AFRICAN GEODETIC REFERENCE FRAME (AFREF)-NEWSLETTER

Secretariat: Regional Centre for Mapping of Resources for Development (RCMRD)

P.O.Box 632-00618, Ruaraka Nairobi, Kenya. Tel:+254-20-8560227/8561775Fax:254-20-8561673

AFREF Newsletter No.6 **May 2008**

Introduction

In this issue we report on establishment of GNSS stations in Malawi, Mauritius and Algeria. Computation and analysis of three new stations in Algeria is also presented. We thank Mr. Hamid Oukaci, Mr. Hadad Mahdi, Dr. Attie Combrink and Prof. Rui Fernandes for their contributions. We appeal for your contributions to be included in the next issues of this newsletter, which is scheduled to come out in September 2008.

Dr. Hussein O. Farah
AFREF Secretariat
Regional Centre for Mapping of Resources for Development (RCMRD)
P.O.Box 632-00618 Ruaraka, Nairobi, Kenya
Tel:+254-20-8560227/8561775;
Fax:254-20-8561673
E-mail- farah@rcmrd.org

Malawi First Continuous Operating Reference GPS Station Established

The first GPS (Global Positioning System) Continuous Operating Reference station of Malawi was installed on 9th April 2008 in Lilongwe. This project was initiated and is managed by the Department of Land Surveys, Ministry of Lands and Natural Resources. The installation was done with the support of Hartebeesthoek Radio Astronomy Observatory(HartRAO) Space Geodesy Programme of South Africa, which funded the equipment, and with the technical collaboration of University of Beira Interior / Instituto D. Luíz (UBI/IDL) from Portugal. This station is located at Capitol Hill, in the building of the Ministry of Home Affairs and Department of Human Resources, which are also supporting the project.

Malawi CORS station in Lilongwe

The existence of proper reference stations, like the one installed in Lilongwe, is essential to make use of the GPS technique for positioning. GPS is nowadays the most used technique for accurately determining the position of points on Earth's surface. With this technique, it is possible to measure distances of several hundreds or even thousands of kilometres with sub-centimetre accuracy.

The Lilongwe station will form part of an international network of stations defining the global reference frame currently in use. In addition, this station will be an important node in AFREF (African Reference Frame), a project aimed to establish a unique, unified mapping system for the entire continent. With this, the projects that are being initiated for land reform in Malawi will benefit greatly due to the higher productivity and better accuracy of this system. The system can help to accurately measure and locate the proprieties of the people on rural and urban environments.

Furthermore, this station will support scientific studies that can help to mitigate the effect of natural hazards like earthquakes caused by the tectonics of the East African Rift on the Lake Malawi area.

The Department of Land Survey intends to expand the network by installing more stations in the north and south of the country in order to properly cover the entire country with a modern mapping system. For further information on the station please contact Mr Mikael Mzunzu of Malawi Departs of Land Surveys (mzunzumtt@malawi.net)

Panoramic View of CORS station in Lilongwe

Continuous Operating GPS Reference Station set up in Mauritius

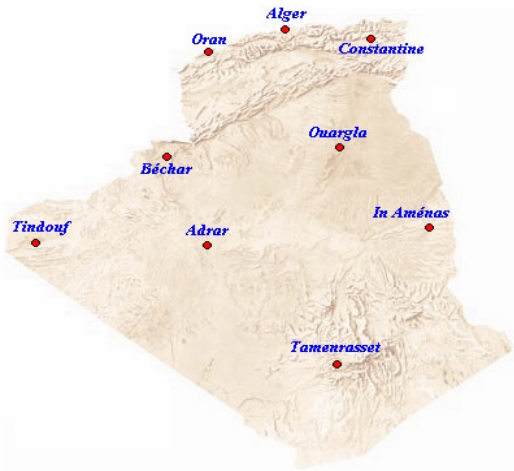
A new GPS Continuous Operating Reference station was installed in Mauritius in begin of April 2008. This station is located at Vacoas, at the headquarters of the Mauritius Meteorological Services (MMS). This station was installed in the framework of a collaborating project between MMS, which is hosting the equipment, JPL/UNAVCO (USA), which provided the equipment, and Center of Geophysics of the University of Lisbon (CGUL, Portugal), which supported the installation. The receiver is a Trimble NetRS with a Zephyr Geodetic Antenna. The data (acquired at 1s rate) will be made freely available through CDDIS (ftp://cddis.gsfc.nasa.gov/pub/gps/data/). Further information about this station can be obtained from Rui Fernandes (rmanuel@di.ubi.pt).

Mauritius CORS station in Vacoas

Algerian Permanent GPS Network starts operations

The National Institute of Cartography and Remote Sensing is implementing a project to define a new three dimensional geodetic system based on the permanent GPS technique. The Algerian Permanent GPS Network (APGN) was initiated in 2006 by the National Institute of Cartography and Remote Sensing (INCT) in the framework of the AFREF project. Nine stations are planned to be established in the next few years.

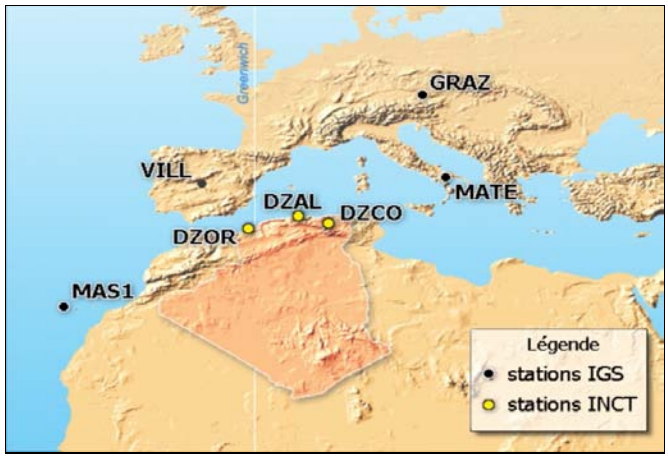
Algerian Permanent GPS Network (APGN)



The nine planned stations in the Algerian Permanent GPS Network (APGN) *project*

Out of the nine planned nine stations in the APGN project, three stations are already operational:

- Algiers, named DZAL started operations in October 2006.
- Oran named CZOR started operations in November 2006.
- Constantine named CZCO started operations in January 2007.



The three operational stations in the APGN project (DZOR, DZAL, DZCO).

The GPS equipment used for the three operational stations is constituted of the following:

- GPS Receiver: ASHTECH UZ-12,
- GPS Antenna: ASH701945E_M SNOW D/M element, REV.E, chokering with radome NGS,
- Manager Software: ASHTECH Micro Manager.

The data of the three stations are archived at the National Institute of Cartography and Remote Sensing offices located in Algiers. For more information please contact Mr. Hamid OUKACI (Email : inct99@wissal.dz) who is the Director General of the National Institute of Cartography and Remote Sensing.

Algerian Permanent GPS Network Data Processing: First Results Obtained

The GPS data used in the process are two data sessions of 24 hours dated January 15th , 2007 and February 1st, 2007 obtained from the three stations of the APGN project (Algiers, Oran and Constantine). The determination of the coordinates of these three stations was made with the use of the scientific Bernese 5.0 software in automatic mode (Precise Point Positioning Process Control File (PPP PCF) and RNX2SNX Process Control File) and in interactive mode.

Before starting the data processing by Bernese, a quality control of GPS observations was made to be sure of performances of the GPS receivers used and the chosen sites of the GPS stations (Multipath, Cycle slips etc.). Two types of software were used for quality control: TEQC of the UNAVCO and QC Leïca GNSS V1.2. The quality of observations obtained from the three permanent GPS stations is acceptable according to the international standards, notably as regards the number of visible satellites, the number of measurements, the multipath effect and the number of cycle slips.

The PPP PCF allows only the determination of priori stations coordinates (Precise Point Positioning) which will serve as an approached solution for the PCF RNX2SNX and interactive mode. The RNX2SNX PCF offers station's coordinates determination and the troposphere parameters from RINEX files of a GNSS regional network on the basis of the ambiguity resolution strategy called Quasi Ionosphere Free (QIF) dedicated to the processing of long bases. The differences of the coordinate's of the stations for the two observations sessions, obtained by RNX2SNX PCF and interactive mode are shown in the tables below:

Station	DX (m)	DY (m)	DZ (m)
Algiers	-0.0042	0.0030	-0.0033
Constantine	-0.0041	0.0029	-0.0033
Oran	-0.0033	0.0027	-0.0030
GRAZ	-0.0039	0.0031	-0.0028
MAS1	-0.0065	0.0033	-0.0047
MATE	-0.0032	0.0034	-0.0024
VILL	-0.0040	0.0027	-0.0030

Differences of determined coordinates by RNX2SNX PCF and interactive mode (January 15, 2007).

Station	DX (m)	DY (m)	DZ (m)
Algiers)	-0.0028	0.0016	-0.0045
Constantine)	-0.0027	0.0015	-0.0045
Oran)	-0.0051	0.0013	-0.0061
GRAZ	-0.0004	0.0018	-0.0029
VILL	-0.0033	0.0016	-0.0050

Differences of determined coordinates by RNX2SNX PCF and interactive mode (February 1st, 2007).

The differences of obtained coordinates by the two modes; automatic (RNX2SNX PCF) and interactive are in magnitude of few millimeters. The two modes give practically identical results. However, the processing in automatic mode (RNX2SNX PCF) allows to reduce considerably the time of execution of the processing. It also avoids the errors of transcription and manipulation of data during the manual introduction of the parameters of the processing as is the case of the interactive mode.

Finally, the implementation of the Algerian permanent GPS network and its densification which represents a major step in the definition of a new national and continental geodesic system will continue.

RCMN Station becomes an IGS Station

RCMN station located at the Regional Centre for Mapping of Resources for Development(RCMRD) in Nairobi Kenya, officially became an IGS station on 8th April 2008. The station was established in March 2007. Mr Robert Khachikyan of the IGS Central Bureau made the announcement in an e-mail circulated to the IGS community.

The station produces both GPS and GLONASS daily data and Real-Time GNSS Multi-Stream NTRIP data. The daily RINEX data is available at IGS data centers including HARTRAO(South Africa); ftp://geoid.hartrao.ac.za/rinex/, CDDIS(USA); ftp://cddis.gsfc.nasa.gov/gps/data/, among others. Real-Time data is available at the web site http://www.igs-ip.net/home . The daily and 6 hourly RINEX data files are also available from RCMRD AFREF site; www.rcmrd.org/AFREF_DATA/ .

AFREF and GNSS data processing Training to be held at RCMRD, Kenya

A two-week AFREF and GNSS data processing training will be held at RCMRD from 18th August to 29th August 2008. The course will be conducted jointly by RCMRD, Hartbeesthoek Radio Observatory (HartRAO) and the Centre of Geophysics of the University of Lisbon.

The purpose of the course is to provide technical skills in base station installation, data handling and dissemination and precise analysis using scientific GNSS processing software. The target group are Land surveyors, Geodesist, Engineers and Researchers African countries with some experience in Global Navigation satellite System (GNSS) technologies. Tuition fee is US Dollars 700.