



WMO technical conference on climate services building on clips legacy

conjunction with the
**Sixteenth Session of WMO Commission for Climatology (CCI-16) and
the 35th Meeting of the Joint Scientific Committee of World Climate
Research Programme (WCRP**

30 June – 2 July 2014

**Venue: Kongresshaus Stadthalle Heidelberg, Neckarstaden 24, D-69117
Heidelberg, Germany**

Characteristics of heat waves over Egypt and east Mediterranean

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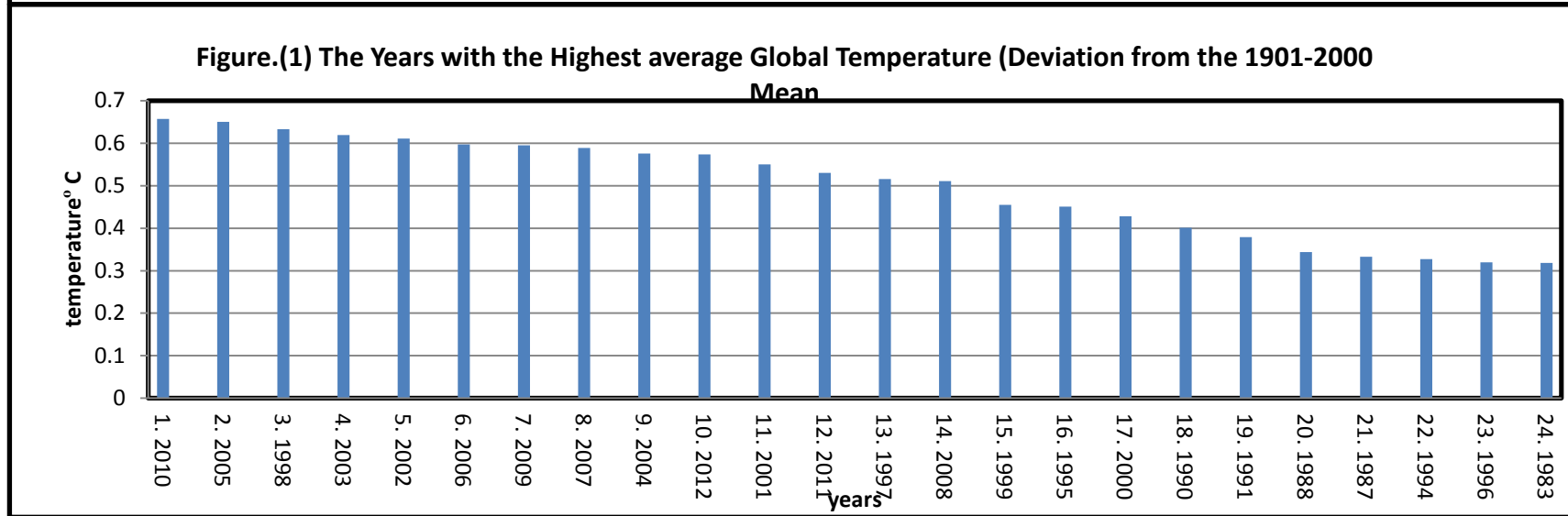
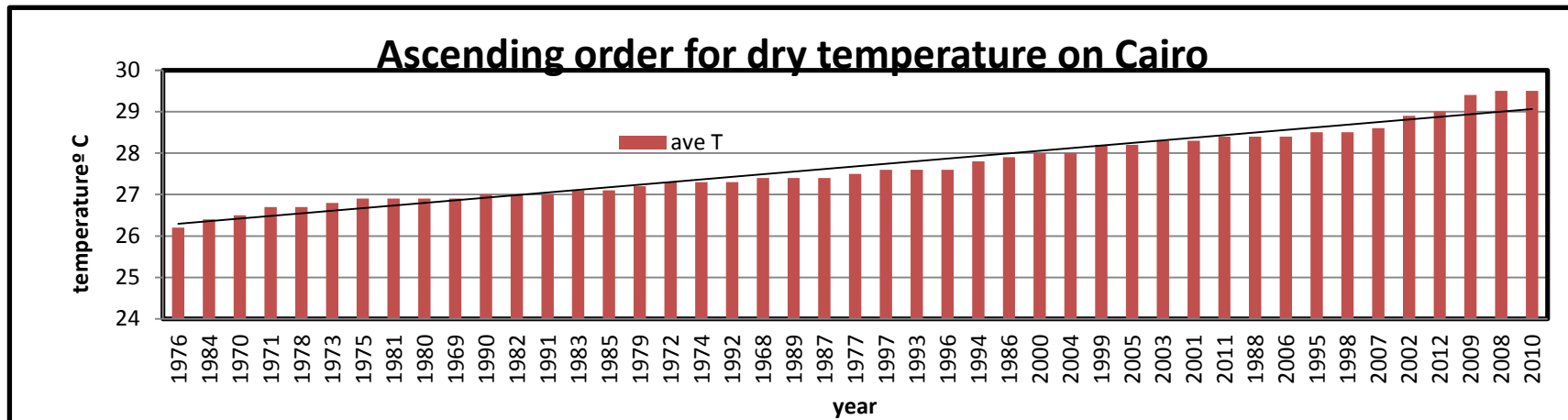


Egypt faces Challenges due to the impacts of climate change.

- Egypt faces significant challenges from climate change as
 - heat waves ,drought ,dust storms and rarely heavy rain with flash flood .
- Heat-waves are more familiar feature of the eastern Mediterranean summer and north Africa.
- The most climate models project decreased flow in the Nile Basin. Egypt's water supplies are already very limited and population growth.
 - A reduction in flow of the Nile River would put additional stress on water resources throughout Egypt.
 - The Nile Delta threatened by sea level rise.
 - In this presentation spot on heat wave affect over Egypt in the last period particularly summer 2010JJAS

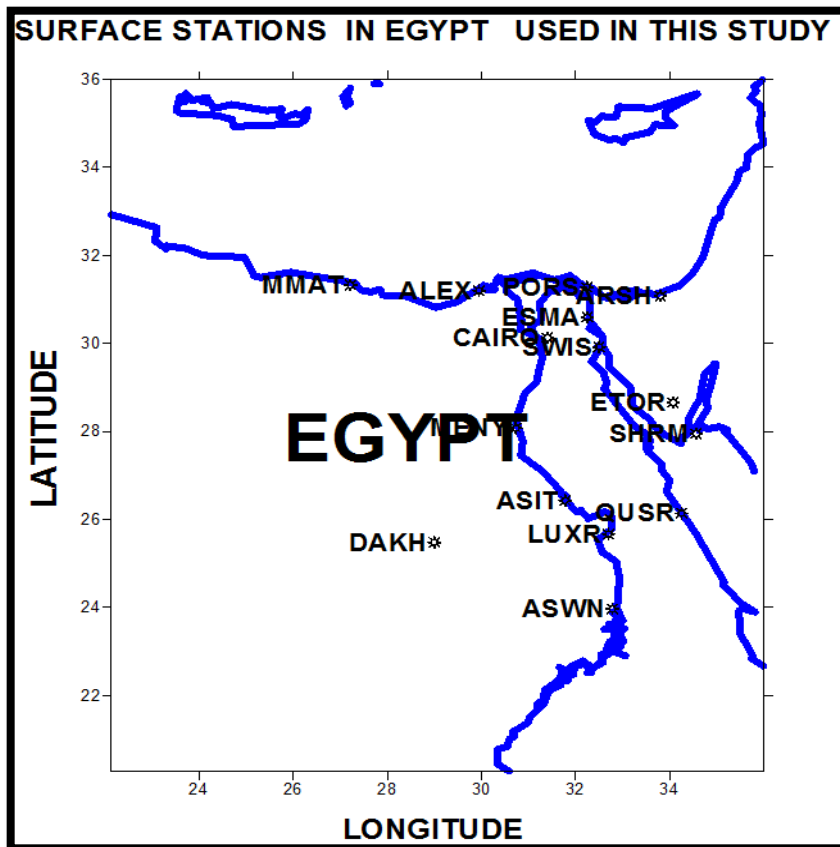
From WMO reports 2010 is the highest average temperature global(blue) compatible with observation in Egypt (red)

WMO reports indicate that Global warming remarkable increase in the last two decades and 2010is the warmest year



Data used in this study

SURFACE STATIONS ARE USED IN THIS STUDY

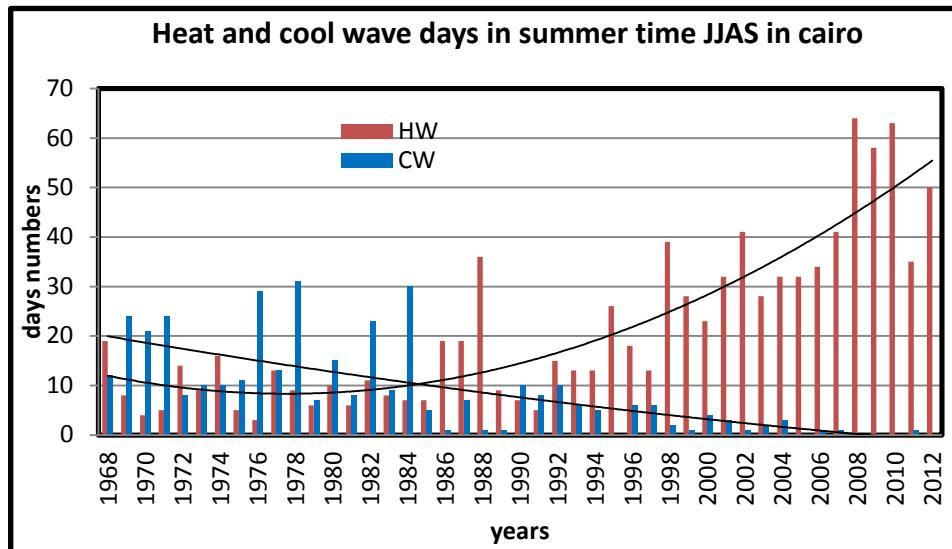


DATA USED DAILY OBSERVED SURFACE STATIONS

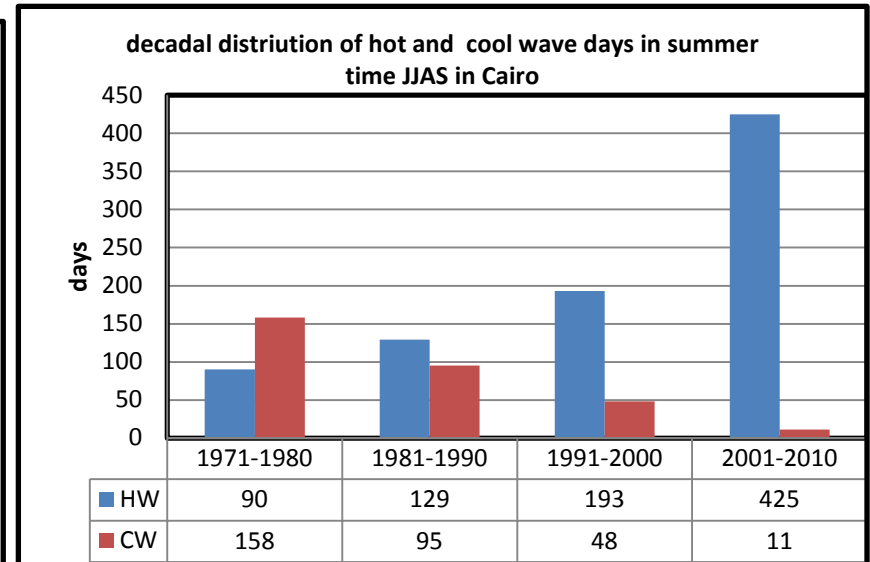
- Daily observed data
- (Tmax, Tmin and Tmean)
- NCAR ,NETCEP REANALYSIS DATA
- Investigate daily data and classify heat waves into long more than (6 consecutive days)and short wave (3-6)consecutive days
- From reanalysis data investigate the features of synoptic patterns .
- Heat waves days more than 90th percentile and cool wave days less than 10th percentile base on the normal's 1961-1990.

Annual and decadal distribution of heat and cool wave days over Cairo

Annual distribution of heat and cool wave days over Cairo



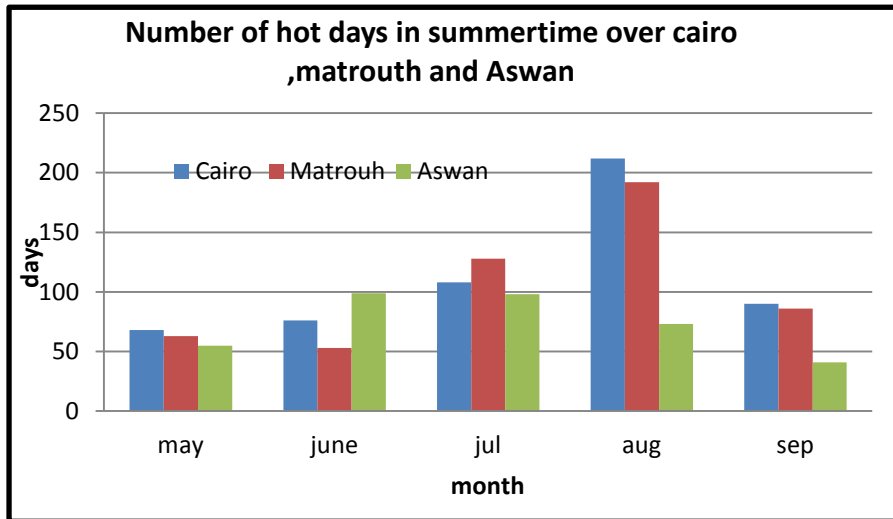
Decadal distribution of heat and cool wave days over Cairo



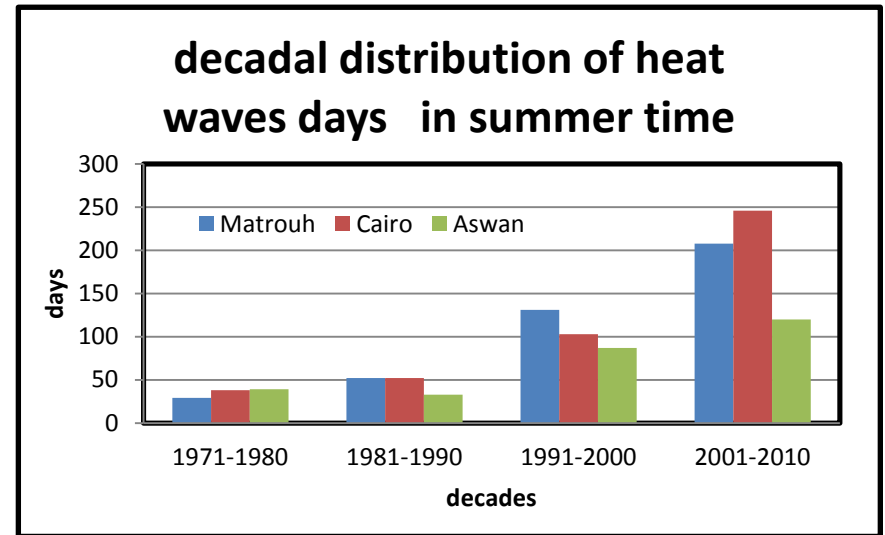
From the annual distribution of heat waves(temperature increase more than 90th percentile we notes that the trend of heat waves days remarkable increase during the last two decades and vice versa in cold wave less than 10th percentile remarkable decrease in the last two decades .

Jul and August are the highest record of hot days and less frequency of cool wave days the last two decades more frequent of heat waves days in summer time

Monthly distribution of heat waves days

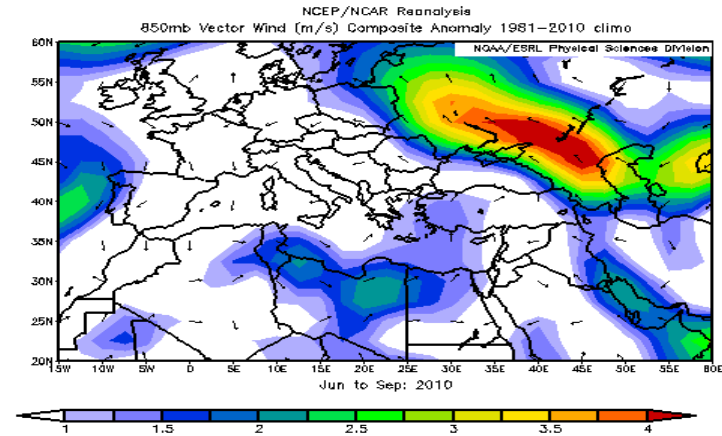
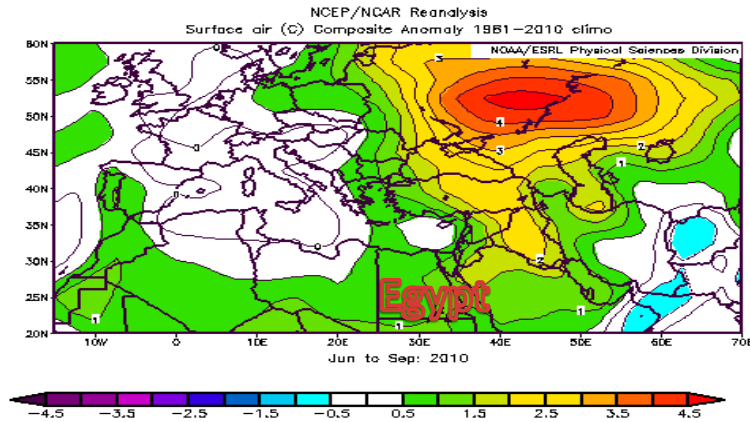


Decadal distribution of heat waves days



The monthly distribution of heat wave days notes that remarkable increase in Jul and August and more frequent in different surface station over Egypt from north Matrouh, lower Cairo and upper Egypt Aswan. During the last two decades .

Anomaly surface air temperature is remarkable increase and vector wind in 850mb in summer 2010 (JJAS) indicate descending motion in troposphere

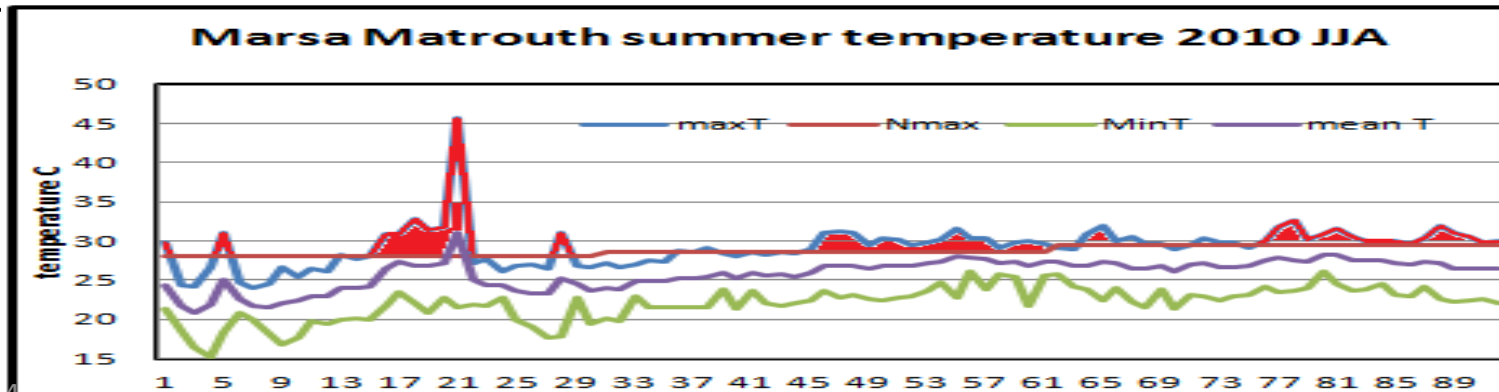
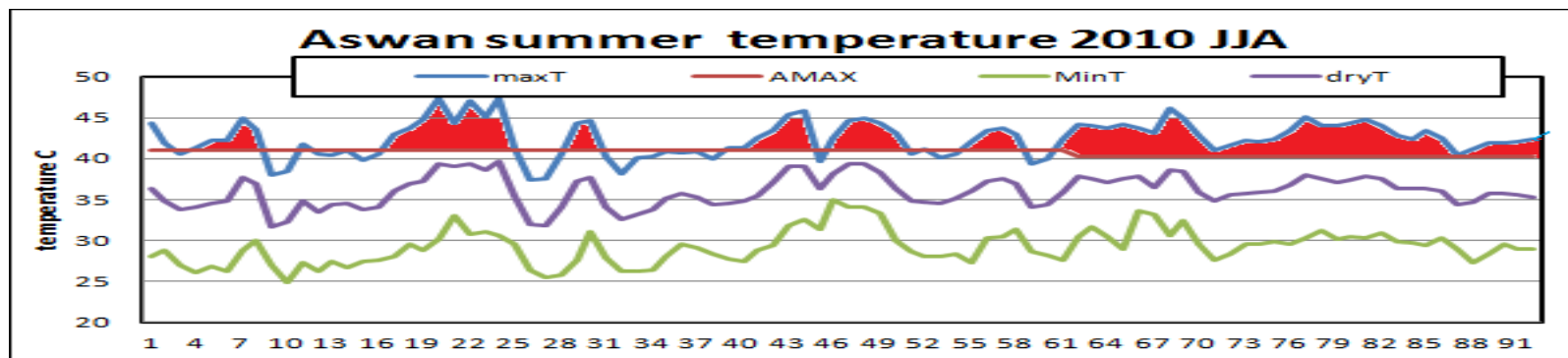
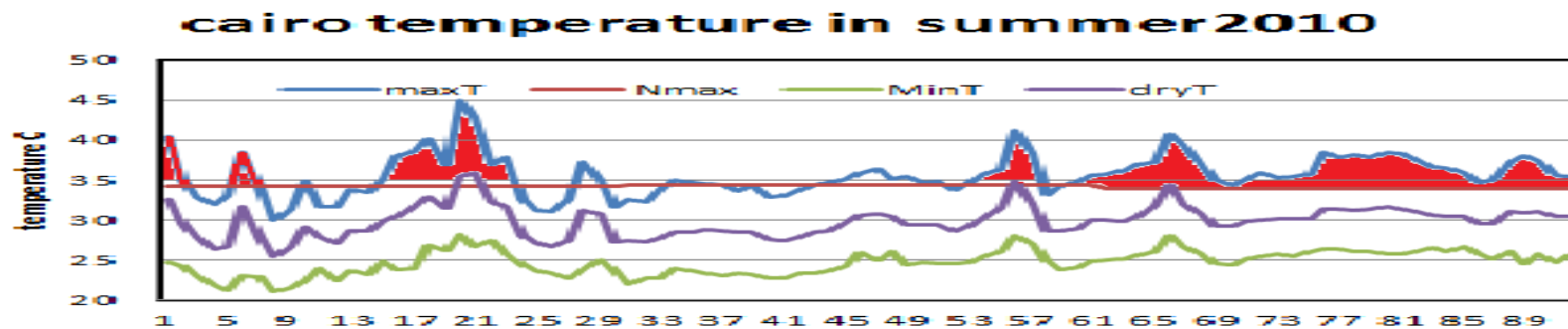


Surface air temperature is remarkable increase (up normal)in north hemisphere particular in east Europe this region is the source of warm air in east Mediterranean and Egypt this warming due to horizontal of warming advection in surface layer and descending motion in troposphere .

The permanent anticyclone in troposphere affect with more subsidence and adiabatic heating in surface layer.

The Indian monsoon low from Indian ocean invade Arabia peninsula ,Egypt and east Mediterranean in summer time with warm and humid air and anticyclone

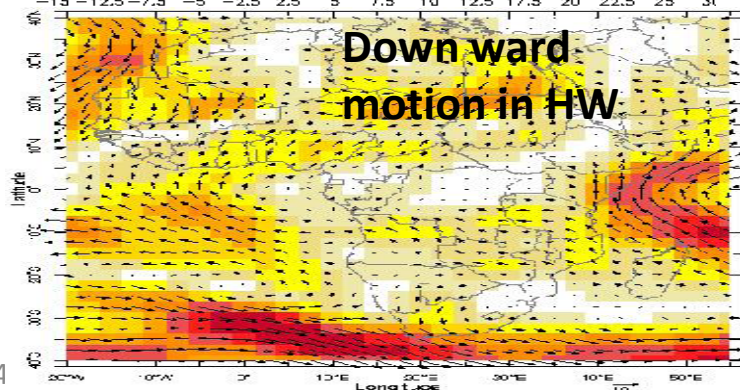
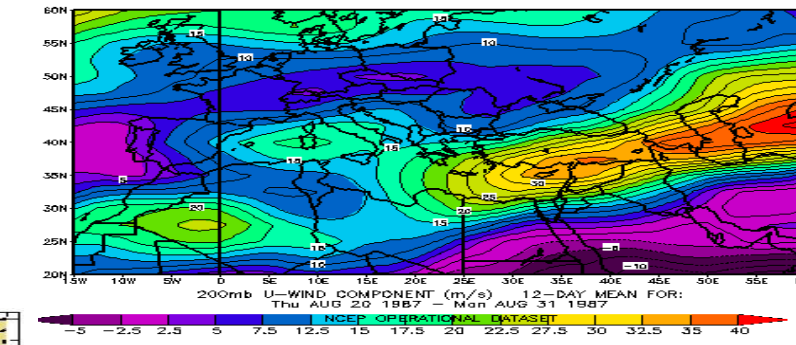
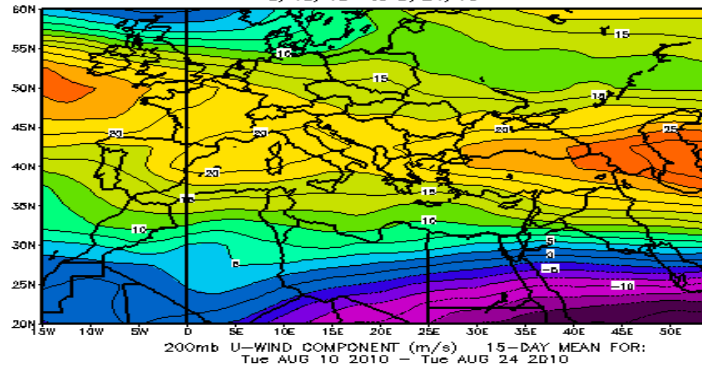
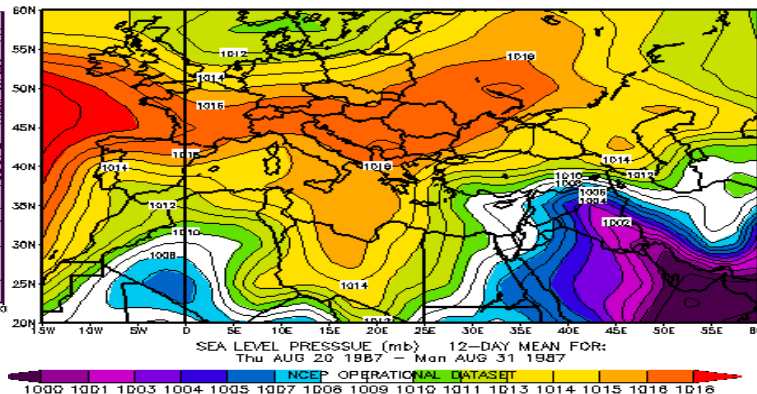
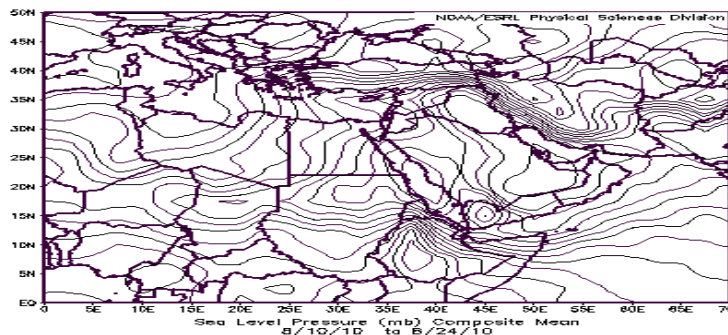
Heat wave more frequent in summer (JJA) 2010, in north, lower and upper Egypt



Synoptic patterns of heat and cool wave(surface pressure ,jet stream position (u wind at 200mb ,

Heat wave more 90th percentile

Cool wave less than 10th percentile



Conclusion

- The conclusion can be summarize in the flowing :-
- Egypt and east Mediterranean more affect with global warming due to increase green house gases by human activity.
- This warming increase the energy in the atmosphere and increase the extreme weather phenomena as heat waves particularly in the last two decades .so the hot days increase and cold night decrease .
- Heat wave more frequent in summer time particularly in Jul and august .
- Summer 2010 record The warmest summer from observation data this consistent with WMO report about 2010 . And record more frequent in extreme events .as flood 17-18 Jan/2010 over Aswan and Sinai peninsula.
- The feathers of weather patterns associated with long heat waves in surface layer Indian monsoon making horizontal advection of warm air and high pressure in troposphere making adiabatic heating in troposphere as a result of descending motion if northern Hadley circulation.