The 5th Meeting of the Coordinating Group of the RA II WIGOS Satellite Project

21 October, Vladivostok city, Russky Island, Russia

Far Eastern Federal University

(Country Report)

Saudi Arabia

General Authority of Meteorology and Environment Protection (GAMEP)
P.O. Box 1358 Jeddah 21431 Saudi Arabia
Tel: +966124237222
E-mail: ghulamas@yahoo.com

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Introduction

I. Country overview

➢ Geography

The Kingdom of Saudi Arabia comprises about 80% of the Arabian Peninsula, occupies approximately 2,250,000 square kilometers area. Saudi Arabia's Red Sea coast on the west stretches to approximately 1760 kilometers, while its eastern coast on the Gulf covers 650 kilometers. Almost two thirds of the country is arid steppe and mountains with peaks as high as 3,000 meters, and most of the remainder is sandy desert. Saudi Arabia consists of two distinct groups of rocks; the Arabian shield and the Arabian Platform.

➢ Population

About 33,200,000, from which 78.5% are urban. Foreigners form21% of the total population.

➢ Climate

Saudi Arabia is mostly located within the sub-tropical belt. The Kingdom is greatly influenced by the stationary pressure patterns extending from the surrounding regions. The general remarks on the seasonal climate can be concluded as follow:

-During winter (D,J,F), the northern, central and eastern parts of the Kingdom are dominated, most of the time, by a cold and dry continental air-mass associated with the extension of the "Siberian high pressure" of central Asia. To the southwest and the west of the country, a warm and humid tropical air-mass is prevailing in

association with an extension of a tropical low pressure, known as "Sudan low", to these parts of the Kingdom.

-During summer (J,J,A), the Kingdom is almost totally dominated by the extension of the "South West Indian Monsoon" and the associated very dry and hot continental tropical air-mass. An exception of this is the south western region (Assir mountain), where moist tropical air mass is delivered by the arrival of the ITCZ.

- During spring (M,A,M), the pressure systems prevailed in winter undergoes changes into the pressure patterns of summer

-During autumn (S,O,N), the clear-cut and long-lasting summer synoptic pattern starts now to breakdown. There is a transition to the general synoptic pressure configuration of the winter season.

II. Major historical hydro-meteorological disasters

- Flash Flood: Flash floods can occur in the kingdom after heavy rains. All valleys "wadi" are considered floodplains and vulnerable to flooding after severe rainstorm.
- Life and economic loss: Two devastating flash flood incidents have occurred recently in Jeddah (2009 and 2011) resulted in more than320 loss of lives and tremendous economic losses.

III. Major national economic sectors relying on GAMEP

GAMEP provide services to a wide range of sectors such as:

a) The agricultural community.

b) Transportation (aviation, land and marine sectors).

c) The civil defense authority.

d) The water authority.

e) The public media.

f) The health sector.

g) Other benefited sector includes, energy, industry, environment, tourism and shore activities.

Short description of GAMEP activities

GAMEP is the primary and the only mandated institution within the country that is responsible for all matters relating to weather, climate and their applications.

MISSION and functions of NMS of GAMEP

(a) Develop and distribute forecasts, warnings and alert;

(b) Provide essential data, information and products;

(c) Maintain a continuous, reliable and comprehensive historical record of national climate data;

(d) Provide relevant advice for decision-making;

(e) Advancing their own operations and services through research and development;

(f) Participate in the national multi-hazard early warning systems;

(g) Fulfill relevant international commitments, participation in the appropriate international programs and activities;

(h) Establish and operate observing station networks that gather observations of the earth-atmosphere-ocean system;

(i) Establish and operate telecommunication networks;

(j) Acquire and operate data-processing and forecasting systems;

(k) Acquire and operate a product dissemination system.

Examples of components of some services are briefly, as follow:

- Meteorological Services for Transportation:

  - Aeronautical Navigation,

    Observation: METARs, MetReport, Speci, Synop , ... etc.

    Prediction: TAFs, Area FCST, Route FCST, SIGWX, ... etc.

    Warnings: Aerodrome and wind shear Warning, SIGMET,... etc.

  - Marine

    Observation: Sea Surface Temperature (SST), ..etc.

    Prediction: Outputs of Marine Models.

- Climate Services:

  - Climate Reports: Historical Climate for Met variables (30 years or more)

  - Climate Prediction: Seasonal (1-4 months)

- Climate Extreme Events: as for climate and prediction.
- Climate Change and Variability: RCM (30-50 years)

Current Observational System Overview

The Saudi Arabian network of meteorological station is relatively new and sparse. In 1960, there were only nine synoptic stations over the whole country. There were a gradual increase ever since to reach 26 station by 1985. Currently, the network of met. station consists of 34 manned synoptic/climate stations and more than 140 automatic weather stations. In details, these are:

I. Surface observations: 28 synoptic (RBSN), 34 climate (RBCN), 6 GCOS (GSN).

II. Upper-air observations: 8 radio-sondes and 0 GCOS(GUAN).

III. Marine observations: None

IV. Aircraft-based observations: None

V. Satellite observations: We are using Meteosat Second Generation (METEOSAT 10) in (GAMEP). The ground station is provided by TECNAVIA company. We are using the skyceiver software to show multi images in different spectrum.

VI. Weather Radar observations: GAMEP uses dual polarized weather radars in issuing very short weather forecasts and in its national cloud physics and rain enhancement program. IRIS, Titan and Rainbow

software are in use. GAMEP is operating 13 weather radars covering almost all the kingdom in real-time every 5 minutes .

VII. Others: Wind profiler (only one), solar radiation measurements.

Collection, Processing and Utilization of Satellite Data and Products

I. List of satellites/instruments currently used operationally for NWP, nowcasting and other applications:
Meteosat Second Generation (METEOSAT 10).

II. Current capabilities of collection, processing and archiving of satellite data and products

1. Currently GAMEP are using Tecnavia/Skyceiver application for reception and processing and dispatching of all 12 channels of EumetSat data.

2. Data are backed up in real-time on archiving system as raw data.

III. Current satellite data applications

1. Key application areas:

We are using satellite data in order to help aviators to detecting the top height of clouds, temperatures, icing level, thickness of clouds and so many things which helping us. Also we are using satellite data in early warnings.

2. Satellite-based products:

- Rain Estimation Computing.

- Rain Probability Computing.

- Cloud Winds Computing.

- Cloud Top Height

- Cloud Top Temperature

- Tropospheric Humidity at medium and upper levels

- Dust, Cb, Air masses and Fog channels.

IV. Satellite data and product needs and gaps

- A Professional Analysis software .

- A web based satellite application .

- Programmers.

Satellite Data to address Regional Challenges

No activities at present. There are plans to coordinate with GCC countries to jointly address regional challenges using satellite data (e.g. dust movement, thunderstorm evolution, development and traking).