

Session 1: Global & African Geodesy Perspectives: summary notes

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Moderator: Hussein Farah

Written from the session transcript (Zoom auto-transcript from 11:15, machine transcription before that). Audience speakers' names are given only where they could be identified with reasonable confidence. Please check against the recording before quoting anyone.

Key points

- **The governance gap is the central problem.** The UN-GGCE baseline assessment found *governance and strategy* was the weakest of six domains. UNGA resolution 69/266 has no binding mandate or funding attached.
- **A UN consultation on global geodesy governance starts in early 2027**, led by the UN-GGIM Subcommittee on Geodesy and managed by UN-GGCE. A call for steering committee members and expert groups is due in about 3–4 weeks. Brown encouraged African participation.
- **AFREF's main problems are institutional, not technical.** The 2014 plan to move AFREF into African Union ownership has not happened. The African Space Agency was suggested as a new entry point.
- **The discussion focused on political advocacy, horizontal collaboration and the human-capacity pipeline**, including gender balance and an astronomy-style (DARA) training programme for geodesy.

Talks

Nicholas Brown: State of Global Geodesy / UN-GGCE Africa survey (online)

- **About UN-GGCE.** Its role is advocacy, awareness and capacity development, not technical geodesy (which the IAG covers). Its message to politicians: GNSS, Earth observation and satellite communications are about 80% of space-market revenue and growing about 9% a year, and all of it depends on geodesy. Geodesy also underpins timing for telecoms, finance and power grids.
- **UNGA resolution 69/266 (2015)** was a landmark but has no funding and nothing binding, “a coalition of the willing”.
- **The global geodesy supply chain** runs from observatories (VLBI, GNSS...) to data centres, analysis and products (reference frames, gravity models, EOPs, orbits), then users. Users are largely unaware of how fragile it is.
 - Even GNSS operators, briefed through the International Committee on GNSS, accept the system is not robust.
 - The capacity shortfall is acute in Africa and, unexpectedly, in Europe too.
- **The European Commission has set up a geodesy task force** after the UN-GGCE study. It first assessed risks to Galileo and EGNOS from losing ground stations, data centres or analysis centres, and is now extending this across the EU Space Programme, including Copernicus. Brown expects more investment in the supply chain.
- **Investing in Africa benefits everyone.** It improves the global reference frame and EOPs more than adding sites in Europe would. UN-GGCE is advocating that new infrastructure, data centres and analysis capacity go to Africa.
- **Baseline maturity assessment.**
 - It covered six domains and 58 capabilities, each scored on people, process, technology and data: 232 assessments in total.
 - Data management scored highest at 2.7/5, largely thanks to IAG volunteer effort.
 - Governance and strategy scored lowest. Mandate development scored 1/5, and there is no strategic planning, risk management or financial management. This weakness “drags down” every other domain.
- **Proposed fixes:**
 1. A shared vision across governments, satellite operators, space agencies, science and the private sector.
 2. Agreed roles and responsibilities.

- 3. Coordination mechanisms.
- 4. A sustainable funding model, for example on WMO or IHO lines.
- **UN-GGIM decided in August (New York)** to run a structured, inclusive consultation on governance options, backed by evidence-based analysis. It has two questions: (1) what does a robust supply chain look like and what does it cost; (2) what governance options could implement and sustain it, and at what cost?

André Nonguierma: Development of Geodesy in Africa

- Three pillars: observations, analysis, human capacity. “Impact comes when observations are translated into knowledge, and knowledge into public value.”
- **History.** He traced the continuity from the Arc of the 30th Meridian through the 12th Parallel survey to the African Doppler Survey (ADOS: more than 300 stations in about 45 countries). ADOS succeeded operationally, but the data were never fully completed, because long-term operations need lasting institutions.
- **AFREF.** It moved African geodesy from campaigns to a permanent service: permanent GNSS stations, open-data policy, operational and analysis data centres, and in-country expertise.
- **Governance.** At a 2014 meeting in Tunisia, the African Union was invited to take ownership, through a joint ECA–AU secretariat and technical and scientific advisory groups. Ten to twelve years on, AFREF is still not African-owned. GGOS-Africa could help build that governance. The newly established **African Space Agency** is a possible entry point.
- **From the GGOS-Africa survey.** About 90% of countries report national CORS, and more than 90% of those are government-owned. Nonguierma questioned this figure, given how many private, academic and research stations exist. The private sector’s role needs discussion.
- **The real gap is continuity, not inventory.** In the last (2017/18) assessment, more than 100 stations existed but only about half delivered daily data.
- **What is needed:** routine processing with QC, weekly solutions, combination across centres and publication in international formats. The 2018 Addis Ababa revamp proposed this architecture (stations → operational data centre → analysis and combination centres → coordinating bureau), but it is not yet in place.
- **People are the lasting infrastructure.** The problem is retention, because technical staff are leaving national mapping agencies. Training must lead to responsibility and leadership roles.
- **Takeaways:** close the gaps, determine the optimal placement of new GNSS stations, and open the data.

Patrick Vorster: Historical Perspective of Geodesy in Africa

- Main sources: the histories by Jim Smith (UK) and Jan De Graeve (Belgium), including five volumes on the size and shape of the Earth and the African meridian arcs.
- **Early arcs.**
 - Eratosthenes (about 230 BC) estimated the Earth’s circumference at about 40,338 km; the modern value is 40,075 km.
 - Lacaille’s Cape arc (1751–53) implied a “pear-shaped” southern hemisphere. This was unresolved for about 90 years, until Everest’s suggestion of plumb-line deflection by Table Mountain was confirmed by Maclear. Maclear’s extended arc and triangulation established the first rigorous geodetic framework for southern Africa.
- **Arc of the 30th Meridian (Sir David Gill).**
 - About 64° of latitude from Port Elizabeth (Gqeberha) to Cairo, across 11 countries.
 - About 680 primary triangulation stations, 32 baselines and 42 astronomical stations.
 - Linked to the Struve Arc, it spans 105° and about 11,650 km, the longest continuous terrestrial arc ever measured.
 - Surveyed in phases from 1883 to the 1950s. It was the primary reference frame for mapping Africa through the 20th century.
- **Proposal: a UNESCO World Heritage nomination for the 30th Meridian arc**, following the Struve Arc (inscribed 2005). All 11 countries would need to submit tentative listings. Vorster invited discussion.
- **South Africa.**
 - Trigonometrical Survey from 1919; more than 29,000 trig beacons.
 - Cape Datum, replaced by Hartebeesthoek94 (ITRF91, epoch 1994) from 1 January 1999.
 - TrigNet: more than 70 CORS streaming at 1 Hz.

- **HartRAO is Africa's only co-located fundamental station** (VLBI, SLR, GNSS, DORIS).
- Gravity history from pendulum measurements in 1818 to absolute gravimetry. Geoid models through to SAGEOID2010.
- University geodesy programmes and professional registration through the South African Geomatics Council.

Interactive discussion

- **Earlier arc work beyond southern Africa.** A participant asked whether comparable studies exist for Central and East Africa. Vorster said the literature covers closing the roughly 10° East African gap of the 30th Meridian arc (1953–54), but he has not studied later work.
- **Politics and advocacy.** Several participants said the main obstacle is getting politicians to fund *maintenance*, not building infrastructure. Some argued geodesists need to “go into politics” themselves.
- **Lazarus Ojiji (RECTAS)** listed three issues:
 1. Advocacy and public awareness.
 2. A lack of horizontal collaboration: institutions work in silos and do not share data, equipment or expertise.
 3. A lack of committed champions in the responsible ministries, departments and agencies.
- **Nicholas Brown** said the call for the governance-consultation steering committee will come out in about 3–4 weeks, via the UN-GGCE mailing list and LinkedIn.
- **André Nonguierma** responded:
 - Africa needs regular continent-wide expert meetings, which have lapsed since about 2013–14.
 - The long-term aim is an African Conference of Ministers on geospatial matters, or a head-of-state champion.
 - Geodesists must communicate better, for example by bringing science journalists along.
 - Accountability: “it’s not always about lack of resources”. He noted that about 90% of attendees were funded by the GGOS-Africa project rather than their own institutions.
- **Demonstrations persuade.** A participant from Malawi said decision-makers were convinced by a demonstration of land-information benefits, not by proposals. Geodesy needs concrete case studies.
- **Partnerships.** The President of the Institution of Surveyors of Uganda suggested partnering with national professional associations and location-based-services companies, and working top-down via the African Union.
- **Human capacity and gender.** Charles Paradzayi noted the field is ageing and the room had very few women. He proposed a coordinated programme through GGOS-Africa: roughly 10 PhD candidates, each supported by 2–3 MPhil students, with a target of about two-thirds women.
- **An astronomy model.** Jack Radcliffe cited DARA (Development in Africa with Radio Astronomy), which has trained more than 1000 young Africans over a decade. A similar programme could work for geodesy, funded via the AU, donors or AU–EU partnerships, with GGOS-Africa as the vehicle.
 - **Brown** strongly supported this: a joint geodesy–astronomy business case, framed around socio-economic benefits, would be much stronger with donors.
- **National working groups.** A participant suggested each AFREF country representative lead a national geodesy working group, following South Africa’s example.
- **Private CORS redundancy.** A Kenyan participant said Nairobi may have more than 10 CORS, some within 2 km of each other. National mapping agencies need guidelines to regulate siting. The participant also noted very few PhD students in geodesy, as students prefer downstream applications.
- **The “Correct the Map” / equal-area projection debate** was raised as a political opening to engage African leaders on geodesy.
- **Naming of degree programmes.** A participant from MUBAS (Malawi) described resistance to “geomatics” curricula from stakeholders. Charles Paradzayi described how enrolment fell when his university renamed its degree away from “surveying”. Packaging matters: keep “surveying” in the name, and offer geodesy as a postgraduate specialisation in line with professional councils. TU Kenya uses “Survey and Spatial Sciences”.
- **Where to push politically (Nonguierma):**
 - The AU Specialised Technical Committee on science and technology, which reports to the Conference of Ministers.

- The African Space Agency, whose pillars include GNSS and astronomy but which lacks a geodesy governance mechanism.
 - Regional economic communities (ECOWAS, SADC...).
 - The RCMRD Conference of Ministers in November.
- **Moderator:** existing geodesy communication and outreach material (from UN-GGIM, GGOS and others) should be compiled and shared before the workshop ends.

Actions and follow-ups mentioned

- UN-GGCE call for the governance-consultation steering committee and expert groups: about 3–4 weeks away.
- Compile and share geodesy outreach and advocacy materials with participants.
- Explore a joint geodesy–astronomy capacity-development business case (DARA-style).
- Explore a UNESCO nomination for the Arc of the 30th Meridian (needs all 11 countries).