

Fortaleza Station Report for 2005

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Abstract

This is a brief report on the activities carried on at Fortaleza geodetic-VLBI Station (ROEN: Rádio Observatório Espacial do Nordeste), located in Eusébio, CE, Brazil, in 2005. Observing activities consisted of 64 VLBI sessions and continuous GPS monitoring recordings. In this year, the VLBI acquisition system was upgraded to Mark 5 recording system and a new GPS receiver was installed. High speed data link (2.5 Gbps) to ROEN is currently being installed, to allow e-VLBI operations in near future.

1. Introduction

The Rádio Observatório Espacial do Nordeste, ROEN, located at INPE facilities in Eusébio, nearly 30 km east of Fortaleza, Ceará State, Brazil, began operations in 1993. Geodetic VLBI and GPS observations are carried out regularly, as contributions to international programs and networks. ROEN is part of the Brazilian space geodesy program which was initially conducted by CRAAE (a consortium of the Brazilian institutions Mackenzie, INPE, USP, and UNICAMP) in the early 1990s. During that time the antenna and instrumental facilities were erected, and it was the beginning of the activities sponsored by U.S. agency NOAA, Brazilian Ministry of Science, and Technology's FINEP agency. ROEN is currently coordinated by CRAAM, Center of Radio Astronomy and Astrophysics, Mackenzie Presbyterian University, São Paulo, in agreement with the Brazilian National Space Research Institute, INPE. A new contract was signed in May 2004 between NASA and CRAAM, Mackenzie Presbyterian Institute and University to partially support the activities at ROEN until 2009. This contract is a consequence of the Agreement of Cooperation signed between NASA – representing research interests of NOAA and USNO – and the Brazilian Space Agency, AEB, in 2002. The counter-part of the operational costs, staff, and support of infrastructure are provided by INPE and by Mackenzie.

2. Brief Description of ROEN Facilities

The largest instrument of ROEN is the 14.2 m radio telescope, on one alt-azimuth positioner. It is operated at S- and X-bands, using cryogenic radiometers. The system is controlled by Field System, Version 9.7.7 program. Observations are recorded with a Mark 5 system. One Sigma-Tau hydrogen maser clock standard is operated at ROEN.

GPS monitoring is performed in a cooperation program with NOAA, USA. Two stations are operated: one dual frequency GPS Rogue receiver and the recently installed Leica System 1200, both operated continuously. The collected data are provided to the NOAA/IGS center, as well to Brazilian IBGE center. ROEN has all basic infrastructures for mechanical, electrical and electronic maintenance of the facilities.



Figure 1. Fortaleza's station team repairing the 14.2 m antenna

3. Space Geodesy Team

The Brazilian space geodesy program is coordinated by Prof. Pierre Kaufmann, from São Paulo main office at CRAAM (CRAAE)/Instituto and Universidade Presbiteriana Mackenzie, receiving scientific assistance from Dr. Claudio E. Tateyama, and partial administrative support from Valdomiro S. Pereira and Neide Gea Escolano. Partial technical assistance is given by Itapetinga Radio Observatory staff, near São Paulo, also operated by INPE/Mackenzie.

The Fortaleza Station facilities and geodetic VLBI and GPS operations are managed on site by Eng. A. M. P. de Lucena (CRAAE/INPE), assisted by Eng. Adeildo Sombra da Silva (CRAAE/Mackenzie), the technicians Avicena Filho (CRAAE/INPE) and Carlos Fabiano B. Moreira (CRAAE/Mackenzie).



Figure 2. Fortaleza's station team

4. Geodetic VLBI Observation

Fortaleza participated in the following geodetic VLBI experiments, as detailed in the table below for the year 2005.

Experiment	Number of Sessions
IVS-R4	49
IVS-T2	06
IVS-CRF	03
IVS-OHIG	06
IVS-R1	02

5. Development and Maintenance Activities in 2005

Considerable attention was given to technical maintenance problems, specially to the following ones:

1. Tests and electrical alignment of the DC motors in both axes.
2. Installation of Mark 5 recorder.
3. Repair of cryogenic system with replacement of dewar O-rings, vacuum valve and helium lines.
4. Repairs on the following circuits, modules, or systems: Mark III video converters, Mark III power supplies, Mark III IF3 module and Mark IV formatter.
5. Maintenance of web site (<http://www.roen.inpe.br>) and the local server computer.

6. GPS Operation

The IGS network GPS receiver operated regularly at all times during 2005. Data were collected and uploaded to IGS/NOAA computer.

7. Upgrading NOAA GPS Monitoring

Drs. Miranda Chin and David Crump, from IGS/NOAA, visited ROEN for installing a new GPS receiver system, a Leica system 1200 in early 2005. It will be working simultaneously with the Turbo Rogue receiver for some time.

8. Major Maintenance and Upgrades

Major mechanical repairs were done on the antenna azimuth reduction boxes drives, to be completed in 2006.

It is planned to complete the Mark IV updating during 2006. It is still necessary to install new filter boards and upgrade the mixer board in the video converters to accomplish the Mark IV upgrading. The installation of a Mark 5 recorder was performed during this past year. Supporting instruments and facilities are expected to be provided in order to accomplish these complementary installations and allow fully operational activities.

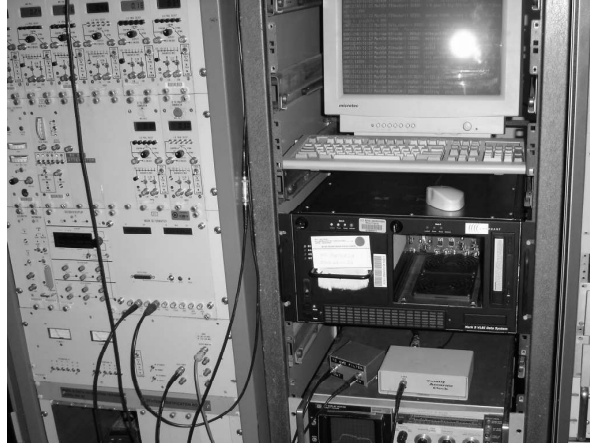


Figure 3. The Mark 5 recorder installed in the equipment rack

9. New Agreement for Research Cooperation

An agreement for cooperation in research related to ROEN activities was signed between the Ceará State University, UECE, Fortaleza and Mackenzie Presbyterian University, São Paulo. The collaboration is intended to have UECE's Physics Department exploring the GPS and VLBI inferred information on atmospheric water vapor content and upper atmosphere total electronic content and compare them to regional meteorology and cloud physics.

10. High Data Speed Connection

With the financial support from Brazilian Ministry of Science and Technology and Ministry of Education, it has been contracted a high speed network connected to ROEN, to become operative in the first months of 2006, at a cost of about US\$ 1.5 M. Initial 2.5 Gbps rate will allow ROEN to participate in e-VLBI experiments.

11. Publications

Kaufmann, P., Aplicações de Geodésia Espacial, Anais do 6o Workshop da Rede Nacional de Ensino e Pesquisa, 9 e 10 de Maio de 2005, Fortaleza, CE, Brazil (http://www.rnp.br/_arquivo/wrnp/2005/kaufman.pdf).