

Intensification and Automation of Moroccan Meteorological Observation Network for the improvement of weather forecasting and warning system

VIGIOBS PROJECT

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Abstract

During the last decade, Morocco was affected by episodes of heavy rain more and more frequent. This causes enormous damages and human losses in particular during the two last winter seasons. As a consequence, the Moroccan government launched a national program to reduce effects of floods and to improve the early warning systems to natural disasters.

The contribution of the National Meteorological Service of Morocco constitutes an essential part of the program. this contribution aims to strengthen and improve the National Meteorological Service Observing and Nowcasting capacities by launching the **VIGIOBS** project funded by a special governmental fund to fight against the effects of natural disasters.

The project concerns the three main following domains :The Strengthening and the extension of the Moroccan radar network, the Densification of the synoptic and climatic observation network and the Densification of the upper air observation network.

VIGIOBS project extends over 3 years (2010-2012) and will enable the NMS of Morocco to strengthen, modernize our meteorological observation system in order to for improve the weather forecasting and warning system

In this paper, the consistency and the aims of the VIGIOBS project are given. The paper describes also the methodology followed to choose the implementation sites for the new weather radars, automatic weather stations and new upper air stations and the interconnection between this components to improve nowcasting and weather monitoring for a best and efficient monitoring and warning system.

Project Objectives

The main objectives of the VIGIOBS project are :

- Improved weather watch through the strengthening of the real-time observation
- Improving the quality of weather forecasts
- Increase the density of the observational network and its automation
- Cover all provinces of the Kingdom by WOS
- Strengthening the weather in mountainous zones,

Consistencies of the project

The project will enable VIGIOBS National Weather strengthen modernize and improve its weather observation system by installing:

- 3 Doppler Weather Radar to cover East Region, South-East and South regions
- 60 synoptic automatic weather stations;
- 90 auxiliary automatic weather stations;
- 06 automatic weather stations in mountain areas;
- 03 Upper air stations (new rawinsonde systems).

Project Planning

The project will be implemented in three phases over the period 2010-2012. For each phase there will be the installation of:

- 01 Doppler Weather Radar
- 20 synoptic automatic weather stations;
- 30 auxiliary automatic weather stations
- 02 automatic weather stations in mountain areas;
- 01 Upper air stations (new rawinsonde systems).

New Weather Radar Network of Morocco

Several factors were considered in order to prioritize the siting of new radars for optimizing the current network and expanding the coverage of the weather radar network of Morocco.

In terms of overall radar coverage for the entire country the region from the northwest Atlantic coast south to about the city of Agadir is relatively well covered, while the region east of the Atlas Mountains from the Mediterranean south through the Southern Provinces of Morocco is nearly devoid of radar coverage. Many factors can be used to assess new coverage areas, but the more important factors being considered for new radar placements are as follows, in order of importance:

1. Areas currently without radar coverage where the addition of a radar would improve public safety in the event of a weather related disaster; e.g., estimation of precipitation over key drainage basins where flooding has been common and resulted in loss of life.
2. Areas without coverage where a new radar would improve short-term forecasts and warnings that could result in a decrease in economic loss to urban areas, industry, and agriculture; e.g., as in 1, but where damage is more related to infrastructure or crops rather than people.
3. Areas without coverage where radar could generally improve the forecasts issued by the Department of Meteorology (DMN); generally filling in the gaps found in the current coverage, or extending coverage to offshore areas.
4. The addition of radar to improve warnings related to aviation safety (strong winds, wind shear, heavy precipitation, etc.).
5. The addition of radar to aid specific projects such as hail suppression programs and snow enhancement programs (e.g., hail algorithms to detect hail-bearing storms).

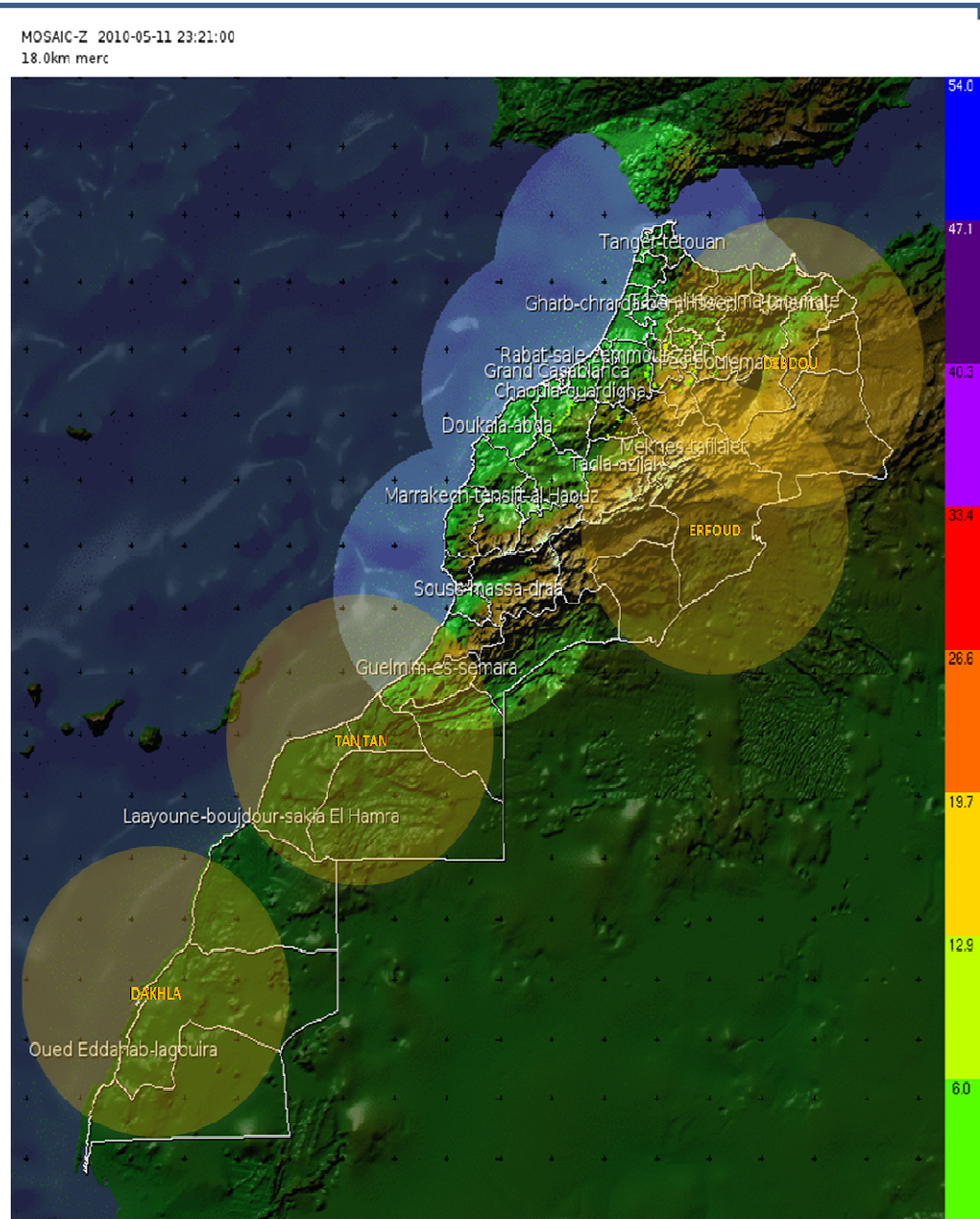


Figure 01. Mosaic of proposed radar network, including existing and proposed radar Sites

Synoptic automatic weather stations

The proposed system consists of three main groups:

- Automatic Weather Stations, each including a 10m mast, probes and accessories with the acquisition module and primary processing of data from sensors, communication support by mobile telephone network for transmitting data collected by the acquisition module.
- Workstations including hardware and software for concentration, processing, visualization and data transmission to the central server located in Casablanca
- Two central servers configured / bypass for concentration, processing, visualization and data archiving.

The central system can be connected to the transmission system and distribution of MND (FORWARDS system) and the system GTS, AFTN and ATIS. But the system's open architecture allows connection to other systems and networks if necessary.

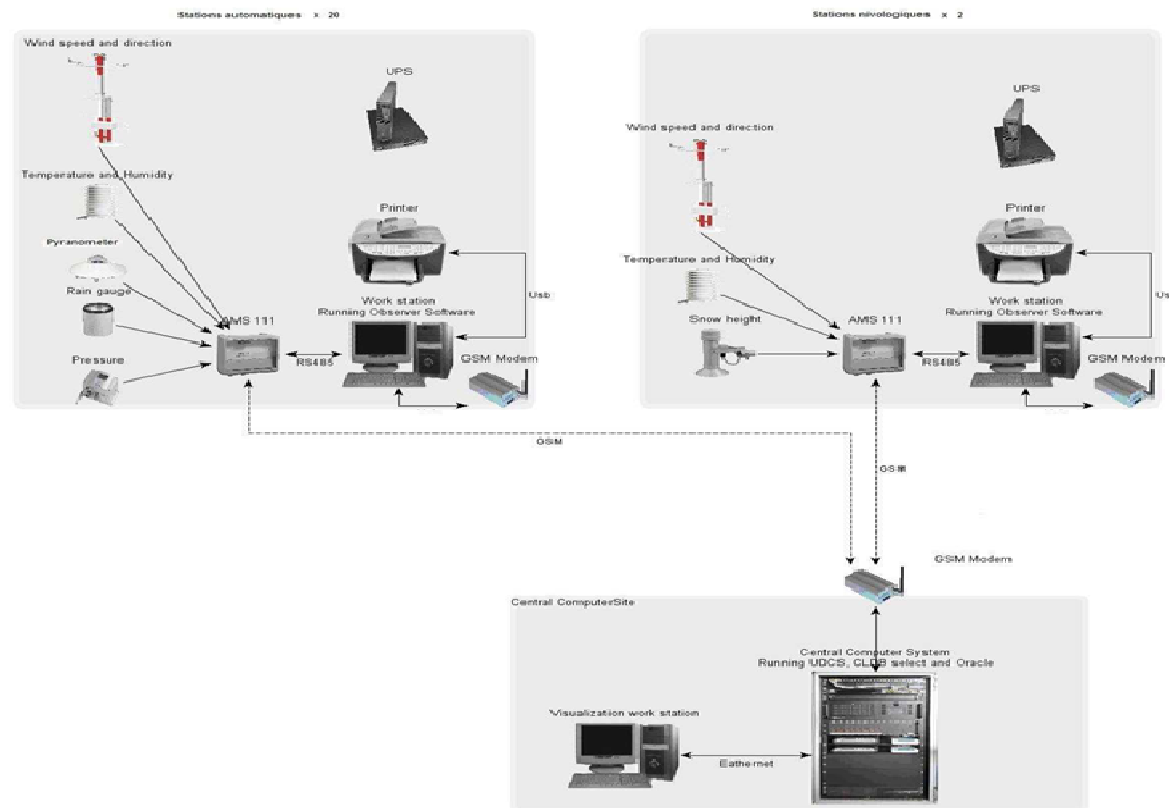


Fig 02 : Interconnection Diagram of Synoptic automatic stations central server

Auxiliary automatic weather stations;

The proposed system consists of:

- Automatic Weather Stations, each including a 10m mast, probes and accessories with the acquisition module and primary processing of data from sensors, communication support by mobile telephone network for transmitting data collected by the acquisition module .
- Central server configured for the concentration of data transmitted by the automatic stations, processing, visualization and archiving of data.

The central system can be connected to the transmission system and distribution of Morocco-Weather system (FORWARDS) and the system GTS, AFTN and ATIS. But the system's open architecture allows connection to other systems and networks if necessary.

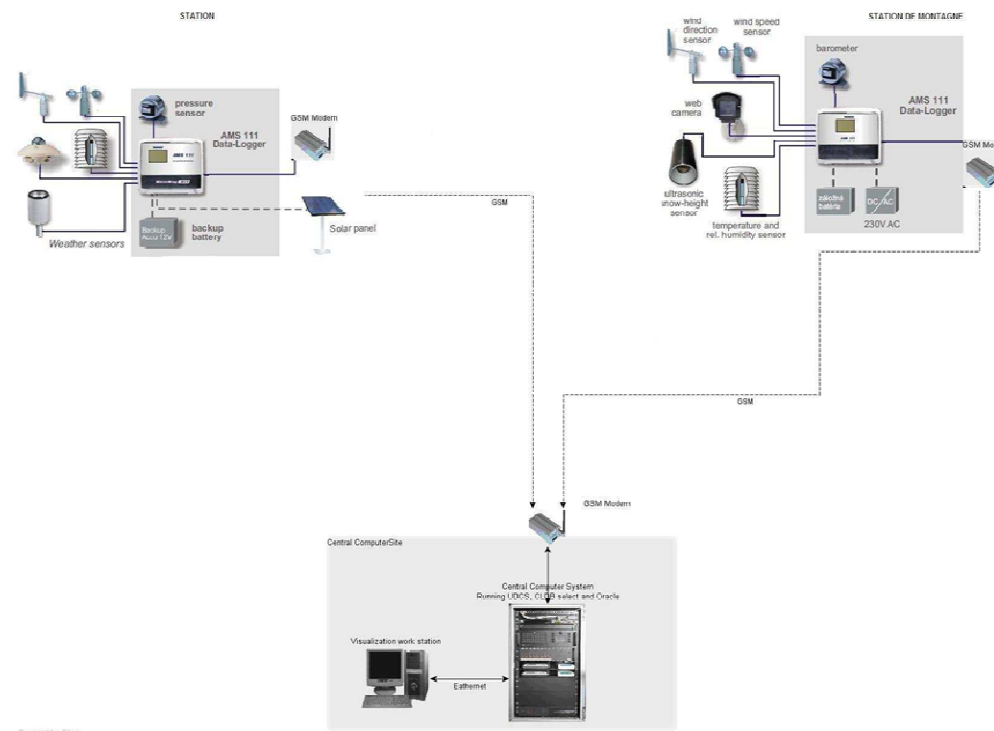


Fig 03 : Interconnection Diagram of Auxiliary automatic stations central server

Morocco Synoptic Observation Network

The Current synoptic observation network of Morocco contains about fifty automatic weather stations

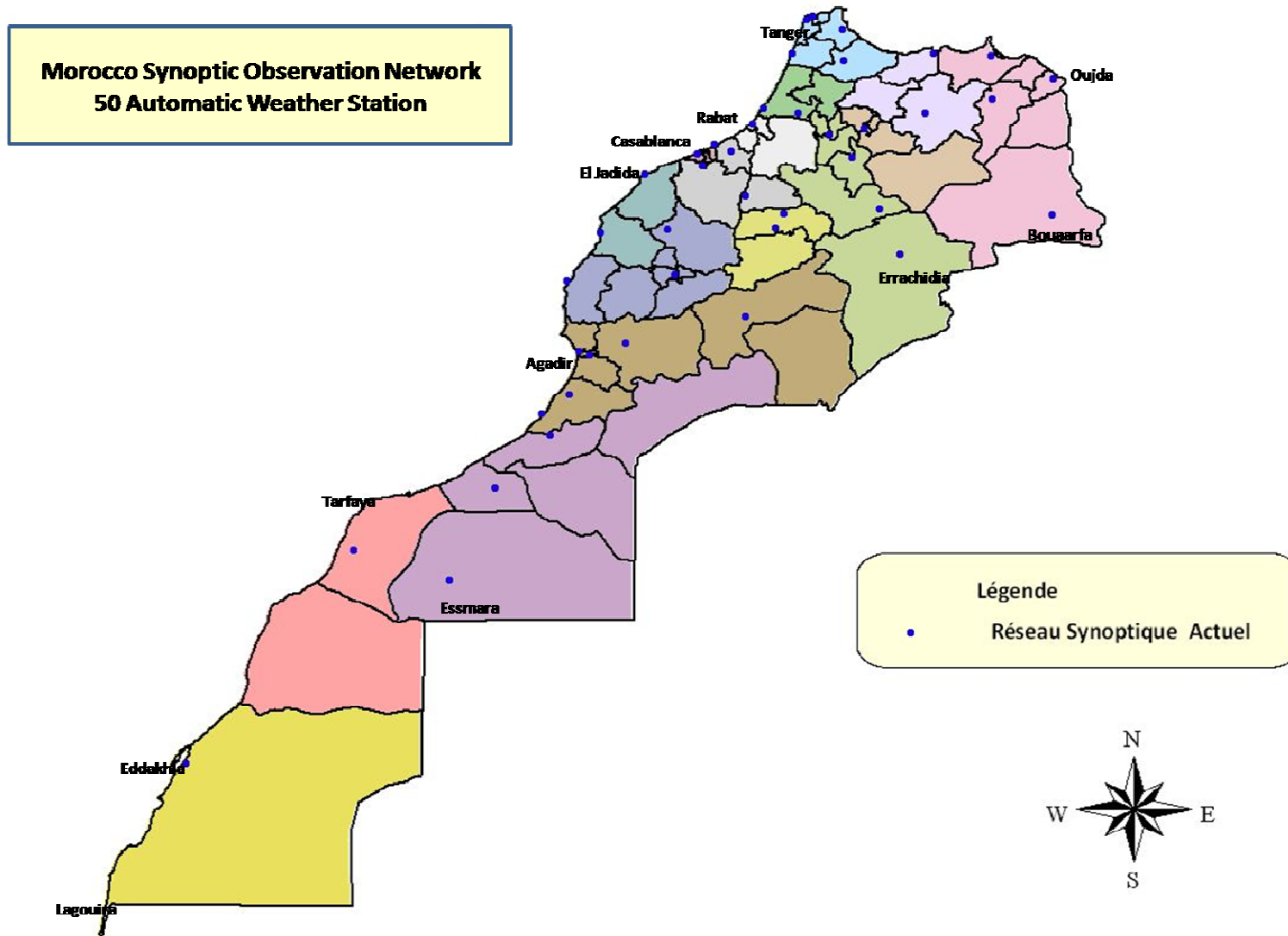


Fig 04 : Current synoptic observation network of Morocco : 2010

VIGIOBS Observation Network

After the execution of the VIGIOBS project the synoptic observation network of Morocco will contains about 206 automatic weather stations

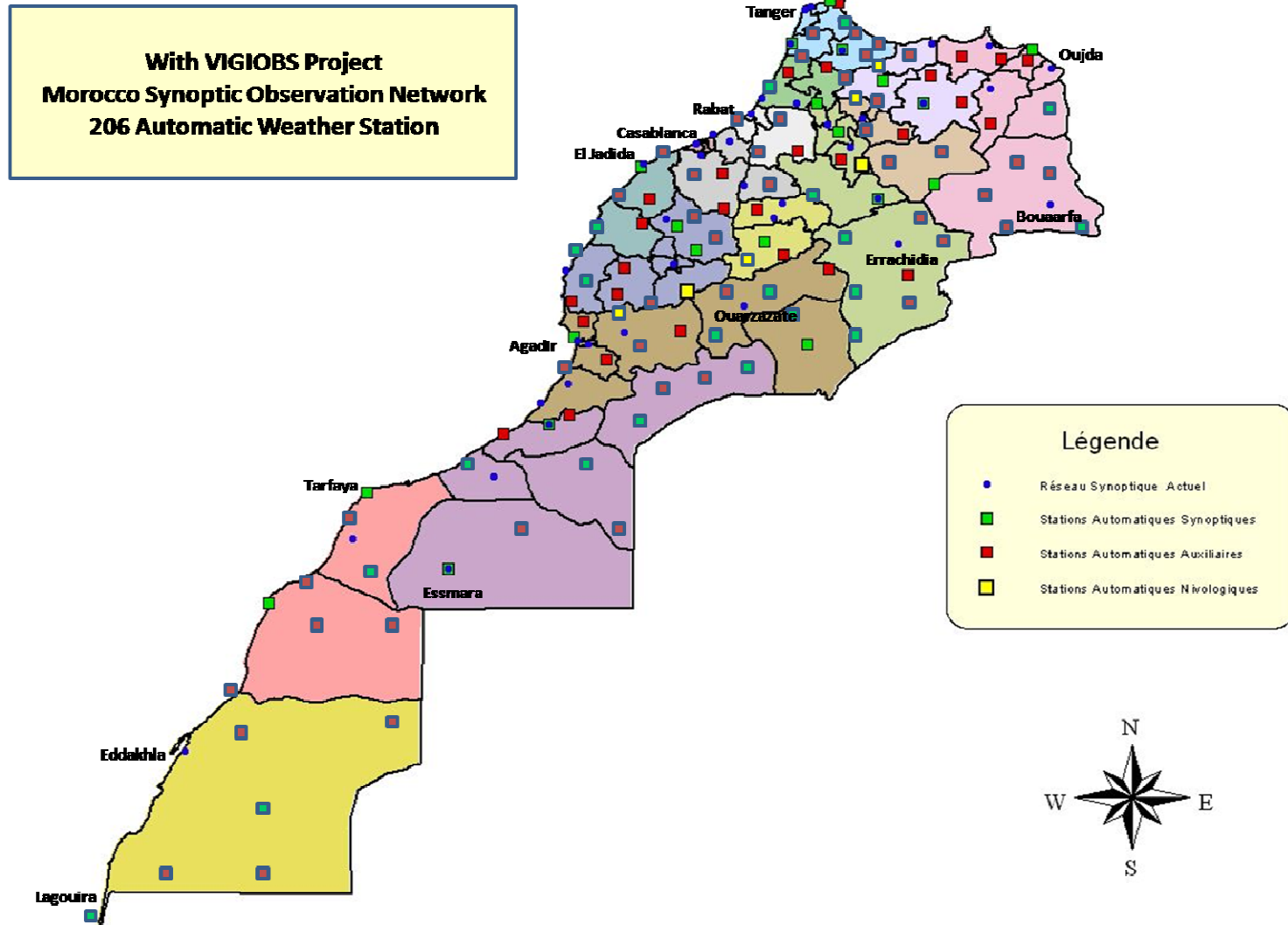


Fig 05 : VIGIOBS Observation Network