Climate Data Availability in Arab Region

By

A. M. El-Asrag
The Egyptian Meteorological Authority
E-mail: am.elasrag@yahoo.com

Presented in the Meeting Group for:
“Assessing the vulnerability of Water Resources to Climate Change in Arab Region”

From 26 – 28 October 2009, Beirut, Lebanon
Presentation Outlines

In this report, we will talk about:

1. The need to an unanimous action by Arab States
2. A glance on current Climate Change
3. Main Factors Control Climate in Arab Land
4. Arab Climate Center (ACC) Objectives
5. Data Availability and Sources
6. Reanalysis of Past and Current Data
7. Concise and Recommendations
8. Case Study about Nile River
1. The Need to unanimous action

• The permanent availability of climate Data to evaluate Climate Change is an urgent need for assessing vulnerability of water resources in Arab region

• A unified Arab Climate Center (ACC) is needed to assure continuous Data Flux among Arab Institutes and Researchers.

• Such ACC need an unanimous action through Arab Governments.
2. Glance on Current Climate Change

2.1. Most of science Academies and IPCC reports according to trusted researches have concluded that:

- Global Temperature increased by $0.74 \pm 0.18^\circ C$ during the last Century and may be raised further from $1.1^\circ$ to $6.4^\circ C$ during this century, which in turn leads to further increase in recent sea level.

- This increase is mainly due to External Radiative Forcing (ERF) of:
  - Greenhouse Gases
  - Solar luminosity
  - Volcanic eruptions

WMO has reported that 2005 was the second warmest year behind El Nino year of 1998.

- Satellite measurements have indicated that lower Troposphere temperature increased by $0.22^\circ C$/decade since 1979.
2. 2 About Precipitation and Runoff IPCC assessment reports have declared that:

- In Arab States that situated in South West Asia, precipitation may increase by about 10 to 50 mm especially in autumn season.

- In Arab Countries that situated in the zonal belt from North Coast of Africa to latitude 15° N, precipitation may decreased by 20%, while it will increase by about 7% in Eastern Part of Africa in the last decade of current century.

- In Nile basin and other Rivers in Africa, runoff may be decreased in spite of the expected increase of precipitation by about 5% due to role played by evaporation. However, a study about Nile Flood will be given at the end of this report.
3. Main Factors Control Climate in Arab Land

Most of Arab countries, either in Africa or in South West Asia, are situated in the Arid Climate Zone. This aridity is due to;

• Existence of wide spread inversion that associates trade winds and the subsidence of air in the vicinity the subtropical High Pressure belt that extends around Globe at 30° N.

• Such Situation stops the formation of any type of rainy clouds.

• However, accidental events of severe rainfall and flash floods take place in internal regions especially in Autumn and Spring as a result of insertion of tropical humid air from Indian Ocean into subsiding cold air from southern parts of middle latitudes.
• In winter, moving troughs and depressions over Mediterranean cause moderate spells of rainfall on the north line coast of Arab land in north Africa with heavy rainfall over East Mediterranean countries, especially when a deep depression resides for many days over Cyprus Island.

• The great renewable water resource in Arab land comes mainly from rivers such as Tigris, Euphrates, Yarmouk, Jordan, and Nile. Most of these Rivers originate from the outside political boundaries of Arab land, which may cause future disputes. This make all Arab Governments plot a future scenario to face such problem.
4. Arab-Climate-Center Objectives

Arab States would better establish an Arab Climate Center (ACC). The ACC may be an independent structure or an entity of a Meteorological Service at one of Arab Countries with its branches at other Arab Meteorological services. The objectives of the suggested ACC may be;

- Collecting available Meteorological, Climatic, and hydrological data of the Atmosphere and Oceans at available global stations and at grid points.

- The ACC control the collected data qualitatively and reanalyze them, especially those related to Arab land. Also, issuing Climate Reports, operating and developing RCM and AOGM.

- ACC should be equipped with appropriate tools for computing and reanalyzing the collected data. In addition, Capacity building of selected team from all Arab Countries may be reinforced in the field of Regional Model (RCM) and Atmospheric Ocean General Circulation Model (AOGCM). However, some ACC objective are depicted in the Figure on the following slide ☹️☹️☹️
Data Flow In & out of the ACC

- Input Data From Int. C. Centers
  - Input Data From Arab Centers
  - ACC
  - ACC OUTPUT
    - Data Collection
    - Data Organization
    - Data Reanalysis
    - Issuing Climate Reports
    - Operating and Developing AOGCM & RCM
  - To Arab Users
5. Data Availability and Sources

5.1 The available actual and past Meteorological, Hydrological, Oceanographic, and Climatic processed data can be collected from different Arab Meteorological Services as well as from International Meteorological services and centers into the suggested ACC for being:

- Organized and closing data gaps, especially in Arab area
- Put data in Binary Universal Format Representation (BUFR) for future use by Arab researchers
- Participating in using and developing International Data Reanalysis Projects.
5.2 International centers that can supply data are listed below:

- National Climate Data Center (NCDC) that have the largest archive of weather data, National Center of Environmental Prediction (NCEP), National Oceanic and Atmospheric Administration (NOAA), and National Center of Atmospheric Research (.NCAR), in USA
- Homburg Marine Data Center (HMDC) in Germany
- Japan Meteorological Agency (JMA)
- European Centre for Medium Range Weather Forecast (ECMWF)
- World Meteorological Organization (WMO) archive, its Global Climate Observing System (GCOS) and daily scheduled-Meteorological-observation through Global Telecommunications System (GTS).
- Some Types of data are supplied free of charge and others are requested in advance by a defined charge.
6. Reanalysis of Past and Current data

Data Reanalysis is similar to the normal analysis technique, except for two important practical differences.

- First, it is not done in real time, and
- second, the background field of data set is continually updated.

Through Reanalysis projects at many advanced Climate and Meteorological centers, especially NCEP / NCAR;

- The data base has been enhanced with many sources of observations that were not available at real time for operations.

  - Wrong dates, wrong locations, and garbled information have been removed from old conventional and sensed Data sets
  - The observations have been saved in the WMO Binary Universal Format Representation (BUFR), while fields in Sigma, Pressure, and isentropic coordinates systems, data have been put in GRIdded Binary Format (GRIB)
  - Different types of output archives have been created to satisfy different user needs.
  - ACC can obtain such reanalyzed data from these centers for Arab Researches
From the foregoing demonstration, one can recommend the following actions that may be taken by Arab Countries for satisfying Climate Data Availability:

- It is recommended that an Arabic Center of Climate (ACC) be established by an agreement among Arab Governments.

- ACC may be an independent entity or may be a part of one Arabian Meteorological Services that has branches in other Arab states with each branch has a specified complementary task of ACC works.

- The tasks of the ACC and its branches are to collect past and current Atmospheric, hydrologic, and oceanographic, reanalysis these data, put them in a suitable format to be used by researchers.

- ACC tasks may include Developing climate Model, making Long Range Forecasting, and issuing climate changes report of the region, especially those related to water resources with cooperation with International Center for Agricultural Research in the Dry Area (ICARDA).
Other Recommendations

It is also recommended that:

- Arab Governments are invited to finance grants to small scientists in Capacity building in the domain of data assimilation system as well as in operating and developing AOGCMs.

- Meteorological observations Network at surface and upper air be upgraded by condensing their number and improving their quality in the domain of the Sahara and at coastal zones. Such addition of new stations will improve our understanding and assessment of climate change and variability.

- Climate Data and reanalyzed ones are available at CLINO of WMO, CDC, and European Centre for Medium Rang Weather Forecasts (ECMWF), Japan Meteorological Agency (JMA), Climate Data Assimilation System or CDAS, NECP and National Center for Atmospheric Research (NCAR), Climate marine Center at Hamburg in Germany, and GMAO at NASA.

- However, Free gridded data of Sea Surface Temperature are free available at the two web sites such as; http://www.cdc.noaa.gov/data/gridded/data.noaa.oisst.v2.html and http://www7.ncdc.noaa.gov/IPS/mcdw.htm

- Finally, the concerned Arab States may seek about an agreement to exchange processed data among them and the roles of using raw data. We belief that the idea of establishment an ACC may help to solve data availability easily among Arab States.
The most devastative flood in 1878 culminated to 142.378 milliard cubic meters while absolute minimum flood in 1913 deteriorated to only 45.879 milliard cubic meters in the Period from 1871 to 1997.
The maximum flood of Nile River at Aswan takes place in Mid August 20%, September 24%, and Early October 16%. The Flood in these three months is represented by the first EOF.
• The First Empirical Orthogonal Function (EOF) represents and elucidates 75% of Nile River Flood, which is Maximum in September.
The existence of many significant cycles in Nile Flood, especially quasi biannual cycle in the series of annual flood may be referred to the effect of the quasi biannual oscillation in the atmosphere on Nile flood with long path that originates form tropical regions.
Closing the Presentation

Thank You for Listening