

Research Project on Impacts of Climate Change on Water Resources and Agriculture – and Adaptation Strategies in Tanzania

Climatic History and Trends in Tanzania

E. J. Mpet

Tanzania Meteorological Agency,
P. O. Box 3056, Dar es Salaam
TANZANIA

Outline

- Introduction
- Observed Impacts possibly linked to Climate Change
- Tanzania temporal climate patterns in recent years
 - Temperatures (time series - Maximum and Minimum)
 - Rainfall (times series –amounts, averages and cessation dates, length of rainfall seasons, etc)
- Climate Changes Challenges facing Tanzania

Definitions

Climate

Climate is usually defined as the average weather, or more rigorously as the statistical description in terms of the mean and variability of relevant quantities (surface variables such as temperatures, precipitation, wind,...) over a period of time ranging from months to thousands of millions years. The period for averaging these variables is 30 years.

Definitions

Climate Variability

Climate Variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc) of the climate on all spatial and temporal scales beyond that of individual weather events.

Definitions

Climate Change

Climate Change refers to a change in state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, that persists for an extended period, typically decades or longer.

Climate change may be due to natural internal processes or external forcing, or persistent anthropogenic changes in the composition of the atmosphere or in land use.

How can we detect climate change

In order to detect climate change at a place rigorous statistical analysis and tests should be performed on climatological variables; such analysis should include:

trend, long term mean change in a climatic variable, changes in frequency and severity of extreme events, temporal distribution of climatic events (e.g. rainfall onset and cessation dates, including shift in seasons), etc.

Observed Impacts Possibly Linked to CC

- Steady increase in temperature for the past 30 years in Tanzania
- Severe and recurrent droughts experienced in Tanzania in the recent past
- Extreme drop of water levels of Lake Victoria, Tanganyika, and Jipe, and **the dramatic recession of 7 km of Lake Rukwa in about 50 years**
- Eighty percent of the glacier on Mount Kilimanjaro has been lost since 1912

Observed Impacts Possibly Linked to CC

- The intrusion of sea water into wells along the coast of Bagamoyo town and the inundation of Maziwe island in Pangani District, off the Indian Ocean shores
- Observation of malaria cases in highland areas previously not malaria prone

Some of the known Factors that are associated with weather and climate variability in Tanzania

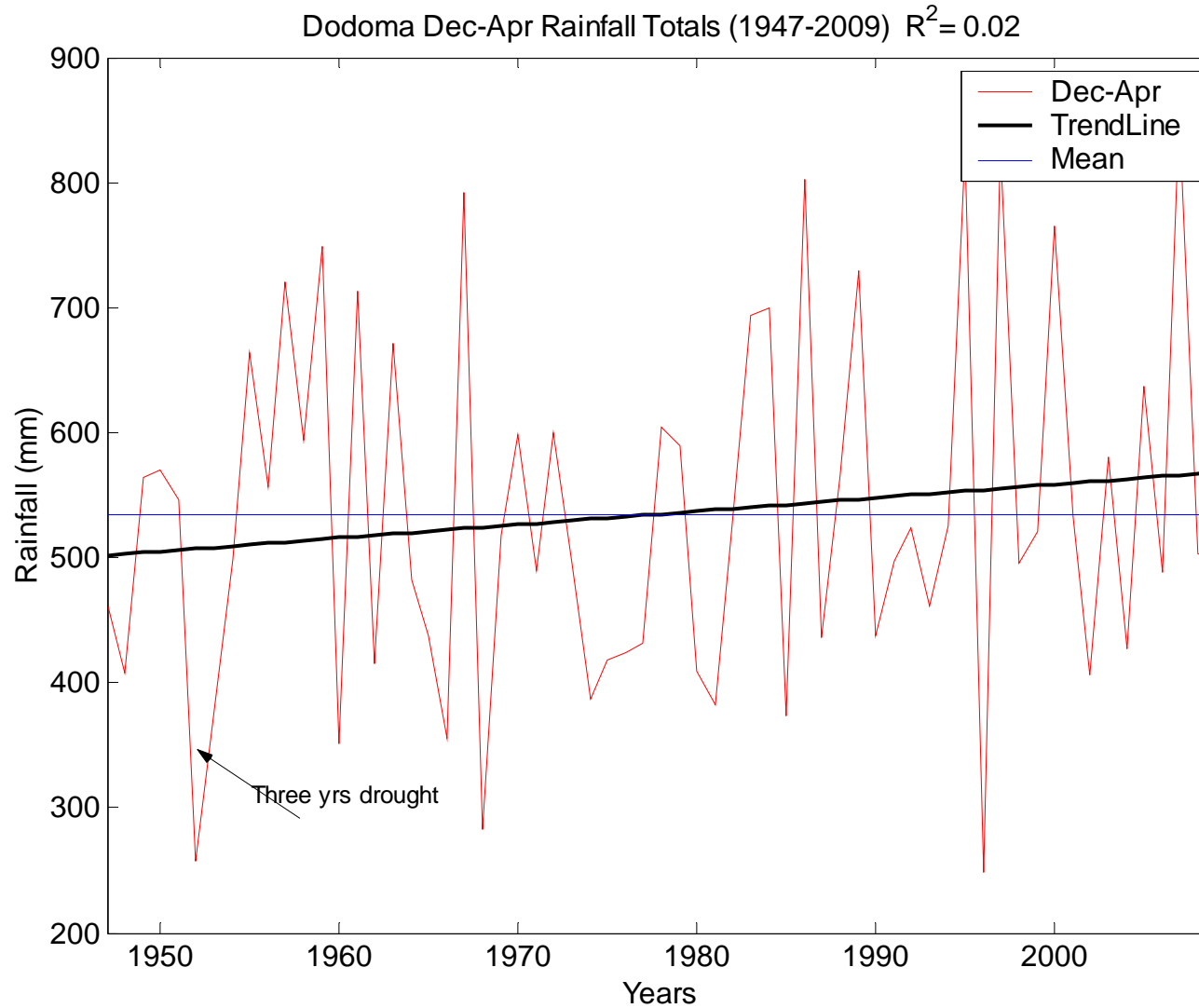
- Inter-Tropical Convergence Zone (ITCZ)
 - Monsoon wind
 - El Nino
 - Tropical cyclones
 - Easterly waves
 - Westerly Waves (Madden Julian Oscillation)
- Congo air mass
- Pressure gradient between Atlantic and Indian Oceans
- Sub-Tropical Anticyclones over the Indian and Atlantic Oceans
- QBO (mainly—southern areas)

Rainfall Patterns in Tanzania

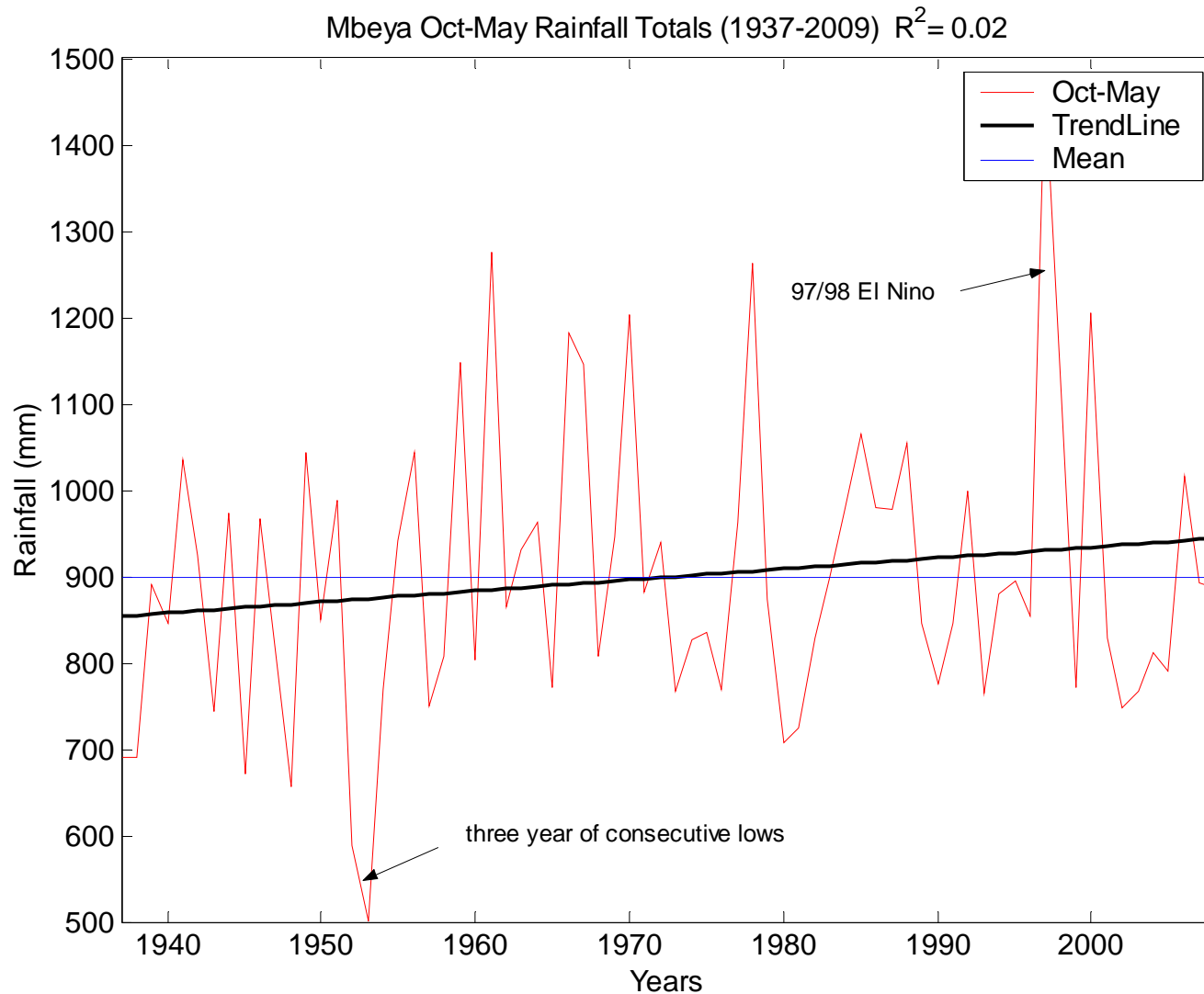
There are two rainfall patterns in Tanzania:

1. The Bimodal rainfall regime:
 - (a) Long rains (March – May)
 - (b) Short rains (Oct –Dec)
2. The Unimodal rainfall regime (November – April)

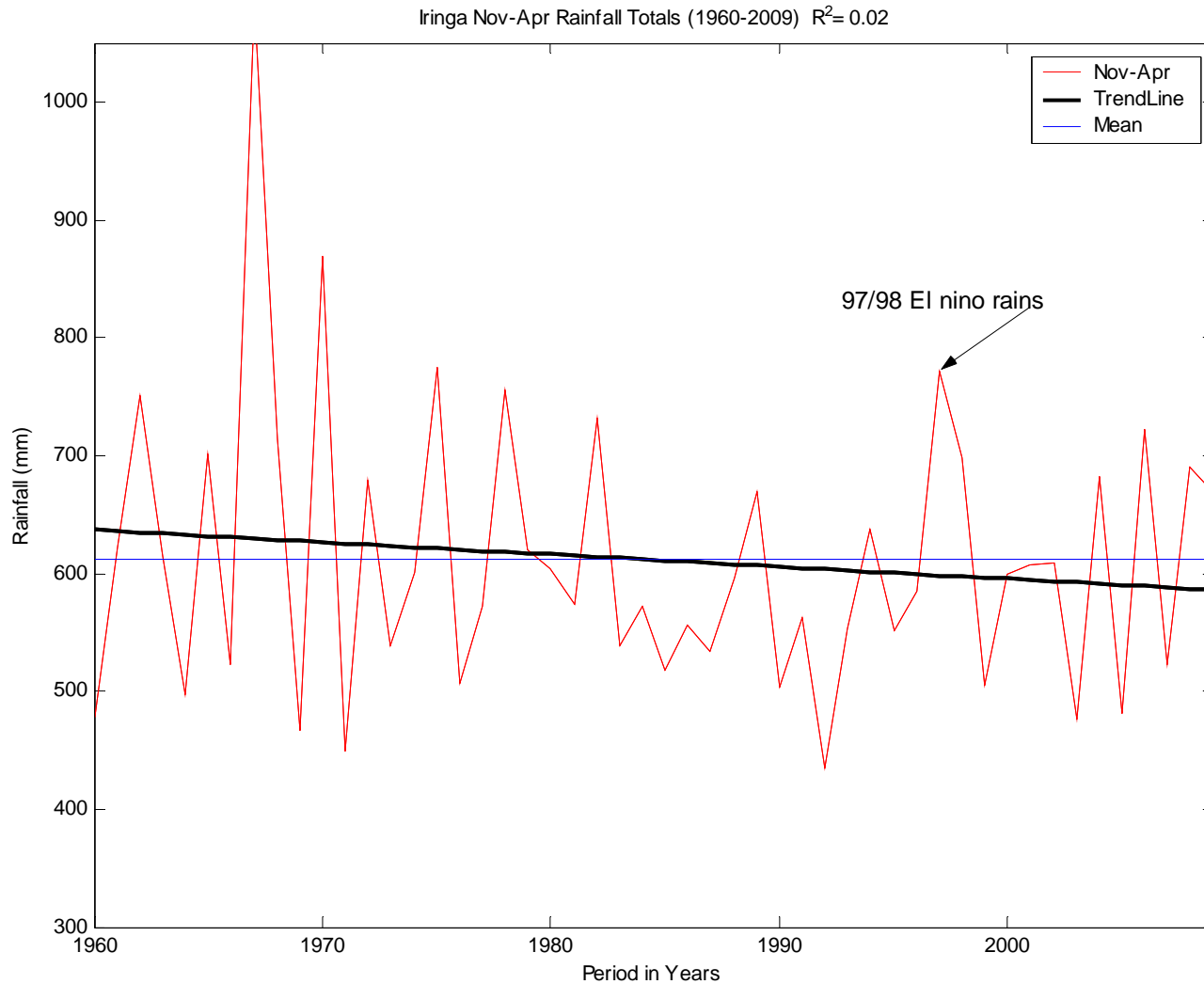
Rainfall patterns in the recent Past



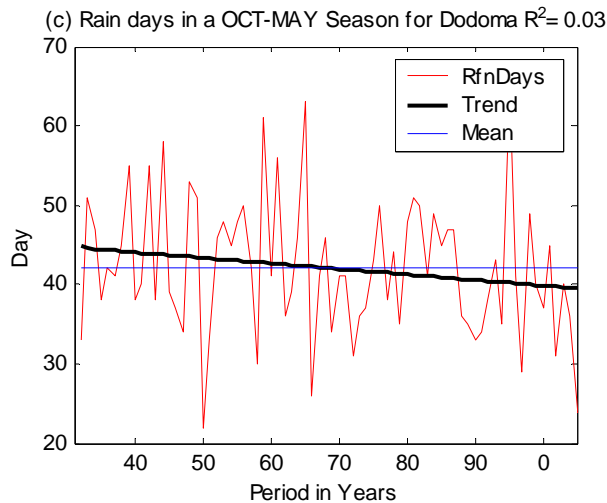
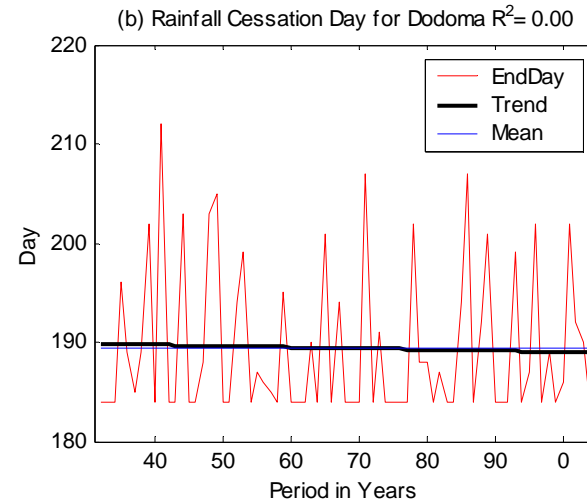
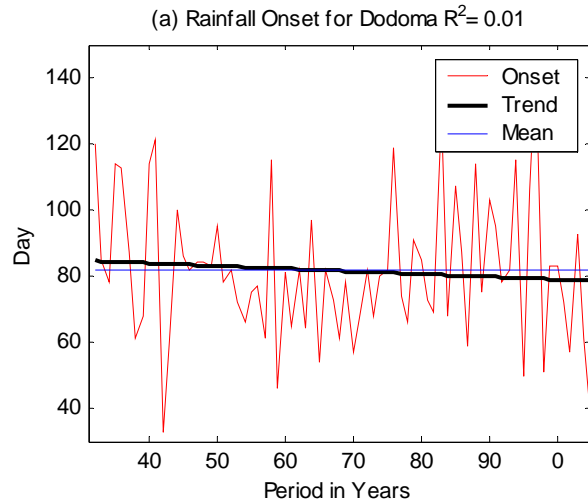
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Rainfall patterns in the recent Past



Rainfall patterns in the recent Past

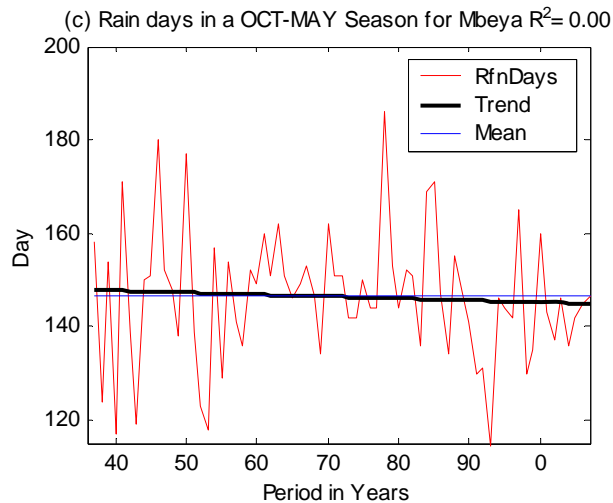
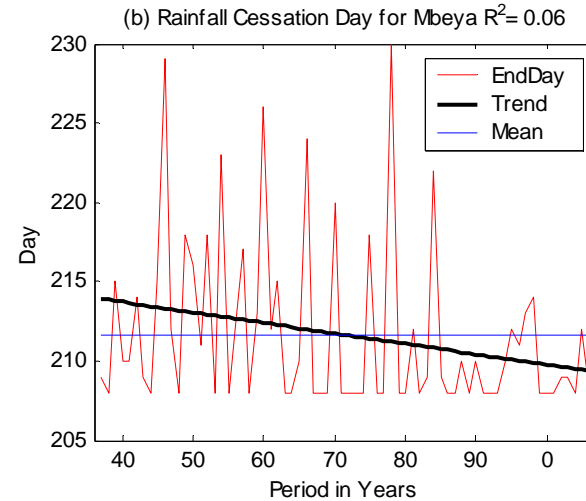
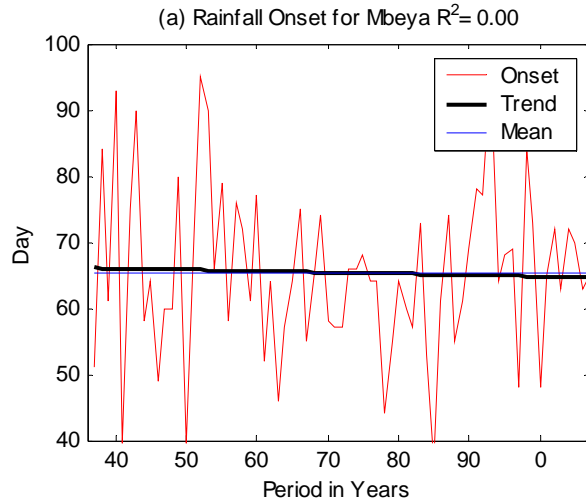


(a): Rainfall Onset day is calculated from 1st October

(b): and similarly cessation day is calculated from 1st October

(c): Total number of rain days in a OCT-MAY Season
PERIOD OF ANALYSIS (1932-2007)

Rainfall patterns in the recent Past

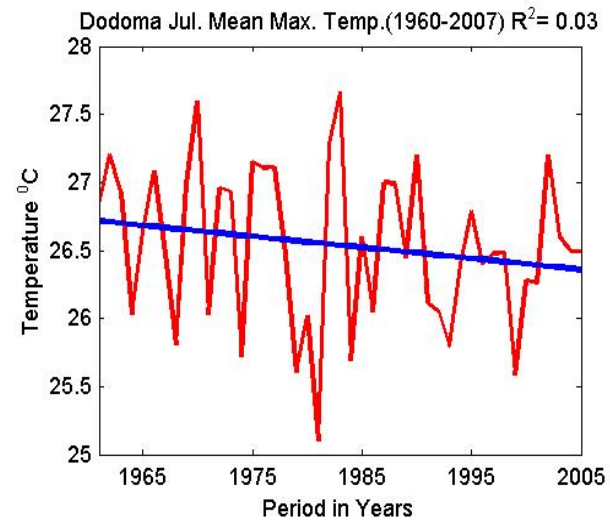
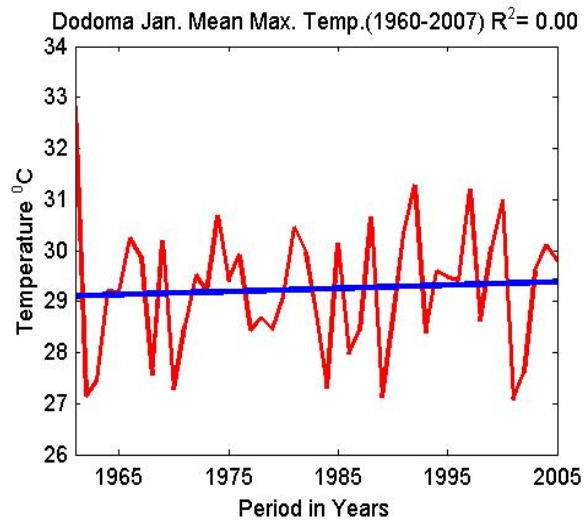
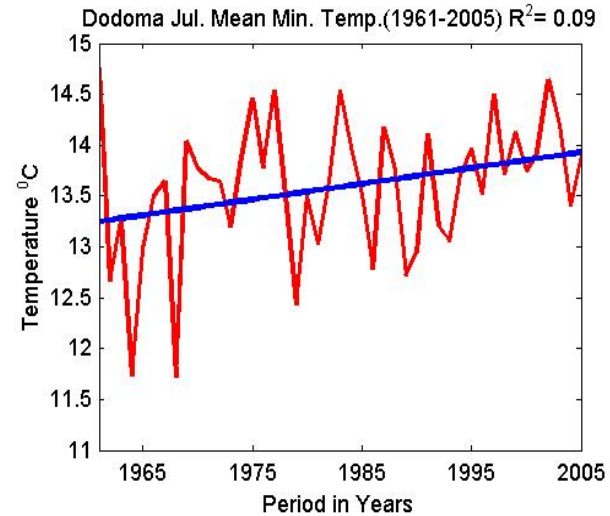
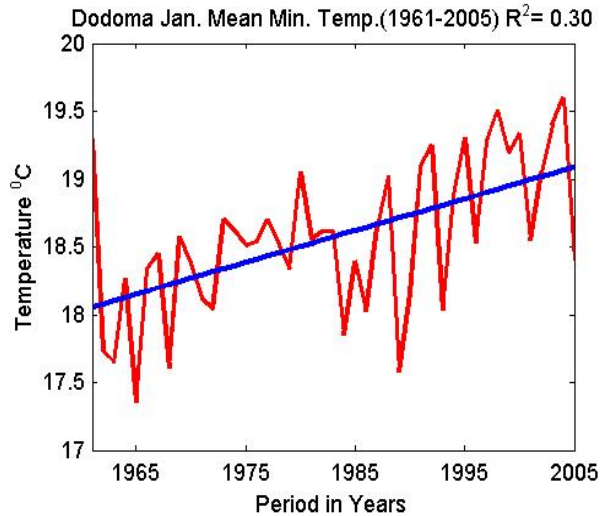


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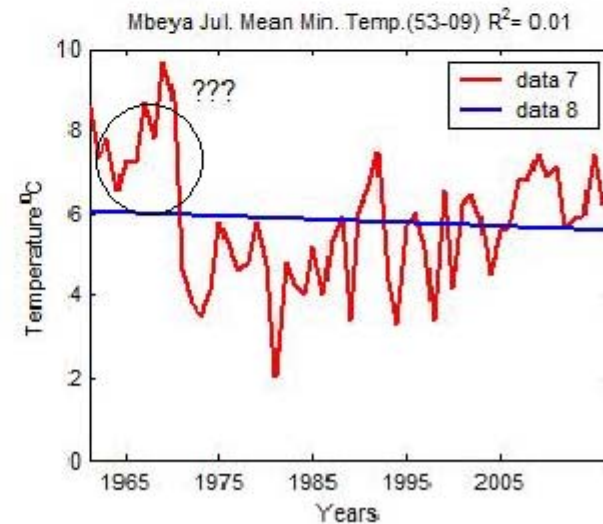
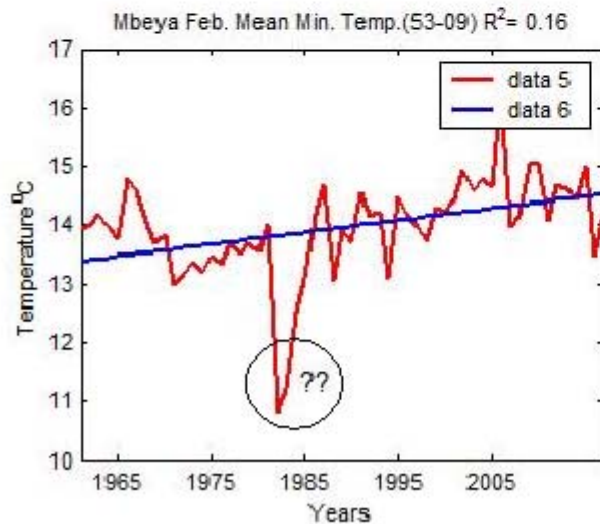
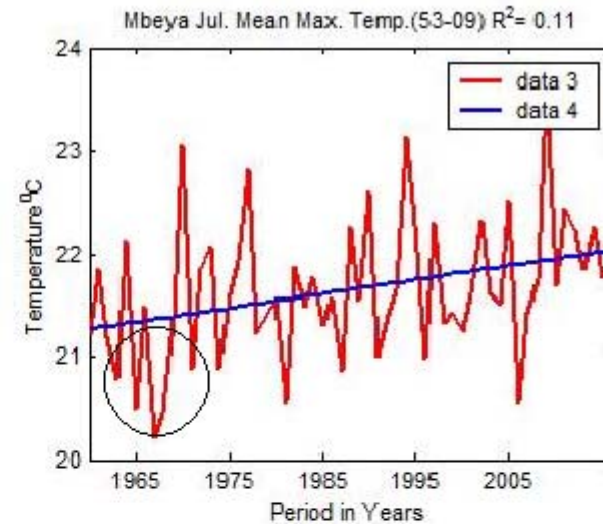
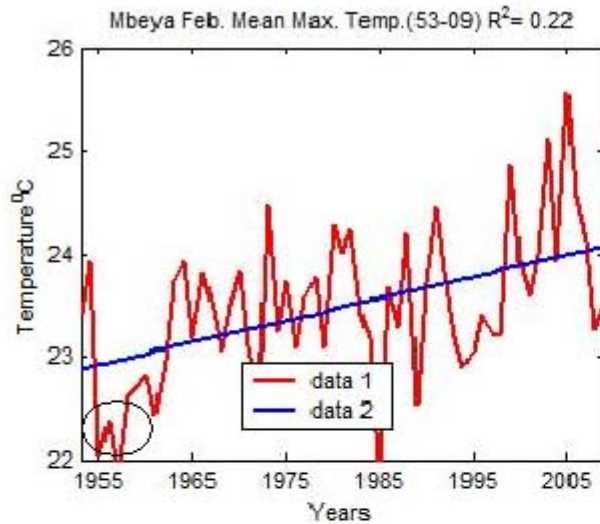
(b): and similarly cessation day is calculated from 1st October

(c): Total number of rain days in a OCT-MAY Season
PERIOD OF ANALYSIS (1937-2007)

Mean Max. & Min. Temp. (Feb. and Jul.)



Mean Max. & Min. Temp. (Feb. and Jul.)



Climate Change Challenges in Tanzania

- Understanding where and the direction of climate change in Tanzania (associated problems: Inadequate
 - climate data and climate monitoring station
 - Resources comprehensively process and analyze climate data
 - Personnel trained in climate change issues

DO WE HAVE CLIMATE CHANGE IN TANZANIA?

- **Indications are there; however more studies have to be done???**
- AR4 projections indicate that there will be an increase of rainfall in East Africa. (But not the whole East Africa will experience this increase);
- As for temperature there is a general indication that temperatures over Tanzania are increasing

CONCLUSIONS

- All climate data sets should be rescued and analyzed;
- More climate stations should be established (both surface and upper air stations);
- Capacity building in climate change issues.

THANKS