

THE AFRICAN GEODETIC REFERENCE FRAME (AFREF) PROJECT: STATUS AND FUTURE

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There are more than 53 countries in Africa each with its own geodetic reference frame based on reference systems and datums that are in some cases over 100 years old. As a result of these disparate reference frames and associated geospatial information, the planning and execution of cross border development projects is exceptionally difficult and becomes a somewhat haphazard exercise. AFREF, therefore, has been designed to unify many national co-ordinate reference frames of Africa into a single reference frame based on the internationally accepted International Terrestrial Reference System (ITRS) and its realization, the International Terrestrial Reference Frame. AFREF will also include the unification and development of a continent wide vertical reference frame based on a single datum, using internationally accepted practices of geoid estimation.

In broad terms, it is planned that a network of Continuously Operating GPS Reference Stations (CORS) will be established such that any user will be within 500km of any one station and have free access to the data generated by that station. The network will create a zero order or fiducial reference frame based on ITRF from which local campaigns may be conducted to densify the network. The densification will be either at the national or regional level to create denser networks of CORS or short campaigns to create networks of permanently marked reference points from which further project-based campaigns shall be conducted.

The realization of AFREF has vast potentials for geodesy, mapping, surveying, geo-information, natural hazards mitigation and earth sciences. Its implementation will provide a major springboard for the transfer and enhancement of skills and knowledge in surveying, geodesy and especially Global Navigation Technologies (GNSS) with its applications.

A key outcome of the AFREF project will be the transformation parameters from AFREF to local frame on which currently most geo referenced products

including maps are based. Conversion of all national surveying and mapping products may be converted to the same common reference system (AFREF). A practical outcome of this will be the ease with which cross-border and regional geo-referenced projects can be carried out. In addition to scientific project applications, this will include projects for the development of agricultural schemes, road, rail, power line construction or eradication of disease, hazard mitigation, etc.

Satellite positioning techniques have the potential for long-term climate monitoring, ground-based weather forecasting, long-term sea level trends at the millimetre level, and low-Earth orbiting satellites with on-board GPS receivers which will contribute to much greater understanding of the earth's gravity field and atmosphere, ionosphere mapping and research, precise timing and time transfer. With a uniform geodetic system throughout the continent, the applications of GPS promise increasing benefit to society through greater understanding of earth science systems. GPS is used in many locations to monitor crustal deformation phenomena, such as earthquakes, volcanoes, tectonic motions and subsidence along coastal regions. Crustal deformation monitoring studies for Eastern African Rift Systems for disaster preparedness and management is an example of studies which will greatly benefit from AFREF project. Some coordinated studies on the East African rift systems are already taking place in Kenya, Ethiopia, and Egypt.

AFREF is an initiative of the United Nations Economic Commission for Africa (UNECA) Committee on Development Information, Science and Technology (CODIST). A steering committee is currently responsible for the coordination of the implementation of AFREF at the continental. Implementation of AFREF is envisaged to be at national level in collaboration with National Mapping Organizations. The current status of AFREF will be discussed. Concerning the current network status, several CORS systems have been installed to support AFREF specifically. Most of the IGS stations located in Africa will automatically qualify as AFREF core stations. Furthermore many others have been installed for scientific and research purposes which can also be used for AFREF purpose. The AFREF implementation plan will be presented. The plan involves not only the establishment of at least one CORS in all African Countries but also the establishment of data holding and analysis centres and the computation of AFREF coordinate solution.

