

INMET EXPERIENCE IN DEPLOYING ITS NETWORK OF AUTOMATIC WEATHER STATIONS SURFACE

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ABSTRACT

The Brazilian National Institute of Meteorology (INMET), from the year 2000, in a process of upgrading its network of surface weather stations, started the use of automatic weather stations. Initially five sites were installed to evaluate the new system of meteorological observation in different climates that Brazil has. This study aims to record the main experiences that INMET has achieved with its network of automated stations, which currently has 449 stations installed. Will be presented: experiences with the structure of teams for installation and maintenance, communication system and network stations management, the positives points in the use of automatic weather stations, and the difficulties encountered installation, operation and maintenance of network.

HISTORY

In January 1996 the Joint Working Group of Meteorology (GTMM), proposed the implementation and modernization of the National Institute of Meteorology. Agreement is signed in Brasilia Cooperative Project between the INMET and the FMI (Finnish Meteorological Institute) on November 26, 1999. In December 1999 it held the FAT (Factory Acceptance Test) of the first five automatic weather stations, brand VAISALA, type MAWS301. March 2000 happens the first training course for Brazilian technician installation of automatic weather stations. This month is also the first two installations of automatic weather stations.

DESCRIPTION OF AUTOMATIC WEATHER STATIONS USED BY INMET

The automatic weather stations used by INMET (Figure 1) measure the following parameters: air temperature, relative humidity, atmospheric pressure, wind speed and direction, precipitation and solar radiation. The stations are also equipped with telecommunication for transmission of meteorological data. In the telecommunication INMET initially used the Orbcomm satellite system, as not met the needs of the synoptic network, the system was replaced by the satellite system Autotrac/OmniTRACS, currently the system is also used by mobile phone.



Fig. 1 - Automatic Weather Station of Brasília/DF

INFRASTRUCTURE USED FOR INSTALLATION AND MAINTENANCE OF STATIONS

For installation and maintenance of automatic weather stations, the INMET has eleven teams consisting of two or three technician, which are distributed by region as shown in Figure 2.

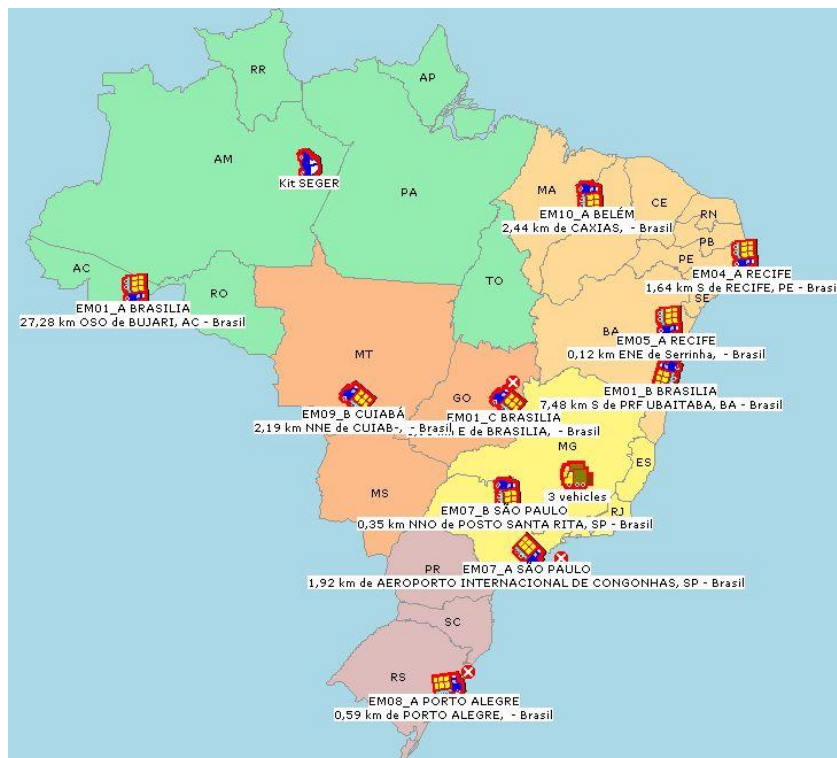


Fig. 2 – Distribution teams maintenance (EM) INMET in Brazil

The technician traveling in pickup trucks equipped with telecommunication system and satellite tracking (Figure 3)



Fig. 3

The operation of the automatic stations is monitored by the Operations Control Center, Communications and Weather Information - CCIM in Brasilia/DF (Figure 4). Any malfunction of the automatic stations is reported to the Office of Management Network (SEGER), which triggers the maintenance team with the closest station malfunction, for appropriate repairs.



Fig. 4 - Operations Control Center of the INMET

MANAGEMENT OF THE NETWORK OF WEATHER STATIONS INMET

For managing the network weather stations, the INMET has a Service Network Management Service (Serviço de Gerência de Rede - SEGER) who oversees the activities related to operation, installation and maintenance of the Network of Weather Stations INMET. Besides these activities SEGER plans and controls the annual preventive and corrective maintenance and technical inspection stations that comprise the network, monitors and controls the purchase and distribution of instrumental and technical material consumption, needed to operate the network of meteorological stations of the INMET; and prepares and monitors activities related to physical infrastructure, logical and operational control systems of the network of meteorological stations and equipment.

In fulfilling its mission to SEGER have two sections that assist in activities of your responsibility. The first section is the Laboratory of Meteorological Instruments - LAIME, who maintains the standards of meteorological instruments adopted by the INMET, following the criteria of accuracy established, aiming at the calibration of instruments, equipment and sensors in the existing observation networks, develops standards on the processes of calibration and verification of instruments, equipment and sensors in the networks of existing stations; issues certificates of calibration of meteorological instruments, performs maintenance, repairs and calibration of meteorological instruments for the network of stations, and prepare the technical specification of material consumption of meteorological instruments, spare parts and performs the preliminary analysis of these materials, and guides the acquisition.

The second section is Section of Supervision and Control (SESUC), which tracks, monitors and examines the activities related to the operation of the network of stations, with the aid of monitoring done by the Center for Operations Control, Communications and Weather Information - CCIM in Brasilia/DF; monitors the annual preventive and corrective maintenance and technical inspections of the network of stations, helps, supports and monitors the implementation of the work, according to standards and technical and operational procedures, and program and directs the acquisition and distribution of technical material consumption necessary to the operation of meteorological networks INMET.

The frequency of preventive maintenance of automatic weather stations INMET, is twelve months. The corrective maintenance occur due to the need, availability of staff, the location of the station and of financial resources earmarked for this purpose

The data transmission from automatic stations are also monitored automatically by a computerized system, Figure 5 shows a table of monitoring that can be consulted.

Referente a 18/03/2009																											
Estação		Horário - UTC																									
Código	Nome	Tipo	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A101	Manaus	Automática																									
A102	Parque Estadual Chandless	Automática	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●						
A104	Rio Branco	Automática	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
A110	Boca do Acre	Automática	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
A111	Lábrea	Automática	●	●	●	●	●	●	●	●				●	●	●	●	●	●	●	●	●					
A112	Humaitá	Automática	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
A113	Assis	Automática	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					

Fig. 5

POSITIVE ASPECTS OF THE NETWORK OF AUTOMATIC WEATHER STATION OF THE INMET

The positive aspects of the modernization of the network of meteorological stations INMET were:

- 1) Increasing the density of stations allowing a greater amount of information, as shown in Figures 6 and 7;
- 2) Increasing national coverage.
- 3) Increase of information by station, because the automatic stations provide hourly data (Figure 8), a total of 24 messages per day.
- 4) Provides for the monitoring and analysis of real-time weather (Figure 9).
- 5) Provides access data via the Internet (Figure 10).

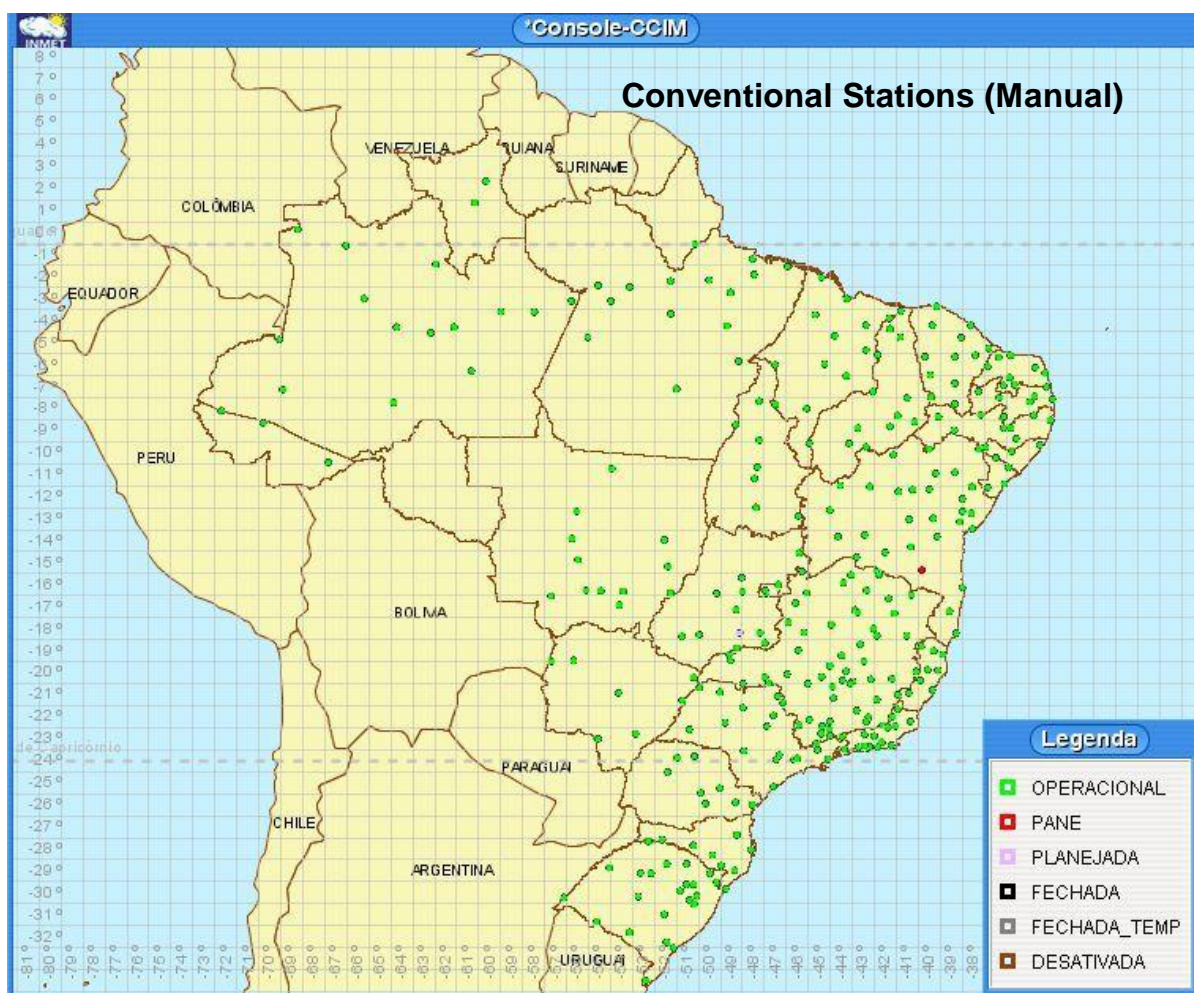


Fig. 6



Fig. 7

Ministério da Agricultura, Pecuária e Abastecimento

INMET INSTITUTO NACIONAL DE METEOROLOGIA

Consulta Dados da Estação Automática: BRASILIA (DF) Fechar

Observação: Estes são dados brutos e sem consistência com o único objetivo de deixá-los disponíveis de forma imediata. Uma nova versão apresentará os dados depois de verificação de consistência.

Data Inicial: 15/07/2010 Data Final: 15/07/2010 [Nova Pesquisa](#) [Download de Dados](#)

Data	Hora	Temperatura (°C)			Umidade (%)			Pto. Orvalho (°C)			Pressão (hPa)			Vento (m/s)			Radiação (kJm ²)	Chuva (mm)
		UTC	Inst.	Máx.	Mín.	Inst.	Máx.	Mín.	Inst.	Máx.	Mín.	Inst.	Máx.	Mín.	Vel.	Dir.		
15/07/2010	00	23.0	23.0	22.5	37	38	37	7.7	7.8	7.6	888.1	888.1	887.4	2.0	75°	3.2	-3.54	0.0
15/07/2010	01	20.1	23.0	19.5	47	49	37	8.4	8.6	7.6	888.4	888.4	888.1	1.4	93°	3.0	-3.54	0.0
15/07/2010	02	22.2	22.7	20.2	39	47	38	7.5	8.5	7.4	888.5	888.5	888.4	2.4	96°	4.0	-3.54	0.0
15/07/2010	03	21.5	22.3	20.8	42	44	38	8.1	8.2	7.3	888.2	888.5	888.2	1.6	74°	3.4	-3.54	0.0
15/07/2010	04	20.4	21.8	20.4	46	46	41	8.5	8.5	7.9	888.0	888.2	888.0	1.5	101°	3.3	-3.54	0.0
15/07/2010	05	19.8	20.4	18.4	49	56	46	8.8	9.5	8.5	887.6	888.0	887.6	1.6	95°	2.6	-3.19	0.0
15/07/2010	06	16.3	19.8	16.2	63	63	49	9.3	9.3	8.7	887.4	887.6	887.4	1.3	122°	2.6	-3.54	0.0
15/07/2010	07	17.1	17.1	15.5	60	66	60	9.1	9.6	9.1	887.5	887.5	887.3	1.2	164°	2.0	-3.50	0.0
15/07/2010	08	16.2	17.7	16.2	61	61	57	8.8	9.2	8.7	887.9	887.9	887.5	1.1	159°	2.5	-3.40	0.0
15/07/2010	09	16.1	17.2	15.7	62	63	58	8.7	8.9	8.5	888.2	888.2	887.9	1.3	167°	2.4	-3.54	0.0
15/07/2010	10	16.3	16.9	16.1	61	62	58	8.7	8.7	8.5	889.1	889.1	888.2	1.7	136°	3.0	9.808	0.0
15/07/2010	11	19.7	19.7	15.9	52	63	51	9.5	9.6	8.7	889.6	889.6	889.1	2.1	97°	3.8	444.4	0.0
15/07/2010	12	21.4	21.4	19.7	48	52	47	10.0	10.1	9.2	890.2	890.2	889.6	4.0	78°	7.2	1267.	0.0
15/07/2010	13	24.0	24.0	21.3	43	49	43	10.7	10.7	9.9	890.4	890.5	890.2	4.2	71°	8.8	1990.	0.0
15/07/2010	14	24.7	25.0	23.1	41	44	41	10.7	11.0	10.1	890.3	890.5	890.2	4.7	82°	7.9	2524.	0.0
15/07/2010	15	25.3	25.9	24.8	40	41	38	10.8	10.9	10.3	889.6	890.3	889.6	4.9	89°	8.2	2832.	0.0
15/07/2010	16	26.5	26.6	24.9	37	41	37	10.6	11.2	10.1	889.0	889.7	889.0	4.0	95°	8.4	2910.	0.0

Fig. 8

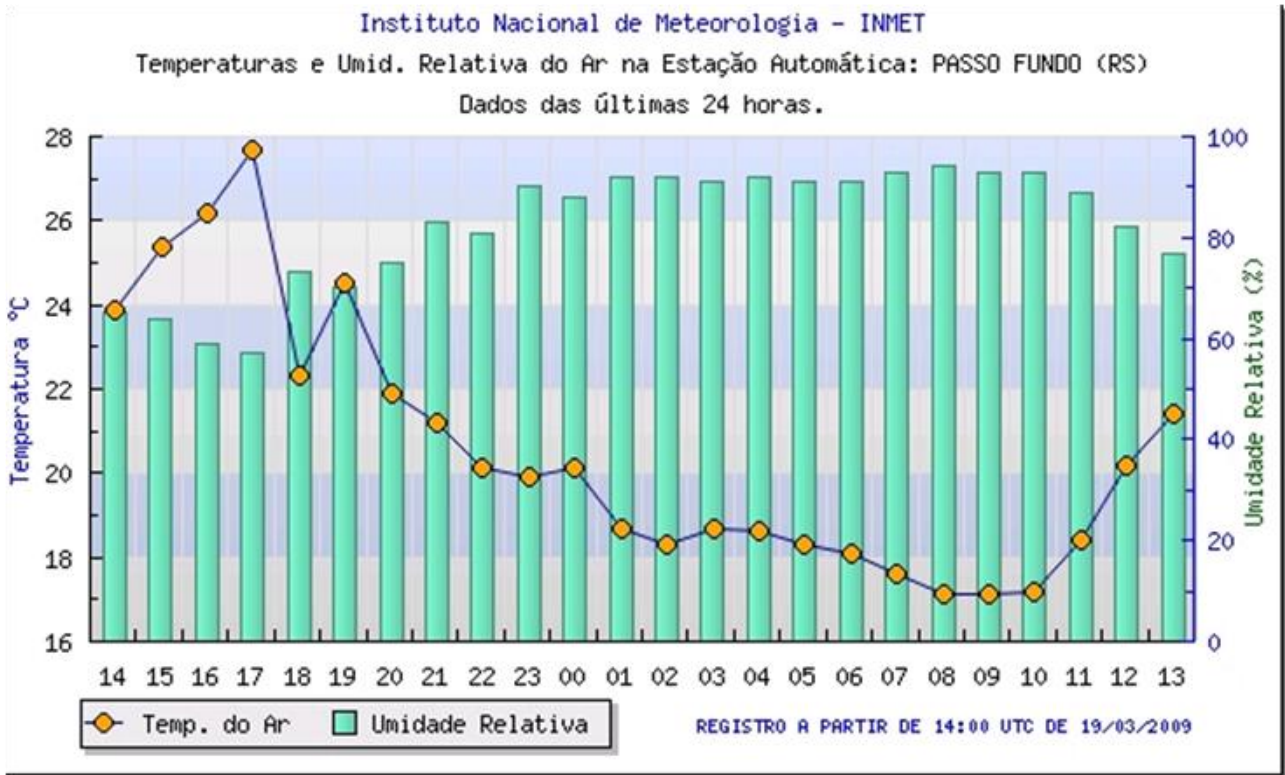


Fig. 9

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Home Prev. do Tempo Observações Agrometeorologia Prev. Climática Clima Rede de Estações Prod. Especiais

Monitoramento das Estações Automáticas

Click no Balão ou nas estações da barra de rolagem para visualizar os dados das estações.

Estação: BRASILIA-A001
Registro: 16 UTC 15/07/2010
Temp. Max.: 26.6 °C
Temp. Min.: 24.9 °C
Umidade: 37%
Pressão: 889.0 hPa
Precipitação: 0.0 mm
Vento Dir: 95 °
Vento Vel: 4.0 m/s

Estação
Aberta em: 07/05/2000
Latitude: -15.7894°
Longitude: -47.9256°
Altitude: 1.159,54 metros

Mapa | **Satélite** | **Híbrido**

- BARRA DO TURVO-SP
- BARREIRAS-BA
- BARRETOS-SP
- BAURU-SP
- BELEM-PA
- BELMONTE-BA
- BELO HORIZONTE - PAMPULHA-MG
- BENTO GONÇALVES-RS
- BOCA DO ACRE-AM
- BOM JESUS DA LAPA -BA
- BOM JESUS DO PIAUI-PI
- BRAGANÇA-PA
- BRASILIA-DF
- BREJO GRANDE-SE
- BRUMADO-BA
- BURITICUPU-MA
- BURITIRAMA-BA
- BURITIS-MG
- CABACEIRAS-PB

Operante Sem Dados

Fig. 10

PROBLEMS PRESENTED BY THE NETWORK OF AUTOMATIC WEATHER STATION INMET

The main difficulties presented in these ten years of deploying, managing and maintaining the network automatic weather stations INMET were as follows:

- 1) The communication system Orbcomm, which did not meet the needs of compliance schedules in a synoptic network;
- 2) The environmental conditions of where the stations are installed. The difficulties in this case was originated mainly by insects, the presence of many birds, the presence of excessive dust in the air and debris originating from forest and trees near the station. Figures 11-19 show the effects of the difficulties reported in this item.
- 3) The characteristics of some types of sensors, for instance sensor precipitation, which clogs up very easily (Figures 17-19);
- 4) The effect of high salinity in coastal stations, where the oxidation and very strong (Figures 20 and 21);
- 5) The vandalism, some stations were attacked by unscrupulous people who cut out (for example) the sensor cables (Figure 22);
- 6) Access to the sites where the stations are installed, some stations, mainly in the Amazon region are accessible only by boat or plane as well as being remote;
- 7) The high costs of installation and maintenance of stations, these costs are accounted for the price of materials, the high price of spare parts, the price of travel and the high price of the communication stations.

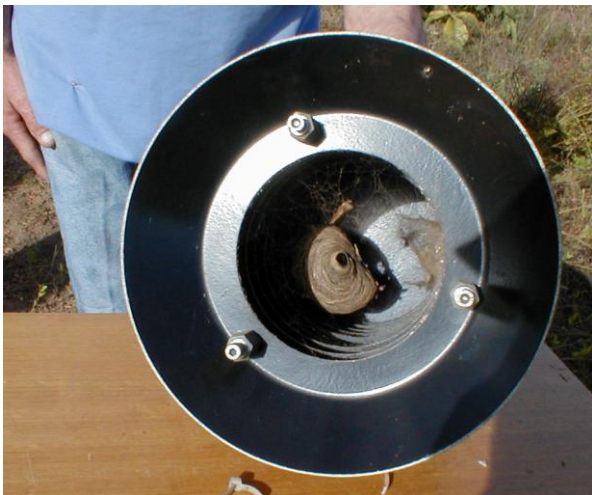


Fig. 11



Fig. 12



Fig. 13

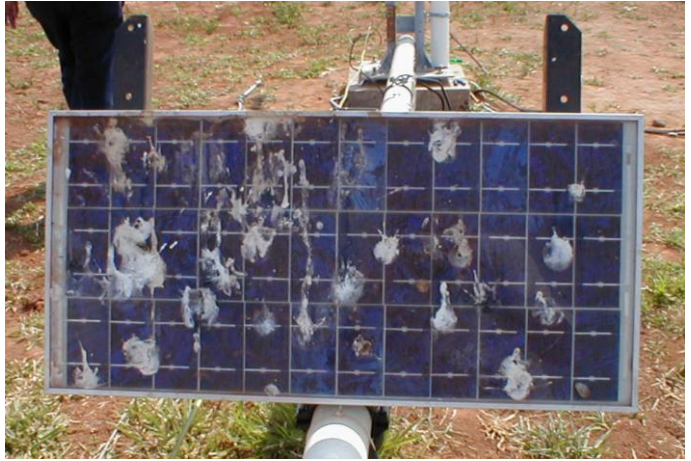


Fig. 14



Fig. 15



Fig. 16



Fig. 17



Fig. 18



Fig. 19

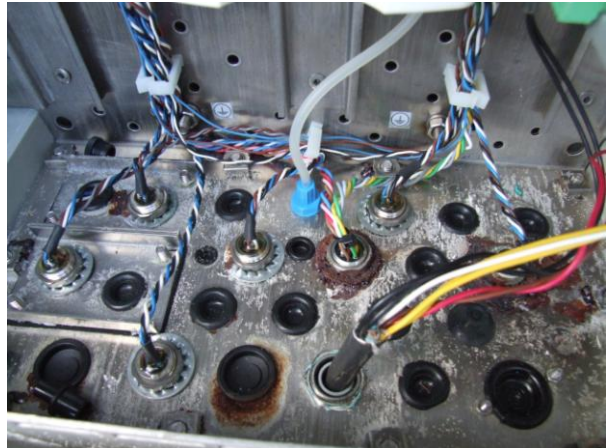


Fig. 20



Fig. 21



Fig. 22