



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

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19-24 May 2024 in Accra, Ghana

ITRF and Geodetic Reference Frames in Africa

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Introduction

- ❑ Establishment and adoption of an international terrestrial reference frame meeting the needs of the scientific and international community
- ❑ An infrastructure defined by different sites distributed across the world, using VLBI, LLS/LSR, DORIS and GNSS techniques
- ❑ Different products are now supplied by the IGS thanks to these stations

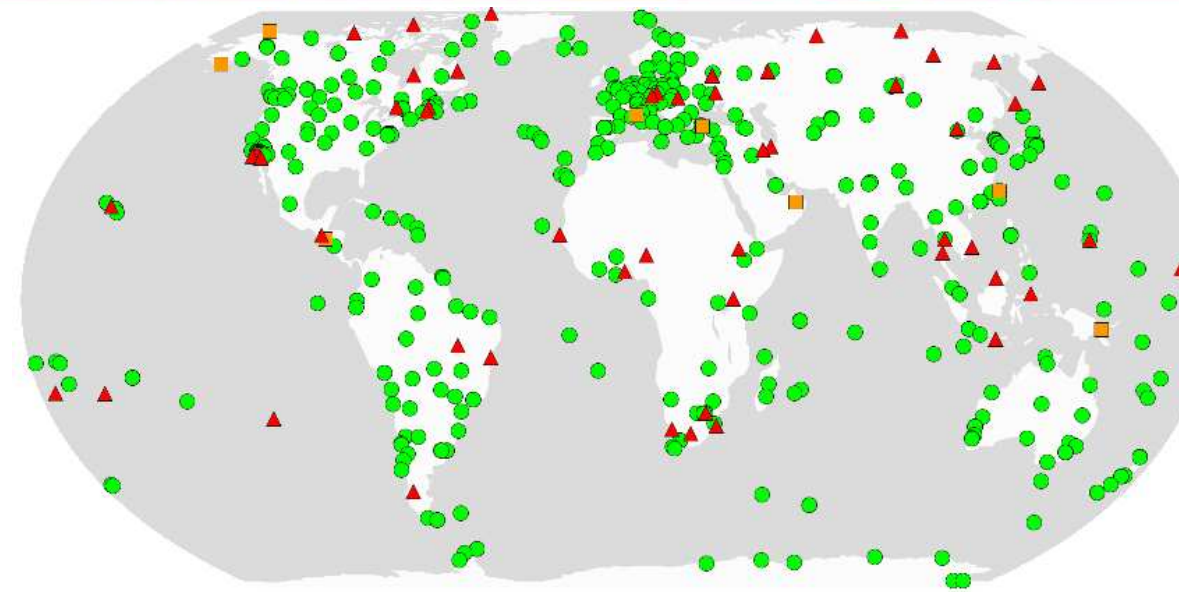


Figure 1 : Distribution of 516 IGS CORS in 2023
(<https://network.igs.org/>, 10 juillet 2023)



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- What is the place of Africa in the distribution of ITRF sites ?
- Could there be an impact on ITRF positioning in Africa ?
- What about the quality of IGS products on the African continent ?
- Could there be an influence on IGS products if this situation improved ?
- What should be the role or responsibility of our States ?

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ITRF in Africa

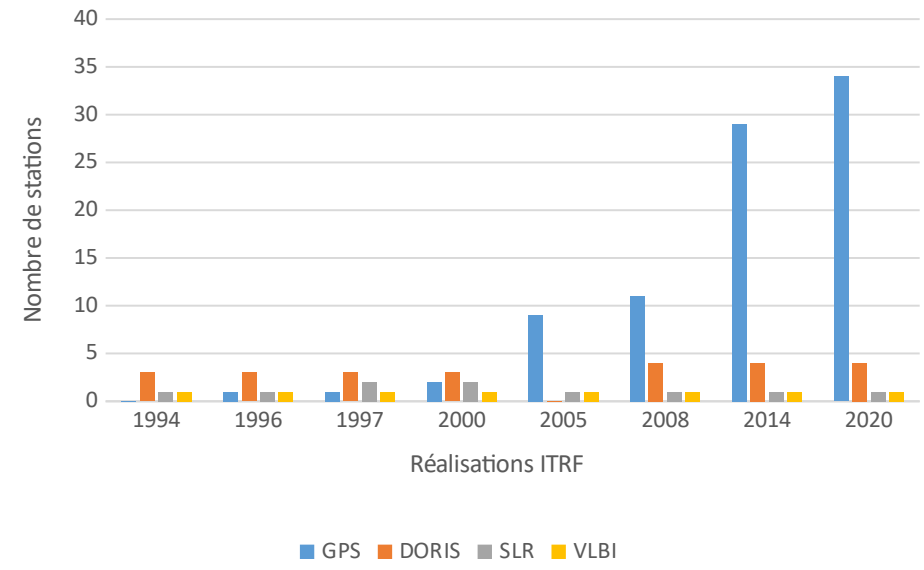


Figure 2 : Evolution of IGS CORS in Africa



Figure 3 : spatial distribution of IGS CORS in Africa in 2022



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It should be noted that this rather limited evolution of IGS stations in Africa (see figure 2) also occurred in a disproportionate manner.

South Africa alone hosts, as a state, 47% of the ITRF2020 IGS stations in Africa at the time when only one station (CORS) is listed in North Africa which is located in Morocco.

Such a distribution may not provide optimal geometric coverage for the precise estimation of certain IGS products. We can note, for example, at the same time, 12 new CORS in France and 15 new CORS in Germany, integrated into the ITRF2020.

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Sustainability problem of CORS in Africa ?

- Qualified human resources to ensure the management and maintenance of stations not always available
- Stations set up without a clear sustainability and sustainable management plan
- Financial resources allocated to station management not always available
- Support plan for maintenance and transfer of skills not always integrated into the acquisition and installation contracts of these CORS
- Absence of a framework for exchange and sharing of experience and good practices between the actors in charge of geodetic infrastructures in different countries and international organizations such as AFREF and IGS
- Absence of an alert and assistance system for local organizations managing IGS CORS

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Situation des referentiels geodesiques en Afrique face a l'ITRF

In 2020, around 37% of African countries had reference frames attached to an ITRF version (yyyy) at a known epoch (eeee.ee).

The other countries either used reference frames officially linked to a version of the ITRF or WGS84 without having found the associated epoch (Rwanda, Togo, Eritrea, etc.), or local reference frames which can sometimes be associated with the definition of a few independent points determined in WGS84 (Niger, Gabon, Equatorial Guinea, etc.).

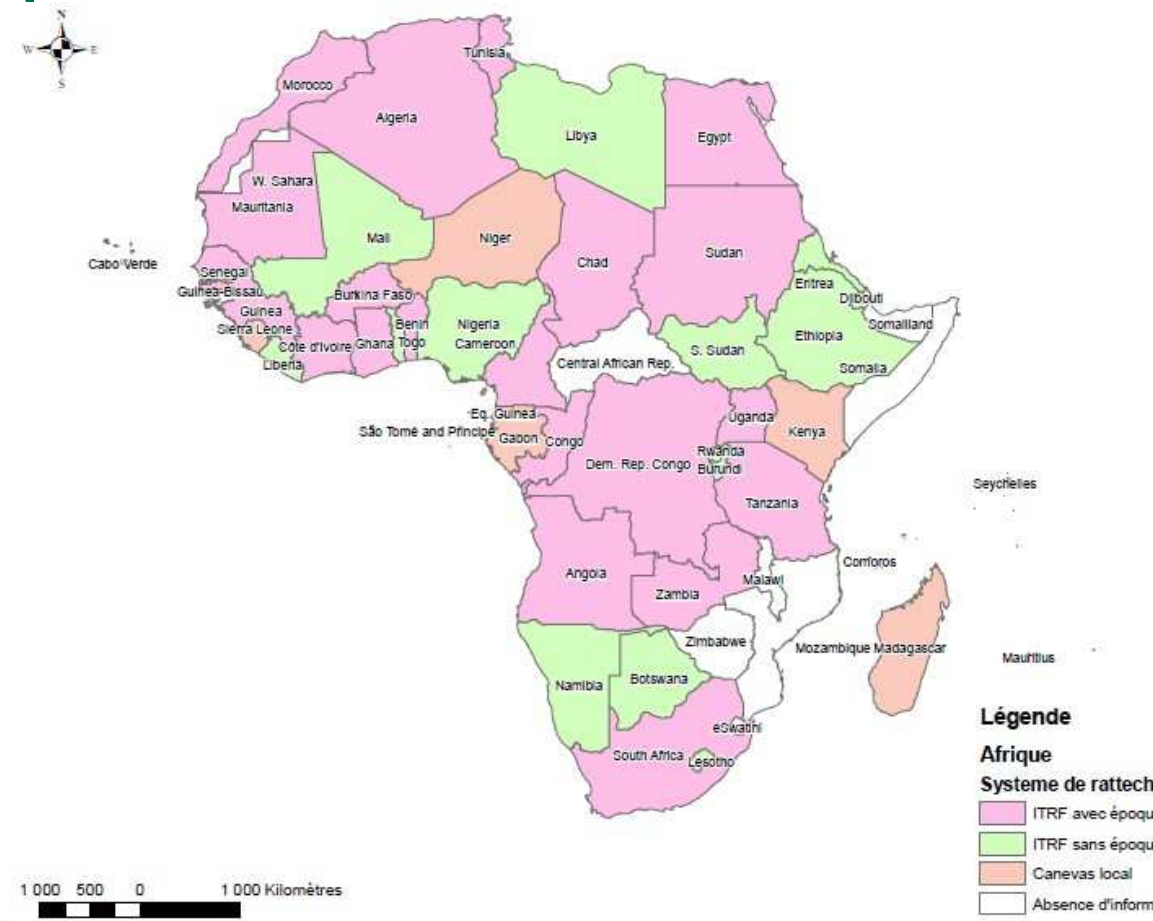




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What more should be done for africa countries ?

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- ❑ 25% of prime geodetic points are unusable
- ❑ 5% of points (corresponding to RRS07) present access difficulties
- ❑ 10% of the points must be maintained to guarantee their sustainability and use;
- ❑ 60% of points are in good condition in an adequate environment

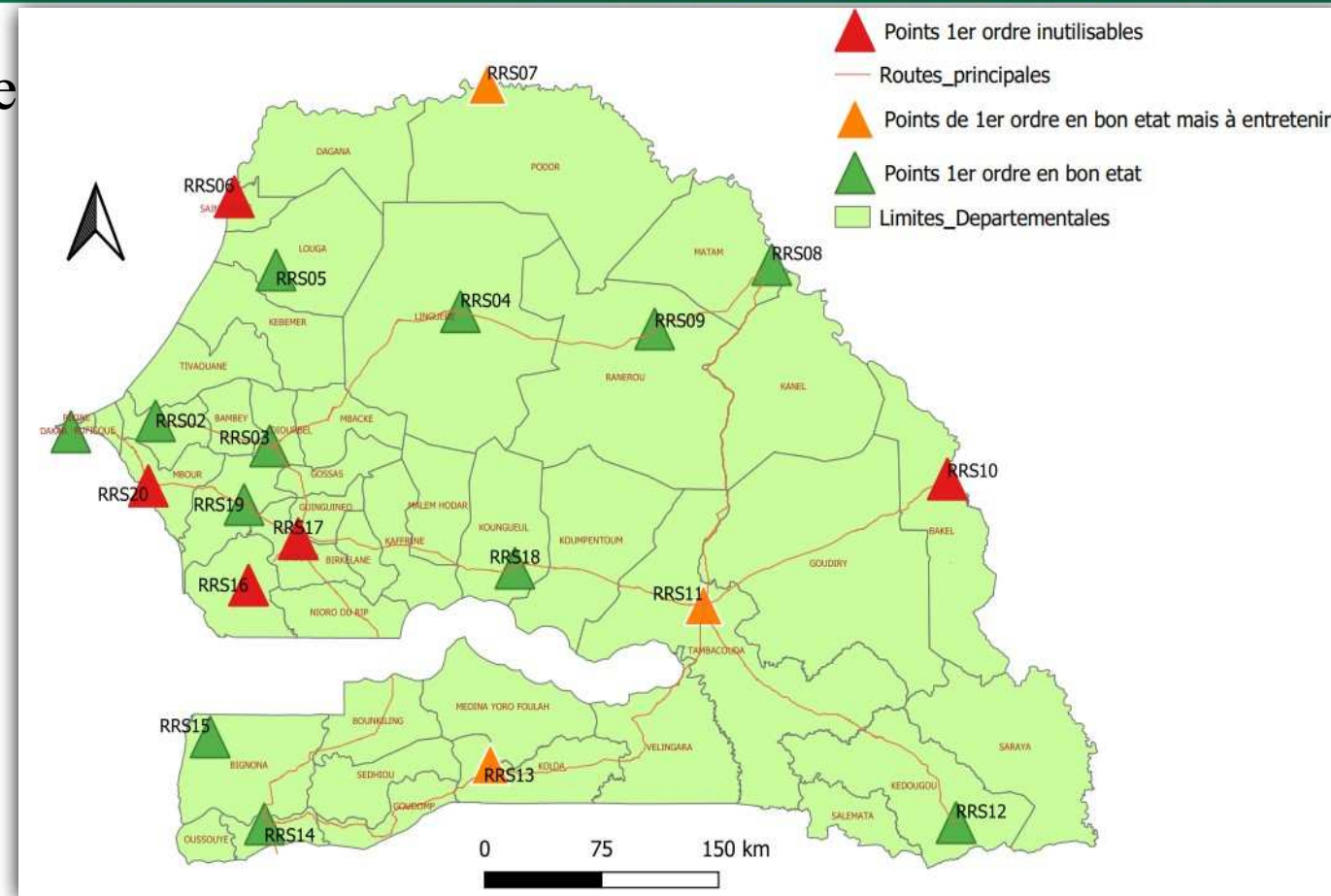


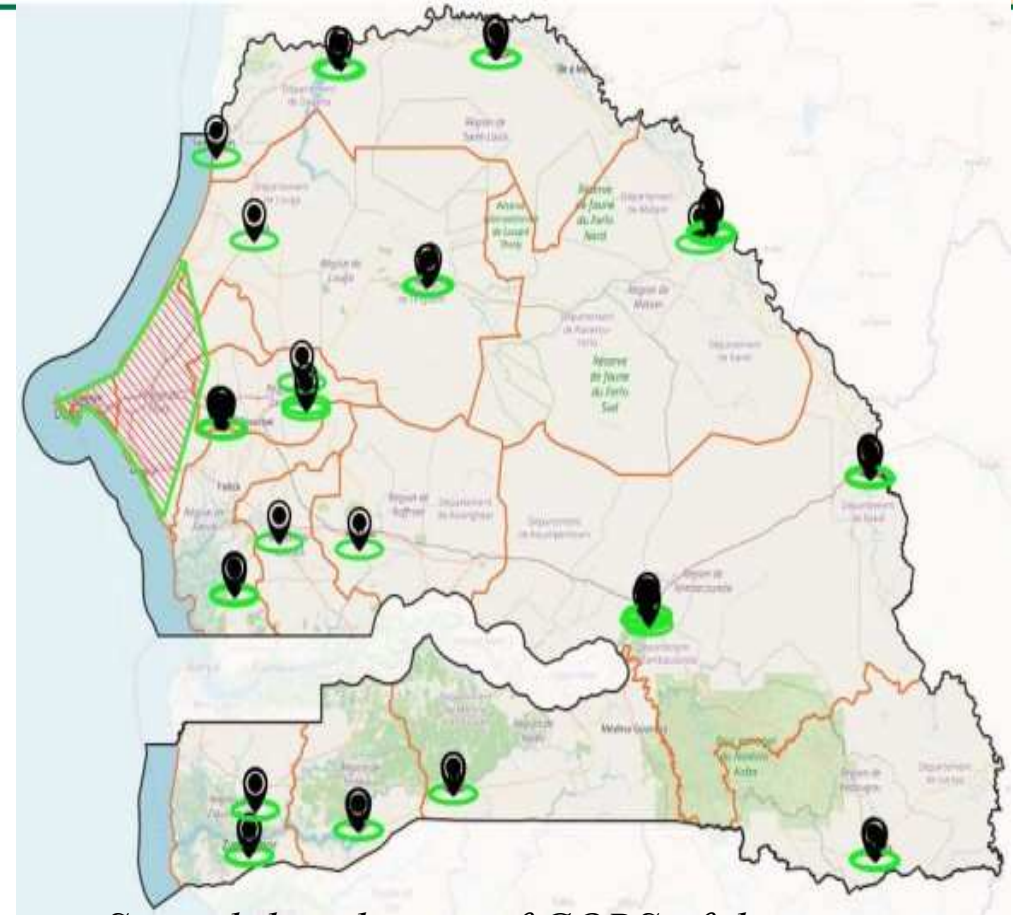


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Spatial distribution of CORS of the future active senegalese reference frame

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challenges of modernization of the senegalese reference frame (RRS04)



Offer reliable, precise, accessible and adapted support to increasingly used positioning technologies (GNSS)



Facilitate the referencing of topographical work carried out through the NRTK and RTK solutions provided by the CCR with ranges of up to 70 km to 100 km depending on the network configuration;



Simplify land operations and make them more reliable



Reduce the risks linked to the use of imprecise or unreliable support or reference points which could lead to inconsistencies in land plans or land information systems



Facilitate land registration operations



Ensure the interoperability of geolocated land data



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Recommendations

 Improve the knowledge for IGS requirements to local actors involved in setting up and managing CORS

 Encourage States and national structures in charge of national geodetic infrastructures to propose to the IGS the integration of the CORS of their countries meeting IGS standards

 Share or establish a manual of good practices for setting up, managing and sustaining CORS

 Support the training of local actors for sufficiently equipped local expertise

 List permanent GNSS stations installed as part of other initiatives for their integration into AFREF after control and validation

 Make an inventory, diagnosis and relaunch the AFREF project



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Commission 5

Reference Frame in Practise

Serving Society for the Benefit of People and Planet

