



Towards GGOS- Africa

Roelf Botha (SARAO)

and

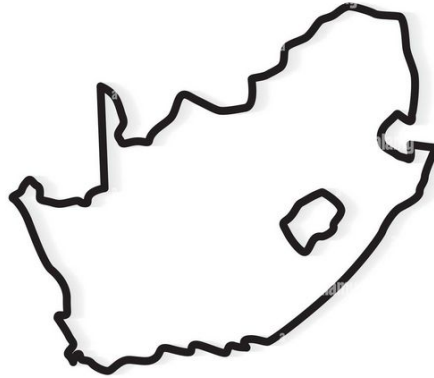
Jack Radcliffe (University of
Manchester)

Towards GGOS-Africa



GGOS
Global Geodetic
Observing System

<https://ggos.org/>



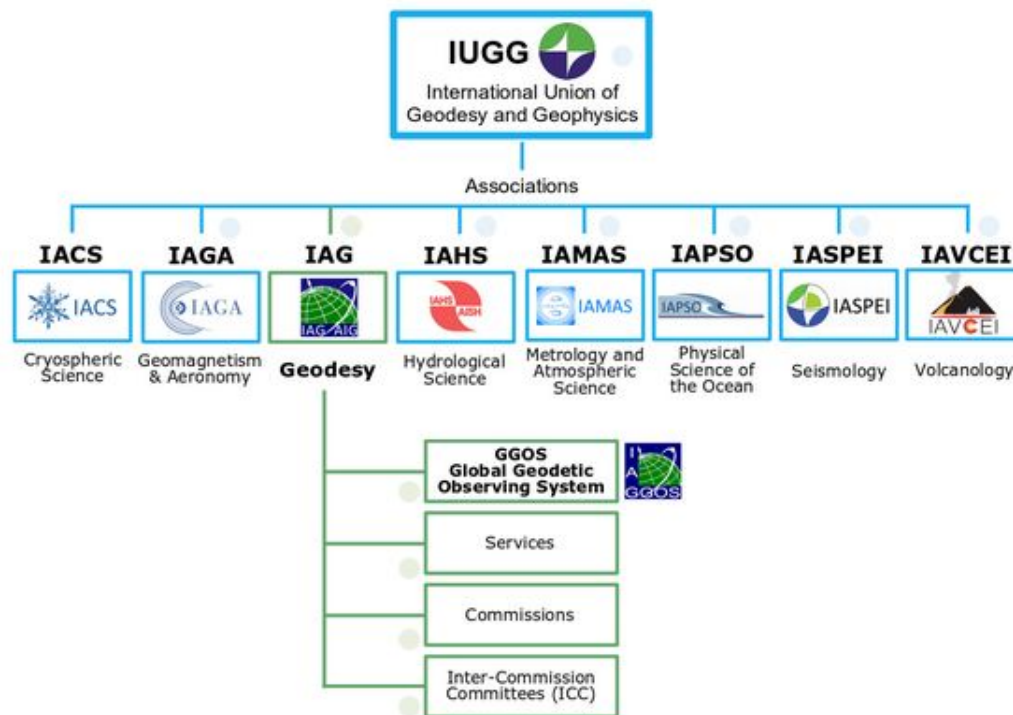
What is GGOS?



GGOS – Part of the IAG and IUGG

GGOS is the **Global Geodetic Observing System** and was initiated in July 2003. It is a component of the **International Association of Geodesy (IAG)**, which is the organization responsible for the advancement of Geodesy. The IAG and therefore GGOS are parts of the **International Union of Geodesy and Geophysics (IUGG)**.

The Global Geodetic Observing System works together with the **IAG Components** – technical services, commissions, inter-commission-committees and IAG-projects – for monitoring the Earth system and global change research.



Need for a Coordinated and Sustained Earth Observation

Recognizing the urgent need for a **coordinated and sustained program of Earth observation**, the recent Group on Earth Observations Summits have tasked the intergovernmental **Group on Earth Observations (GEO)** with implementing the geodetic component of the **Global Earth Observation System of Systems (GEOSS)**. **GEOSS** is a set of coordinated, independent Earth observation, information and processing systems that interact and provide access to diverse information for a broad range of users in both public and private sectors. **GEOSS** links these systems to strengthen the monitoring of the state of the Earth.

This 'system of systems', through its **GEOSS Platform** (former GCI), proactively links together existing and planned observing systems around the world and support the need for the development of new systems where gaps currently exist. It will promote common technical standards so that data from the thousands of different instruments can be combined into coherent data sets.

By contributing to **GEO** and **GEOSS**, **GGOS** provides geodetic data which, when combined with other Earth observations, can be translated into support for political decision-making. The main objective is to provide open, timely, and reliable Earth observation data to facilitate the development of policies that address societal challenges. Thus, **GEOSS** is essential to implement the **Sustainable Development Goals (SDGs)** of the United Nations (UN), the **Sendai Framework for Disaster Risk Reduction**, and the **UN Framework Convention on Climate Change**.





Discover GGOS and Geodesy

WHAT IS GGOS ?

WHY GGOS ?

VISION & MISSION



OBSERVATIONS



SERVICES



PRODUCTS

- 1998 - Birth of GGOS: “Towards an Integrated Global Geodetic Observing System”
- 2017 - Establish Affiliate GGOS-Japan
- 2021 - Establish Affiliate GGOS D-A-CH
- 2024 - Establish Affiliate GGOS IberAtlantic

Towards GGOS-Africa (Affiliate)



- Southern Hemisphere requires more core sites
- Africa need more core sites
- UN Support via UN-GGCE
- GGOS Support for affiliate project

Approach this on two fronts:

1. Efforts in South Africa
2. Efforts for Africa

Leaflet | Tiles © Esri — Source: Esri, DeLorme, NAVTEQ, USGS,

GGOS Core Sites

Discussions between SARAO, SANSA and NGI to establish a South African 'Geodesy Working Group'



Photo credit: Jacoline Schoonees/DIRCO

The SARAO Space Geodesy Programme *participates in global networks* which uses applications of Very Long Baseline Interferometry (VLBI) and the Global Positioning System (GPS) to do research in geodesy. They operate two SLR (Satellite Laser Ranging) systems in collaboration with NASA's GSFC and Roscosmos. Having ***all four of the main space geodesy techniques located on the same site*** positions SARAO to play an important role in international space geodesy networks. This collocation makes SARAO ***a true fiducial site***.

More than 100 years ago National Geo-spatial Information (NGI), a component of the Department of Agriculture, Land Reform and Rural Development (DALRRD) commenced with the establishment of an ***integrated survey system*** and provision of extensive mapping and aerial imagery coverage of the country. NGI is also known as ***South Africa's national mapping organisation***.



SANSA operates the ***only operational Space Weather Warning Centre for Africa*** that forms part of the International Space Environment Service (ISES). The Centre provides an important service to the nation and the region by monitoring the Sun and its activity, providing ***space weather forecasts, warnings, alerts, and environmental data*** on space weather conditions to the global aviation sector, defense, government and private-industry users in Africa to ***mitigate the effects of space weather on technological systems***.

The GGOS-Africa project



UK Research
and Innovation



Science and
Technology
Facilities Council

- UK Research and Innovation (UKRI) & Science and Technologies Facilities Council (STFC) provided 2-yr seed funding through the [Africa-UK physics partnership collaborative research projects](#) fund to start building the **foundations of GGOS-Africa**.
- Project from 02/2025–02/2027 and is a collaboration of the following institutes:



The University of Manchester



TECHNICAL UNIVERSITY OF KENYA
Education and Training for the Real World



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



United Nations
Global Geodetic
Centre of Excellence



National Research
Foundation

SARAO

South African Radio
Astronomy Observatory



GHANA SPACE
SCIENCE & TECHNOLOGY
INSTITUTE





UK Research
and Innovation



Science and
Technology
Facilities Council

Our vision and goals

Our vision:

We intend to establish GGOS-Africa and support both new and existing geodetic initiatives throughout Africa, thereby promoting developments at global, regional, and national levels.

*Not a replacement for ongoing initiatives (e.g., AFREF) but instead a forum to network, unify and create common goals in advancing geodetic initiatives across the continent.

Our goals:

- Assessing Africa's geodetic infrastructure and resources.
- Developing strategic infrastructure plans using simulations.
- Training early-career African geodesists through workshops and collaborations.
- Establishing GGOS-Africa to help coordinate geodetic activities.
- Raising awareness among policymakers about the role of geodesy in sustainable development.

More information at the project website: <https://www.jb.man.ac.uk/GGOS-Africa/>
(still partially under construction)

Delivered via five work packages



WP1 - Project office

WP lead: J. Radcliffe (Manchester)

Develops the governance, structures, and processes to enable and monitor the project and ensure all deliverables and milestones are achieved.



WP2 - Assessment of geodetic infrastructure in Africa

WP lead: Prof P. Baki (TUK)

Conducts a comprehensive assessment of the current status of geodetic equipment, computational infrastructure, and human capacity across the participating countries.



WP3 - Simulations and strategic planning for infrastructure development

WP lead: Dr A. de Witt (DSI)

Utilise simulations and geospatial analysis to identify optimal locations for new geodetic infrastructure and develop a strategic plan for infrastructure enhancement



WP4 - Building the foundation for GGOS-Africa

WP lead: Prof R. Botha

Lay the groundwork for establishing GGOS Africa, a regional GGOS affiliate coordinating geodetic activities across the continent.



WP5 - Sustaining and expanding the initiative

WP lead: J. Radcliffe (Manchester)

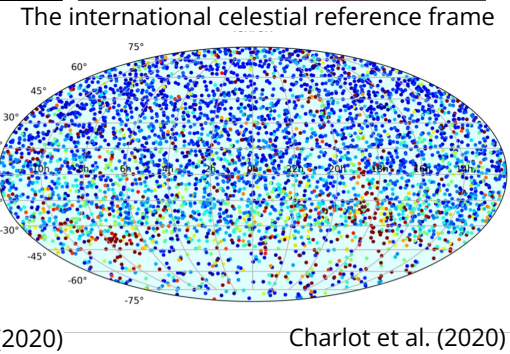
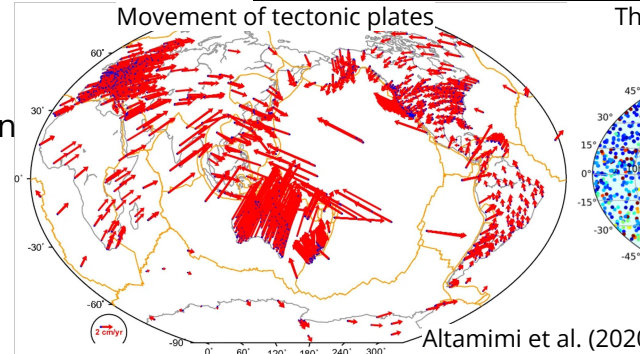
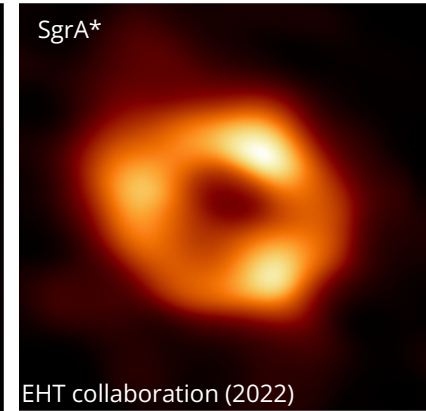
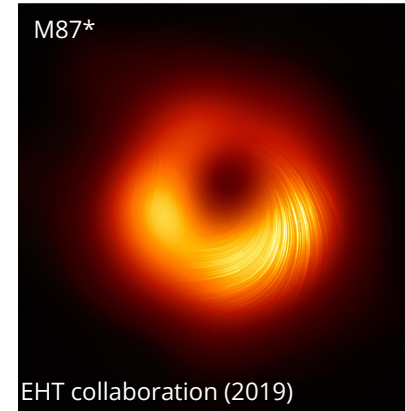
Ensure the long-term sustainability of the project's outcomes and explore opportunities for expanding the initiative to cover more regions and aspects of geodesy.

Relevance to astronomers

Geodesy is **truly complementary** to astronomy and vice versa:

- Very Long Baseline Interferometry techniques are used to look at extreme astrophysical phenomena **and** determine Earth Orientation parameters, universal time (UT1) & plate tectonics.
- Geodetic measurements are used to allow for:
 - Determination of precise coordinates of astronomical objects (e.g., via determining the ICRF).
 - Geometric delays for interferometric correlators
 - Ionospheric & tropospheric calibration corrections.

Another possible avenue to funding parts of the African VLBI Network(?)



Thank you

Interested to participate / would you like to comment?

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