# Cloud Microphysics Climatology over Kenya

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Email: dmuchemi@bluebottle.com, dmuchemi@meteo.go.ke
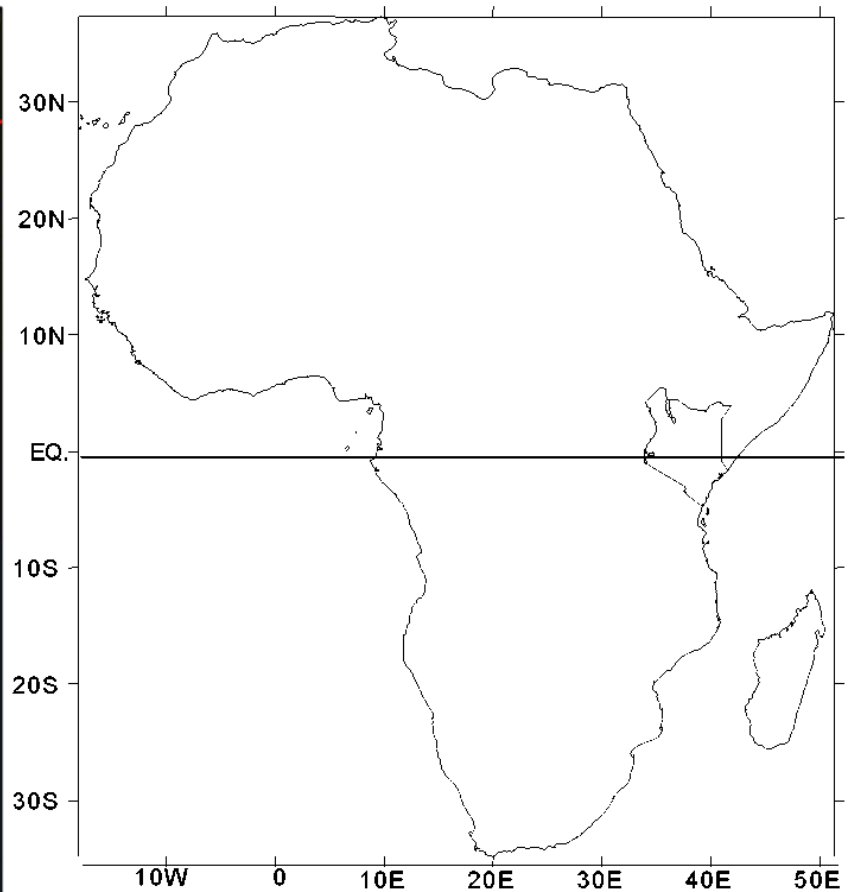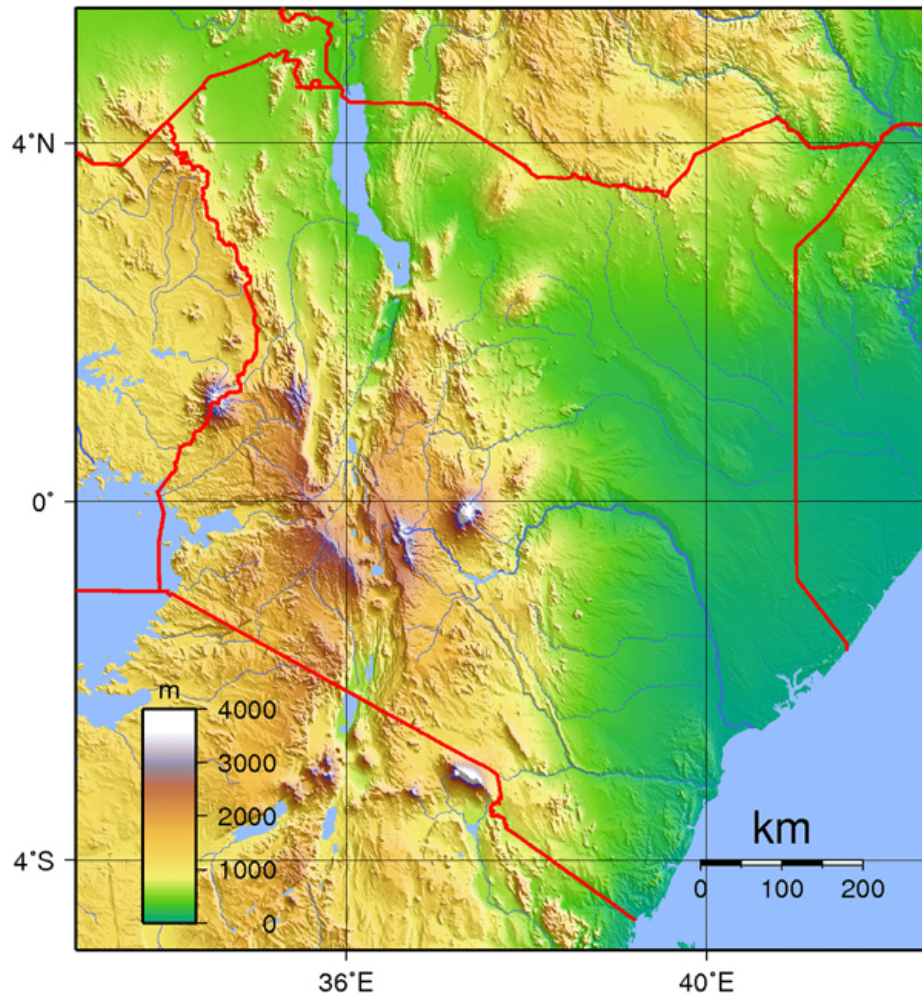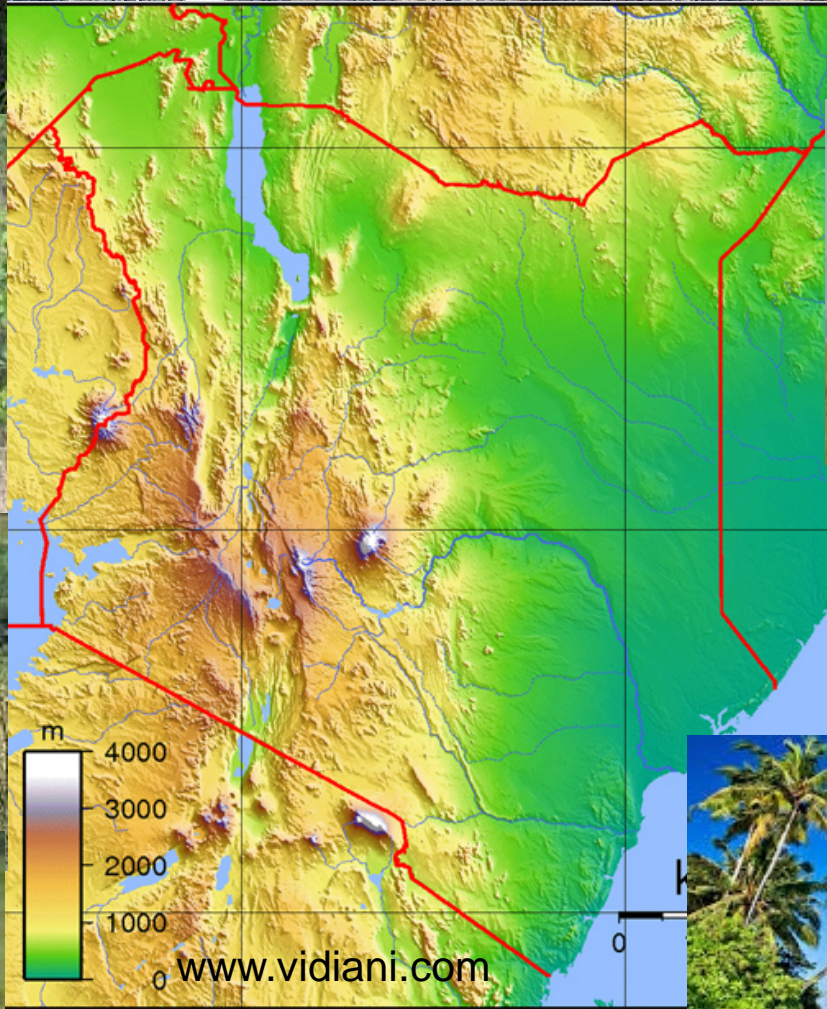
# Kenya
## Area of Interest



Figure 1: The location of Kenya in Africa

# Kenya

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# Kenya

- Economy
  - Agricultural Based
    - Cash Crops
      - Tea
      - Coffee
      - Horticulture
    - Livestock
    - Subsistence
  - Tourism

# Climate Monitoring Infrastructure

- **Stakeholders**
  - KMD - National Weather Service
    - Public Service
    - Volunteers
  - Other Government Agencies
  - International Agencies
  - NGOs
  - Private Enterprises
  - Individuals

# Kenya
# Climate Monitoring Infrastructure



- Rainfall Stations
  - 2700 in 1970s
  - 300 in 1990s
  - 700 in 2012
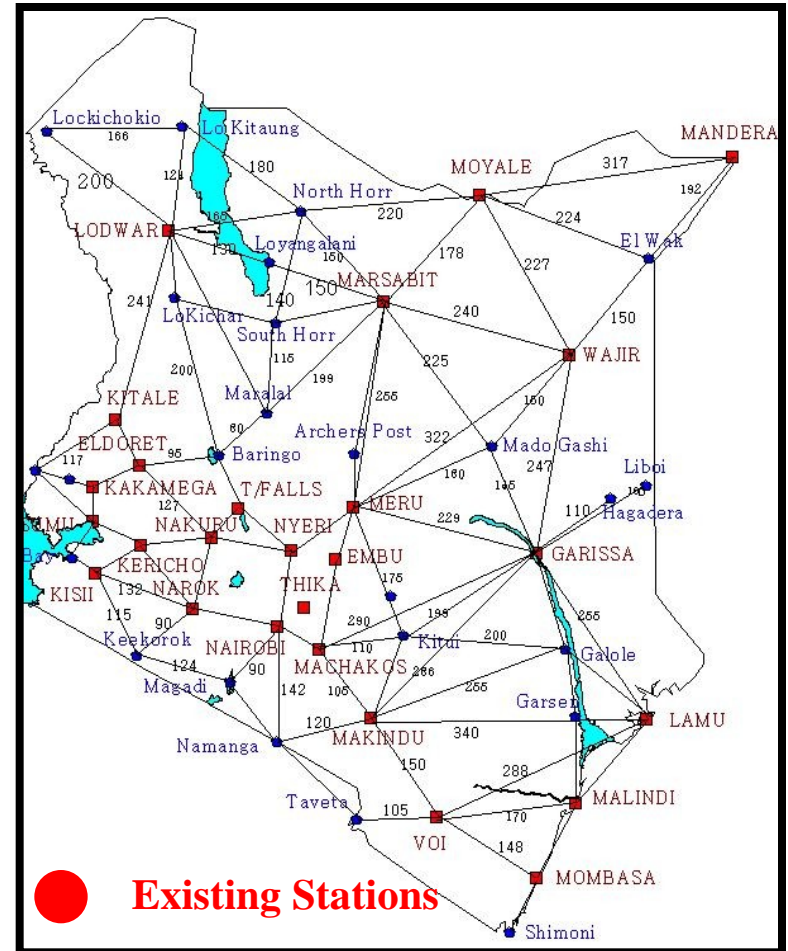
# Climate Monitoring Infrastructure

- ## Synoptic, Hydromet & Agromet Stations
  - 38 Manned
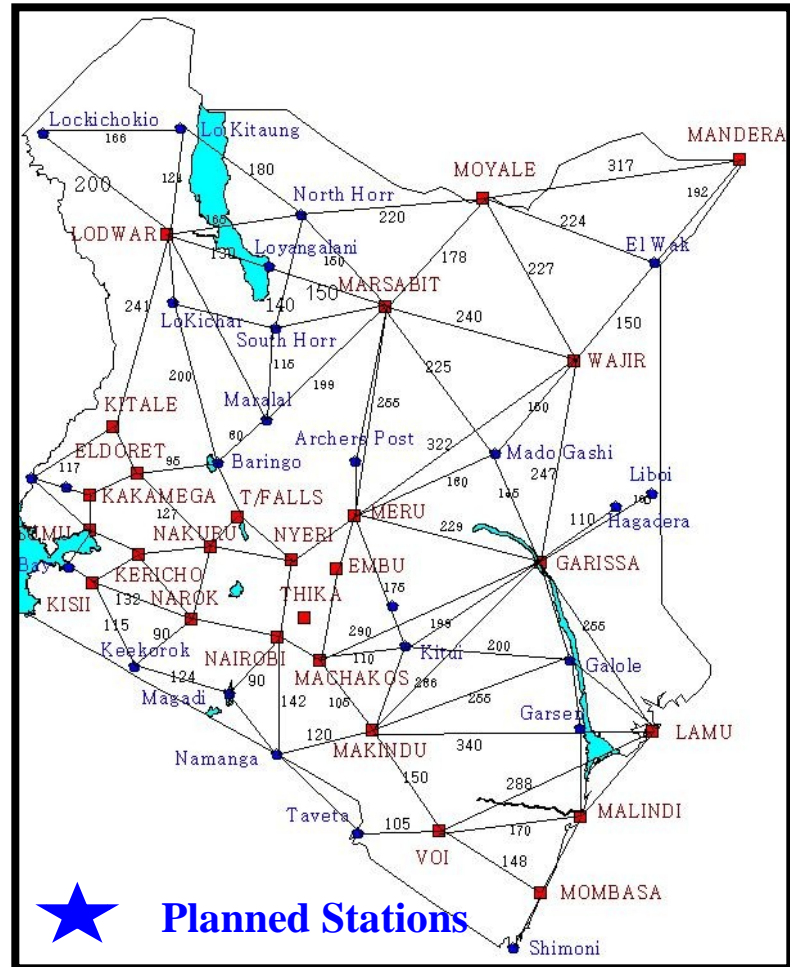  - 72 Automatic (AWS)

# Kenya
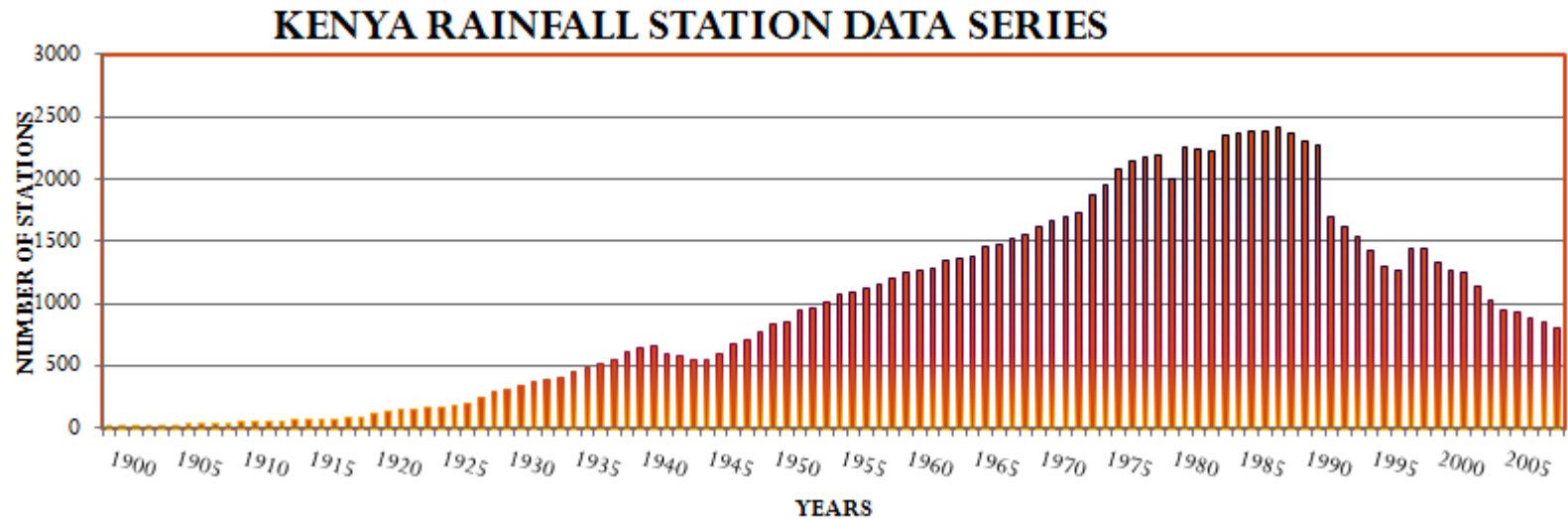# Climate Monitoring Infrastructure

- Current Network

# Kenya
# Climate Monitoring Infrastructure

- Future Synoptic Network

# • Station Network Trend



KENYA RAINFALL STATION DATA SERIES

# Kenya
# Climate Monitoring Infrastructure

- Human Resource
- 700
  - Meteorologists
    - Forecasting
    - Education and Training
    - Research
    - Marine and Oceanography
    - Hydromet
    - Agromet
    - Biomet
    - Environmet
    - Climate Change
    - Publicity and Media
  - Aeronautical Forecasters
  - Meteorological Technicians
  - Observers
  - Support Staff (Accounts, HRM, Procurement)
  - Engineers
    - Electrical/electronic
    - Mechanical

Droughts
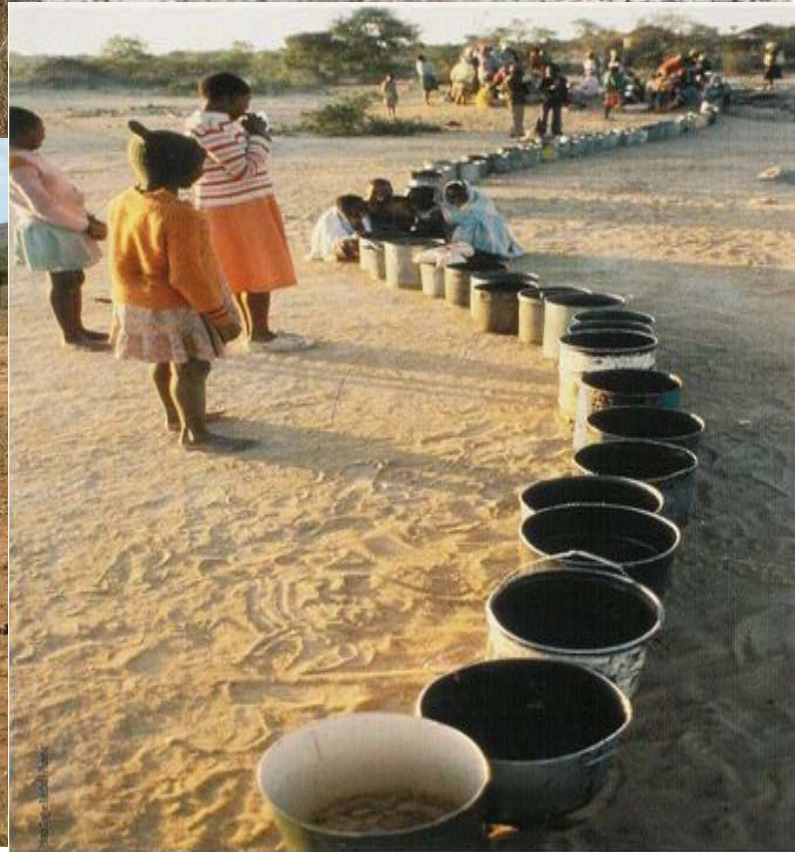
# Weather Modification Programme

Kenya Vision 2030 Flagship Project



**Hail Suppression**
Kericho, Nandi Hills

**Snow-pack Augmentation**
Mount Kenya

**Frost Protection**
Kinangop, Timboroa, Narumoru, Narok

**Rainfall Enhancement**
ASAL Regions

**Fog Suppression**
Kinale, Kimende, JKIA

CM SAF Users Workshop, 10-12th March 2014
Hotel Am Bardersee, Grainau, Germany

# Weather Modification Programme
## Sampling Methods and Equipment

Aircraft Borne

Ground Radar

# Weather Modification Programme
## Sampling Methods and Equipment

| Cloud Element | Equipment, Manufacturer, Model |
|---|---|
| Temperature | Rosemount Model 102 |
| Cloud Liquid Water | Sky Tech Nevzorov LWC Probe |
| Cloud Ice Content | Sky Tech Nevzorov TWC Cloud Total Water Probe |
| Cloud Particle Size | 2D-S (Stereo) Optical Array Spectrometer SPEC Model OAP 2D-S |
| Cloud Droplet Size | Fast Cloud Droplet Probe (FCDP) SPEC Model FCDP-100 |
| Optical Particle Counter | Fast Forward Scattering Spectrometer Probe (FFSSP) SPEC Model FFSSP-100 |
| Precipitation | High Volume Precipitation Spectrometer (HVPS) SPEC Version-3 HVPS |
| Cloud Particle Image | SPEC model 3V-CPI |
| Aerosols | Passive Cavity Aerosol Spectrometer Probe (PCASP) DMT model 100 |

# Weather Modification Programme
## Sampling Methods and Equipment

- ## Space Based

# Weather Modification Programme
## Satellite Cloud Products

- Cloud Fractional Coverage:CM-02, CM-03, CM-04
- Cloud type: CM-08, CM-09, CM-10
- Cloud top products          CM-14, CM-15, CM-16
- Cloud optical thickness      CM-32, CM-33
- Liquid water path   CM-36, CM-37
- Cloud Phase           CM-41, CM-42
- Cloud Particle Concentration
- cloud effective radius
- cloud liquid water path

- Cloud drop number concentration.