AFRICAN GEODETIC REFERENCE FRAME (AFREF)-NEWSLETTER

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Introduction

The purpose of this newsletter is to create a forum for discussions and exchange of information and experiences in the implementation of AFREF. The objective of the AFREF initiative is to unify and modernize the geodetic reference frame for Africa. When fully implemented, it will consist of a network of continuous, permanent GPS stations such that a user anywhere in Africa would have free access to the generated data.

In this issue we report on this year's CODIST-AFREF meeting, expected GPS receivers donations by Ordinance Survey, UK, and proposed establishment of Botswana, Rwanda and Nairobi real time geodetic networks. We also report on the upcoming training and workshops in GNSS technologies.

We like to thank Andre Nonguierma, United Nations Economic Commission for Africa, and Addis Ababa, Ethiopia for his report on Ordinance Survey donation

For more information on AFREF, please log on to AFREF websites: http://geoinfo.uneca.org/afref

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AFREF Workshop on Computation held in Addis Ababa, Ethiopia

The Committee on Development Information Science and Technology (CODIST-II) Conference took place from 2nd to 5th May 2011 in Addis Ababa, Ethiopia. A one day Pre-Conference Workshop on AFREF Computations was conducted on 1st May 2011 under the Geo-Information Sub-Committee of CODIST II. The following presentations were made: AFREF First Computation, AFREF concept and status, AFREF data holding centre, AFREF guidelines on stations requirements, and Velocity fields for Africa from GNSS and DORIS data.

After presentation by Elias Lewi and Elifuraha Saria on AFREF GNSS data processing, it was decided that a call for participation in AFREF first computation be prepared and invitations made from qualified local and international professionals. The status of the donation of GPS receivers to AFREF expected from Ordinance Survey UK was also reported.

Ordnance Survey UK to donate 30 GPS receivers for the implementation of AFREF

ECA has been making effort towards the implementation of the AFREF project and during the 2009 biennial Cambridge Conference organized by Ordnance Survey, ECA negotiated with Ordnance Survey to pass on the decommissioned, but still functional GPS receivers. The receivers are currently undergoing full refurbishment and service in the UK, and will later be shipped and deployed across the continent.

Based on the previous work with other partners such as Trimble, ECA has developed a product grant agreement with the donor and custodianship agreements with hosting countries. The custodian shall typically be the National Surveying & Mapping Authority in the host countries. In 2010, ECA performed gap analysis within the continent to review the locations of existing stations and determine the optimum sites for the receivers pledged by Ordnance Survey.

ECA will provide technical assistance to the custodians to perform the installation of the receivers, which shall be done in accordance with IGS/AFREF Site Guidelines. Each custodian shall be responsible for the site selection with adequate facilities including power and internet, building of the antenna monument, and provision of the ancillary equipments such as uninterruptible power supply (UPS), lightning protection devices, suitable housing within 30 metres of the proposed antenna site and a router or modem to connect the receiver to the internet.

A series of hands-on training workshops will be organized for custodians' technical staff at regional levels to build the capacity of the hosting institutions to set up, operate and maintain the stations.

Establishment of Real Time Geodetic Network in Botswana

The Department of Surveys and Mapping (DSM) of Botswana assisted by the Regional Centre for Mapping of Resources for Development have carried out a feasibility study on the establishment of real time geodetic network in Botswana. Geodetic network design in Fig 1 below was one of the

outcomes of the study. Botswana want to modernize her geodetic network and provide all possible GNSS products including RTK and DGNSS corrections, GNSS data and post processing services to her citizens. This is expected to improve and reduce the cost of mapping activities in Botswana.

The network design proposed in Fig 1 below was based on 70km span distances, population density and availability of the required resources including power, internet and security. A network of 78 stations has been proposed.

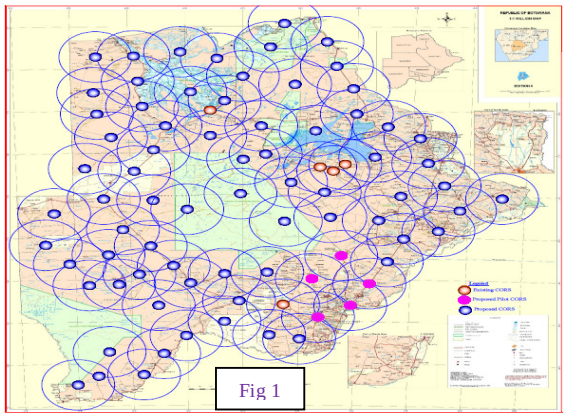

Fig 1

To achieve the above objectives, the national mapping authority in partnership with other GNSS users and particularly the regional land boards intends to implement this in phases by first setting up the pilot project of five stations and a national network control centre. The land boards would later and progressively as resources allow, contribute GNSS systems for sites in their regions.

It is proposed that the country should be covered by 78 stations. It is also proposed that the existing CORS should be integrated into national CORS network. Golden and pink symbols, fig1 above on network design map represents the existing CORS and the proposed pilot respectively. The existing four CORS are privately owned by DeBswana Mines Co. Ltd, one by University of Botswana and the other is one of Trimble receiver donated to AFREF. Then last two are hosted at University of Botswana research facility in Maun. It is proposed that one of receivers at Maun be relocated to one of proposed new sites.

Establishment of Real Time Geodetic Network in Rwanda.

A similar feasibility study as the one done in Botswana has also been carried out in Rwanda with similar objectives where a network of six stations is proposed.

The existing CORS in Kigali is an IGS station managed by the National University of Rwanda (NUR) through the Centre for Geographic Information Systems and Remote Sensing(CGIS). It is proposed that the station should be integrated with the Rwanda Real Time Geodetic Network and would provide the international and regional networks including AFREF. Another existing CORS is located at Butare by CGIS but is not suitable this network.

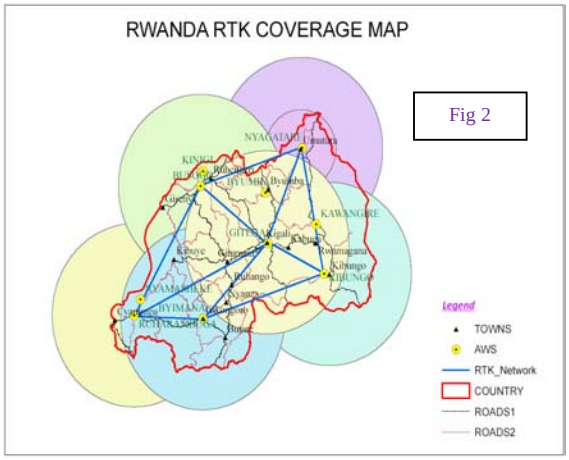

Fig 2

The new stations proposed are located at Kibungo, Nyagatare, Busogo, Ruharambuga and Butare. It's also proposed that the new station where possible be collocated within Automatic Weather Station (AWS)sites (yellow symbols in fig 2 above)

Establishment RTK Geodetic network in Nairobi, Kenya

Leica Geosystem in collaboration with RCMRD and Survey of Kenya intends to establish a Real Time Geodetic Network in Nairobi as a test bed by providing the necessary hardware and software including 3G internet hardware for data transmission during the project period (6months). But where landline internet infrastructure is available, 3G would act as back up.

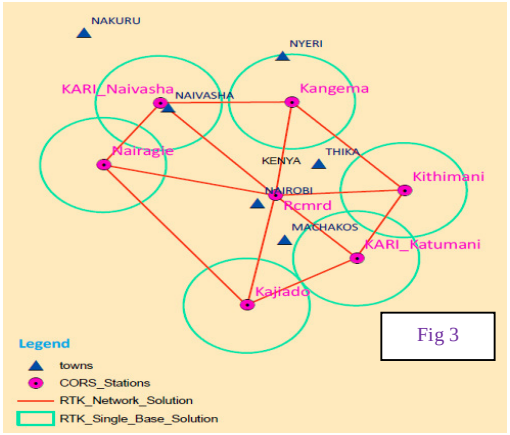

Fig 3

Stations at spans of at most 70-80km from RCMRD shall form the basic network. The idea is to have 360 degrees RTK Network solutions coverage within Nairobi and 30km RTK single base from each station beyond the network solutions limits.

Any user with a single rover within the network would therefore be able to receive network RTK solutions to achieve cm level accuracies.

Also where they exist, the project would integrate existing CORS/IGS stations in Kenya to the network for single base RTK solutions within 30km from the station. Such stations exist in Eldoret at Moi University, Njoro at Egerton University and at Malindi IGS station.

6th Annual AFREF & GNSS Data Processing Course, to be held on 5th to 15th September, 2011 at RCMRD Nairobi, Kenya

RCMRD in conjunction with the Center of Geophysics of the University of Lisbon (CGUL), Portugal and HARTRAO South Africa have been conducting a course on African Reference Frame (AFREF) and Global Navigation Satellite System (GNSS) Data Processing at RCMRD in Nairobi, Kenya annually since 2006. This year, the course will be held on 5th -16th September 2011.

Participants of 5th AFREF & GNSS course

The objectives of the course will be to provide technical skills in the installation and management of GNSS base stations, data handling, dissemination and processing towards AFREF realization. Registration is currently on-going. For more information, contact Muya Kamamia at muyack@rcmrd.org .

AfricaArray Workshop to be held on 20th -22nd November 2011 in Johannesburg, South Africa

The 7th Annual Africa Array Workshop would be held in Johannesburg, South Africa, from 17th to 22nd November 2011.

The first three days between 17th and 19th November will be devoted to the GPS Data Processing short course, for which separate registration is required. The short course will be led by Dr. Bob King from MIT (Massachusetts Institute of Technology) and Dr. Henry Berglund from UNAVCO, and will include lectures and one-on-one tutoring in static processing of both continuous and survey-mode measurements; defining global, regional, and local reference frames; temporal and spatial filtering of time series; modelling troposphere, antenna, and loading effects in height estimates; combining solutions to estimate post-seismic and long-term crustal deformation; handling step-displacements due to earthquakes and instrument changes; and developing an error model for velocity estimates. Tutoring will be based on data sets participants bring on their own laptops or else provided by the instructors. Participants will be expected to have installed and practiced with the software prior to arriving.

The actual Africa Array workshop will take place on 20th and 21st November 2011. Both oral and poster presentations would be made. The International Geoscience Programme (IGP - formerly International Geological Correlation Programme), IGCP565 Workshop will take place on 21st and 22nd November, 2011 which also requires separate registration. This workshop will focus on the integration of geodetic observations and products in models of the hydrological cycle. For more information please visit the following website: http://www.igcp565.org/workshops/johannesburg2011

Delegates wishing to obtain sponsorship to attend this workshop will be required to submit a separate request to Dr Hans-Peter Plag at hpplag@unr.edu . Delegates may wish to register for the entire 6 days or for a shorter stay. Hereto find attached the registration form, which is also available online, or on the following website http://www.africaarray.psu.edu/