



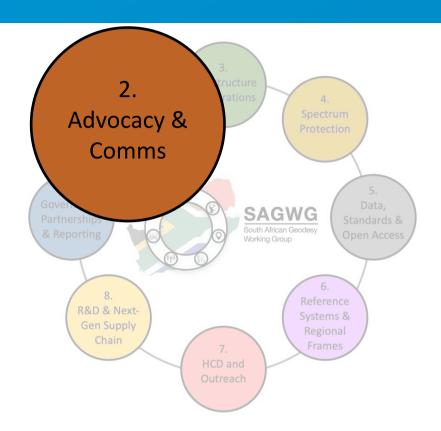
South African Geodesy Workshop

1-2 October 2025, SAAO, Cape Town





If We Don't Talk About Geodesy, Who Will?



Build the case for investment by showing geodesy's value to government, other science organizations, industry, and society

Development Plan Activities

Phase 1: Avoid further degradation of the global geodesy supply chain

- Develop and submit business cases to government to access resources
- Develop and communicate national and regional stories which demonstrate the value of geodesy to government, other science organizations, industry sectors and society

Phase 2: A robust global geodesy supply chain:

- Develop country-specific evidence (e.g., policy briefs, business cases, stories) to influence decision-makers and secure resources for a robust global geodesy supply chain, while designating and resourcing elements of that supply chain as critical national infrastructure where possible.
- Share evidence, and stories of success and failure (with respect to getting resources), with UN-GGCE to share with other Member States
- Increase awareness in the greater UN-community of the weaknesses of the supply chain and the need for improved governance

Phase 3: A next-generation global geodesy supply chain

• Same as Phase 2, but for a next-generation geodesy supply chain

If We Don't Talk About Geodesy, Who Will?



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If We Don't Talk About Geodesy, Who Will?



Build the case for investment by showing geodesy's value to government, other science organizations, industry, and society



















Geodesy: The World's Best-Kept Secret (Until Now) Government/Policy



FEATURE









16 INNOVATION **FEATURE**



Geodesy underpins countless technologies we depend on every day.

magine a world where disasters strike without warning, cities expand chaotically, satellites fail to guide us, and the shifting of tectonic plates or rising sea levels goes unnoticed. This could be our reality without geodesy - the science that helps us measure the Earth's shape, gravity, and orientation in space. Geodesy provides the foundation for monitoring, mapping, and navigating our planet with extraordinary precision. Despite its indispensable role, geodesy remains one of the most underappreciated and undervalued

Geodesy is far more than a scientific pursuit, it is the unsung hero behind many aspects of modern life and its importance extends far beyond our daily conveniences. The science of geodesy underpins all positioning,

navigation, and timing applications, enabling a wide range of critical applications across infrastructure development, urban planning, resource management, and environmental monitoring. Yet, in Africa, geodesy remains woefully underdeveloped. leaving the continent vulnerable to a range of challenges that compromise its sustainable development.

The invisible engine of progress

Geodesy underpins countless technologies we depend on every day. It ensures the precise operation of satellites, which provide navigation, telecommunications, and Earth observation services essential for disaster response, economic growth, and environmental monitoring. These services are supported by the global geodesy supply chain, which links

ground stations, data centres, and analysis hubs to deliver the accurate geospatial data we take for granted.

Mapping and surveying are key

outputs of geodesy, forming the foundation for designing transportation networks, constructing resilient buildings, and managing land use effectively. Without geodesy, critical functions like urban planning, mineral exploration, and disaster recovery would falter. Precise geodetic data enables the creation of floodplain maps to mitigate risks, supports precision agriculture, monitors deforestation, tracks climate changes, and manages underground water resources, safeguarding communities and ecosystems.

An accurate and accessible geodetic reference frame is pivotal for moni18 INNOVATION

structure and education. Africa risks falling further behind in global geodetic initiatives, limiting its ability to address critical challenges and achieve sustain-

able development goals. Seizing the opportunity

Despite these challenges, Africa has a unique opportunity to transform its geodetic capacity, and South Africa has taken the initiative to lead the way. Through the DSTI, South Africa has invested significantly in multi-wavelength astronomy, including geodesy. These investments reflect a broader vision to position Africa as a global leader in astronomy and geodesy, fostering collaboration, building capacity, and raising awareness of the continent's scientific potential. By driving the establishment of a geodetic chapter for Africa, South Africa aims to create a robust network of geodetic infrastructure that aligns with global standards and supports Africa's growth.

In September 2024, the DSTI, in collaboration with the UN-GGCE and the Global Geodetic Observing System (GGOS), convened leaders and experts from across Africa and the

globe at the UN Science Summit in New York. The session, titled "Africa Rising: Shaping Our Common Future Through Geodesy", highlighted the urgent need to close infrastructure gaps and build a robust global geodesy supply chain. https://ggos. org/2024/10/27/un-sciencesummit-africa-rising-shaping-our-common-future-through-geodesy/

Through these initiatives, South Africa is positioning geodesy as a cornerstone for sustainable development across the continent.

"Africa's geodetic transformation requires collaborative efforts to close infrastructure gaþs, train skilled professionals, and foster innovation."

A call to action

Africa must prioritise geodesy as a critical national infrastructure. Governments need to invest in building new geodetic stations, upgrading existing systems, and developing comprehensive national strategies that integrate geodesy into broader development goals. Public awareness campaigns and educational programmes are essential to cultivate the next generation of geodesists and ensure long-term sustainability.

Partnerships between governments, academia, and industry will be instrumental. Africa's geodetic transformation requires collaborative efforts to close infrastructure gaps, train skilled professionals, and foster innovation. The continent's ability to integrate fully into the global geodesy supply chain hinges on this

Geodesy may be the "forgotten science", but it is the foundation upon which modern life is built. It enables us to map and navigate the Earth. predict disasters, combat climate change, and plan for the future with precision. For Africa, investing in geodesy is not just a scientific imperative - it is a pathway to sustainable development, resilience and global leadership

The time to act is now. By strengthening its geodetic infrastructure, expanding mapping and surveying capabilities, and actively participating in global geodetic initiatives, Africa can transform this undervalued science into a powerful tool for progress and prosperity. The stakes are too high to ignore, for Africa and for the

This article was written by Dr Aletha de Witt, Director - Radio Astronomy Projects at the DSTI.

For more information on geodesy, contact Aletha.dewitt@dsti.gov.za



Africa has a unique apportunity to transform its geodetic capacity, and South Africa has taken the initiative

Geodesy: The World's Best-Kept Secret (Until Now)



7. Objectives



- 7.1. South Africa's geodetic infrastructure, expertise, and leadership in Africa provide an opportunity to strengthen its role in global geodesy while addressing national and regional geodetic challenges. To achieve this, the following key objectives are proposed:
 - Establish a National Geodesy Working Group: Create a national coordination body to align geodetic efforts across government agencies, research institutions, and industry, ensuring strategic investments and enhanced collaboration.
 - Formalise South Africa's role in global geodesy governance by signing the UN-GGCE multilateral MoU: Strengthen South Africa's engagement in the global geodetic community, reinforcing ts commitment to the sustainability of global geodesy.
 - Develop a National Geodesy Coordination Framework: Provide an immediate
 mechanism for coordinating geodetic activities across DSTI, DLRRD, SANSA,
 universities, and other stakeholders such as the Department of Defense, the SA
 Navy, and private sector partners. This framework could later evolve into a full
 National Geodesy Strategy if required.
 - Secure long-term funding for geodetic infrastructure and human capacity
 development: Pursue sustainable funding models, including infrastructure
 grants, public-private partnerships, international collaborations, and infrastructure
 hosting agreements, to support geodetic infrastructure upgrades, technical staff
 training, and research initiatives.
 - Lead the establishment of GGOS Africa: Establish GGOS Africa as a regional
 coordinating entity under the Global Geodetic Observing System (GGOS) to
 enhance Africa's integration into global geodesy, coordinate geodetic activities
 across the continent, and build technical capacity.

United Nations Whations Unies

[19.3.2025]

Dear Minister Nzimande,

Subject: Recommendation for the Establishment of GGOS Africa as an Affiliate of GGOS

I am writing to you on behalf of the United Nations Global Geodetic Centre of Excellence (UN-GGC express the support of the recommendation to establish GGOS Africa as an affiliate of the Global Geodetic Observing System (GGOS), under the support of the Department of Science, Technology a Innovation (DSTI).

UN-GGCE supports the establishment of GGOS Africa as a pan-African chapter, which aims to producing the regular dialogue on goodetic issues, share knowled dedicated platform for African antions to engage in regular dialogue on goodetic issues, share knowled resources and best practices, and collaborate on the development of innovative solutions to the continuing challenges. Moreover, GGOS Africa would play a critical role in strengthening the geodesty chain in Africa and ensuring that the continent, with its special geographical location in the Southern Hemisphere, is equipped to contribute to the global geodetic supply valant. This fully aligns with the

velopment, climate action, and the efficient

where geographic and environmental challeng and natural disasters to the development of

ortance of accurate geospatial data for evi-

c supply chain and to address its specific

, formal structure to facilitate collaboration

esent. Africa lacks a unified and formal

Nicholae Brown

Head of Office

Nations Global Geodetic Centre of Excelle

ent of GGOS Africa would help fill this o

Global Geodetic Observing System (GGOS) of the International Association of Geodesy (IAG)

South Africa, as the host of the continent's only fundamental geodetic station, is in a unique position to drive GGOS Africa forward. In addition, recent discussions with DSTI have explored the integration of GGOS Africa with the African Astronomical Society [AFAS], which oversees a network of subsidiary and affiliated organisations. This dual affiliation would unlock synergies between geodery and astronomy, providing access to sharder desources and funding streams, while enhancing interdisciplinary collaboration. GGOS supports this potential integration and reconsists its value in promotinis holistic scientific propersys across. Africa.

We believe that DSTI's leadership in hosting and supporting GGOS Africa will establish a formal structure to promote geodesy in Africa. We seek your support for this initiative, which will provide access to the funding and operational backing necessary for its success. A partnership between DSTI, GGOS and AfAS represents an unprecedented opportunity to advance Africa's geodetic capacity and address pressing global challenges.

We would be honoured to discuss this proposal further and work together to ensure the successful establishment of GGOS Africa. Please do not hesitate to contact me for additional information or to coordinate next steps.

Thank you for your consideration and leadership in advancing science, innovation and sustainable development in Africa.

Vours sincerely

Jans Hauding &

Robal Geodetic Observing System (GGC6) Hernational Association of Deodesy (AG) New 8205.012

Dr. Laura Sáncheo 6005 President Deutscher Geodálásches Forschungsinstit. Terbeische Lieberstätt Müschen (DSFLT) Arciostr. 23 80333 Munich, Germany Phone: +69 (89) 289-28747 E-melt Impanchop@tum.de



International Association of Geodesy

of the International Union of Geodesy and Geophysics

March 19, 202

To: Honourable Minister Blade Nzimande Department of Science, Technology and Innovation Republic of South Africa

Re: Letter Supporting the Establishment of GGOS Africa

Door Minister Namenda

It is a great pleasure to have this opportunity to write a letter supporting the establishment of GGOS Africa as an Affiliate of the International Association of Geodesy's (IAG's) Global Geodetic Observing System (GGOS).

The IAG is a scientific association in the field of geodey. It promotes scientific cooperation and research in geodey on a global case and contributes to it through its various research holies. The IAG formed GGOS in 2003 to organize the different technique-specific observing Services of the IAG formed GGOS in 2003 to organize the different technique-specific observing instrument. IAG of under one unifying umbrella in order to form a comprehensive geodetic observing instrument and to integrate the separate pillars of geodesy (shaper, rotation and gravity) into one consistent observing system. I was the President of GGOS during 2017 to 2019 prior to becoming the Vice President of the IAG in 2019. While I was President of GGOS were catabilistical GGOS Affiliates as a war to further rormote geodesy in energe and to increase participation in GGOS in antitiates as

A GOOS Affiliate is a national or regional organization that coordinates space-goodetic activities and that provides a forum for multi-technique, space-goodetic discussions in that area, GGOS Affiliates are an important component of GGOS with representation on its Governing Board. There are currently three GGOS Affiliates are GGOS Pa-Cell (Germany, Austria, and Switzerland), and GGOS ba-Cell (Germany, Austria, and Switzerland), and GGOS bherAtlantic (Spain and Portugal). These Affiliates have had great success in organizing goodetic activities and promoning the importance of goodesy in their area. In fact, in 2023 GGOS Japan neceived the Tsuboi-Prize from the Goodetic Society of Japan in recognition of its important contributions to goodesy in Japan.

As the president of IAG I enthusiastically support the establishment of GGOS Africa. The Republic of South Africa is a strong supporter of geodesy and through GGOS Africa this support for geodesy can be extended throughout the African continent. I am confident that GGOS Africa will be a successful in promoting geodesy in Africa as the other GGOS Affiliates have been in promotine needers; in their respinse please for me know low. Jun the IAG Can belt with this

Sincerely,

Rishard S. Frosa

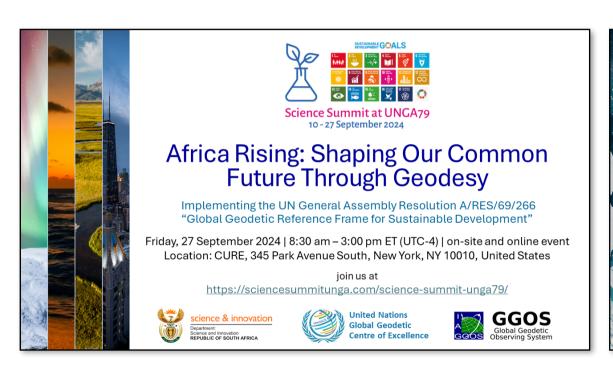
Richard S. Gross

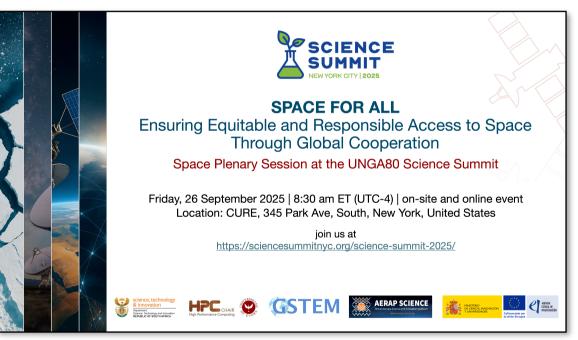
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ter 3.6. TEUNISSEN Dr. Daniela THALLE lity of Technology Poderal Agency for Ca and Geodosy (BKG) ft: Bichard-Straum-Allen D-6598 Frankfart an E-mail: 146-Officeallt Bermil: 146-Officeallt Ber

www.iag-aig.or















Geodesy: Fundamental Astronomy Meeting Space Science for Global Impact

Discover why geodesy matters for Science, Society, and Africa

and

join us for an engaging discussion on —Geodesy's place in Astronomy—

| Monday 24 March 2025 | 16:30-18:00 | Special Session |
AfAS Conference and General Assembly 2025
Location: Emperors Palace Hotel Casino Convention Resort
Johannesburg, South Africa

join us at https://events.saao.ac.za/event/10/



PACE FOR ALL

and Responsible Access to Space h Global Cooperation

sion at the UNGA80 Science Summit

| 8:30 am ET (UTC-4) | on-site and online event Park Ave, South, New York, United States

join us at summitnyc.org/science-summit-2025/













Aletha de Witt, DSTI Aslam Parker, DLRRD, SA Jack Radoliffe, UMan, UK Paul Baki, TUK, Kenya

STRENGTHENING AFRICA'S GEODETIC INFRASTRUCTURE



ABSTRACT

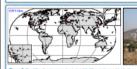
Recidency is the backbons of modern infrastructure, enabling climate reallience, disaster preparedness, precision agriculture, and smart clibes. Despite its printical role, Africa's geodetic infrastructure remains underdeveloped and fragmented, limiting the continent's ability to high support its own development and contribute to global geodesy. The accuracy and sustainability of global reference frames and Earth system monitoring deepend on a well-distributed, utility integrated geodetic interval—one in which Africa's participation is not optional, but essential. However, the region continues to face infrastructure selficits, data accessibility challenges, and policy gaps, which hinder long-term geodetic sustainability. Recognising the urgency of this issue, initiatives are underway to assess Africa's geodetic infrastructure, expand networks, and improve data accessibility. South Africa is leading efforts to bridge this gap, eleveloping policy frameworks that priorities geodesy as critical infrastructure, securing sustainable investment, and fostering international partnerships to modernise and expand geodetic instructure including work underway to assess the extinct of existing infrastructure progress, organing illulatives, and largors the estatus of existing infrastructures consists the continent way to be extended and Africa becomes a fully integrated and believes to the extended of the progress, organization. We provide an update on reaccess the continent. While histories are included to the progress, organization and the progress or an extended of the progress of the progress, organization and the progress or an extended or a progress or a progress, organization and the progress or

AFRICA'S ROLE IN GLOBAL GEODES

- Africa is vital to the ITRF, ICRF, and GGRF but its geodetic infrastructur remains sparse (see Fig. 1: ITRF station map. Fig. 2: ICRF-3 station map.)
- Africa has only one GGOS Fundamental Station the SARAO/Hartebeesthoek site (South Africa) the continent's sole site hosting all four space geodetic techniques and the only African contributor to geodetic VLBI (see Fig. 3)
- The Global Geodesv Supply Chain Needs Africa:
- Filling the Gaps:
- → Africa's vast landmass helps reduce spatial bias in global reference frame solutions
 → Contributes essential tectonic & atmospheric data (e.g., East African Rift, equatorial ionospheric data (e.g., East African Rift)
- Sparse geodetic coverage leads to unmodelled errors in geodetic products
 Satellite navigation, Earth observations, and disaster early-warning systems degrade global Conclusion:
- → Investing in African geodetic infrastructure is not optional...
 → It's a ninhal imperative for accurate reference frames and Earth observation systems



Figure 1. The global distribution of (TRY2020 sites (Int), streeting M.R.II (evenge stars), SLP (green distribution) of (TRY2020 sites (Int), streeting M.R.II (evenge stars), SLP (green distribution) of (Int), and DOME (Int) or criving. The production of contract of the distribution of (Int) or critical production of the contract of



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GEODETIC INTEGRATION FOR AFRICA'S FUTUR

- Many African countries have QNSS stations, but numerous are privately owned or poorly maintained, with little or no public data access. Several countries lack any CORS stations, and existing infrastructure is often fragmented, outdated, o underutilised
- R. A lack of national and regional repositories and data-sharing frameworks hampers national development, while inconsistent standards, no preservation records of legacy systems, and limited technical capacity result in uneven dat usuality and now system intercoparability.
- Most African countries use independent and often multiple geodetic reference frames based on different datums, creating a fragmented landscape that hinders regional integration. AFREF, launched by LINECA in 2000 to unity these, has stalled due to coordination and resource gaps. A UN-GGIM-Africa, Geodesy Working Group was proposed in 2024 to review AFREF efforts. The
- RAFrica Needs a Modern, Integrated Geodesy Supply Chain

Sustainable Developmen

- Geodesy underpins national mapping and land-use planning essential for African development
- Strengthens climate adaptation, environmental monitoring, and sustainable natural resource
- Enables African-led research on geodynamics and climate across diverse ecological zones
 Supports resilient infrastructure and spatial development in rapidly growing African cities
 - Africa is home to ~1.5 billion people with some of the world's fastest-growing economic
- Geodetic underpins Africa's digital transformation and 4IR innovation across the continent.
 Essential for cross-border intrastructure and regional integration under the AIDs Agenda 206.
 Harmonisad geospatial reference frames are essential for full implementation of the African.





Figure 3. Distribution of insues 9858 postativ and reference resolvers in and around Africa (HT). Borne recoivers/instruction are privately owned and data in not feesly evaluation. RMAA/CORB and MOMET were shot diness 2017 and 2020, 9855 data from 14878ET CORB (right) is archived at the AFREF Operational Data Cuestry (AOCS), http://www.statistia.org.

















Department: Science, Technology and Innovation REPUBLIC OF SOUTH AFRICA

Virtual School June 2025:

Terrestrial Reference Frame. <u>Geodynamic</u> and Atmospheric Monitoring







DEVELOPMENT IN AFRICA WITH RADIO ASTRONOMY









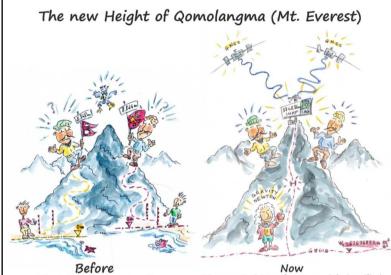


GGOS Implementation Plan: outreach activities



- One of the main goals of the GGOS Strategic Plan is to raise awareness of geodesy through visibility and engagement
- Identified as key task: the generation of outreach material, such as flyers, videos, brochures and policy briefs
- Recent efforts: new IAG/GGOS merged webpage, 3 GGOS videos, and Cartoons as outreach material
- Planned outreach packages: brochure, factsheet, flyer, GGOS video, and social media campaign — translation into other languages

Turn Science into Smiles:)



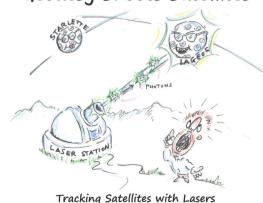
Lost Without Geodesy



No GNSS - No Position

From navigation and timing to urban planning and geohazard alerts, geodesy powers countless everyday applications through various space technologies, such as Global Navigation Satellite Systems (GNSS). Hopefully, you will never have to witness what happens when it breaks down.

Geodesy Shoots Satellites



With Satellite Laser Ranging (SLR), geodesists fire laser pulses at satellites like LAGEOS to measure their distance with millimeter accuracy. This sharp-shooting helps track satellite orbits precisely, which is crucial for accuracy of positioning systems like GPS or many other applications. Those lasers aren't just for fun - they kep your location on point!



Do you like drawing? Are you creative?



Draw your geodesy cartoon and win amazing prizes!

Turn Science Into Smiles



Help people discover and understand geodesy



Prizes

Win up to 900 € + IAG Membership + additional benefits



- Submission Deadline: March 22, 2026

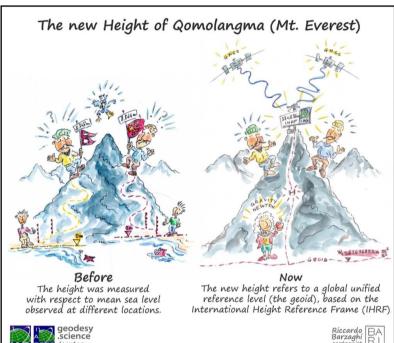
- Winner Announcement: *May 2026*

Learn more and submit your cartoon geodesy.science/cartoon/competition

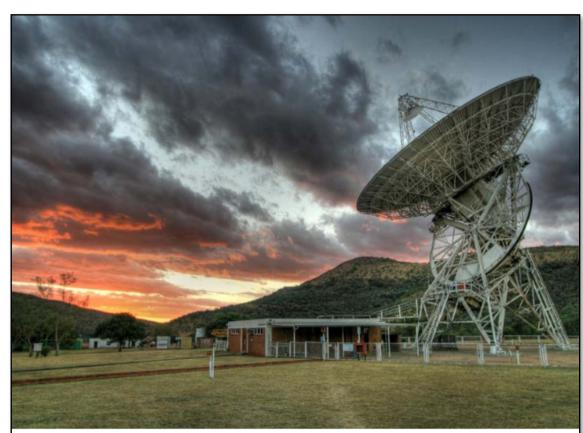
Scan me:











Hartebeesthoek observatory (HartRAO), South Africa: Shooting of the new documentary film on geodesy has taken place in South Africa, the UK, Argentina, Svalbard/Norway, the USA and Japan. PHOTO: THOMAS ABBOTT

New documentary film

















"I have no singing, dancing or other talents"







"I have no singing, dancing or other talents"

"You do have other talents ... you can talk about Geodesy"

Advocacy, Communication & Outreach

2.
Advocacy,
Communication
& Outreach

If We Don't Talk About Geodesy, Who Will?





South African Geodesy Workshop

1-2 October 2025, SAAO, Cape Town



