AFREF
African Reference Frame

AFRICAN GEODETIC REFERENCE FRAME (AFREF)-NEWSLETTER

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

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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 the Kenya Reference Frame (KENREF) workshop held from 28th to 29th April 2010, Nairobi Kenya on the implementation of AFREF in Kenya, Continuously Operating Reference Stations (CORS) station in Ethiopia and Benin, newly released 10cm geoid for South Africa, AFREF data centre in South Africa and workshop report on Africa Array network held between 2-4 June 2010 in Washington D. C. USA.

We welcome Africa Array Network collaborative initiative to support multidisciplinary science in Africa. We particularly look forward to working together Africa Array in the establishment of CORS collocated with automatic weather stations for mutual benefit. We would therefore like to encourage the National Mapping Agencies in Africa; the lead agents in the implementation of AFREF, to work with Africa Array representatives in their countries.

We also invite you to contribute news items to this newsletter on GNSS activities including workshops, training, newly established CORS, GNSS networks in your countries, your experiences while establishing AFREF and even suggestions on how AFREF implementation can be fast tracked.

Now that one AFREF operational data has been established and hosted in South Africa, we appeal to AFREF members and research scientist operating CORS in Africa to make available the GNSS data to the data centre. Get in touch with Richard Wonnacott at RWONNACOTT@ruraldevelopment.gov.za for more information.

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

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AFREF Operational Data Centre Launched in South Africa

The African Geodetic Reference Frame (AFREF) is a project designed to unify the very many geodetic reference frames of Africa using data from a network of permanent Global Navigation Satellite Systems (GNSS) stations, as the primary data source for the realization of such a uniform reference frame. Numerous National Mapping Agencies, Universities in Africa, International agencies and organizations have installed suitable geodetic grade GNSS receivers at many locations throughout Africa.

The AFREF Operational Data Centre (ODC) collects data on a daily basis from as many of these datasets as are freely available. As on May 2010, data from 37 stations is available though it's known the existence of more than 10 other CORS in Africa.

The AFREF ODC has been set up as part of the activities of the AFREF Steering Committee and in compliance with the guidelines of the International GNSS Service (IGS). Please note that all GNSS data is supplied in the standard RINEX format at 30 second epoch.
For more information, please logo on;
www.afrefdata.org or ftp.afrefdata.org and
RWONNACOTT@ruraldevelopment.gov.za
Source: AFREF operational data centre website

US-Africa Workshop report on Expanding the Africa Array Network to Support Multidisciplinary Science in Africa, June 2-4, 2010, Howard University, Washington D.C.

Over the past few years, as the Africa Array seismic network has been developed, many scientists from allied fields have inquired about expanding the geographic extent of the network and adding additional sensors to the network for making a range of in-situ measurements. It is widely recognized that obtaining field observations from Africa can be challenging, and therefore to the extent that it is possible, the Africa Array partners are interested in working with other organizations and scientists to take advantage of the established network infrastructure for obtaining new environmental observations in Africa.

As an initial step in expanding the Africa Array seismic network, starting in July 2010 GPS receivers and automated weather stations will be added to 20 or more Africa Array stations. Funding for this network expansion has been provided by the National Science Foundation through UNAVCO.

A three day workshop was held in Washington D.C. that brought together U.S. scientists and program managers engaged in geoscience research in Africa and their African collaborators. The workshop was convened by Department of Geosciences, The Pennsylvania State University. The purpose of workshop was to examine and codify the scientific rationale for expanding the Africa Array seismic network into a multidisciplinary science network. The workshop assemble participants from a range of science fields that are interested in exploring the benefits of a single instrumentation initiative addressing the science needs of several geoscience disciplines, including, atmospheric science , geodesy, geography, hydrology, seismology, and space weather. AFREF Steering Committee was represented by .Hussein Farah, Andre Nonguierma and Richard Wannocott.

To obtain community input on key science questions (multidisciplinary and discipline-specific) that cannot be addressed without new observations from Africa.

To determine the observational infrastructure needed to provide cross-cutting and discipline-specific data sets for addressing the science questions.

To explore the intersection and overlap between the observational infrastructures identified above and existing infrastructure within the Africa Array network.

To investigate broader impacts, including best options for communicating and disseminating science information to government and non-government organization (NGO) decision-makers and supporting educational activities in Africa and the U.S.

A science plan describing the rationale for developing a single instrumentation initiative the addresses the needs of several geoscience disciplines,

A logistics plan that outlines the observational needs for each science field and indicates how the existing Africa Array network can be adapted to meet those needs,

A "broader impacts" plan discussing ways to support science education in Africa and the U.S. and how to effectively provide information to decision-makers in government agencies and NGOs.

Source; Africa Array website: www.africaarray.unavco.org

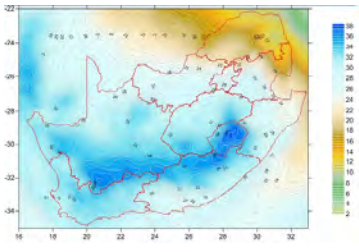
Kenya Reference Frame (KENREF) workshop

A workshop on the modernization of Kenya references frame took place from 28th - Thursday 29th April at Panafric Hotel in Nairobi Kenya. It was organised and co-sponsored by Ministry of Lands through the Land Reform Transformation Unit(LRTU) and The Swedish Mapping, Cadastral and Land Registration Authority (LANTMATERIET). Modernization of the Kenya Geodetic Reference Framework (KREF) is one of the key components under the Institutional Cooperation between Lantmateriet and Ministry of Lands.

During the workshop, presentations and discussions were held on current status on National Geodetic Control Networks and Surveying Techniques in both Kenya and Sweden, implementation of AFREF at national level followed by a formulation and proposals of the way forward for the establishment of a Geodetic Framework in Kenya in line with AFREF requirements. One of the key outcomes of the workshop was a draft network design on the locations/distribution of the CORS at primary and secondary level. 21(marked blue in the map) stations were proposed at primary level and 71 at secondary. The implementation will be done in phases by first establishing a passive network on the 21 primary stations , and later progressively upgrade them to CORS. Densification of the primary through the 71 stations of secondary controls will thereafter be carried out. Also a network of RTK system is proposed for Nairobi metropolitan city. Currently, Kenya has three IGS CORS at Nairobi(RCMN), Malindi(MALI) and Eldoret(MOIU).

10cm Hybrid Geoid for South Africa released.

The chief directorate National Geospatial Information (NGI) has released a 10cm hybrid geoid model for South African users to enable the conversion of GNSS derived ellipsoidal to orthometric heights**.** The purpose of the release is to allow users to test the accuracy of the product and make comments for improvement of the next version. The model was also released to GNSS receiver vendors for implementation in firmware and software. The geoid file format is similar to that of EGM2008. The geoid file, SAGEOID2010.dat is available as SAGEOID2010.zip from trigNet website on ftp://ftp.trignet.co.za/RefData.Station%20information/SA%Geoid/ or http://trignet.co.za/RefData.Station%Information/SA%Geoid/



The geoid model which is 2.5 by 2.5 minute is produced by NGI in conjunction with Prof. Charles Merry using land based gravity measurements, satellite altimetry,

global DEM, the earth gravity model 2008(EGM2008) and GPS levelling. The model I only valid for south Africa between 22°S and 35 °S latitude and 16 °E and 33 °E longitude and is estimated to have an accuracy of better than 10cm. Source: Trignet website

Continuous Operating Reference Stations (CORS) in Ethiopia

Four CORS station were been established in Ethiopia, in November 2007 by EMA and National Geodetic Services, USA using Millennium Challenge Account. All are erected on flat concrete roof tops of building. The stations are being operated by EMA. The 30" sampling interval GNSS data and other station information is available at NGS website http://www.ngs.noaa.gov/cors. Their ITRF00 (1997.0 Epoch) positions were computed in July 2008 using 20- 24 days of data. In addition IGS station, ADIS is also available at Addis Ababa University, Geophysical Observatory, Science Faculty.

Source: National Geodetic Service USA, website

Continuous Operating Reference Stations (CORS) in Benin

Seven CORS station were established in October 2008 through Millennium Challenge Account, Benin(MCAB) and National Geodetic Service, USA. Trimble NetR5 GNSS systems are being used in all the stations. The stations are being operated by Millennium Challenge Account, Benin (MCAB) and the 1" GNSS data and other stations information is available at NGS website http://www.ngs.noaa.gov/cors Their ITRF00 (1997.0 Epoch) positions were computed in August 2008 using 13-69 days of data.

Source: National Geodetic Service USA, website

RCMRD trained 14 Surveyors at Ethiopian Mapping Agency on GNSS data processing

A hands on training was carried out at EMA offices for 14 surveyors in the directorate of surveys on the use of LEICA system 1200 GNSS receivers and GNSS data processing. A static survey campaign using 4 LEICA receivers was carried out in Addis Ababa on 4 old control points where the participants carried out the observations, downloaded and processed the data using LEICA Geo Office software. The participants were also trained on how to integrate GNSS data from various receivers including LEICA, ASHTECH, etc by adding GNSS data from IGS data station at Addis Ababa and CORS(Trimble) within EMA compound into the project. Geo Office and ASHTECH solutions were used during the training.

5th Annual AFREF & GNSS Data Processing Course, 24th August to 3rd September 2010, 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 offices in Nairobi Kenya annually since 2006. This year, the course will be held on 24th August to 3rd September 2010. The Objectives of the course is to provide technical skills in the installation of GNSS base stations, data handling, dissemination and processing towards AFREF realization. Registration is currently going. For more information, contact Muya Kamamia at muyac@rcmrd.org .

2010 International Symposium on GPS/ GNSS

The annual International Symposium on GPS/GNSS provides an open forum for researchers and engineers to exchange innovative ideas on GNSS systems, techniques, applications, and opportunities. The 2010 symposium will be organized by National Cheng Kung University, at Taipei, Taiwan from 26th to 28th October 2010. For registration and more information, please check http://www.un-spider.org/event-en/3272/2010-10-26/2010-international-symposium-gps-gnss-2010

Fourth United Nations International UN-SPIDER workshop on disaster management and space technology

Fourth United Nations International UN-SPIDER workshop on disaster Management and space technology will be held at Bonn, Germany, from 12th to 14 October 2010. It's being organised by United National Office for Outer Space Affairs (UNOOSA) and German Aerospace Centre (DLR). For registration and more information, please check http://www.un-spider.org/workshop-bonn-2010