Global temperature ? ? ? ? ? ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! !

- New statistical scenario for Global temperature

Mohamed Mahmoud Eissa

Vice-Chairman of Egyptian Meteorological Authority for Researches and Climate

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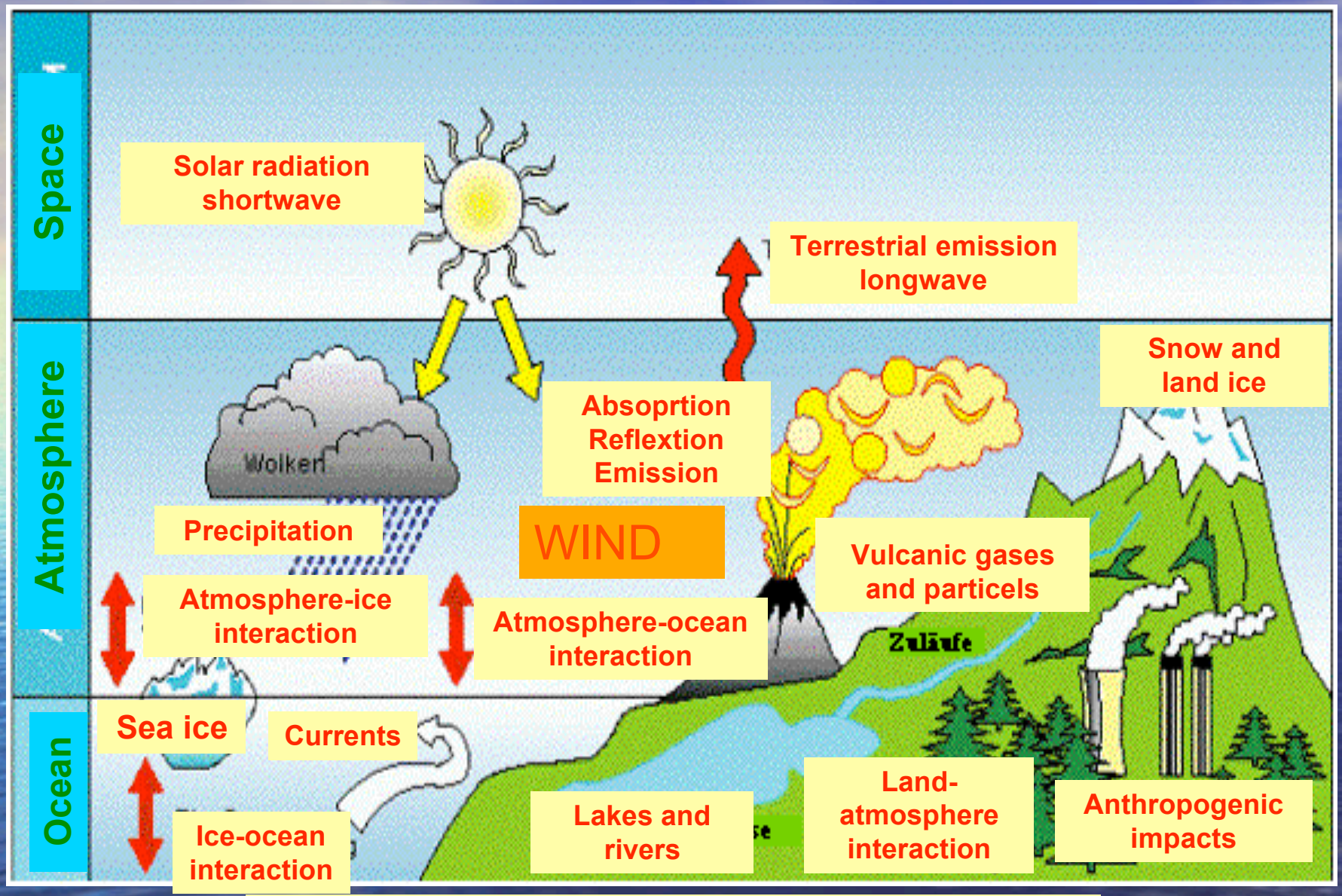
- Interactions in the global climate system



The climate system

What causes the Earth's climate to change?

- **Climate Variability is complex — there are many dynamics involved.**
- **A major factor may be the relationship between the Earth and the Sun.**

Milankovitch studied three factors:

- 1. Changes in the tilt of the Earth's axis;
- 2. Variations in the shape of the Earth's orbit around the Sun
- 3. Precession: changes in how the tilt of the axis is oriented in relation to the orbit.

- the tilt changes between 22.1° and 24.5° within a cycle of the tilt is less, summers are cooler and winters milder about 41,000 years. When the tilt is greater, the seasons are more extreme.

The Shape of the Earth’s Orbit around the Sun

- **The shape of the Earth's orbit around the Sun. It is not quite circular. The Earth is a bit closer to the Sun at some times of the year than at others.**

But the shape of the Earth's orbit is also changing on cycles of between 90,000 and 100,000 years. There are times when it is more elliptical than it is now

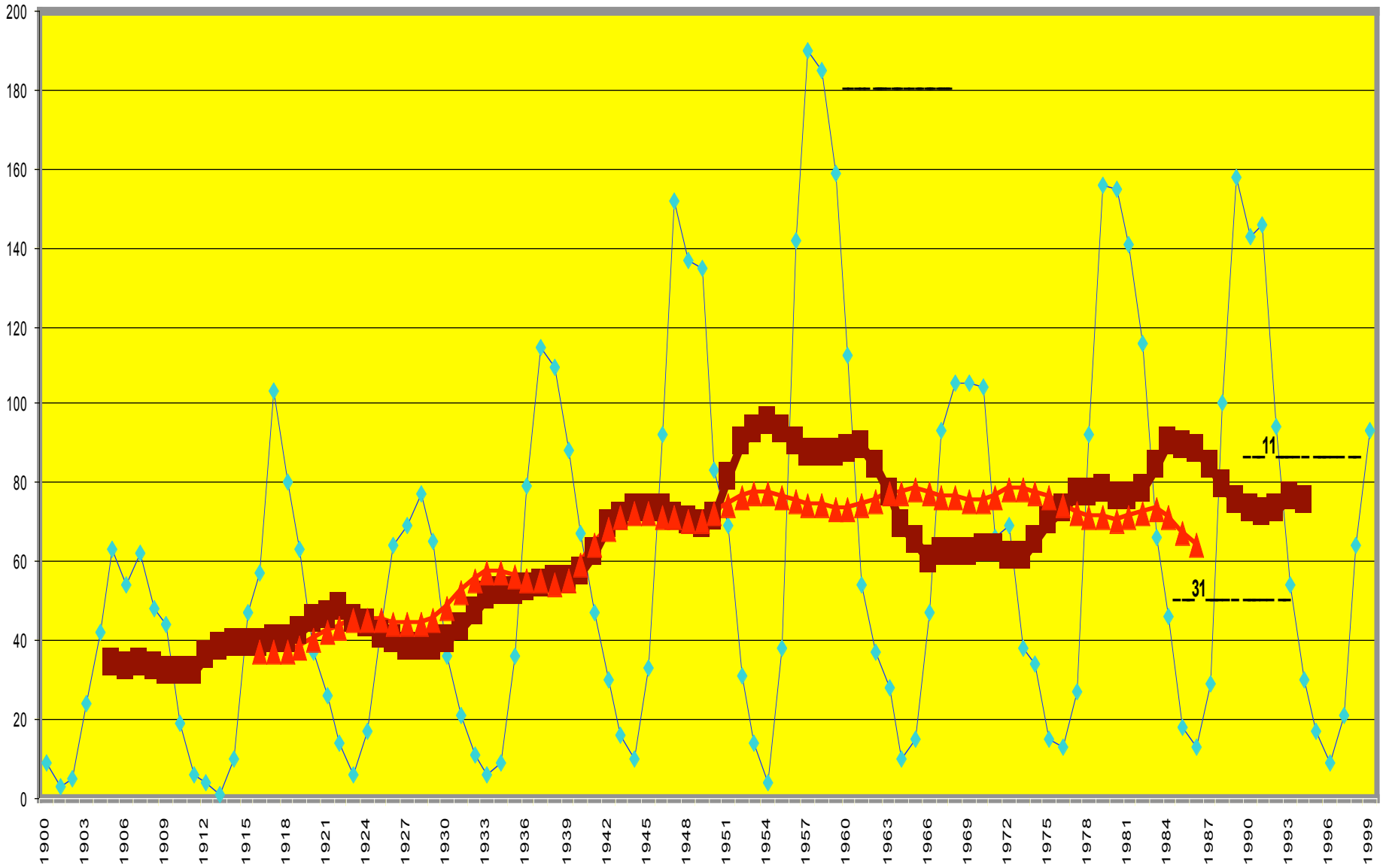
Precession

- There is another complication. The orientation of the tilt of the Earth's axis changes over time. Like a spinning top that is winding down, the axis moves in a circle. This movement is called precession.

- It occurs on a 22,000-year cycle. This causes the seasons to slowly shift through the year.

- Some 11,000 years ago the Northern Hemisphere was tilted toward the Sun in December rather than in June. Winter and summer were reversed. They will have switched again 11,000 years from now.

- Sun Spots Cycles


200
180
160
140
120
100
80
60
40
20
0
11
31
1900
1903
1906
1909
1912
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1918
1921
1924
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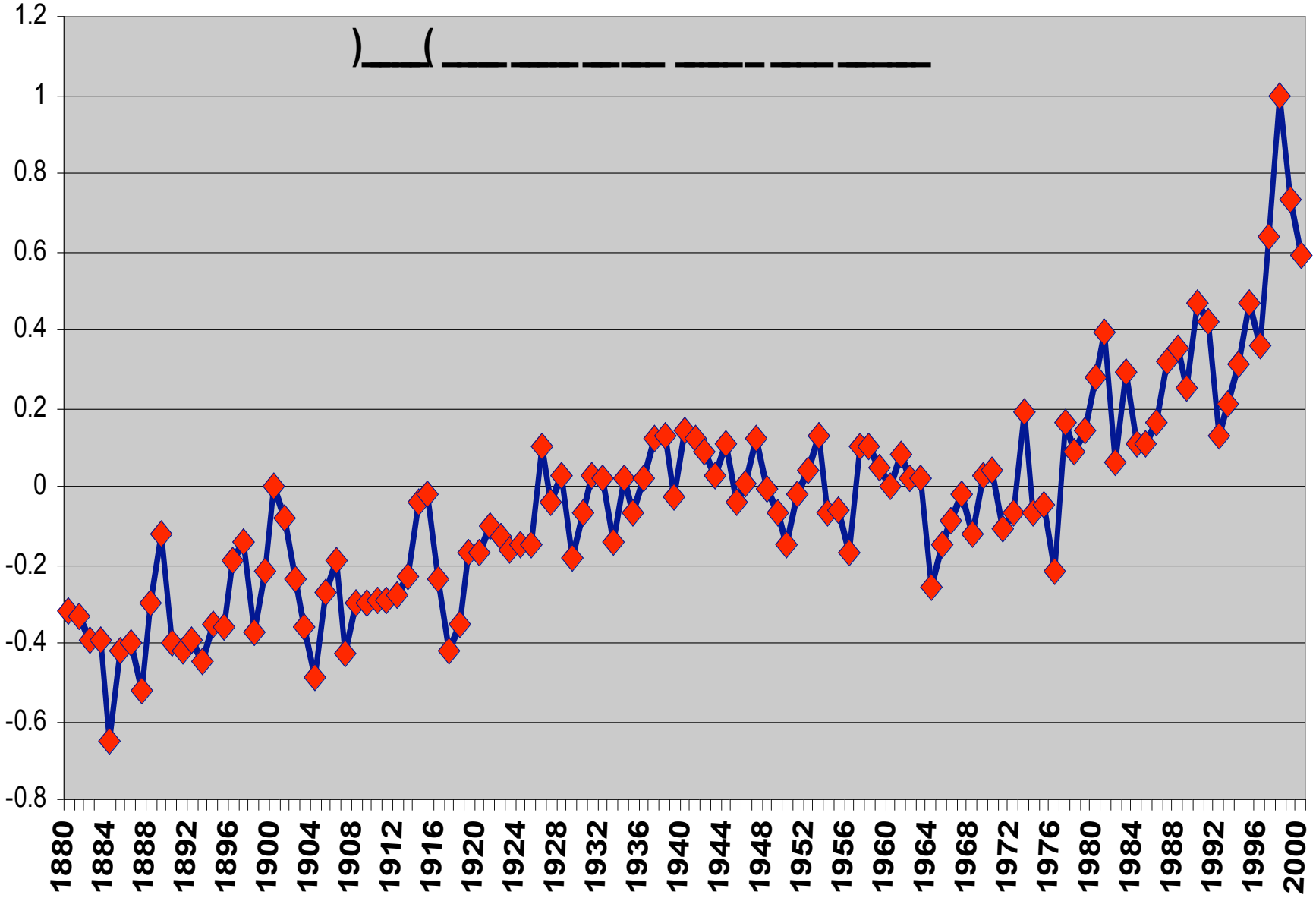
1933
1936
1939
1942
1945
1948
1951
1954
1957
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999

- Earth Temperature Anomaly
  - from normal (1951-1980)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1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
1884
1888
1892
1896
1900
1904
1908
1912
1916
1920
1924
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1932
1936
1940
1944
1948
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1956
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1980
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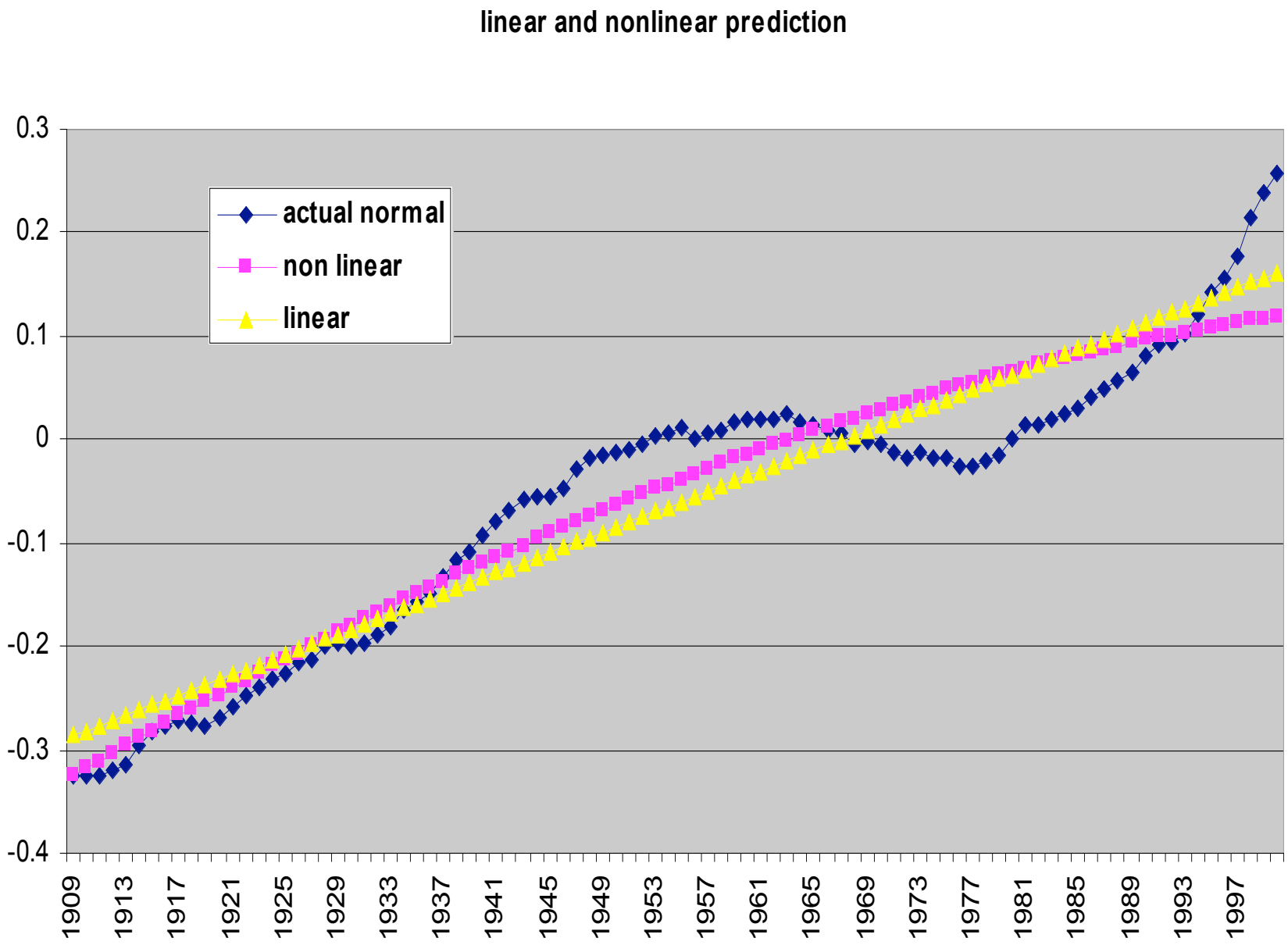
1996
2000


linear and nonlinear prediction
actual normal
non linear
linear
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
1909
1913
1917
1921
1925
1929
1933
1937
1941
1945
1949
1953
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1961
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1969
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1977
1981
1985
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1993
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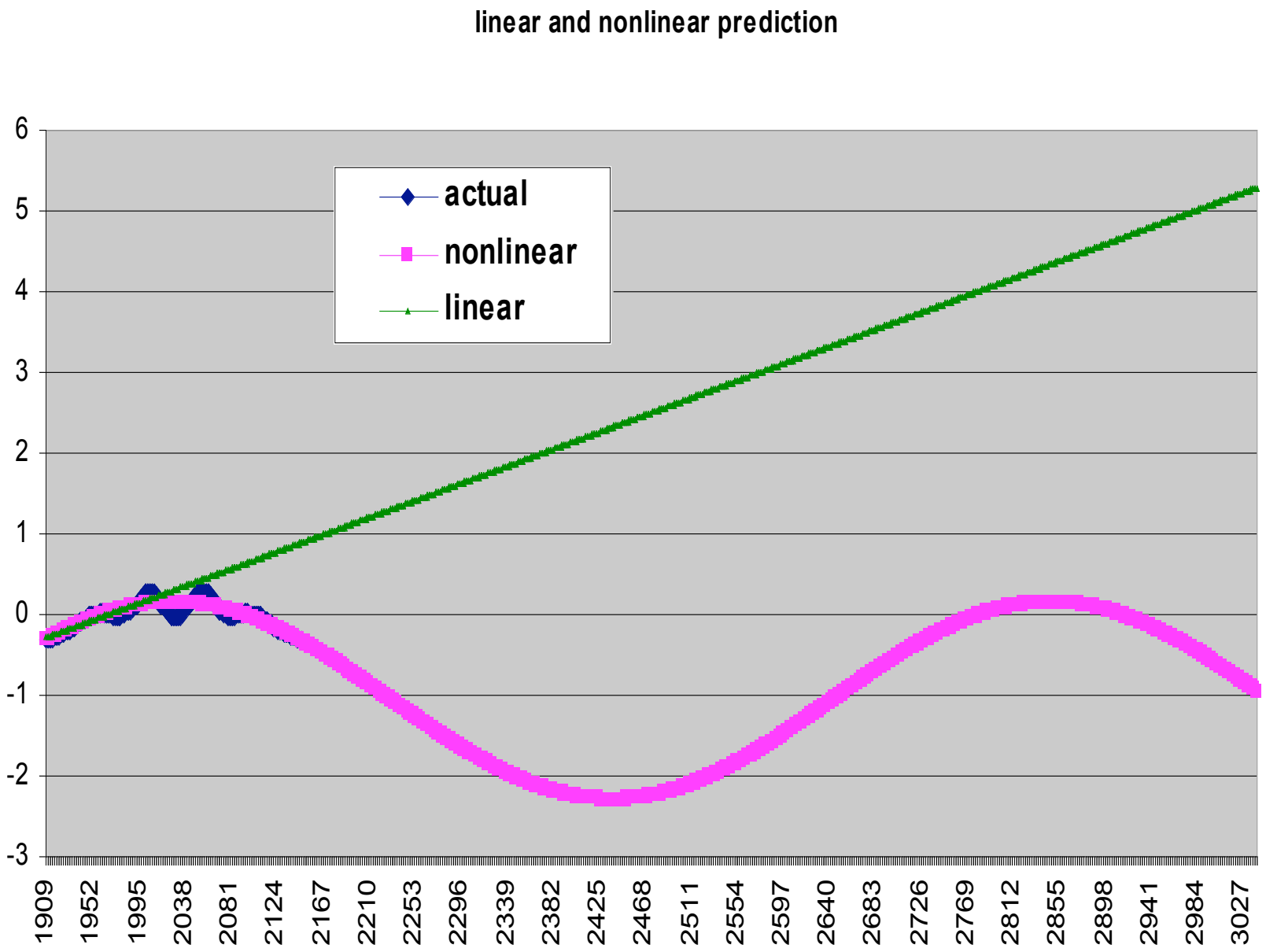

linear and nonlinear prediction
actual
nonlinear
linear
6
5
4
3
2
1
0
-1
-2
-3
1909
1952
1995
2038
2081
2124
2167
2210
2253
2296
2339
2382
2425
2468
2511
2554
2597
2640
2683
2726
2769
2812
2855
2898
2941
2984
3027

Trend

Linear Group

y=0.048586+0.001642*x

r2 Coef Det 0.887166

Nonlinear

SineWaveSquared

y=2.299096+2.445688*SIN(2*(22/7)*X/4925.360148+1.376281)^2

r2 Coef Det 0.905285

Linear trend

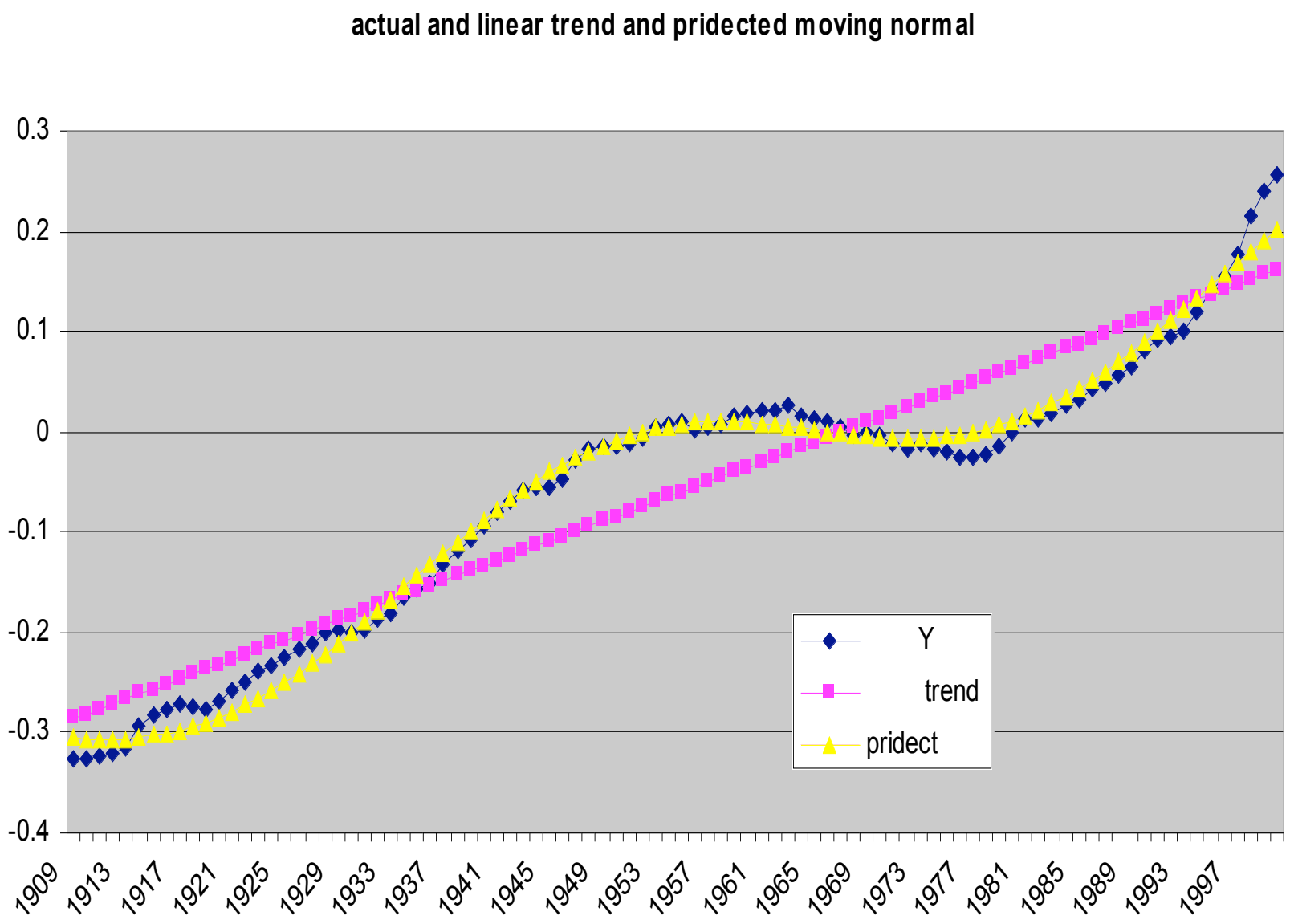
- Linear Group y=0.048586+0.001642*x + 0.064465+ SIN(2*(22/7)*x/91.425366-9.746549)

- r2 Coef Det 0.977166

Non Linear Trend

0.145164-
2.041202*SIN(2*(22/7)*O293/2216.
772592-
0.534377)^2+0.007477+0.05493*SI
N(2*(22/7)*O293/81.198029-
10.464075)

r2 Coef Det 0.985285


actual and linear trend and pridected moving normal
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
1909
1913
1917
1921
1925
1929
1933
1937
1941
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1953
1957
1961
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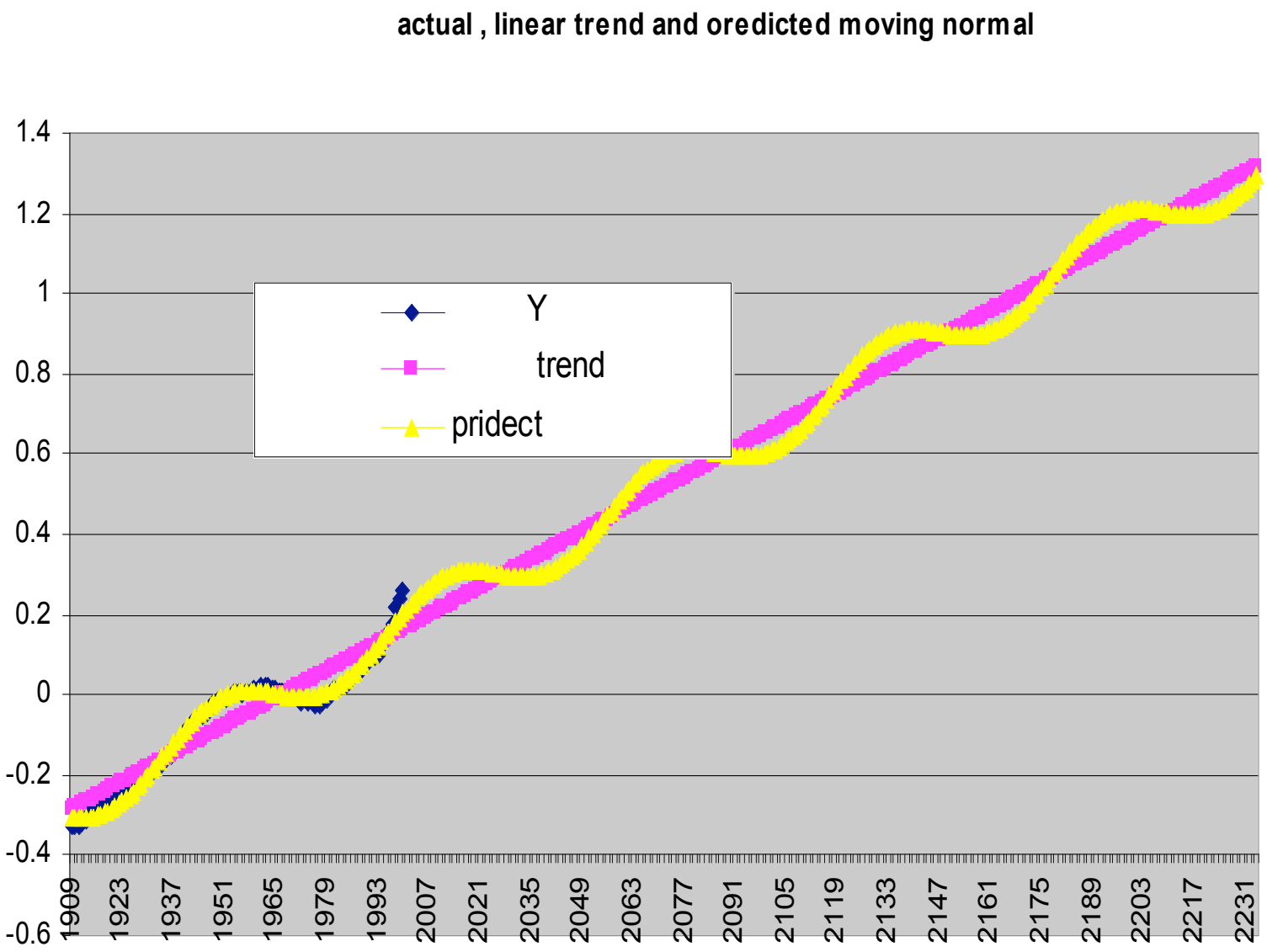
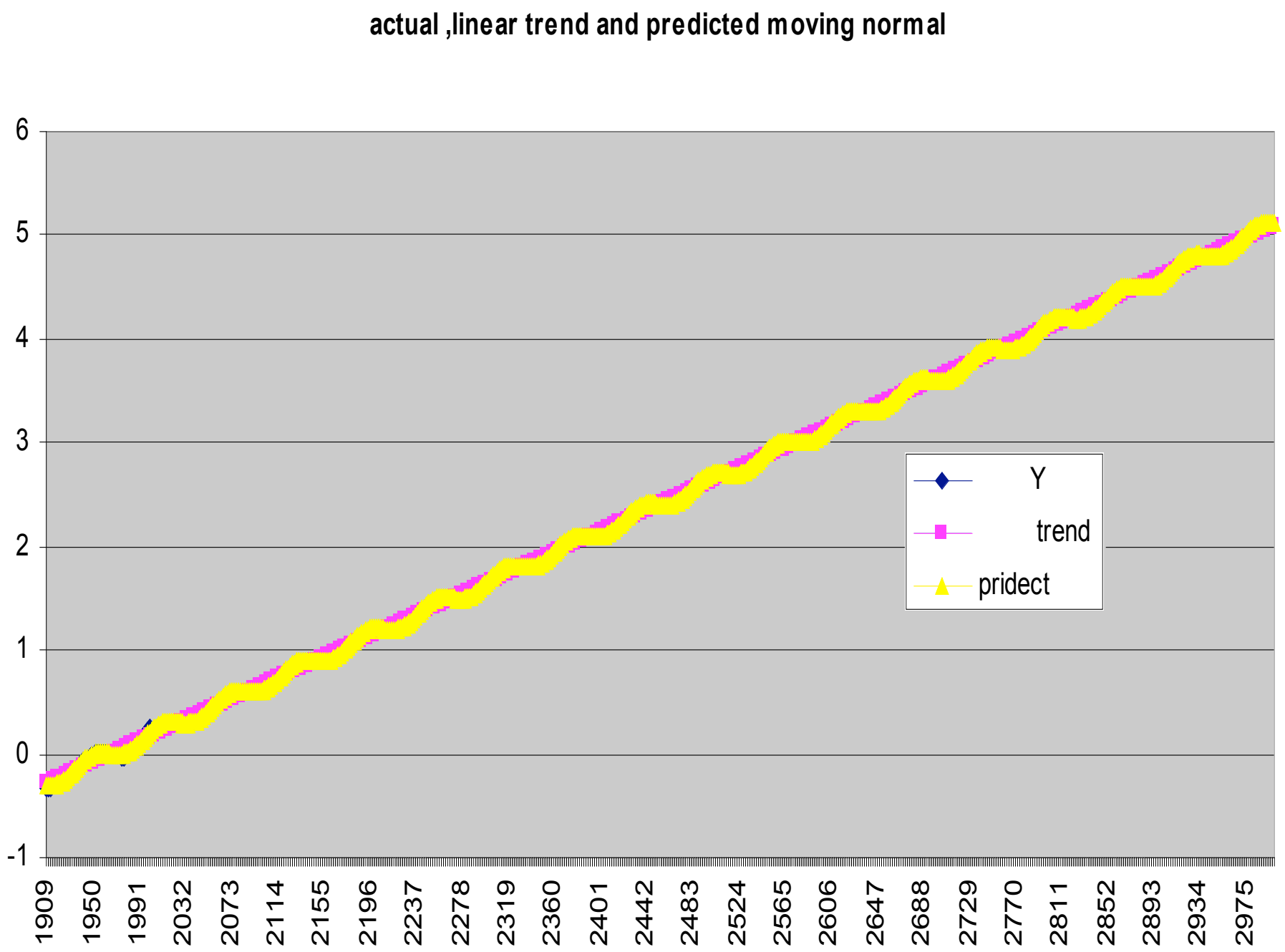
trend
pridect


actual , linear trend and oredicted moving normal
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Y
trend
pridect
1909
1923
1937
1951
1965
1979
1993
2007
2021
2035
2049
2063
2077
2091
2105
2119
2133
2147
2161
2175
2189
2203
2217
2231


actual ,linear trend and predicted moving normal
6
5
4
3
2
1
0
-1
1909
1950
1991
2032
2073
2114
2155
2196
2237
2278
2319
2360
2401
2442
2483
2524
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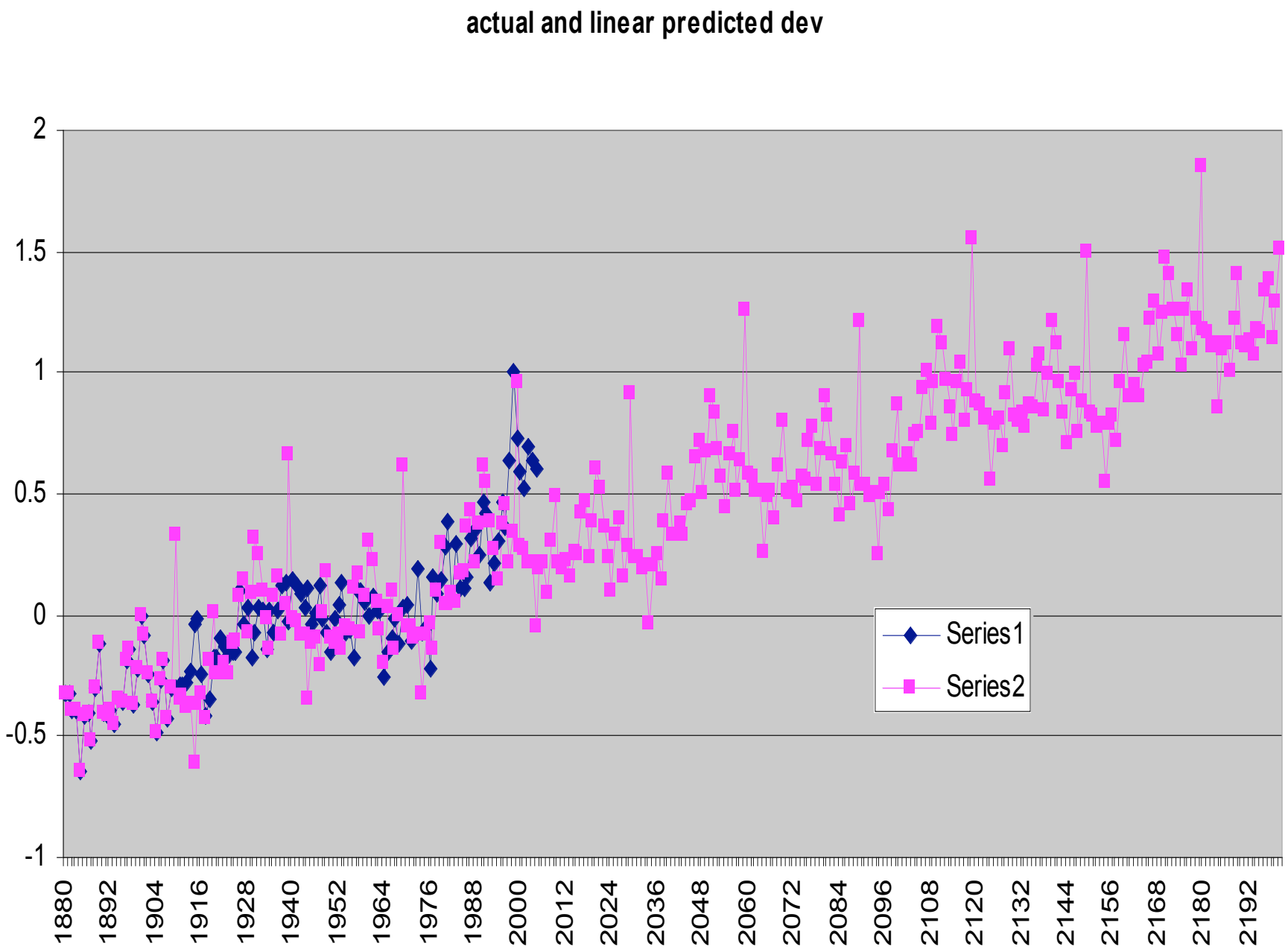
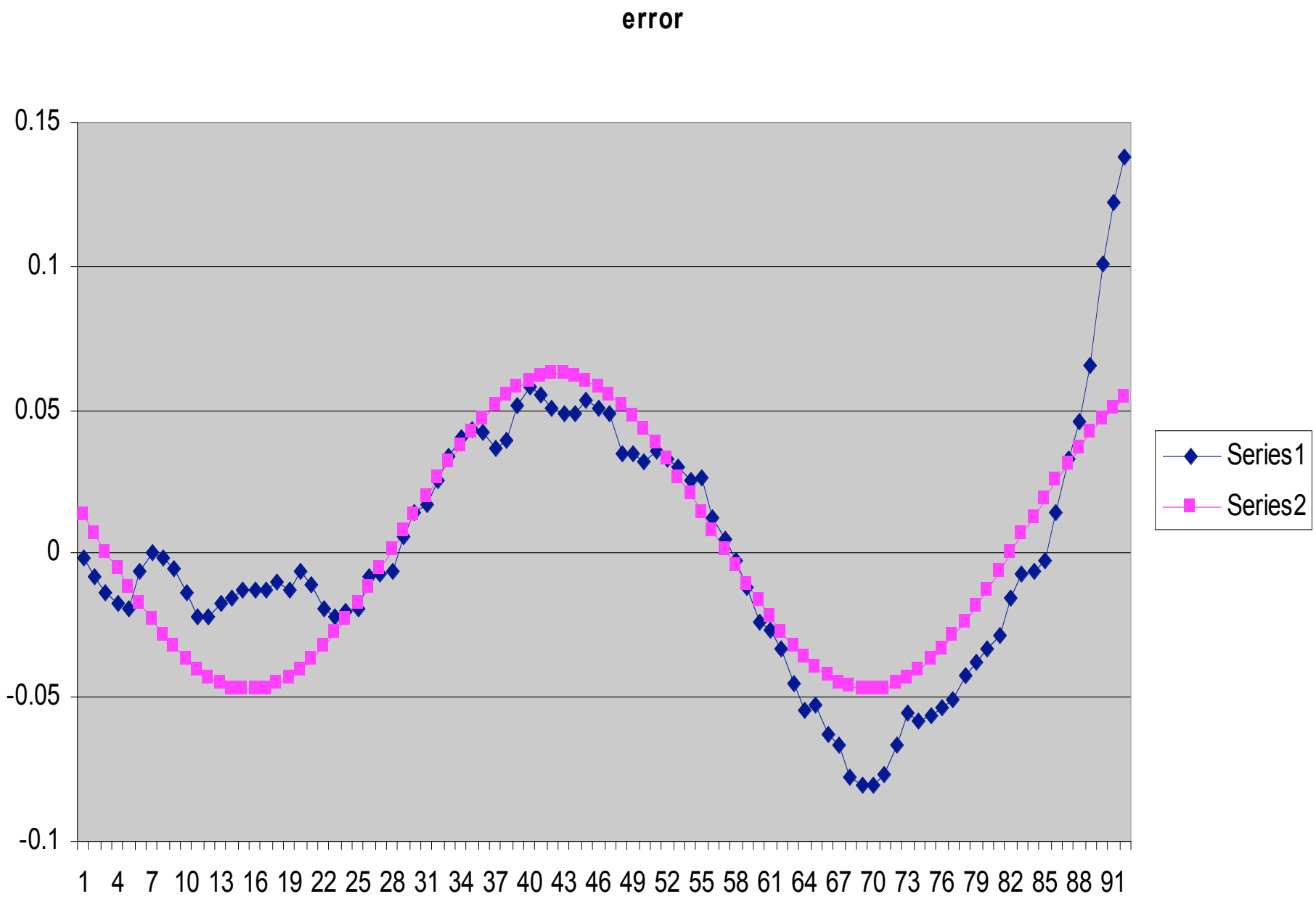
2893
2934
2975
Y
trend
pridect


actual and linear predicted dev
2
1.5
1
0.5
0
-0.5
-1
1880
1892
1904
1916
1928
1940
1952
1964
1976
1988
2000
2012
2024
2036
2048
2060
2072
2084
2096
2108
2120
2132
2144
2156
2168
2180
2192
Series1
Series2

- NON LINEAR TREND


error
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0.1
0.05
0
-0.05
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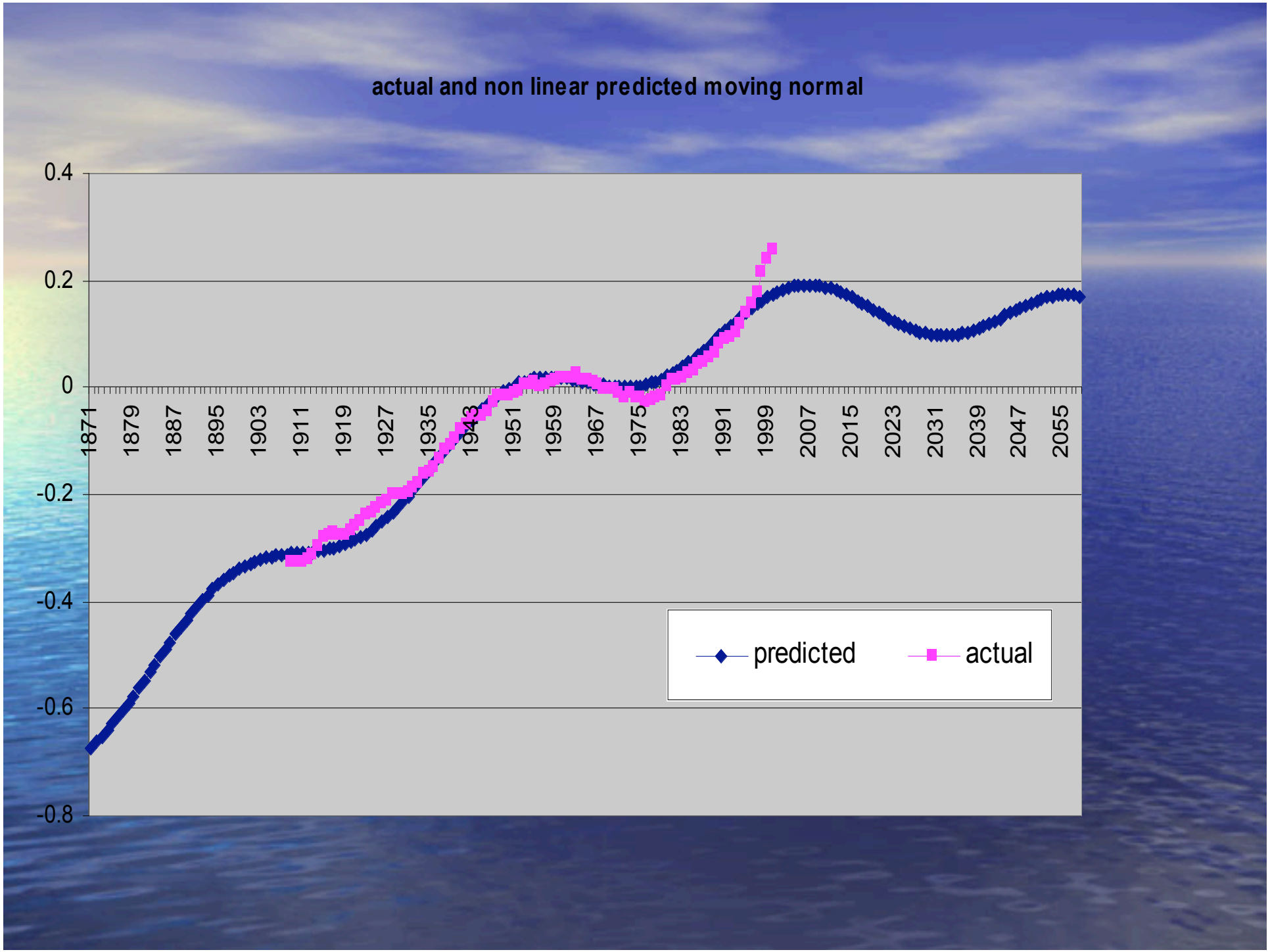
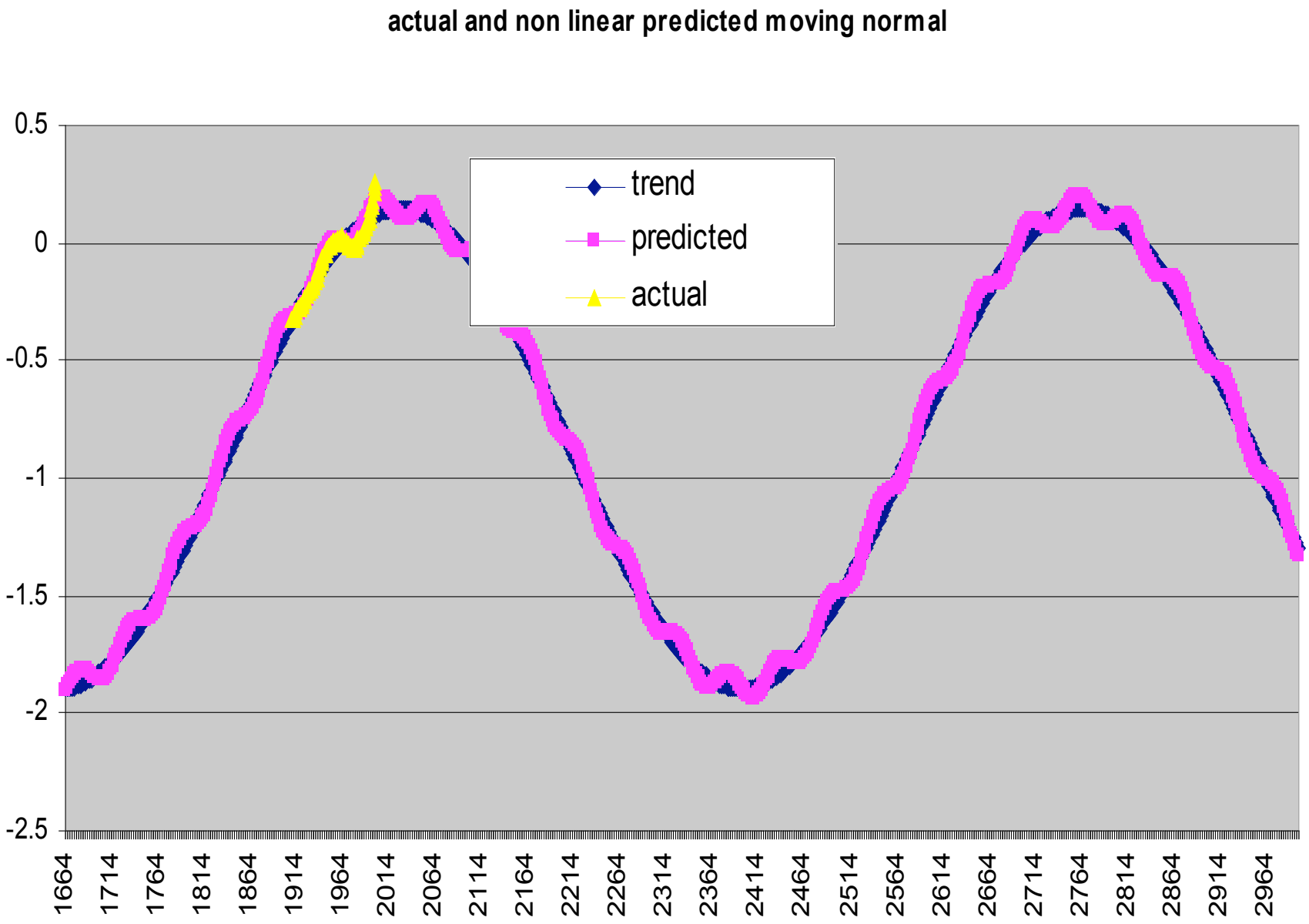
1 4 7 10 13 16 19 22 25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85 88 91
Series1
Series2


actual and non linear predicted moving normal
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1871
1879
1887
1895
1903
1911
1919
1927
1935
1943
1951
1959
1967
1975
1983
1991
1999
2007
2015
2023
2031
2039
2047
2055
predicted
actual


actual and non linear predicted moving normal
0.5
0
-0.5
-1
-1.5
-2
-2.5
trend
predicted
actual
1664
1714
1764
1814
1864
1914
1964
2014
2064
2114
2164
2214
2264
2314
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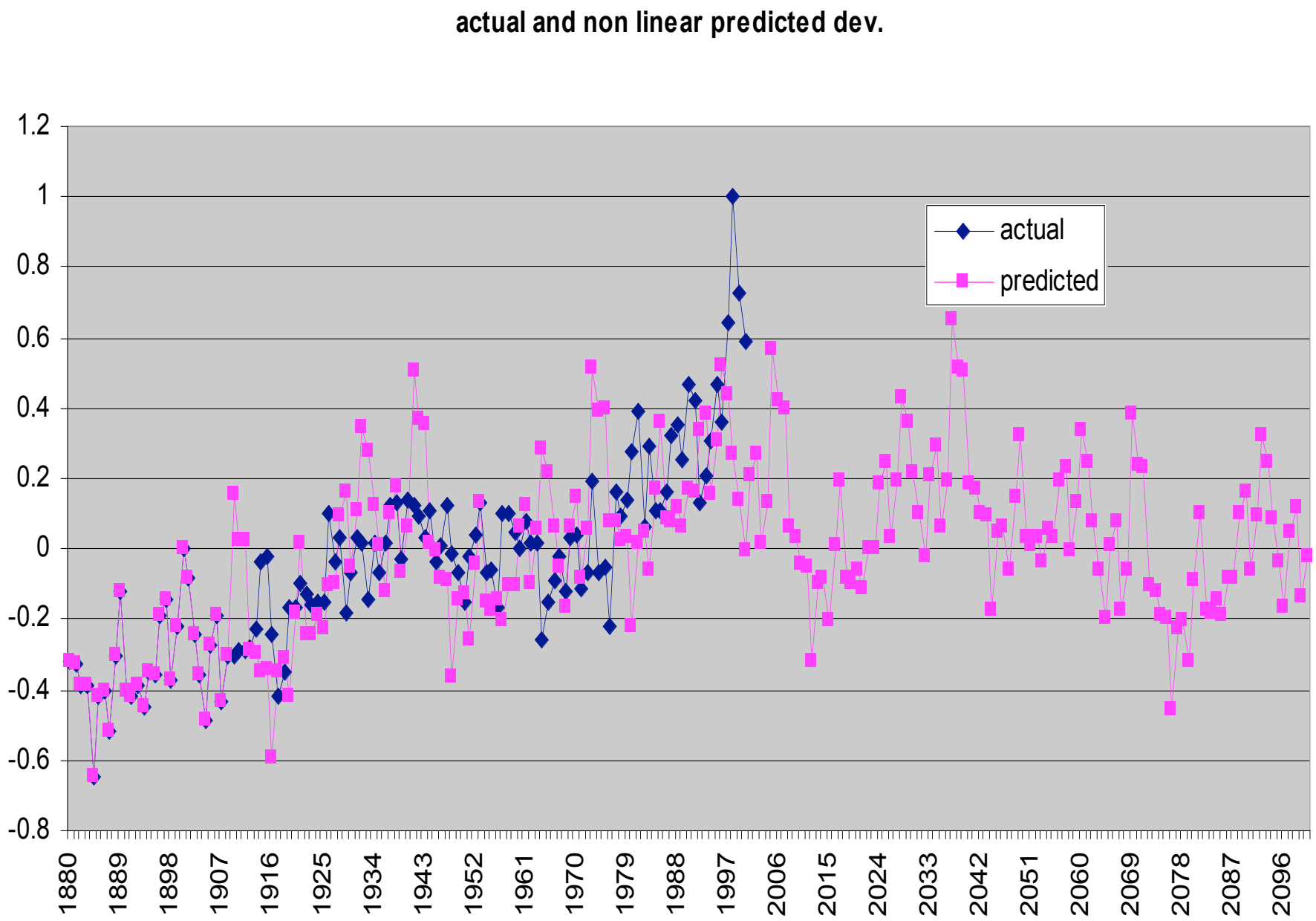
actual and non linear predicted dev.
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
1880
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1934
1943
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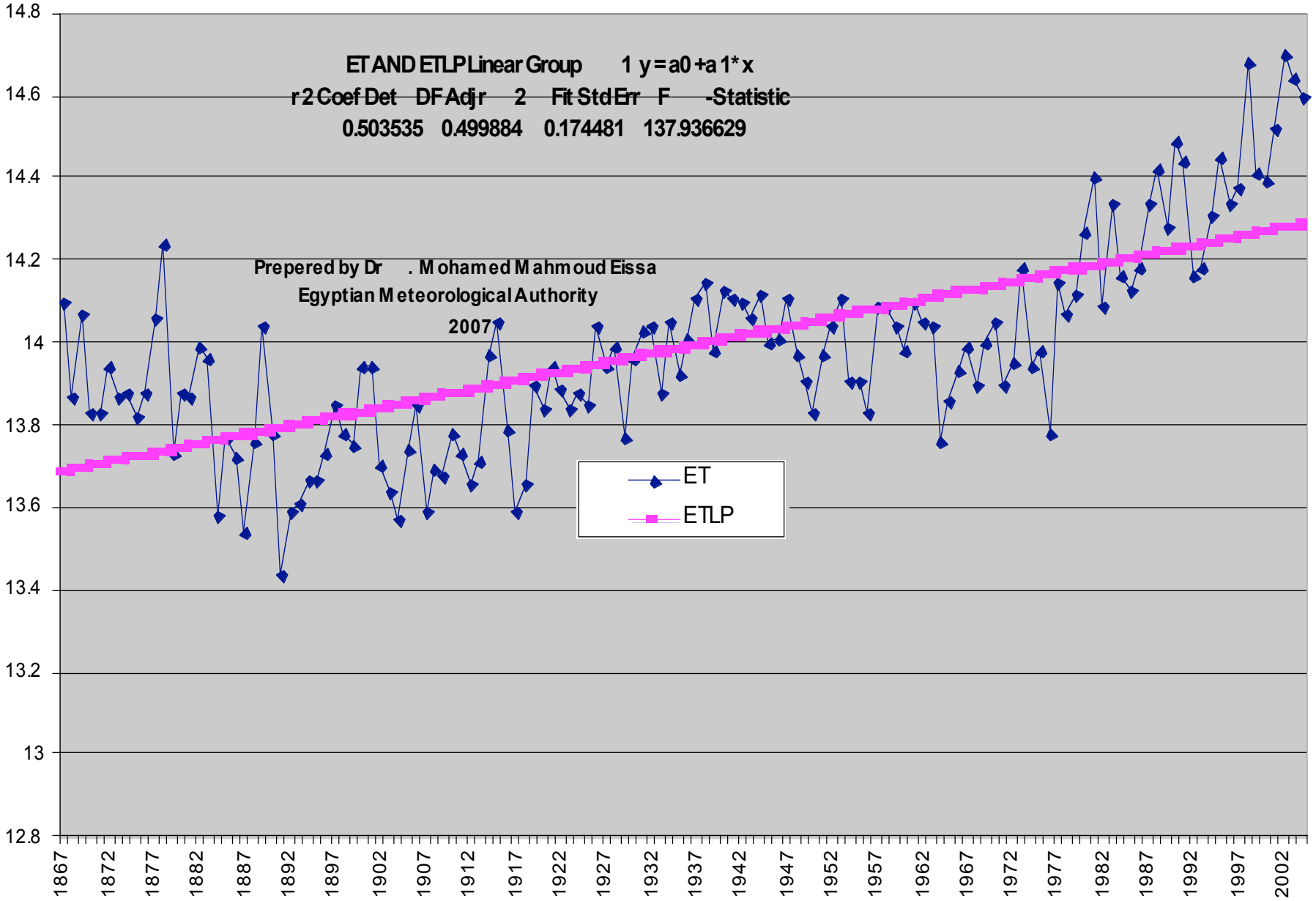
1961
1970
1979
1988
1997
2006
2015
2024
2033
2042
2051
2060
2069
2078
2087
2096
actual
predicted

- The Author found that the wave length of the sinesquared wave $\lambda 1 \simeq 673$ year and the length of sinwave $\lambda 2 \simeq 56$ year and don't found the reason of
- The cycle of change of Earth tilt $\simeq 41000$ year $\simeq (365.25) * 2 * \lambda 2 \simeq (365.25) * \lambda 1/6$
- Where 365.25 is the cycle of changes Earth around the sun orbit


ET AND ETLP Linear Group 1 y = a0 + a1 * x
r2 Coef Det DF Adjr 2 Fit Std Err F -Statistic
0.503535 0.499884 0.174481 137.936629
Prepered by Dr . Mohamed Mahmoud Eissa
Egyptian Meteorological Authority
2007
ET
ETLP
14.8
14.6
14.4
14.2
14
13.8
13.6
13.4
13.2
13
12.8
1867
1872
1877
1882
1887
1892
1897
1902
1907
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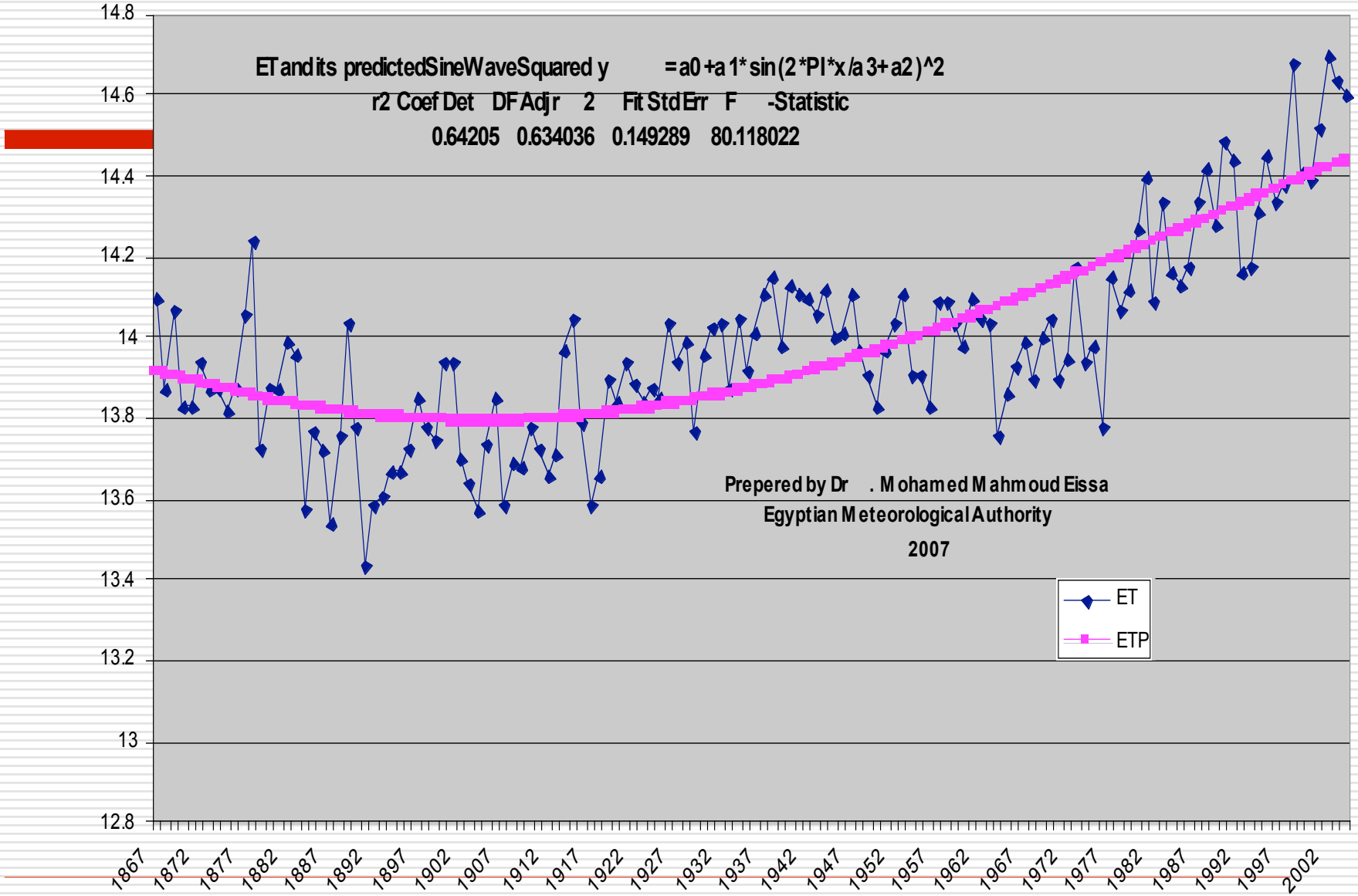
2002


ET and its predicted Sine Wave Squared y = a0 + a1* sin(2*PI*x/a3+a2)^2
r2 Coef Det DF Adj r 2 Fit Std Err F -Statistic
0.64205 0.634036 0.149289 80.118022
Prepered by Dr . Mohamed Mahmoud Eissa
Egyptian Meteorological Authority
2007
ET
ETP
14.8
14.6
14.4
14.2
14
13.8
13.6
13.4
13.2
13
12.8
1867
1872
1877
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1922
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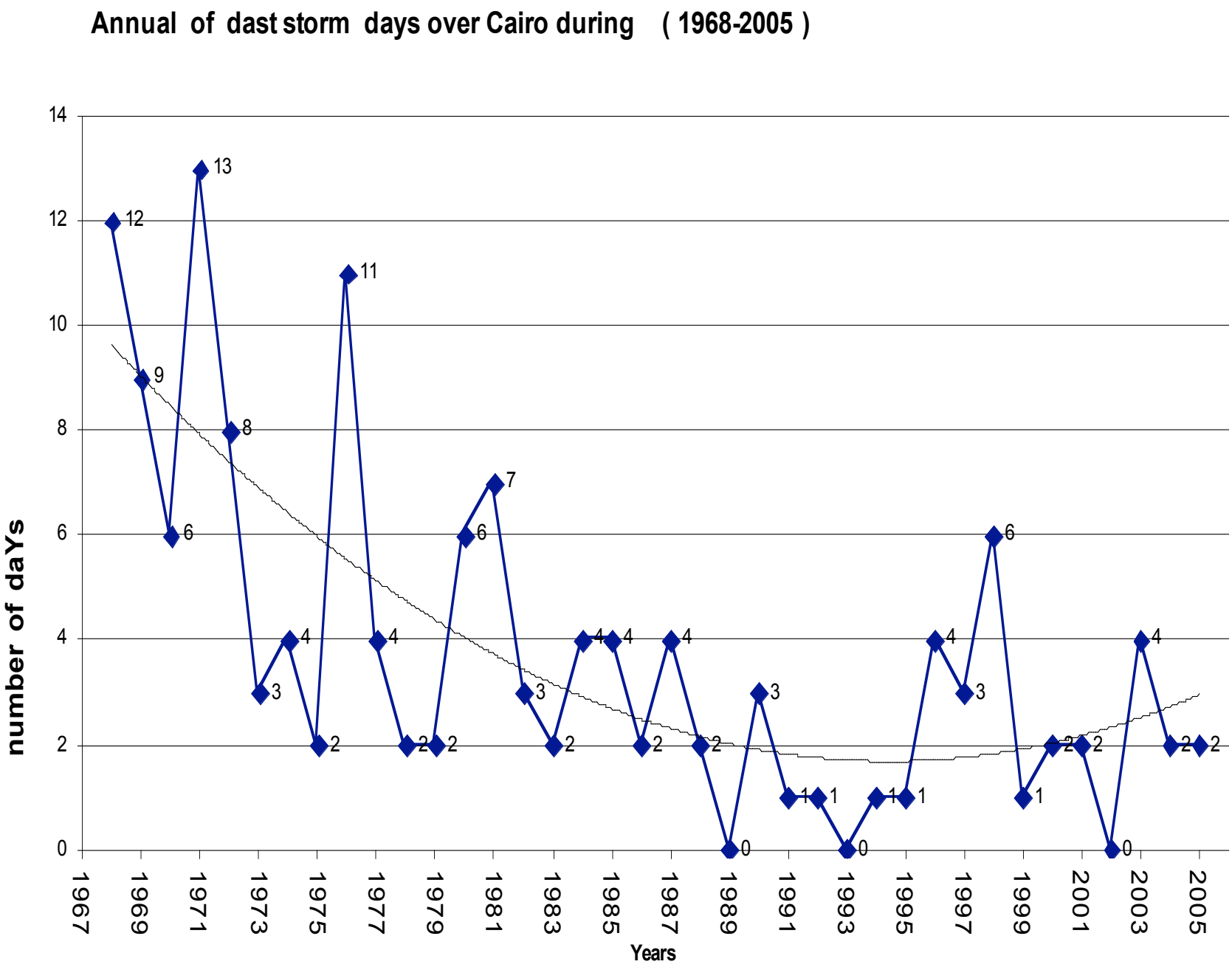
2002

- CYCLE OF DUST STORM OVER CAIRO


Annual of dast storm days over Cairo during (1968-2005)
number of daYs
Years
0
2
4
6
8
10
12
14
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005

QUASTIONS

1- ARE ICE LIQUEFACTION ON THE RISING CURVATURE , CORRESPONDING AN ICE BUILDING UP ON THE DECREASING CURVATURE OF NON LINEAR MODEL ?.

- 2- ARE RISING OF CARBONE DIOXIDE ON THE RISING CURVATURE , CORRESPONDING DECRIEASING OF CARBONE DIOXIDE ON THE DECREASING CURVATURE OF NON LINEAR MODEL ?.

- THANK YOU