

Cuban Weather Radar Network. Recent Advances and Future Plans

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1 Network composition

Nowadays Cuban Meteorological Institute operates eight weather radars. Three of them are RC-32B (Mitsubishi-Japan), deployed in Cuba in 1972-73. Other four MRL-5 (Russian) were set up in the late 80's. And recently, in 2005, there was deployed a new Doppler radar for a temporary use.

Table 1. Radar stations names, numbers, locations and codes.

Nº WMO	Location	Province	Code
78311	La Bajada	Pinar del Río	LBJ
78324	Punta del Este	Isla de la Juventud	PDE
78325	Casablanca	Ciudad Habana	CSB
78335	Camagüey	Camagüey	CMW
78336	Pico San Juan	Cienfuegos	PSJ
78366	Gran Piedra	Santiago de Cuba	GPD
78379	Pilón	Granma	PLN
--	Holguín	Holguín	HLG



Fig. 1. Cuban weather radar network.

2 Coverage

Weather radars in Cuba guarantee an excellent coverage of Cuban archipelago in quantitative mode (red area in Fig.2) as well as neighboring seas in surveillance mode (blue area in Fig. 2).

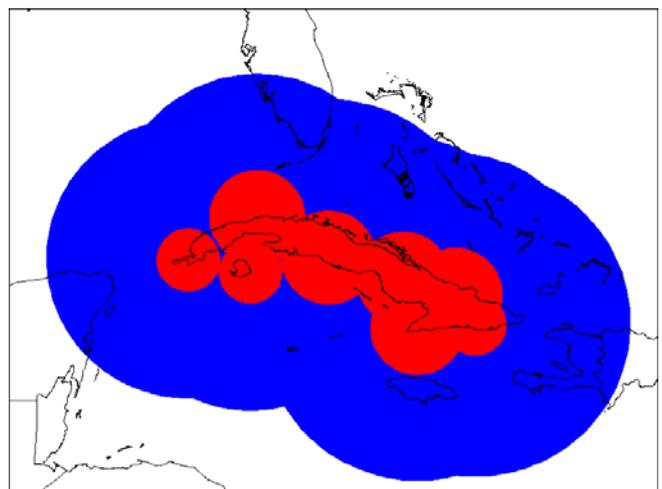


Fig. 2. Cuban weather radar network coverage.

3 Network modernization

In 1997 the Ministry of Science, Technology and Environment (to which belongs Cuban Meteorological Institute) embarked in a national radar modernization program which has proven to be very successful.

The heart of the modernization is an in-house developed hardware and software solution equal for all types of radars.

Operating console and all old man-radar interfaces are substituted by a computer friendly interface which shows all radar parameters and allows complete manual or automatic (scheduled) operation.

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An industrial PC with I/O cards performs: radar control, timing, signal processing and data acquisition. I/O cards are wired directly to transmitter, receiver, and antenna, checking status and sending commands and timing signals to them. Manufacturer's name and models are irrelevant because functions provided by these components are widely available in the market. This way, the original architecture is dramatically simplified, allowing an unprecedented performance and higher reliability.

4 The data

In clear air weather, Cuban radars make a full volume scan (19 elevations) each hour. Whenever precipitation begins, they make a full scan each 15 minutes. In some cases of interest, a full scan is provided each 5 minutes.

Each volume scan consists of 19 tilts, to be completed in 5 minutes. Following McGill practice, antenna is elevated according to an exponential sequence, denser in the lower part. Data is acquired in 300 m. range gates, and 1.4° in azimuth, up to 450 km (500 km in Pico San Juan and Gran Piedra, because they are higher 1200 m).

Raw data is archived in proprietary files (Rodríguez et al., 2001) and is transmitted to Radar Center in Camagüey, via Frame Relay channel. In the Radar Center they are processed to generate products and images aimed to Cuban Meteorological Institute Web site, and also to some other government users. Raw data and products are available to Provincial Meteorological Center, to be used by local forecasting offices, via Frame Relay channel.

In-house developed software generates a wide suite of products: PPI, RHI, CAPPI, Echotop, Maximum projection, VIL, etc., and also allows working interactively (see Fig. 3).

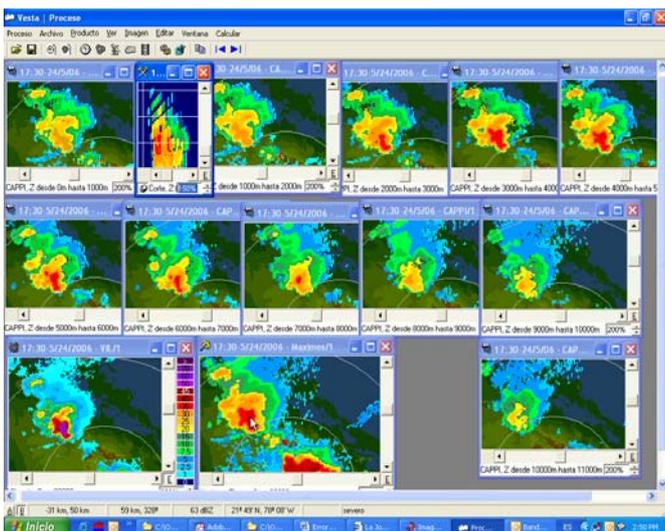


Fig. 3. Working session in interactive software package.

Images from all modernized radars are routinely available at www.insmet.cu as can be seen in Fig.4

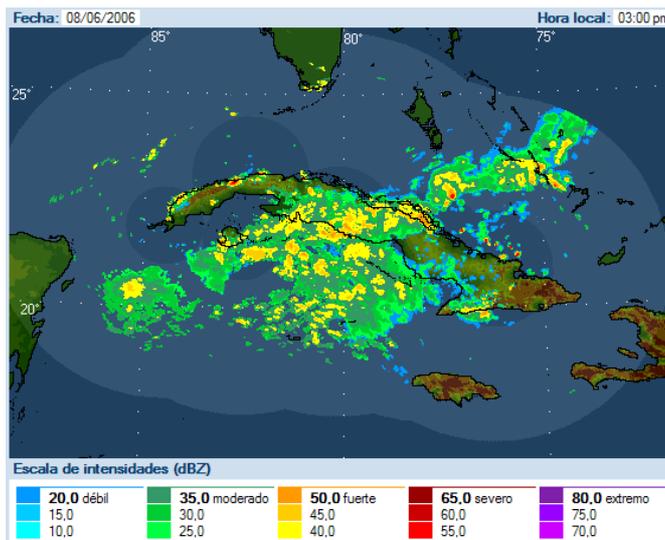


Fig. 4. National composite image.

5 Maintenance

Personnel at the radars sites perform routine checks daily, weekly and monthly. Once a year, a general maintenance activity is organized under the auspices of the Radar Center.

Calibration checks are performed according to what is described in Rodríguez, et al. (2003).

6 Future plans

The Technical Development Laboratory (belonging to the Radar Center) is developing a Doppler digital receiver to upgrade old radars in the near future, using the existing transmitters and antenna.

Software package will be upgraded to generate velocity, and spectrum width related products.

In a more distant future, transmitters and antenna pedestal are in plan of modernization.

Acknowledgements: Authors would like to thank radar operators, technicians and service personnel from the Cuban Institute Meteorology in general, as well as Minister (past and present) of Science, Technology and Environment, for their kindly support to this activity along these 10 years.

References

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