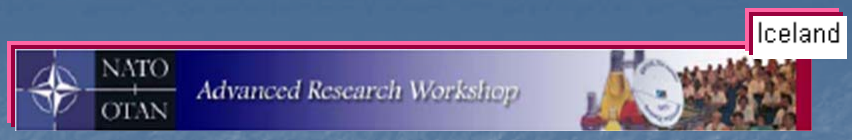

Climate Change: Global, Regional and National Dimensions

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Egypt

-Solar activities and the prevalent global warming

-Nile Basin and forecast future climate changes

-Recent changes in climate parameters over Egypt and its impacts

- Conclusions

Introduction

Iceland

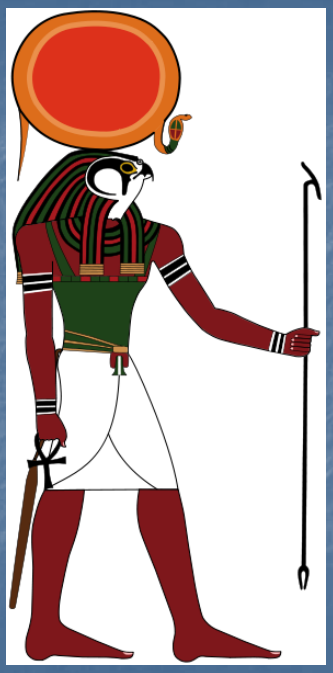
Climate change has become a prominent item on the agenda of world concerns. Is this global climate change a geological issue or cosmological issue or an issue of social behavior?

In this paper we try to discuss the solar activities and its effects on the climate changes. Solar activities have had notable effect on palaeoclimatic changes. Contemporary solar activities are so weak and hence expected to cause global cooling. Prevalent global warming, caused by building-up of green-house gases in the troposphere, seems to exceed this solar effect.

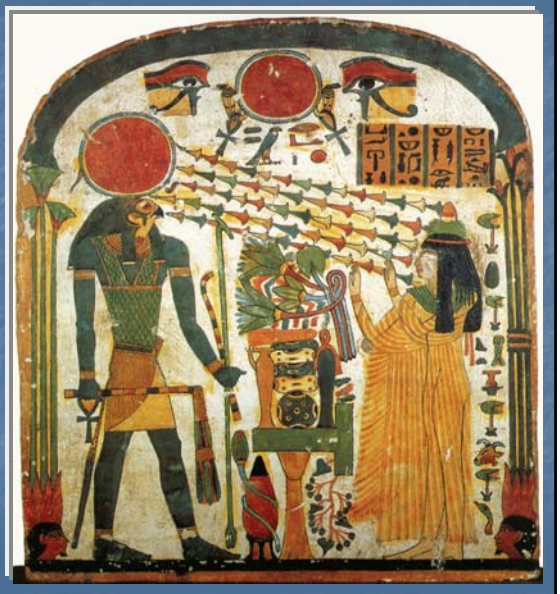
The regional and recent changes in climate parameters over Egypt and its impacts will be addressed in this paper.

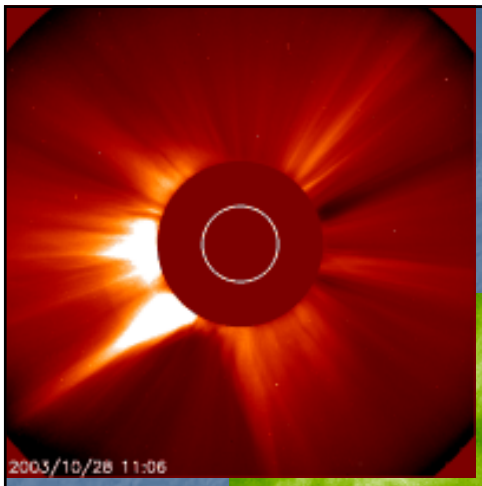
Solar activity effects

Mankind realized the Sun to be the source of all life on the Earth: The Sun is the God

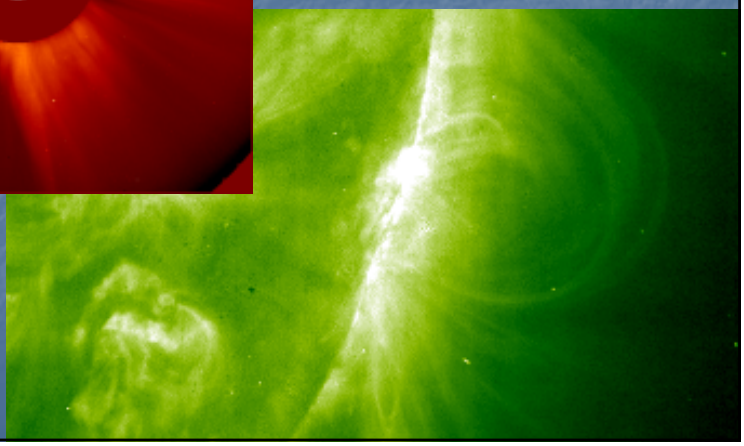


Starting from the beginning of the life

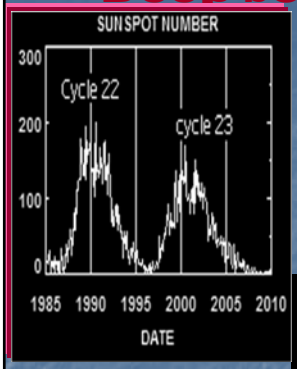




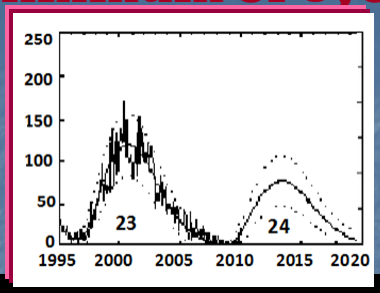
SoHo observations of Halloween storms (28 October 2003), the most eruptive storm observed in history



Deep Solar Minimum of Cycle 23



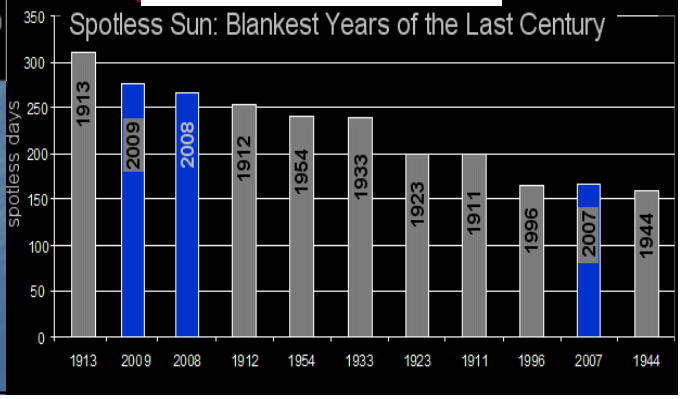
Sunspot Cycles
22
23



Cycle 23 and cycle 24 prediction

Sunspot counts for spotless years during the 20th century.

The years 2007, 2008, 2009 are the years of minimum of solar cycle 23



Monthly and Yearly Mean SUNSPOT NUMBERS of Cycle23

Year 2001:
Monthly mean: 95.6 80.6 113.5 107.7 96.6 134.0 81.8 106.4 150.7 125.5 106.5 132.2
Yearly Means: 110.58

Year 2003:
Monthly mean: 79.7 46.0 61.1 60.0 54.6 77.4 83.3 72.7 48.7 65.5 67.3 46.5
Yearly Means: 63.57

Year 2006:
Monthly mean: 15.3 4.9 10.6 30.2 22.3 13.9 12.2 12.9 14.4 10.4 21.5 13.6
Yearly Means: 15.16

Year 2007:
Monthly mean: 16.8 10.7 4.5 3.4 11.7 12.1 9.7 6.0 2.4 0.9 1.7 10.1
Yearly Means: 7.5
Spotless Days 149 of 365 days (41% spotless days)

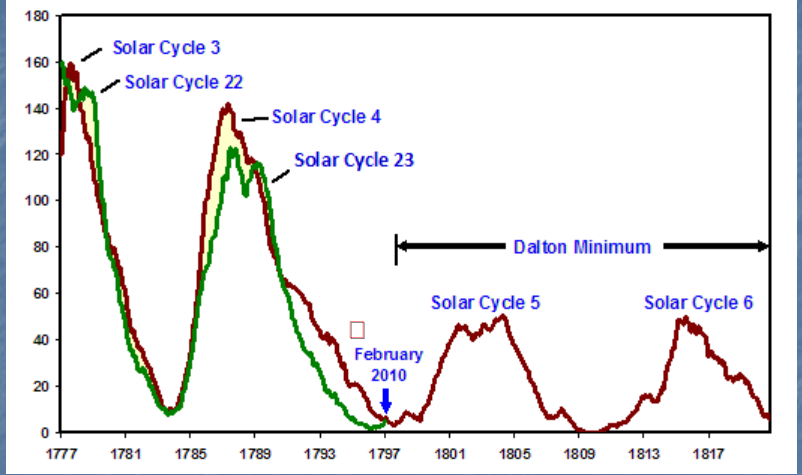
Year 2008:
Monthly mean: 3.3 2.1 9.3 2.9 3.2 3.4 0.8 0.5 1.1 2.9 4.1 0.8
Yearly Means: 2.85
Spotless Days 266 of 366 days (73% spotless days)

Year 2009:
Monthly mean: 1.5 1.4 0.7 0.8 2.9 2.9 3.2 0.0 4.3 4.6 4.2 10.6
Yearly Means: 3.1
Spotless Days 274 of 365 days (75% spotless days)

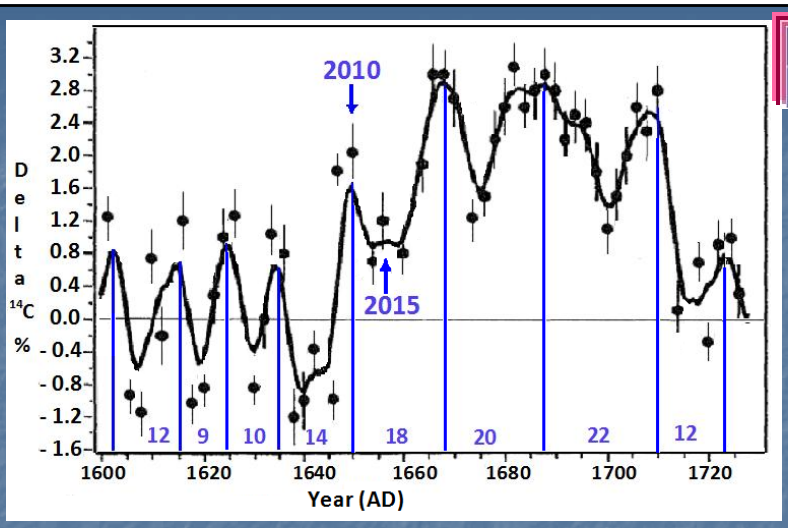
Minimum and maximum of sunspot in the series of solar cycles

Sunspot Cycle Number	Year of Min	Smallest Smoothed Monthly Mean	Year of Max	Largest Smoothed Monthly Mean	Rise to Max (Yrs)	Fall to Min (Yrs)	Cycle Length (Yrs)
1	1755.2	8.4	1761.5	86.5	6.3	5.0	11.3
2	1766.5	11.2	1769.7	115.8	3.2	5.8	9.0
3	1775.5	7.2	1778.4	158.5	2.9	6.3	9.2
4	1784.7	9.5	1788.1	141.2	3.4	10.2	13.6
5	1798.3	3.2	1805.2	49.2	6.9	5.4	12.3
6	1810.6	0.0	1816.4	48.7	5.8	6.9	12.7
7	1823.3	0.1	1829.9	71.7	6.6	4.0	10.6
8	1833.9	7.3	1837.2	146.9	3.3	6.3	9.6
9	1843.5	10.5	1848.1	131.6	4.6	7.9	12.5
10	1856.0	3.2	1860.1	97.9	4.1	7.1	11.2
11	1867.2	5.2	1870.6	140.5	3.4	8.3	11.7
12	1878.9	2.2	1883.9	74.6	5.0	5.7	10.7
13	1889.6	5.0	1894.1	87.9	4.5	7.6	12.1
14	1901.7	2.6	1907.0	64.2	5.3	6.6	11.9
15	1913.6	1.5	1917.6	105.4	4.0	6.0	10.0
16	1923.6	5.6	1928.4	78.1	4.8	5.4	10.2
17	1933.8	3.4	1937.4	119.2	3.6	6.8	10.4
18	1944.2	7.7	1947.5	151.8	3.3	6.8	10.1
19	1954.3	3.4	1957.9	201.3	3.6	7.0	10.6
20	1964.9	9.6	1968.9	110.6	4.0	7.6	11.6
21	1976.5	12.2	1979.9	164.5	3.4	6.9	10.3
22	1986.8	12.3	1989.6	158.5	2.8	6.8	9.7
23	1996.4	8.0	2000.3	120.8	4.0	10.0	13.5
Author's estimation of cycle 24							
24	2009.96	9.0	2015.2	105.0	5.24	7.8	13.04
Mean Cycle Values:	6.1		113.2		4.7	6.3	11.0

NATO OTAN Advanced Research Workshop



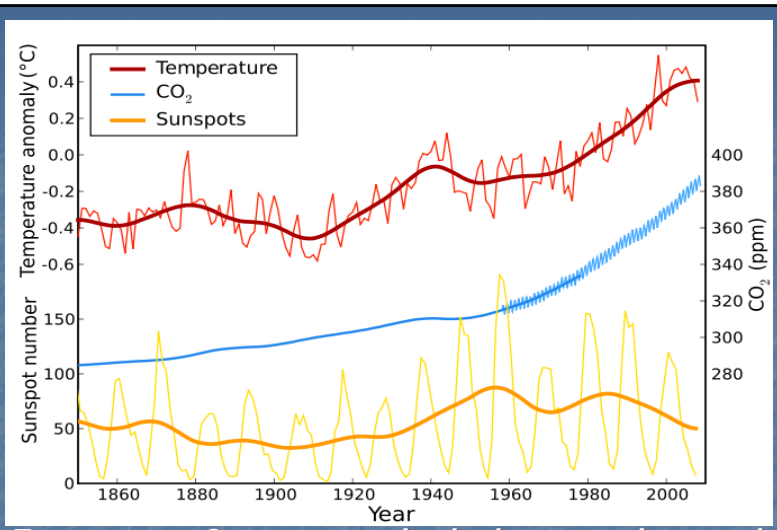
Dalton minimum era and the Solar Cycle 22 and 23 are overlaid on solar cycle 3 and 4 above to show similarity



NATO OTAN

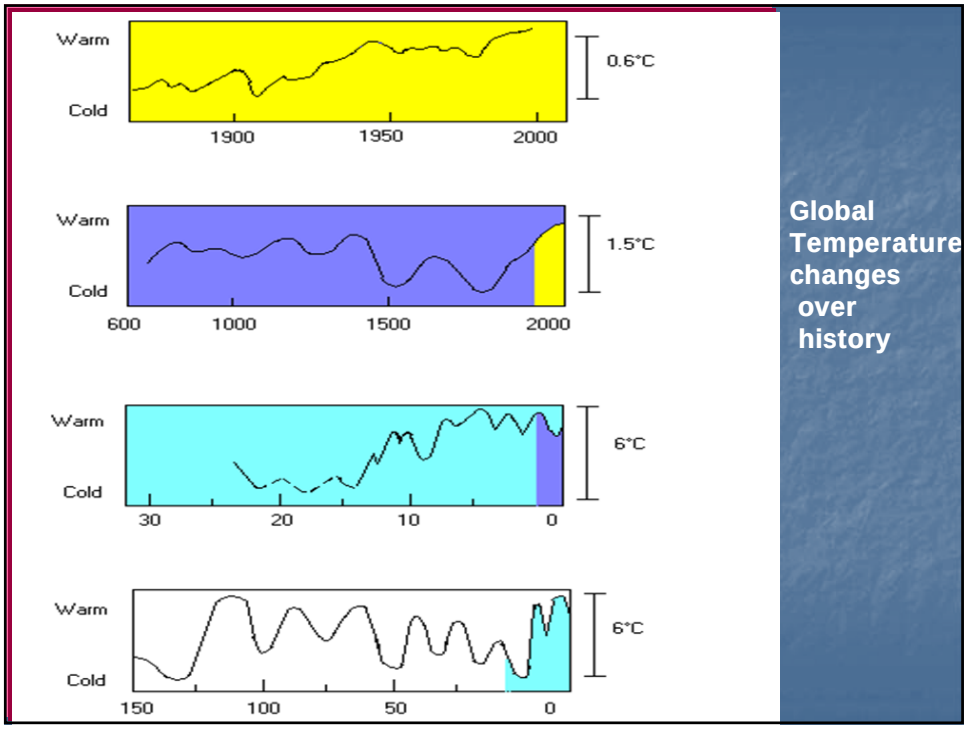
Iceland

Solar cycles during the Maunder minimum, the solar minimum marked with vertical lines. The numbers along the lower part of the figure are the length of the solar cycles from minimum to minimum in years. The suggested comparison with years 2010, 2015 was marked by Watts (2009)



Temperature, Co_2 concentration in the troposphere, and sunspots variations starting year 1850 until now

Then :The solar activities have had notable effect on palaeoclimatic changes. Contemporary solar activities are so weak and hence expected to cause global cooling. Prevalent global warming, caused by building-up of green-house gases in the atmosphere, seems to exceed this solar effect



Global Temperature changes over history

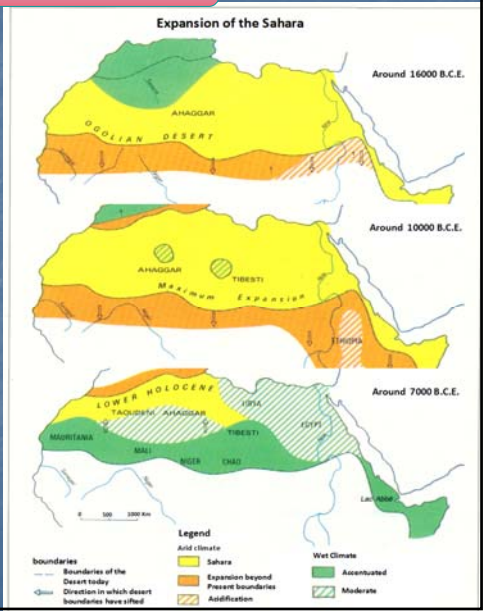
Regional climates of the Nile basin: past and future

Iceland

In Maps: The expansion of the Sahara around 16000-7000 B.C.E., (Combaz 1985).

its present form with it summer floods and its diverse sources is relatively recent (10-20 thousand years)

The river Nile runs in a south to north alignment for 35º of latitude: from Lake Tanganyika (Lat 4ºS) to the Mediterranean (Lat 31ºN). Its basin is shared by 10 countries: Zaire, Burundi, Rwanda, Tanzania, Uganda, Kenya, Eritrea, Ethiopia, Sudan and Egypt, and spans a very wide spectrum of climates from humid tropics to deserts.



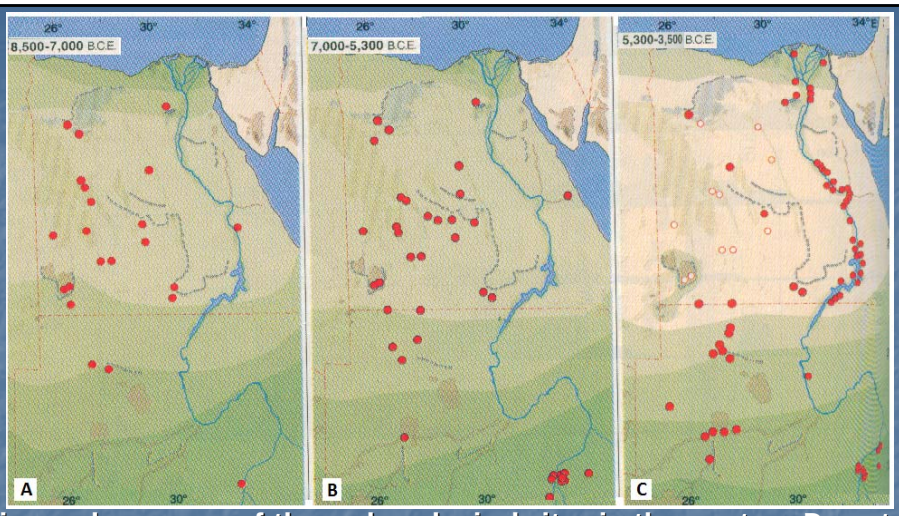


Figure shows map of the archaeological sites in the western Desert in 8500-700 B.C.E. (part A), 7500-5000 B.C.E.(Part B) and then during 5300- 3500B.C.E.(Part C). Red dotes indicate major occupation areas, white dots indicate isolated settlements in ecological refuges and episodic transhumance. The Saharan desert was void of any settlement outside of the Nile valley and extended about 400 Km farther south than it does today (Kuper & Kroperlin 2006).

Nile Basin

With the pending climate changes that seem likely to prevail later in the 21st century, the countries of the Nile Basin need to be able to forecast the manifestations of these changes in the basin.

The available GCM seem unable to do this forecast.

A regional circulation model, or a series of sub-regional models, each addressing one of the 5 climate systems prevalent within the Basin, need to be developed.

This would be a major undertaking that requires region-wide collaboration and substantial technical assistance

National needs

Iceland

Due to the impact of climatic change on industry, agriculture, energy use and all other aspects of human life, a national research program in Climate change is very important.

The data collected for the period 1961-2000 Shows:

1. The mean atmospheric pressure has positive trend +0.026 hPa/year.
2. The mean maximum air temperature has positive trend of +0.34 ^{0}C /decade
3. The mean minimum air temperature has positive trend of +0.31 ^{0}C /decade
4. Positive trend in mean annual relative humidity of air of + 0.18% /year.
5. Negative trend in sunshine duration of – 0.01 hours per year.
6. Negative trend in mean annual total solar radiation of – 0.09 MJ/m2

The data indicate that there is a climate change trend associated with the global warming. The number of days of maximum temperature equaling or exceeding 45 ^{0}C have increased in Upper Egyp from 50 days in the first decade to 52 in the second and reached 69 days in the last decade of the 20th century

The potential social and economic impacts of climate change would be serious on the country's futur The main key sectors relevant to climate change are; energy, transportation, industry, agriculture an wastes. Their activities produce GHG emissions.

To mitigate climate change, Egypt need to develop renewable source of energy, to use it as fuel in industry and transport, domestic and industrial programs, energy-efficient buildings, and agriculture.

The Nile Delta region is presently subject to changes; including shoreline changes due to erosion and accretion, subsidence and sea level rise due to climate changes. It is well known that the delta suffer from land subsidence that increases from west to east. Hence it is highly vulnerable to potential impacts likely sea-level rise. A national research program on climate change is very important now. This program may include exploring means for protecting the sea coasts against likely sea-level rise.

Conclutions

1-Although the solar activity during the last 30 years has a deep minimum there is a global warming. The solar variations of it activities do not seem to play a major role in determining present-day observed climate change, Prevalent global warming, caused by building-up of green-house gases in the atmosphere, seems to exceed and hence mask this solar effect, but it played a major role in palaeoclimatic changes.

2-To manage the water resource of Nile Basin and to forecast possible changes to be associated with rending climate changes, we need to develop a regional circulation model, or a series of sub-regional models, each addressing one of the five climate systems prevalent within the Basin.

3-In the local side, high effects of the climatic change are expected on industry, agriculture, energy use and all other aspects of human life in Egypt. To mitigate climate change, Egypt need to develop renewable source of energy, to use it as fuel in industry and transport, domestic and industrial programs, energy-efficient buildings, and agriculture. A national research program on climate change is very important now. This program may include exploring means for protecting the sea coasts against likely sea-level rise.

UN/NASA/ESA/JAXA /Egypt Workshop on the International Space Weather Initiative (ISWI)

"The observation result and their applications for the prediction of Space Weather"

(ISWI-2010)

November 6-10, 2010, Luxor, Egypt

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THANK YOU