

Africa's Role in the Global Geodetic Observing System

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Our present knowledge of the Earth's complex system is rather limited, and how these complex systems affect the massive continent of Africa are perhaps even more obscure and most necessary today. Modern day space geodesy can make important contributions to Earth monitoring and monitoring systems within Africa through the Global Geodetic Observing System (GGOS) established by the International Association of Geodesy (IAG). GGOS provides the three fundamental geodetic observations and how they vary through time: the Earth's shape, the Earth's gravity field and the Earth's rotation. GGOS' objective is to integrate the different geodetic techniques, their technique models, and different approaches in order to ensure long-term, precise monitoring of the observations as key to assessing, interpreting and understanding global changes. GGOS provides the observational basis to maintain a stable, accurate and global reference frame as a crucial, multi-disciplinary grid for all Earth observations and many practical applications, in this context, a number of examples within Africa will be highlighted.

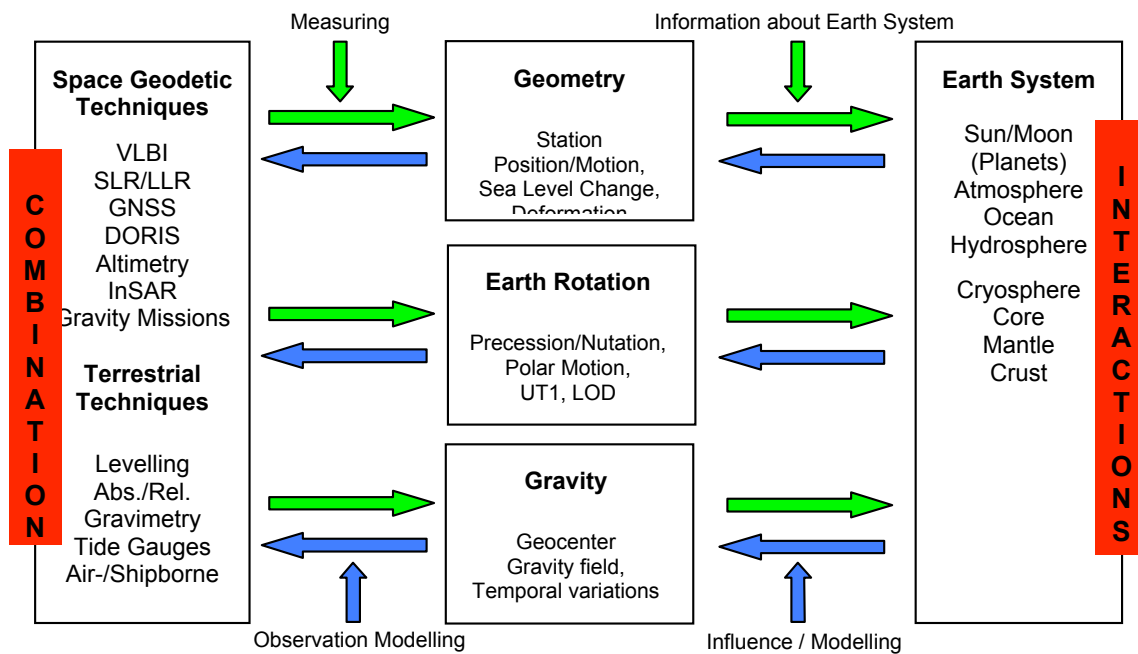
Modern geodetic observations involve a range of space and terrestrial technologies that contribute to our knowledge of the solid Earth, atmosphere, ocean, cryosphere, and land water storage. Many of these techniques require a globally distributed infrastructure, and a variety of technique-specific services have been established since the late 1980's under the IAG. These services (e.g., International GNSS Service [IGS], International Earth Rotation and Reference System Service [IERS], and a about a dozen more) facilitate global coordination and ensure high accuracy and reliable geodetic products for geoscientific research and numerous applications. GGOS is an important new component of IAG that serves as an umbrella for these scientific services and works with them to ensure the development and availability of a global geodetic infrastructure to meet the needs of scientific users in today's and future societies.

GGOS consists of the following four crucial parts, all of which must be also be realized within Africa, as elsewhere in the world, for GGOS to truly succeed globally:

- Instrumentation: global terrestrial networks of observatories, Earth observing satellites and planetary missions
- Data infrastructure: data transfer, communication links, data management and archiving systems, data and product dissemination centers, web portals, etc.
- Data analysis and combination: data analysis centers and centers combining the solutions from different analysis centers and from different observation techniques and generating a series of well-defined GGOS products.
- Modeling and interpretation: institutions and groups that construct geodetic, geodynamic, geophysical models of the processes in the Earth system based on

the GGOS products, confront these models with the GGOS products and interpret the processes in the Earth system and the interaction between the various components of this system.

These four components are shown in the figure below and show how GGOS is designed to connect the space and terrestrial geodetic observations (left-hand side) to the Earth system components and their interactions (right-hand side) with the three fundamental observables of geodesy (the Earth geometry and deformation, and the Earth gravity field with its temporal changes, and the Earth rotation and its variations) in the middle.



This paper will describe the current status of GGOS, scientifically, technically and organizationally, discuss how GGOS is envisioned to develop through African professional partnerships, and detail geodetic activities and plans for pan-African observations, data information systems, communications, data analyses and interpretations. Ensuring sustainable capacity for African contributions to GGOS, and GGOS contributions to Africa is of tremendous mutual benefit and will be the key focus of this paper.