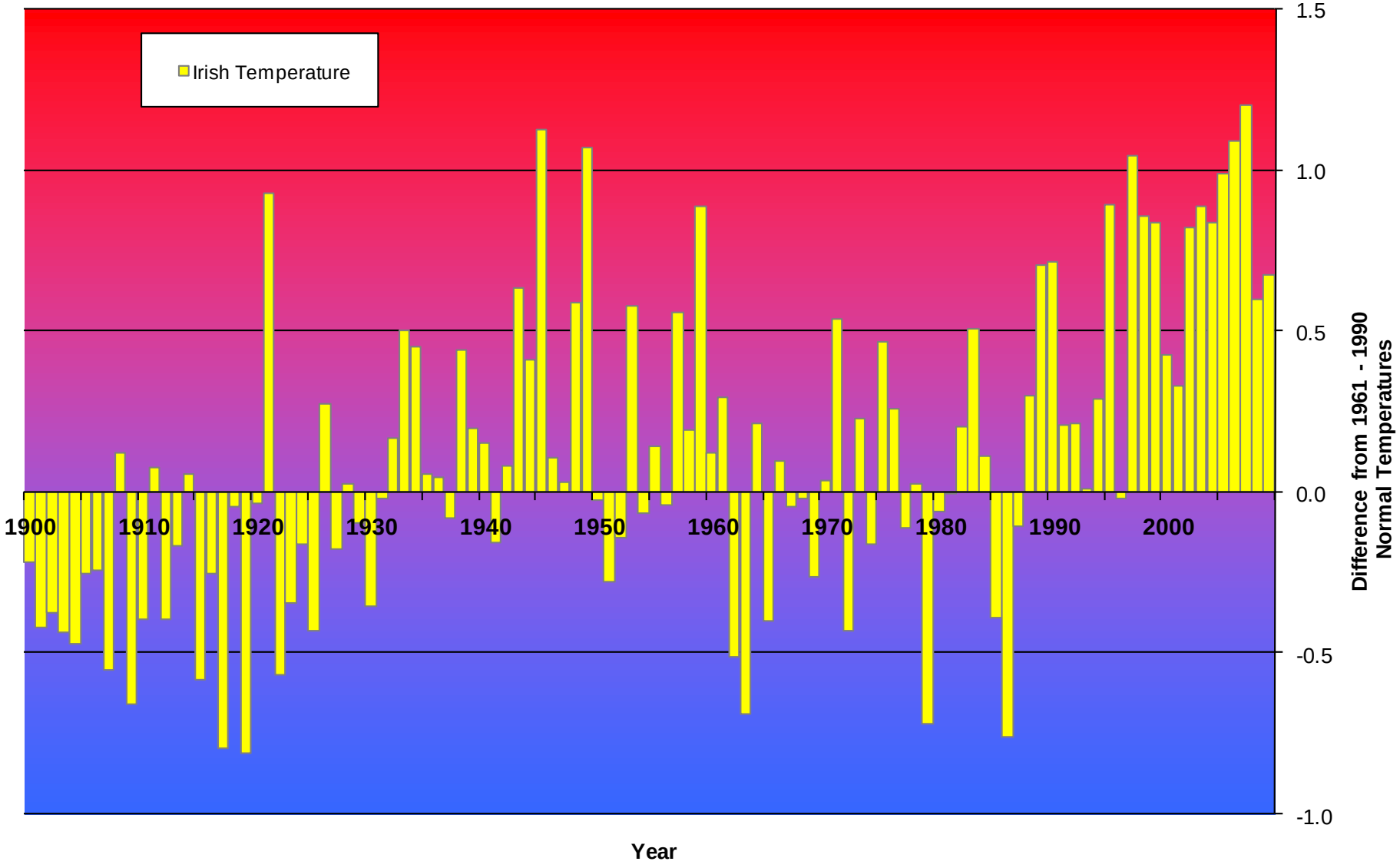
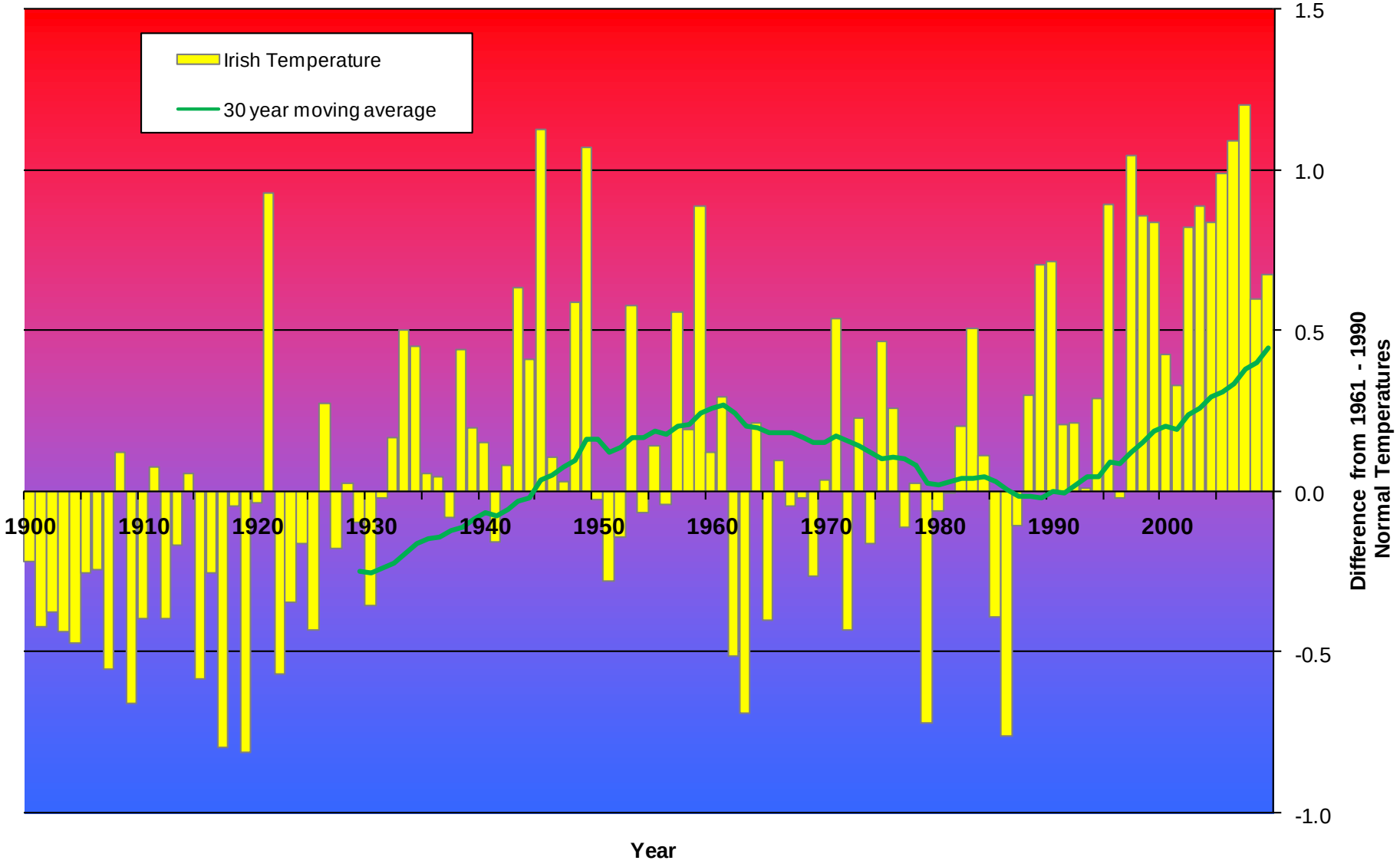


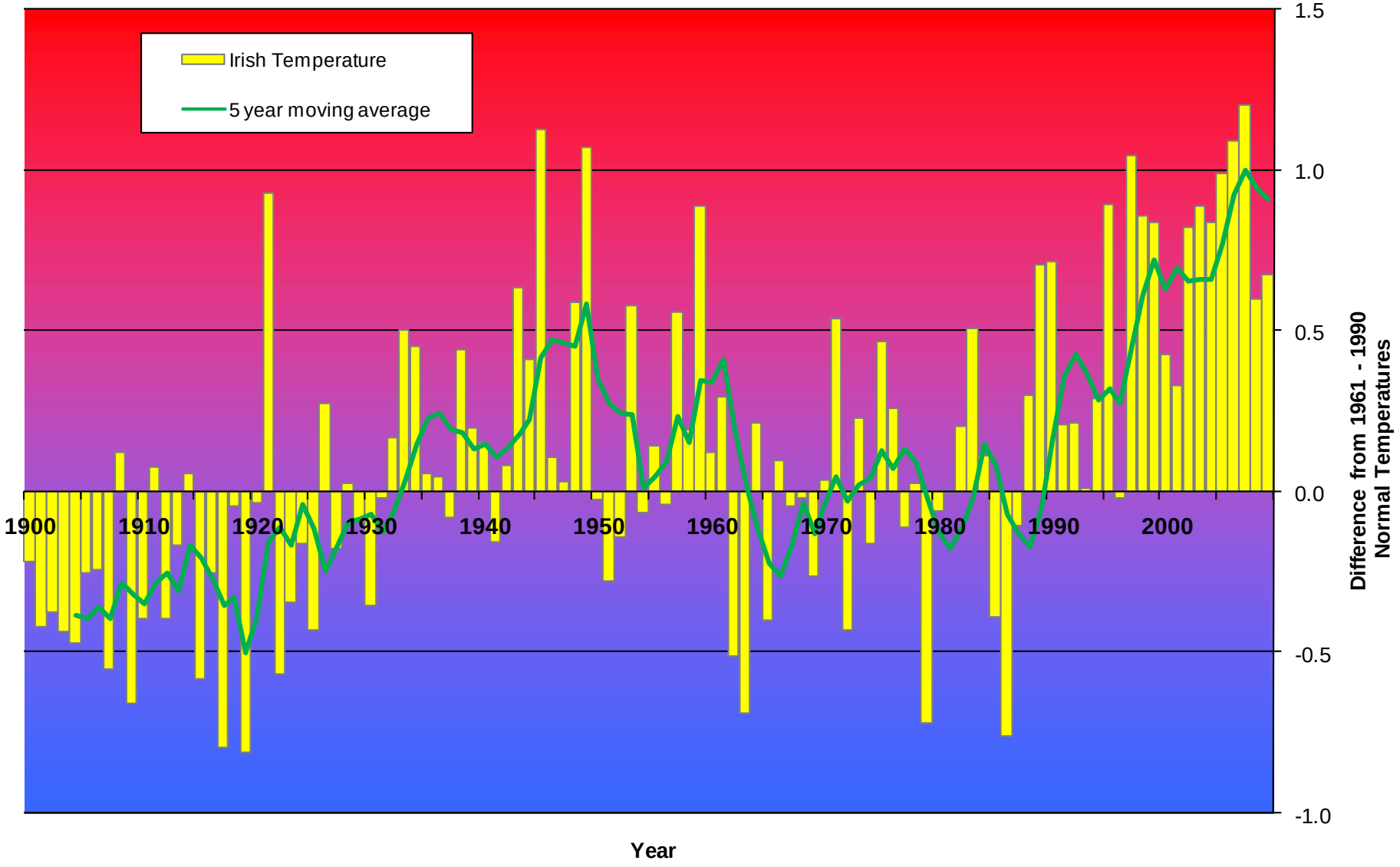

Hum A
Hum B

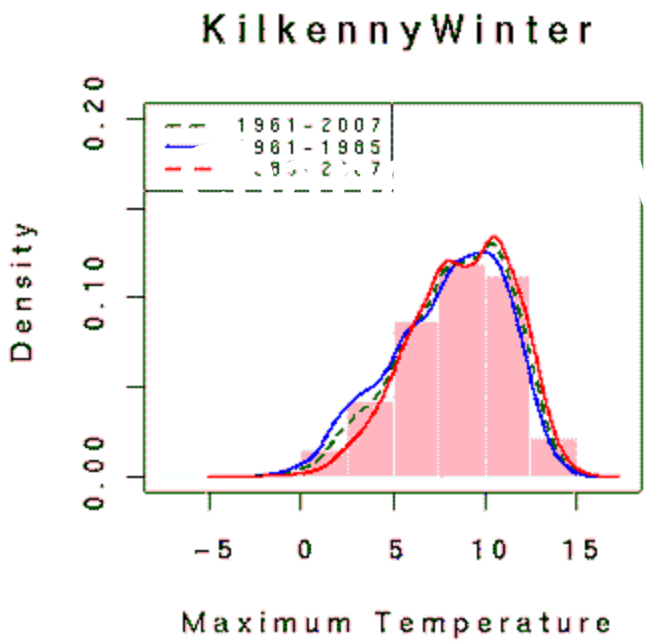
1900-2009 Air Temperature Difference from 1961-1990 Normal Values

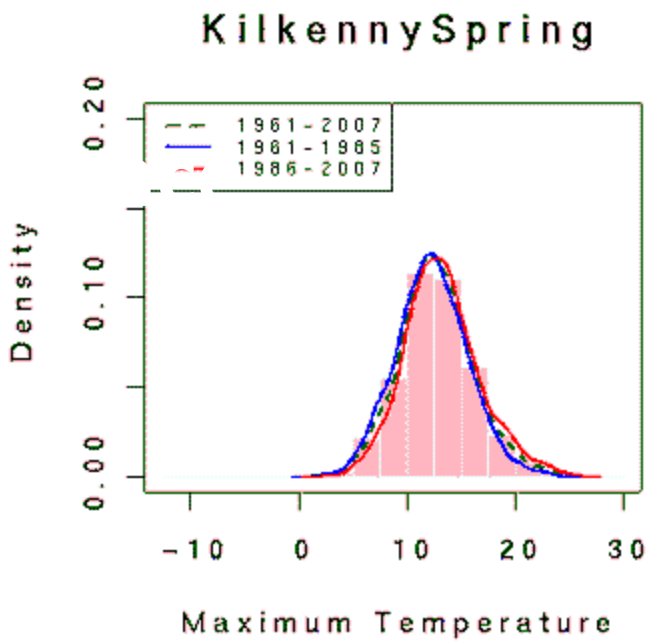


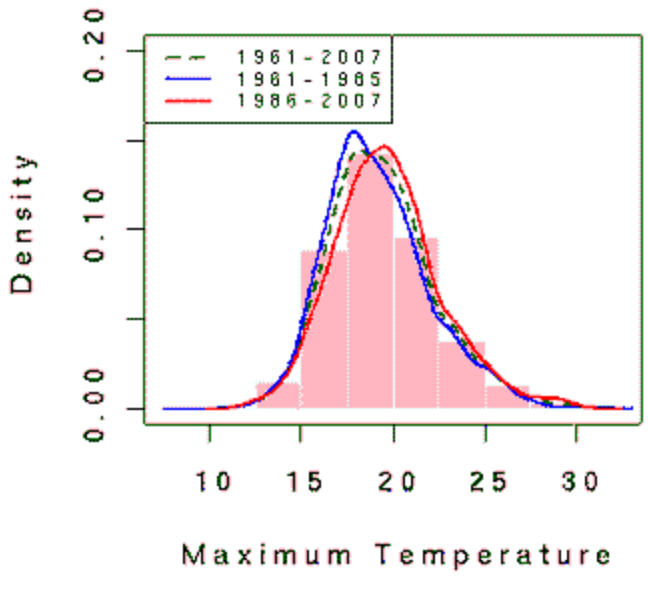

1900-2009 Air Temperature Difference from 1961-1990 Normal Values
Irish Temperature
30 year moving average
1.5
1.0
0.5
0.0
-0.5
-1.0
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
Year
Difference from 1961 - 1990 Normal Temperatures

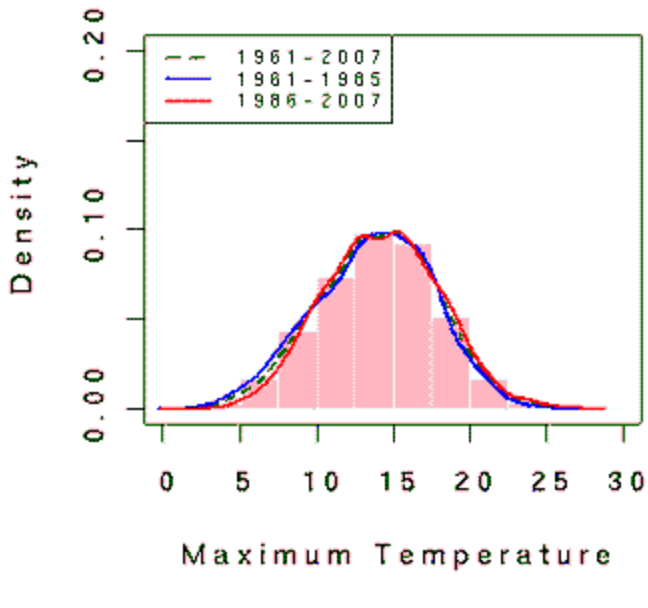
1900-2009 Air Temperature Difference from 1961-1990 Normal Values

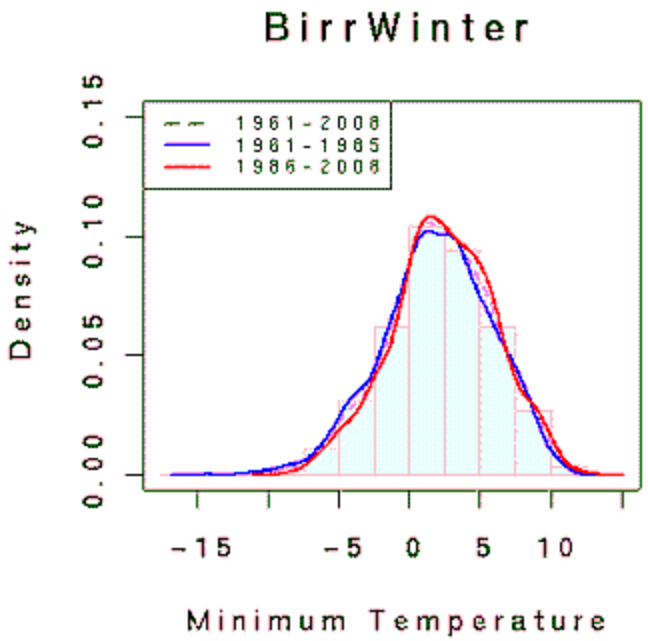


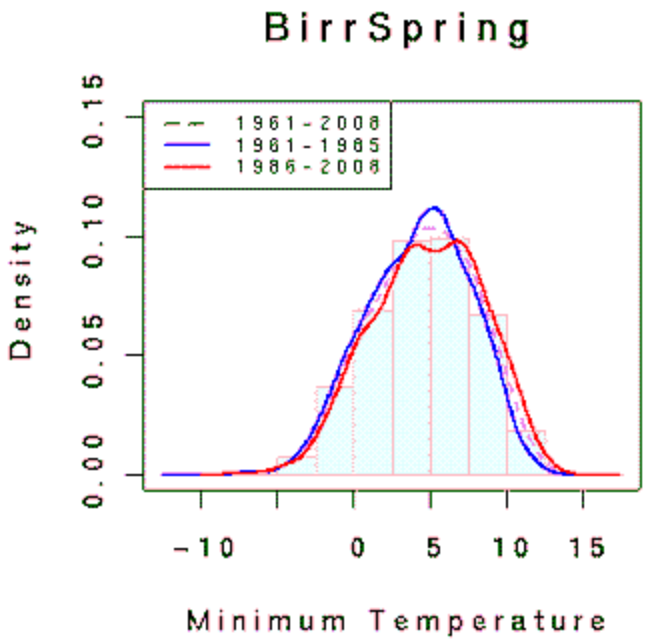

KilkennyWinter
1961-2007
1961-1985
1986-2007
Density
0.00
0.10
0.20
-5
0
5
10
15
Maximum Temperature

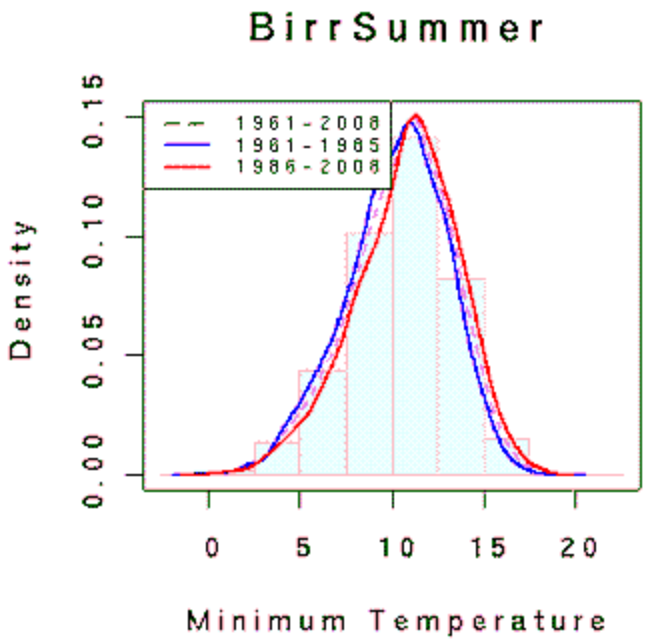

KilkennySpring
1961-2007
1961-1985
1986-2007
Density
0.00
0.10
0.20
-10
0
10
20
30
Maximum Temperature

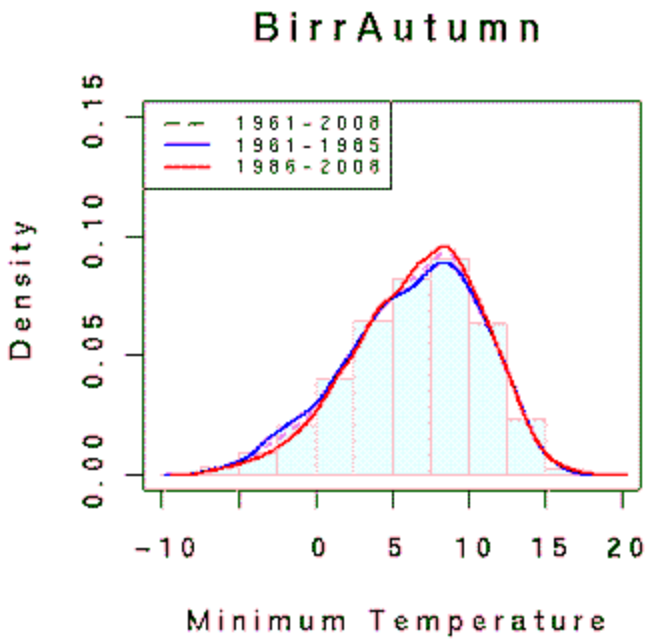

KilkennySummer
1961-2007
1961-1985
1986-2007
Density
0.00
0.10
0.20
10
15
20
25
30
Maximum Temperature


KilkennyAutumn
1961-2007
1961-1985
1986-2007
Density
0.00
0.10
0.20
0
5
10
15
20
25
30
Maximum Temperature

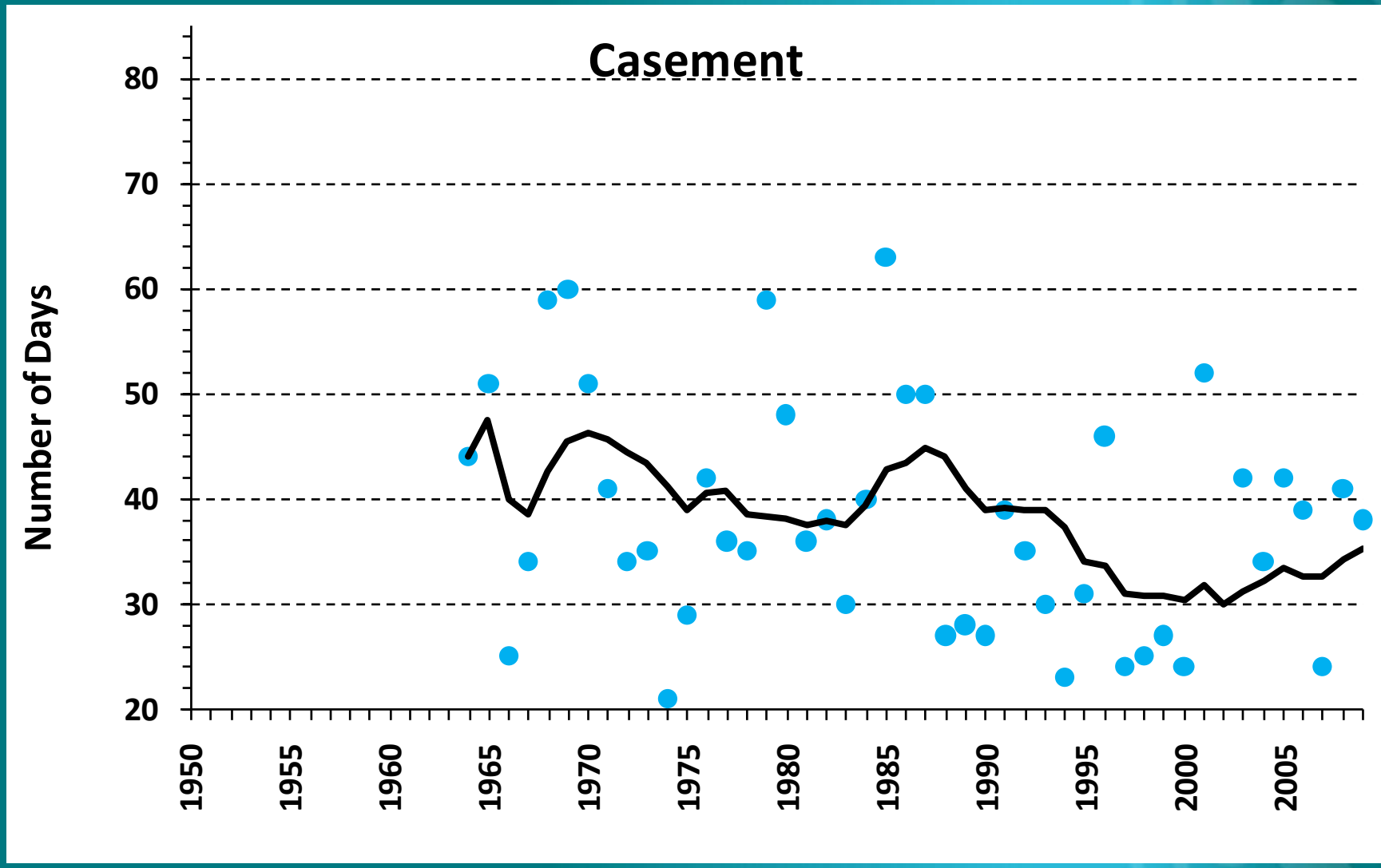

BirrWinter
1961-2008
1961-1985
1986-2008
Density
0.00
0.05
0.10
0.15
-15
-5
0
5
10
Minimum Temperature


BirrSpring
1961-2008
1961-1985
1986-2008
Density
0.00
0.05
0.10
0.15
-10
0
5
10
15
Minimum Temperature

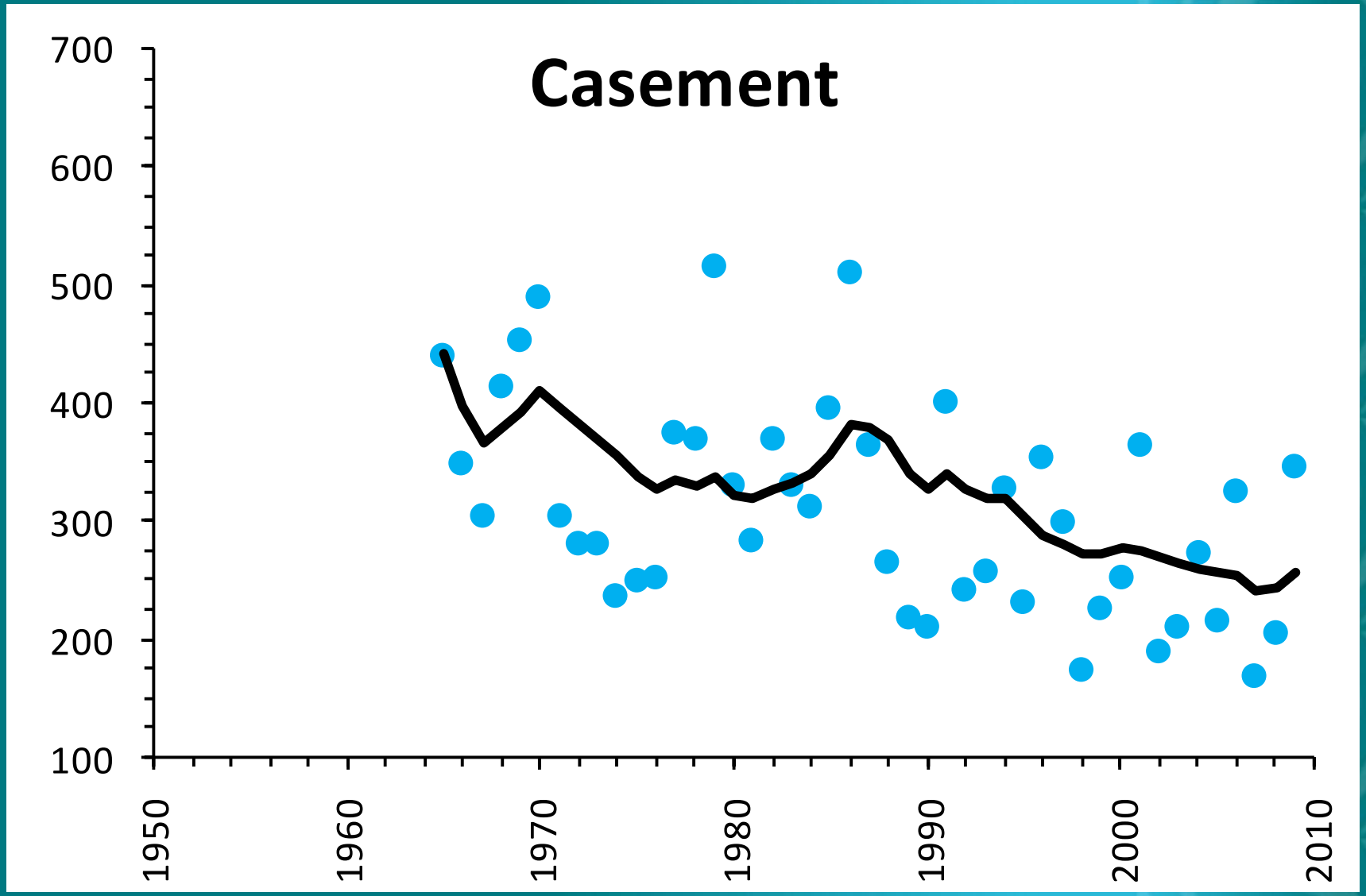

BirrSummer
1961-2008
1961-1985
1986-2008
Density
0.00
0.05
0.10
0.15
0
5
10
15
20
Minimum Temperature


BirrAutumn
1961-2008
1961-1985
1986-2008
Density
0.00
0.05
0.10
0.15
-10
0
5
10
15
20
Minimum Temperature

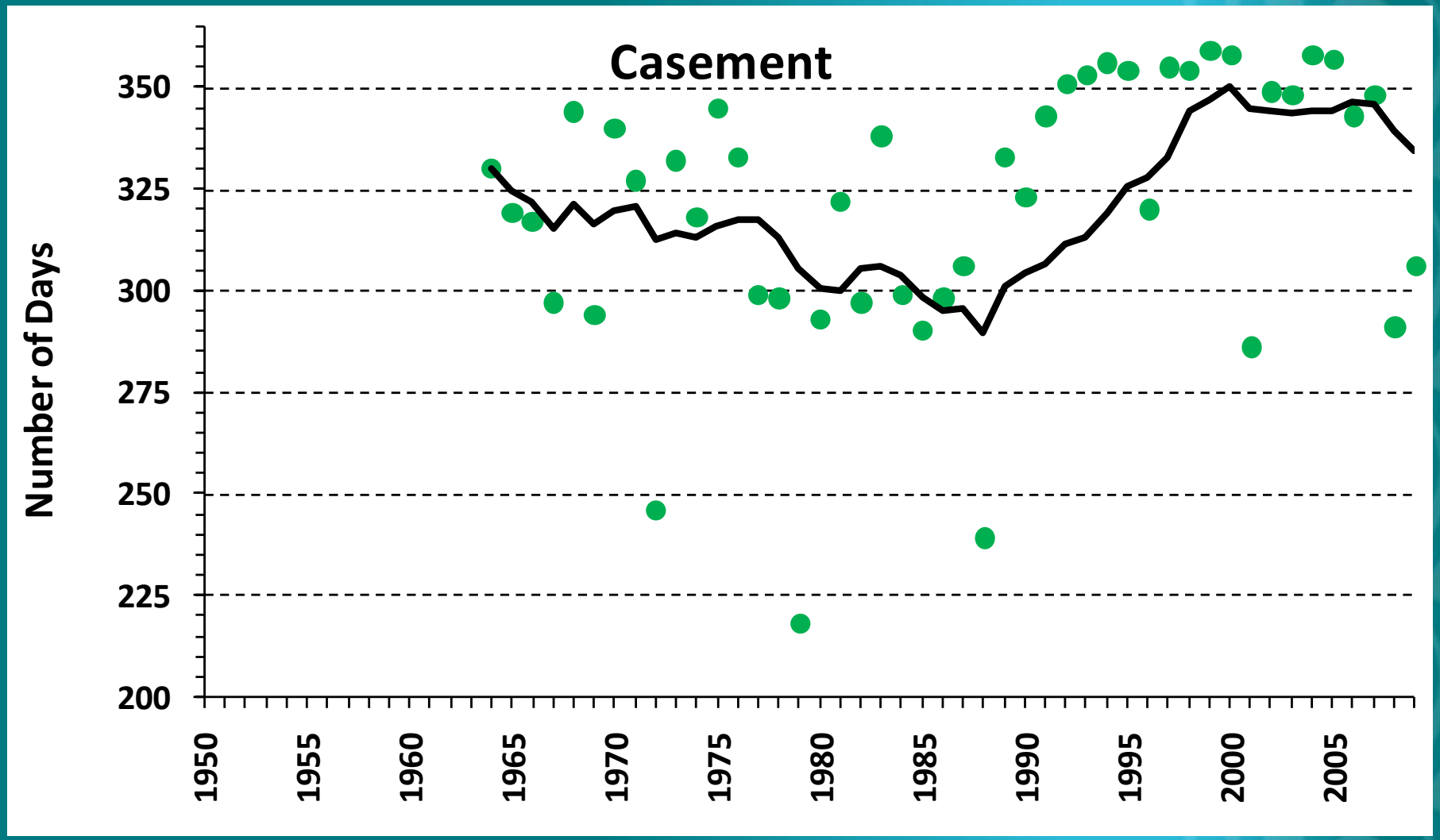
Frost Occurrence

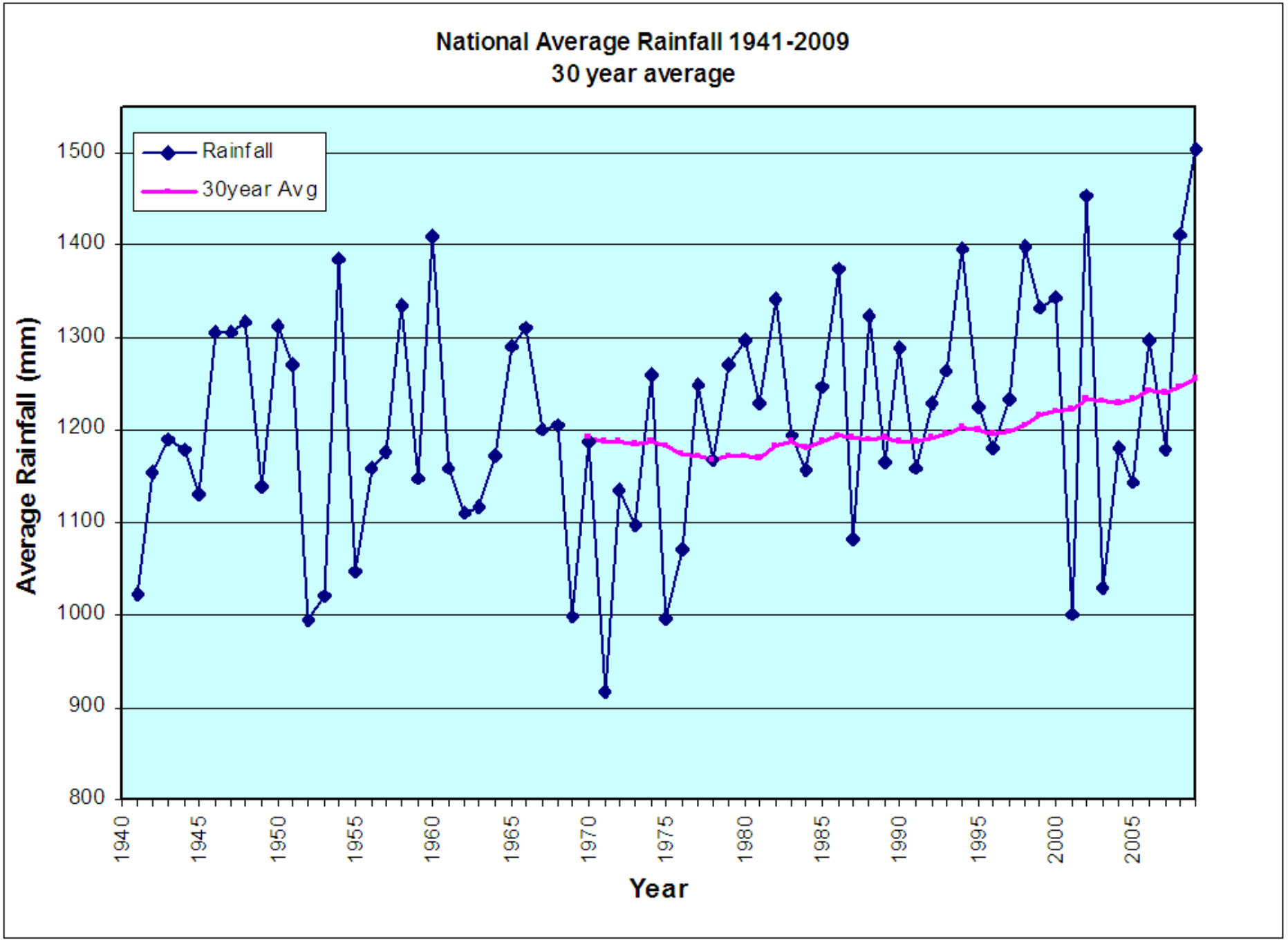


Cold Units

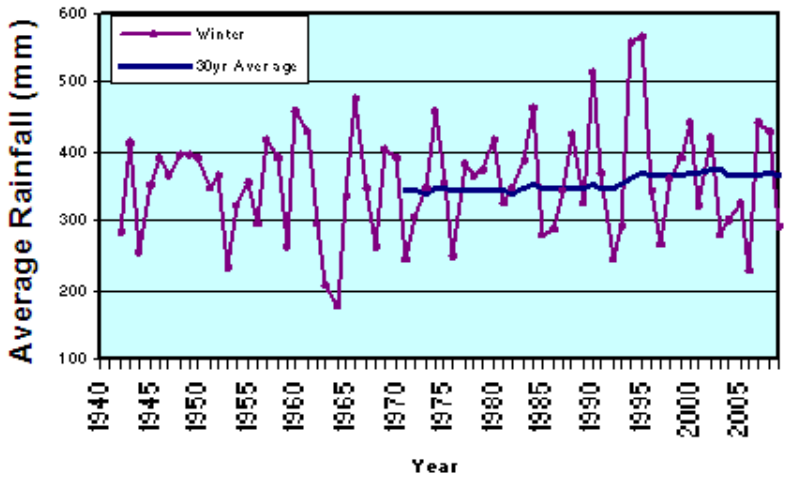

Casement
700
600
500
400
300
200
100
1950
1960
1970
1980
1990
2000
2010

Growing Season Length

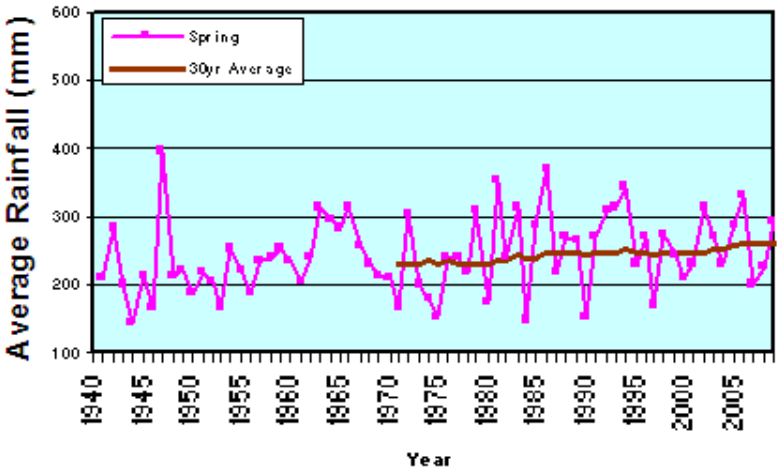



National Average Rainfall 1941-2009
30 year average
Rainfall
30year Avg
Average Rainfall (mm)
1500
1400
1300
1200
1100
1000
900
800
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year

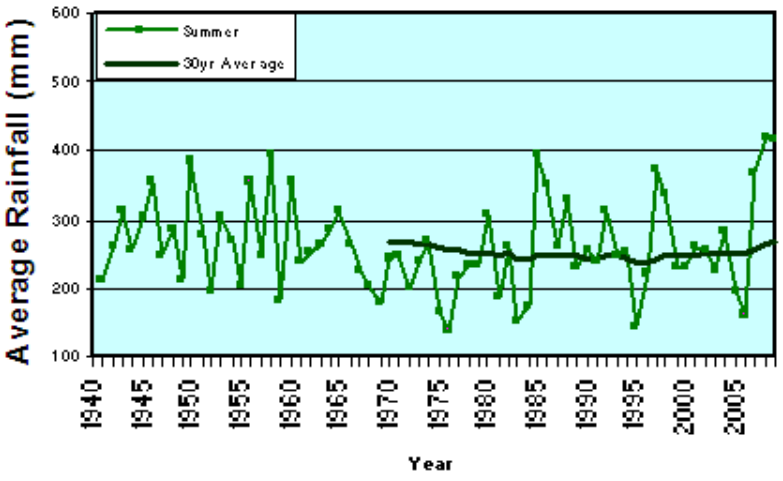
National Average Rainfall Winter 1941-2009



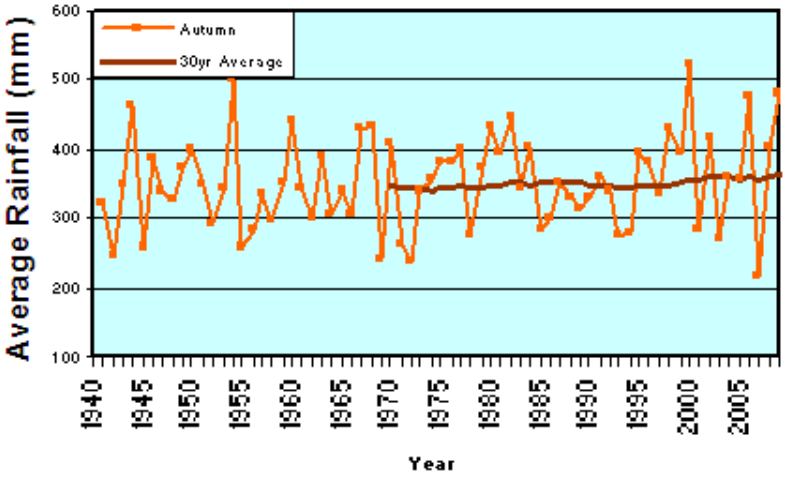
National Average Spring Rainfall 1941-2009

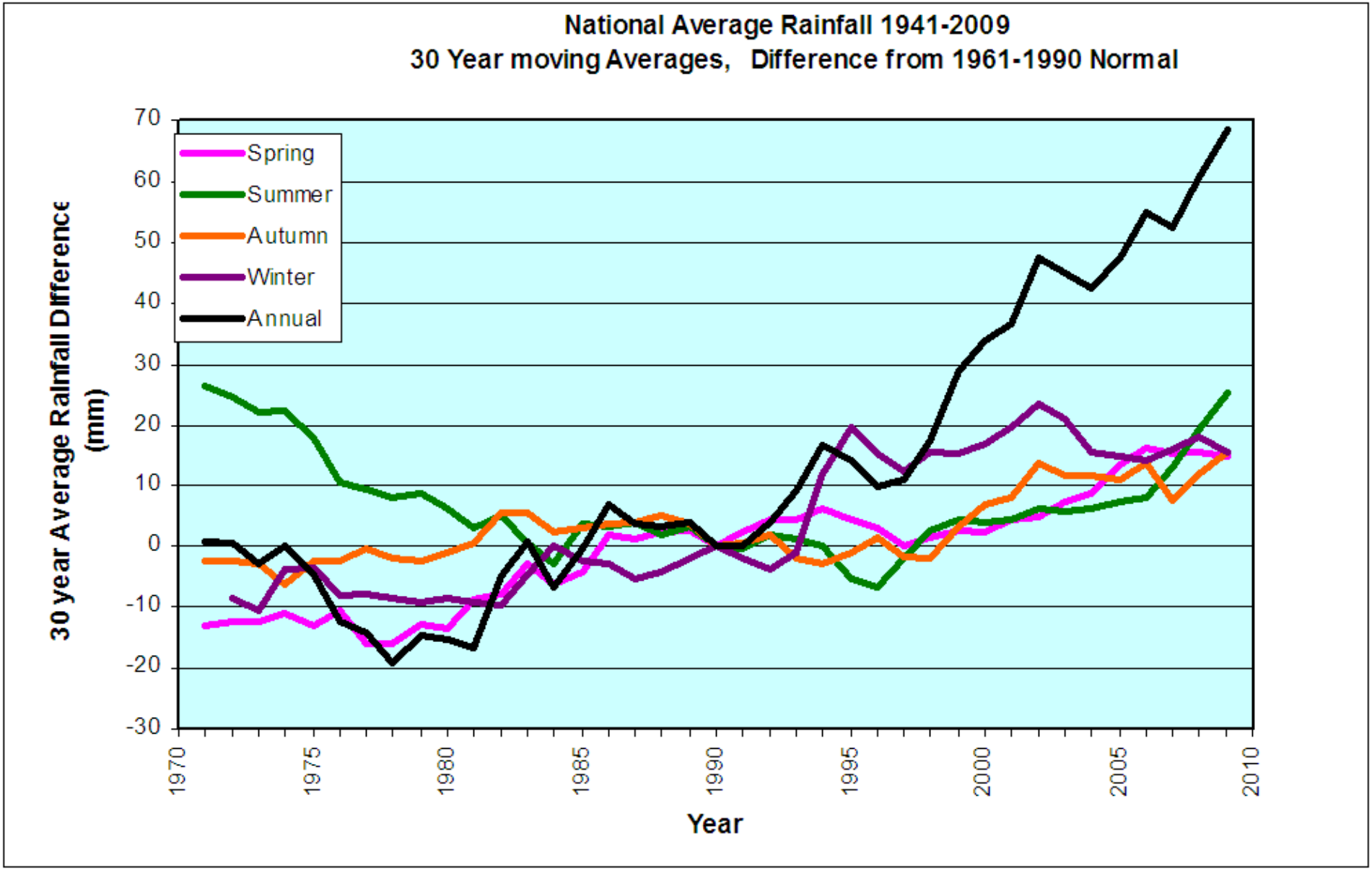


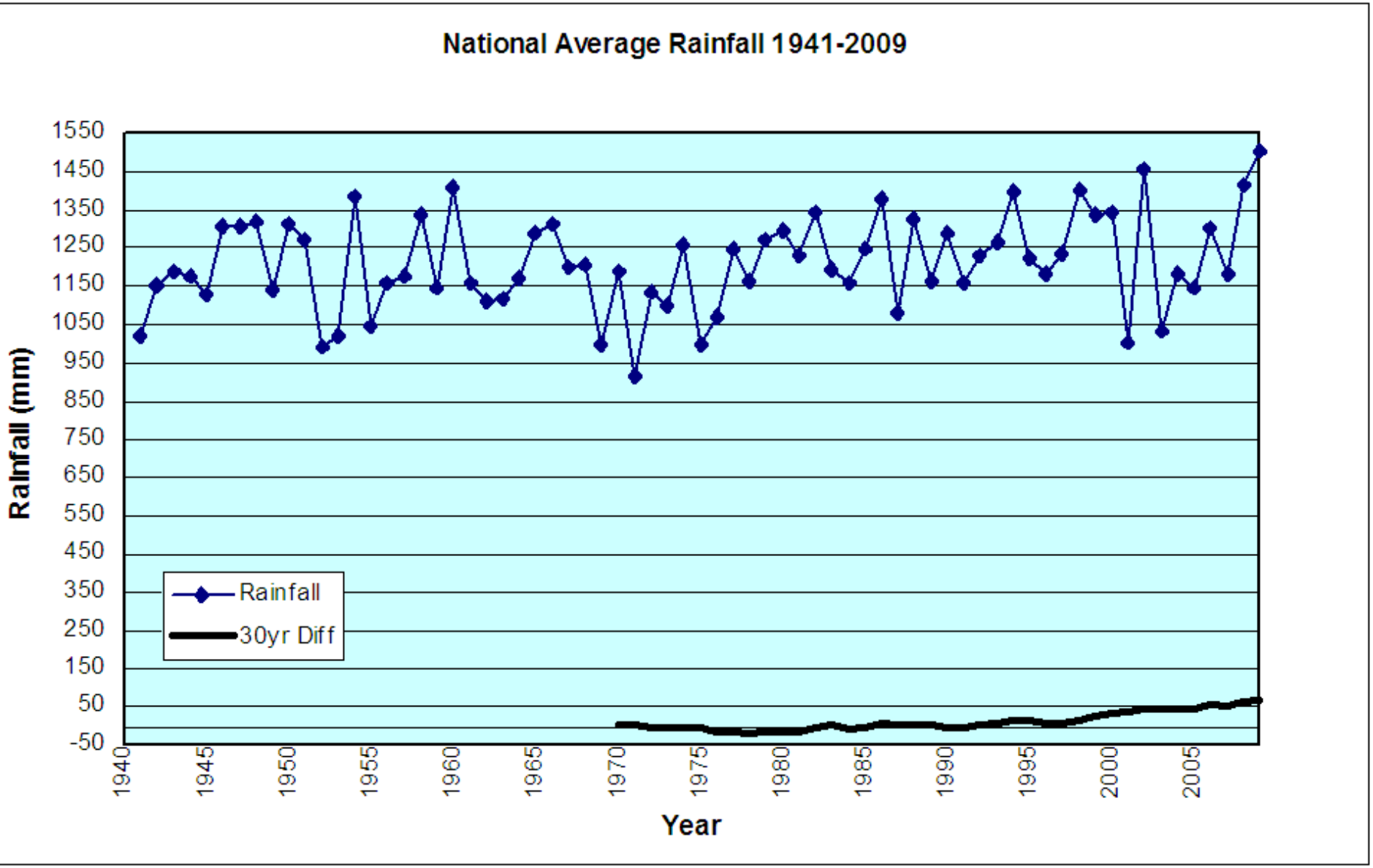
National Average Summer Rainfall 1941-2009



National Average Autumn Rainfall 1941-2009

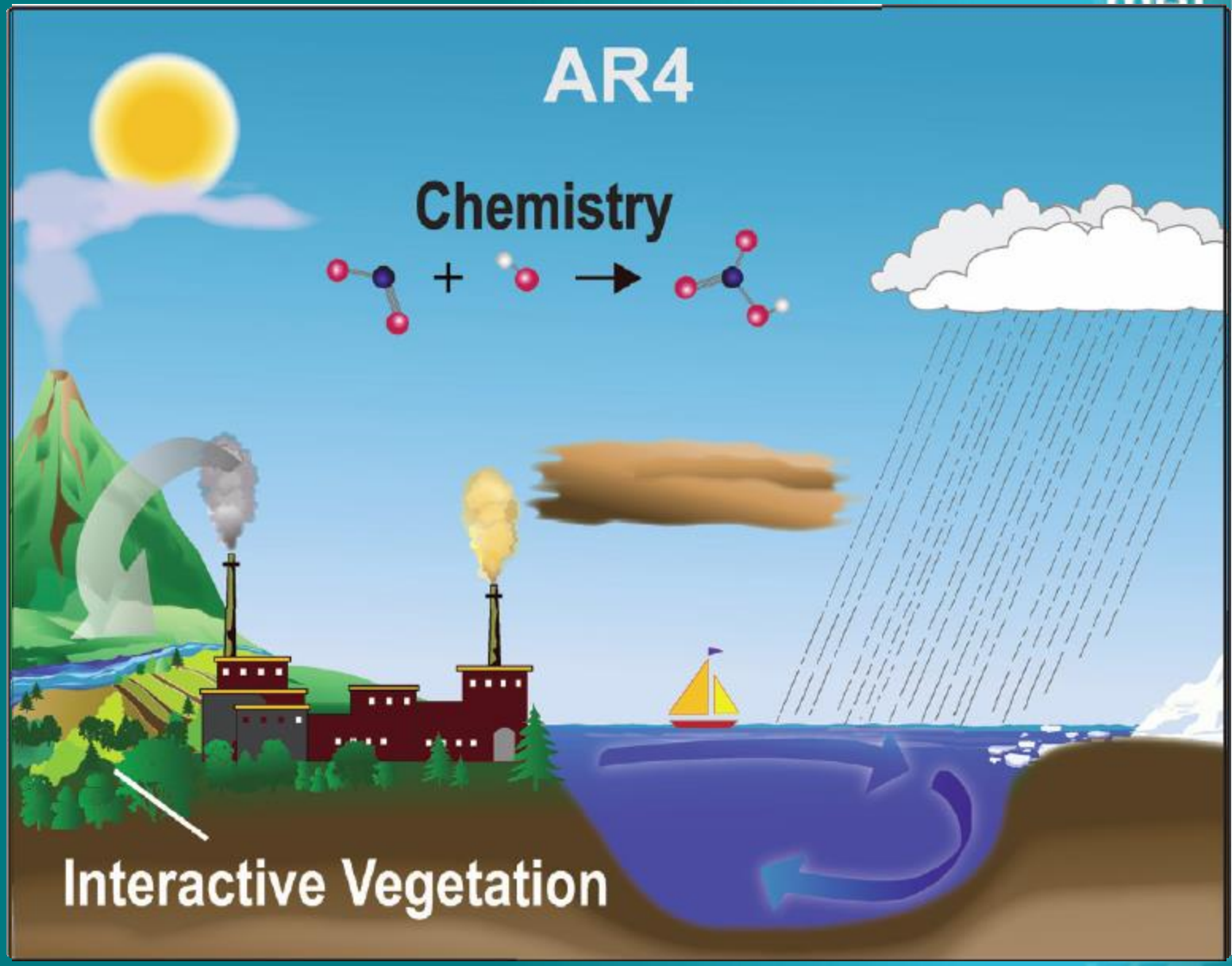


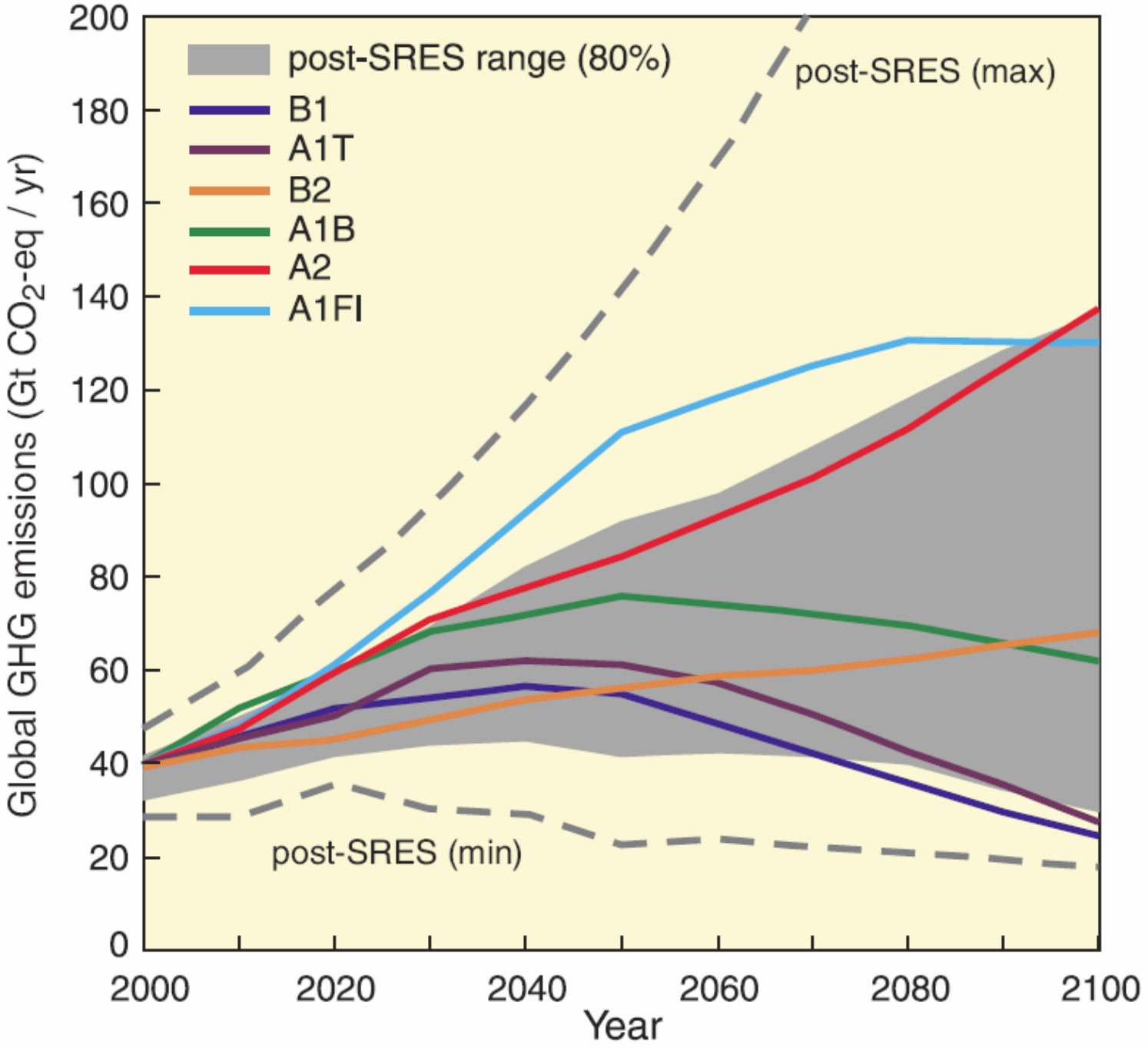

National Average Rainfall 1941-2009
30 Year moving Averages, Difference from 1961-1990 Normal
30 year Average Rainfall Difference (mm)
70
60
50
40
30
20
10
0
-10
-20
-30
Spring
Summer
Autumn
Winter
Annual
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

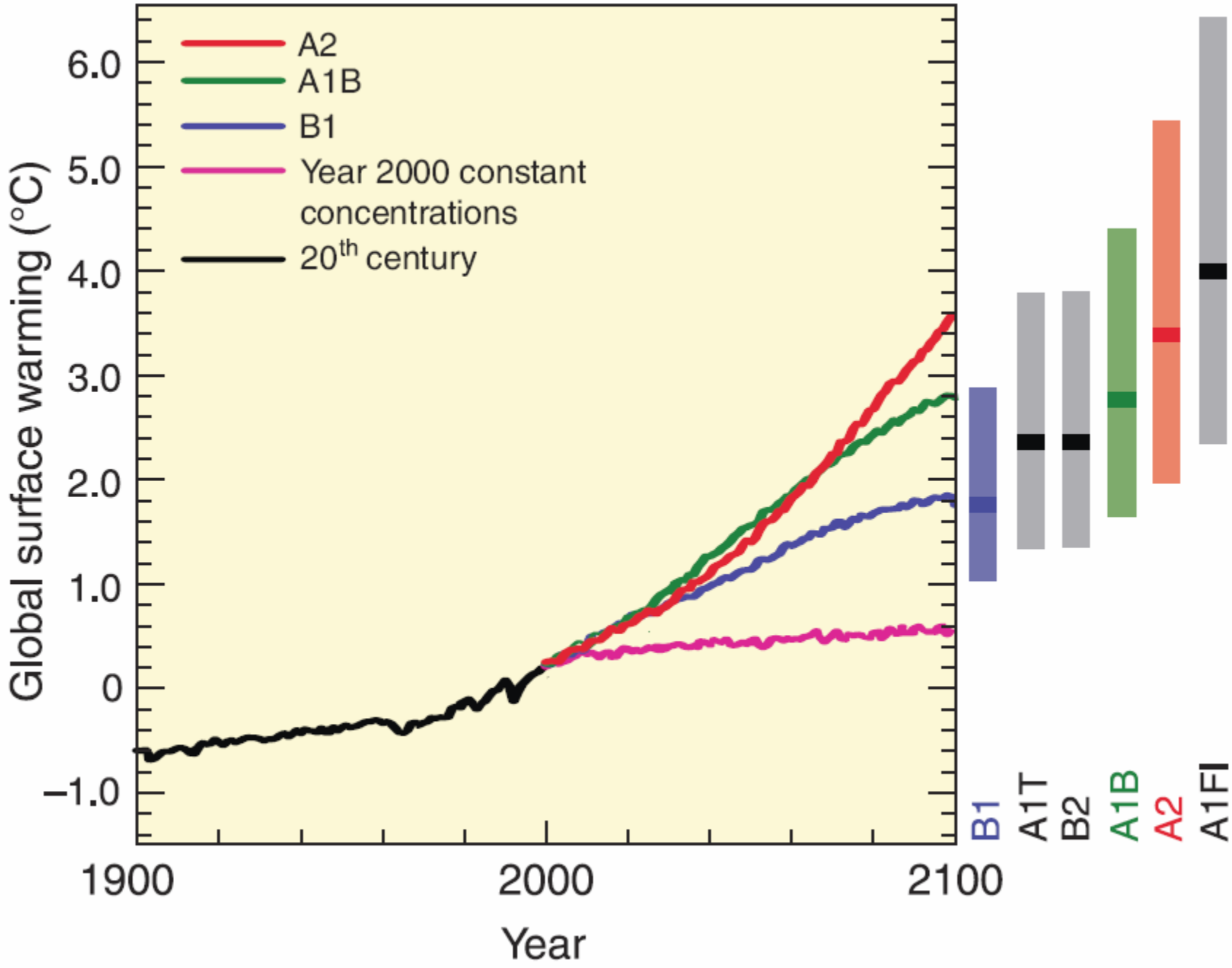

National Average Rainfall 1941-2009
Rainfall (mm)
1550
1450
1350
1250
1150
1050
950
850
750
650
550
450
350
250
150
50
-50
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Year
Rainfall
30yr Diff

Future Changes ?

- Assess factors forcing climate
- Model the impact of these factors on climate

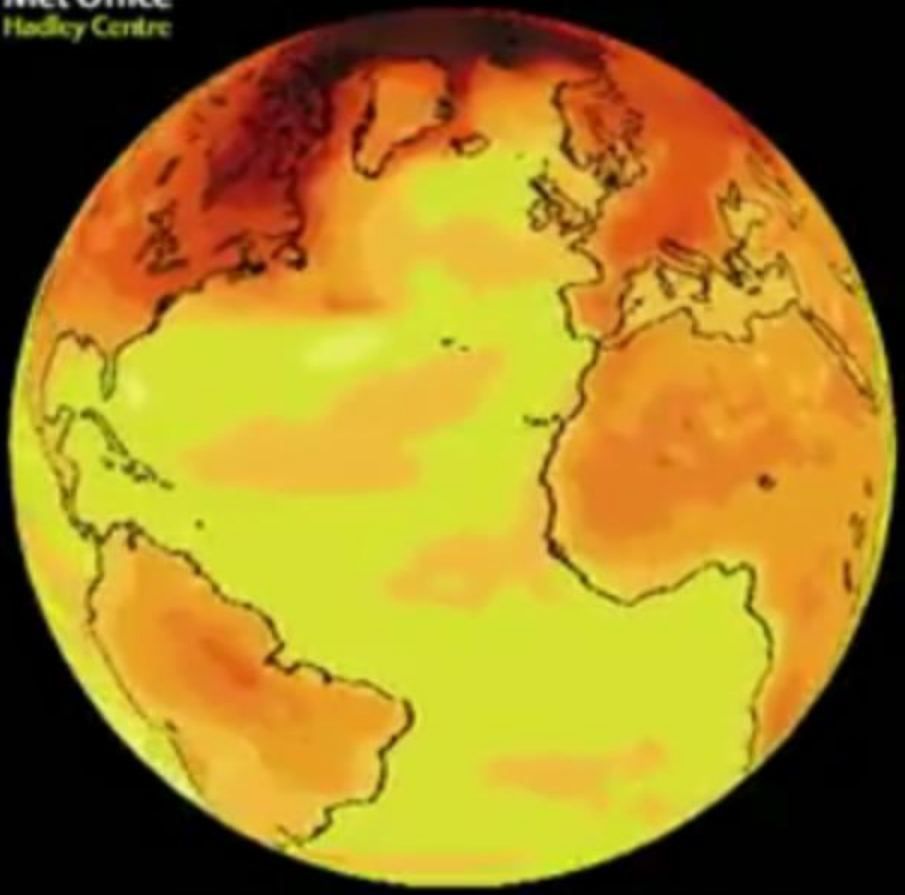

AR4
Chemistry
Interactive Vegetation


post-SRES range (80%)
B1
A1T
B2
A1B
A2
A1FI
post-SRES (max)
post-SRES (min)
Global GHG emissions (Gt CO_2-eq / yr)
Year
0
20
40
60
80
100
120
140
160
180
200
2000
2020
2040
2060
2080
2100


A2
A1B
B1
Year 2000 constant concentrations
20th century
Global surface warming (°C)
6.0
5.0
4.0
3.0
2.0
1.0
0
–1.0
1900
2000
2100
Year
B1
A1T
B2
A1B
A2
A1FI

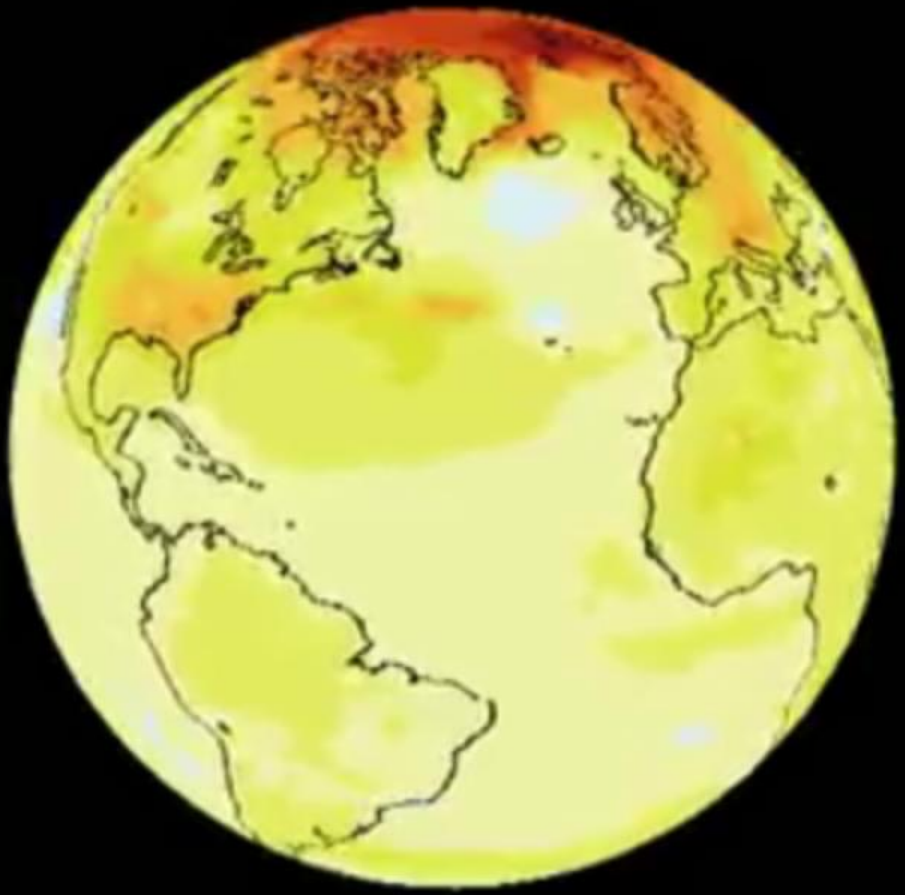
Met Office
Hadley Centre

Temperature rise relative to pre-industrial levels (°C)



4.4°C global average temperature rise

Increasing emissions (A1B)



2.1°C global average temperature rise

Decreasing emissions (E1)

2099

Met Office Hadley Centre model HadGEM2-AO

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Projections for Ireland

- Focusing on local detail - C4I
- Assessing uncertainty - Ensembles
- Reducing uncertainty - EC-Earth

Temperature Projections 2021-2050

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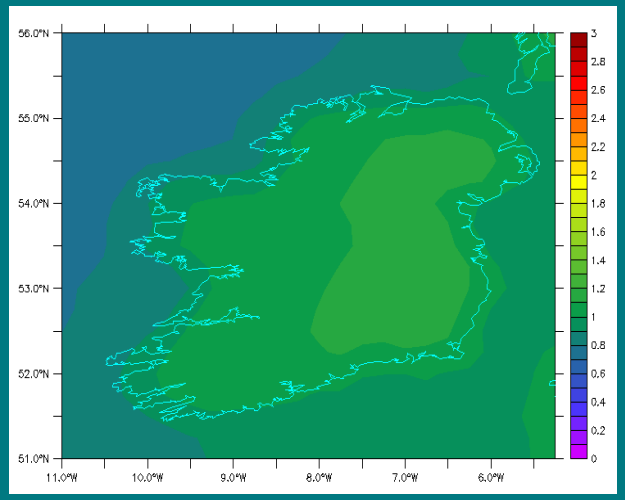
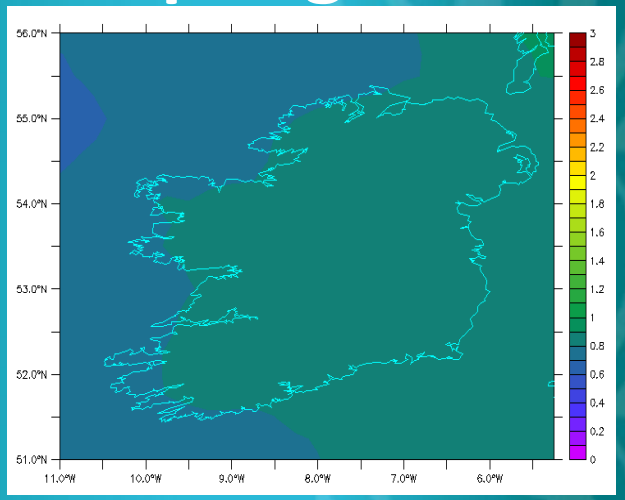
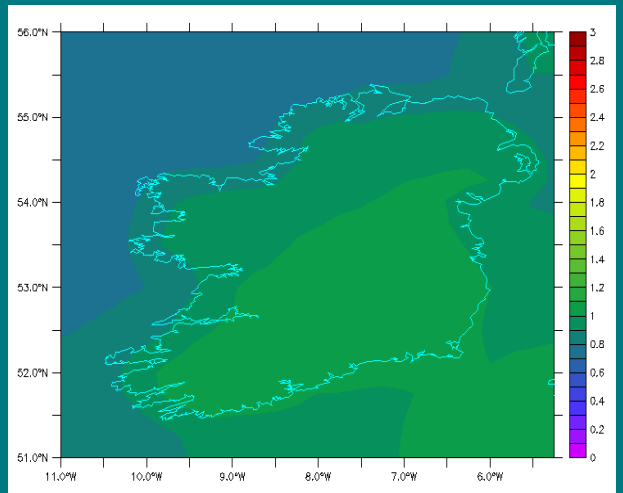
Winter

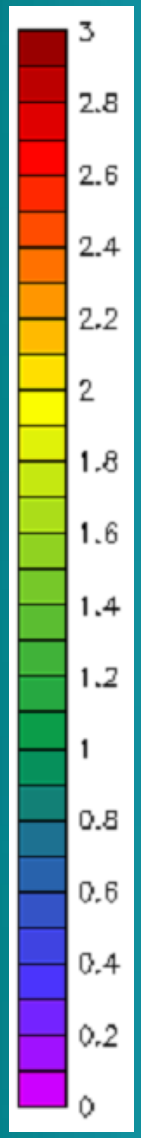


Spring



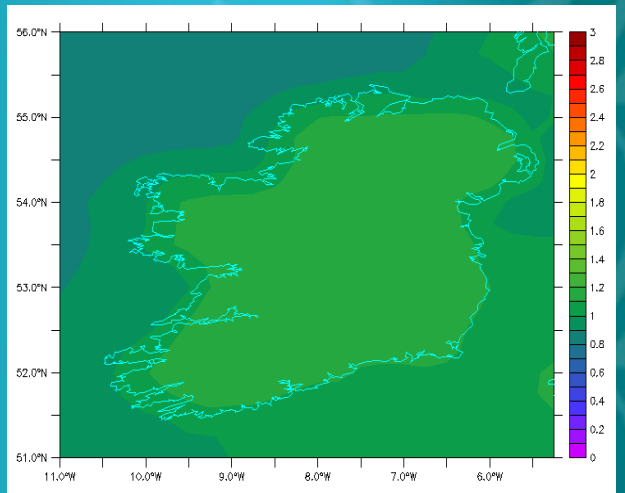
Summer





^{o}C difference 1961-1990

Autumn



Temperature Projections 2071-2100

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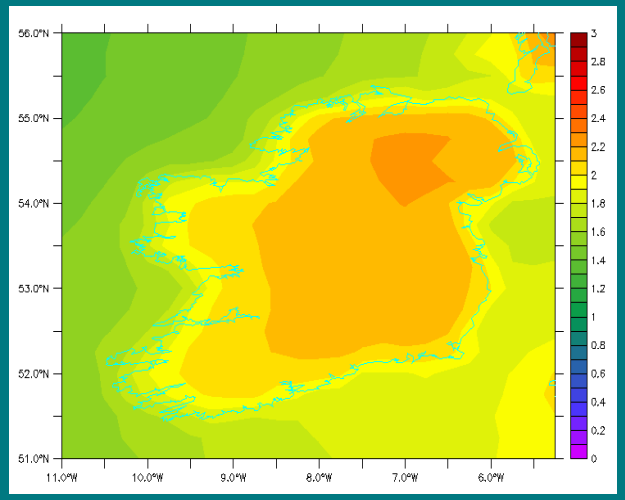
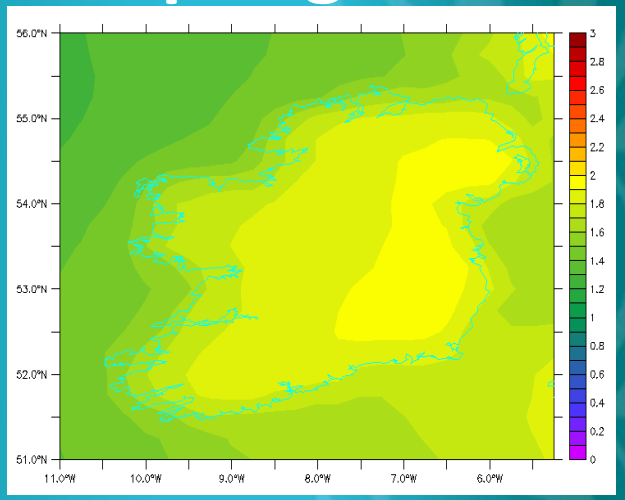
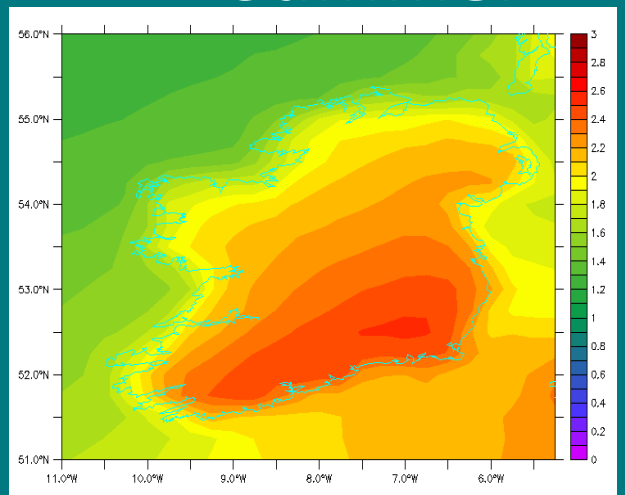
Winter



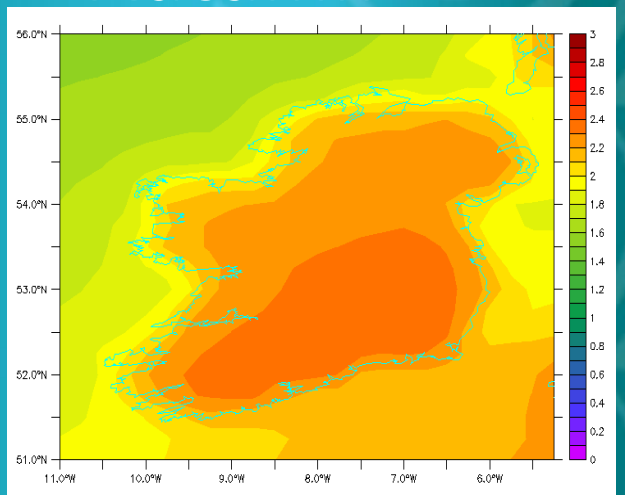
Spring

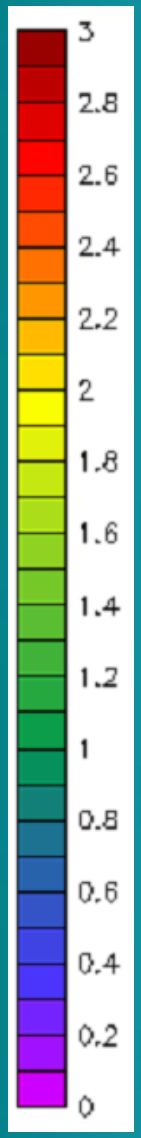


Summer



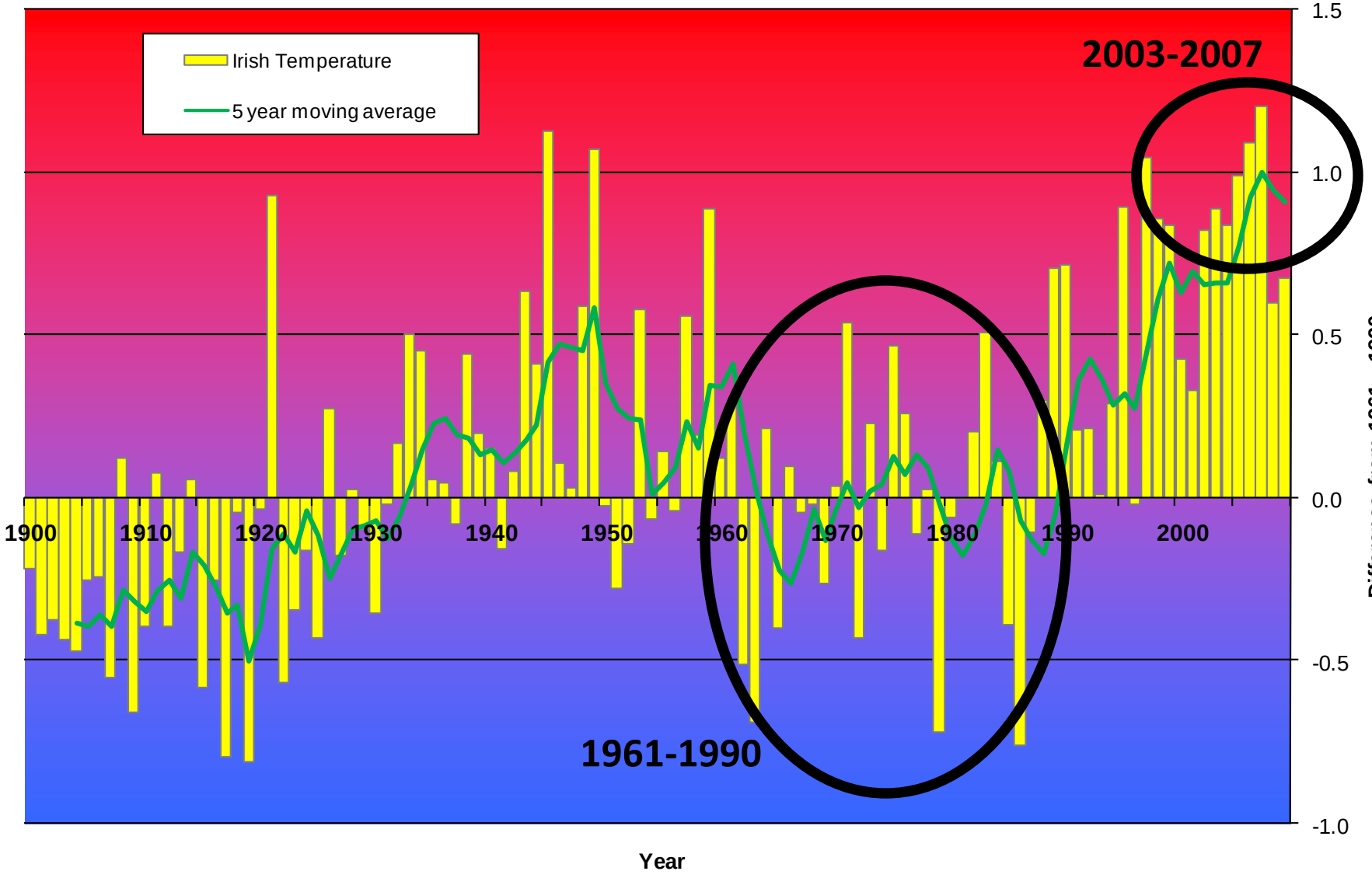
Autumn





°C difference 1961-1990

1900-2009 Air Temperature Difference from 1961-1990 Normal Values



Rainfall Projections 2021-2050

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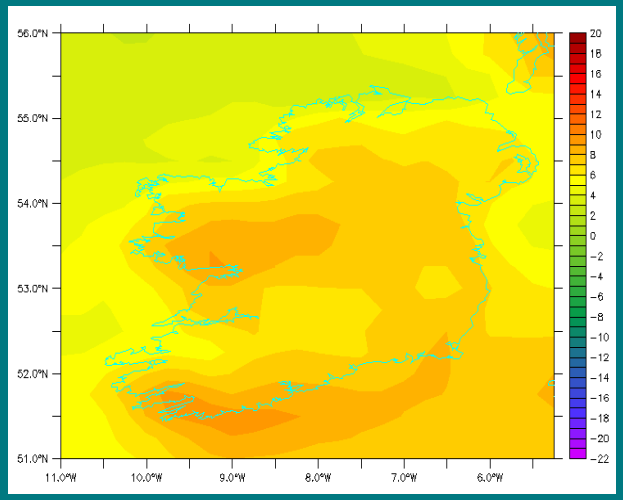
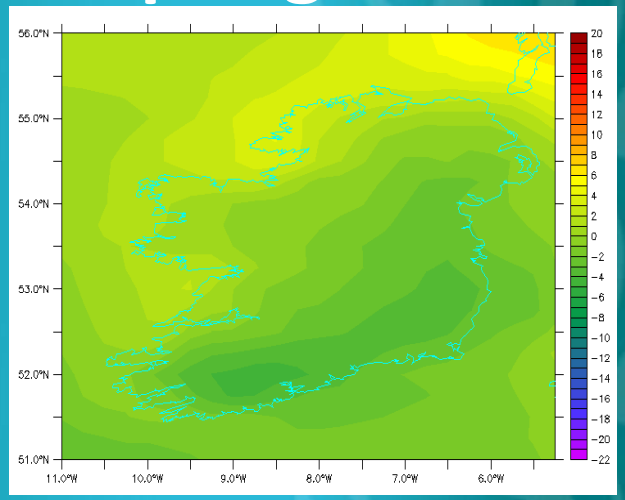
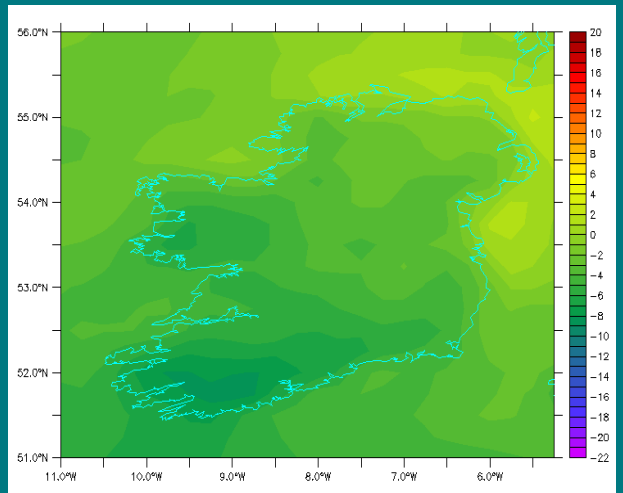
Winter

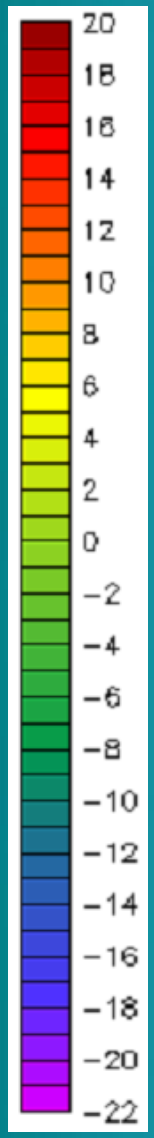


Spring



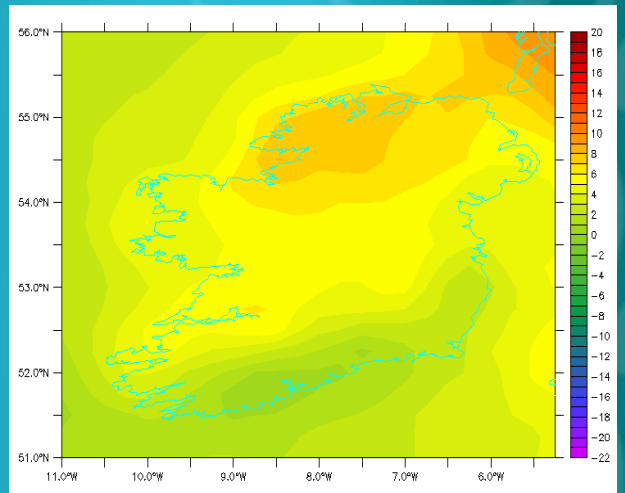
Summer





% difference to 1961-1990

Autumn



Rainfall Projections 2071-2100

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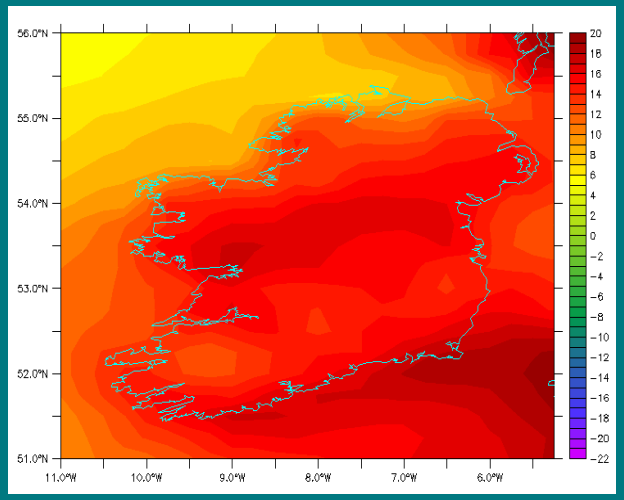
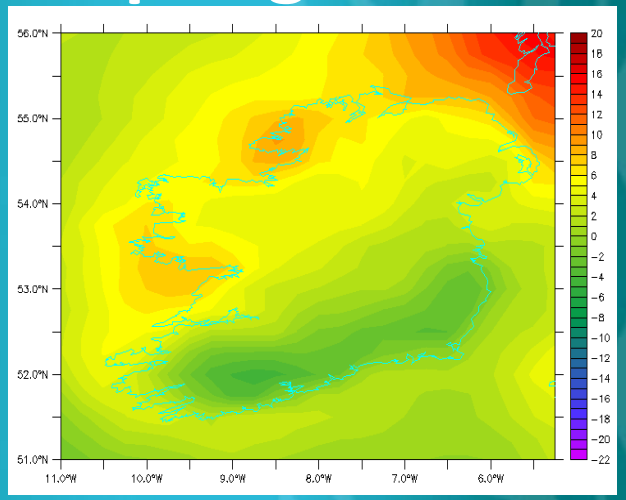
The Irish Meteorological Service

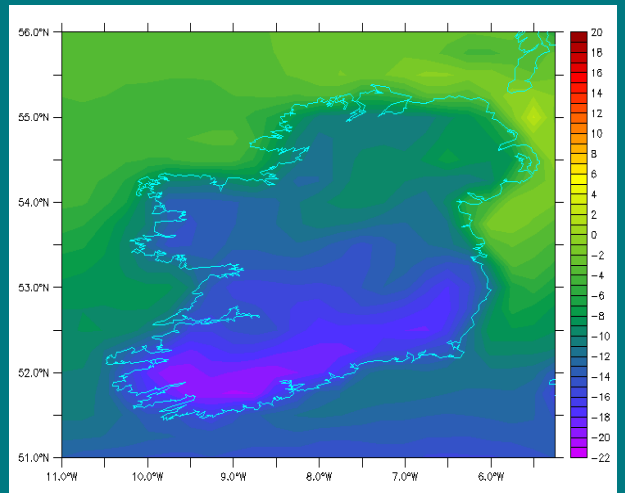
Winter

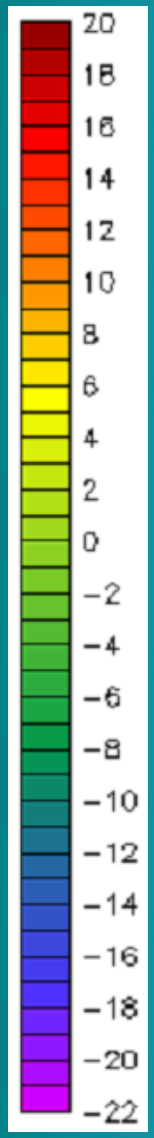


Spring



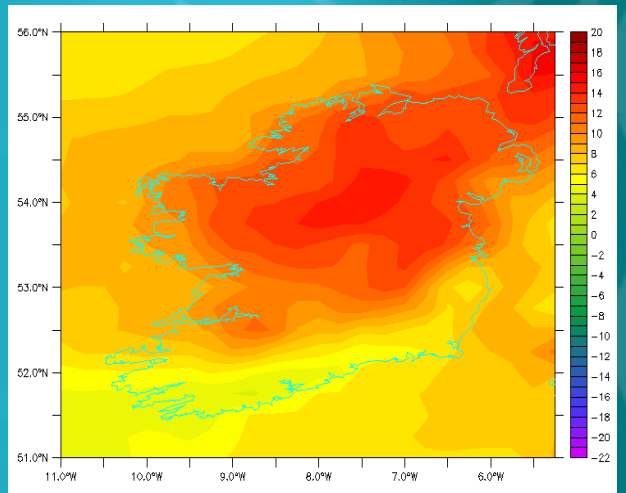
Summer

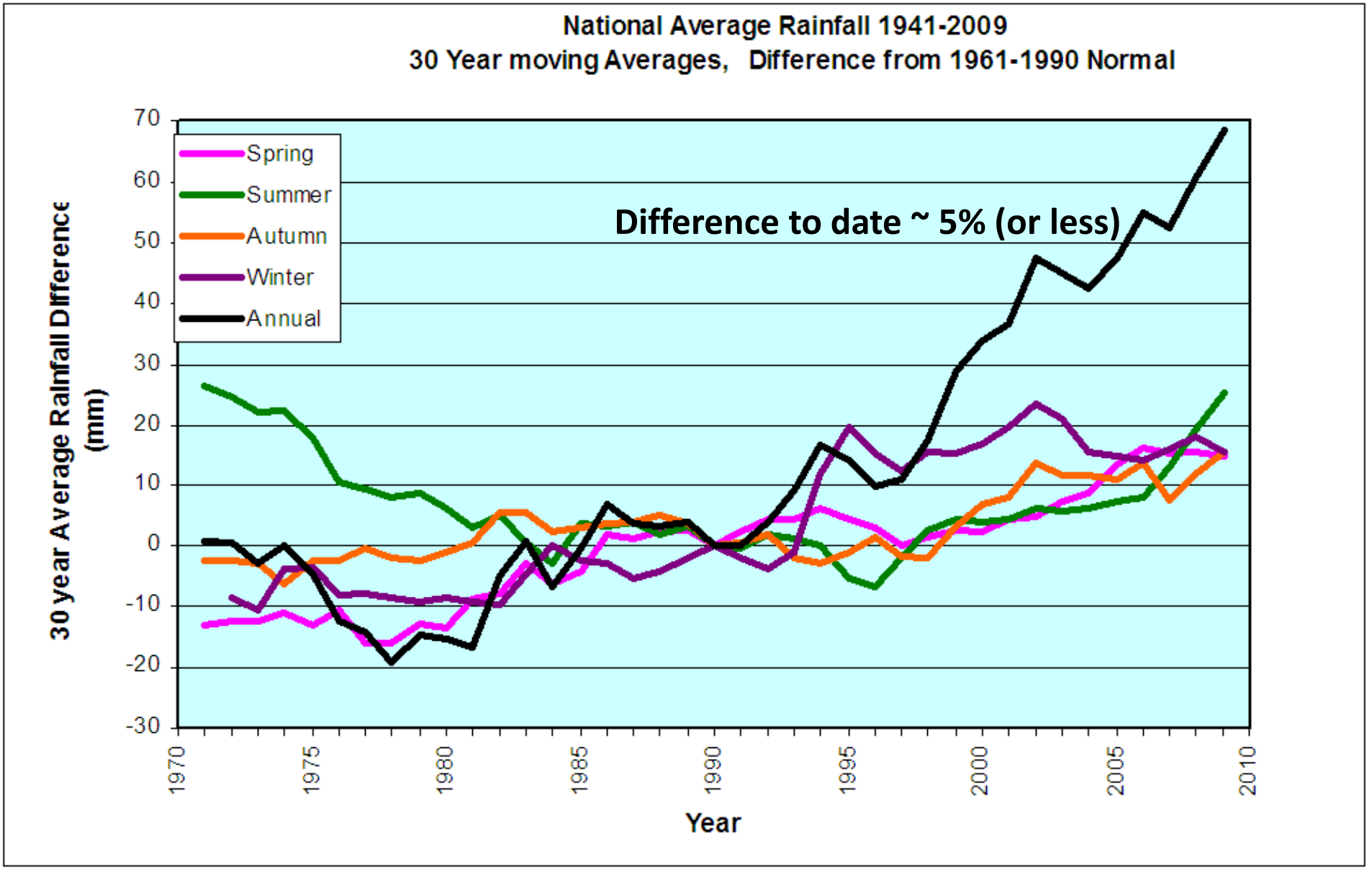




% difference to 1961-1990

Autumn




National Average Rainfall 1941-2009
30 Year moving Averages, Difference from 1961-1990 Normal
Spring
Summer
Autumn
Winter
Annual
Difference to date ~ 5% (or less)
30 year Average Rainfall Difference (mm)
70
60
50
40
30
20
10
0
-10
-20
-30
1970
1975
1980
1985
1990
1995
2000
2005
2010
Year

Summary

- Ireland's climate has become milder

- Weather variability continues to be a feature of our climate

- Climate projections
  - further warming (high certainty)
  - changes in rainfall (lower certainty)
  - continued variability