

GPS-GNSS IN AFRICA

Christine Amory-Mazaudier

Senior Scientist -LPP/Polytechnique/UPMC

Christine.amory@lpp.polytechnique.fr

Staff Associate/ICTP



Outlines

- **Tools**

GPS=> GNSS

- **Capacity building**
- **Outreach**

DELOYEMENT OF GNSS RECEIVERS

GPS => GNSS for Research and applications

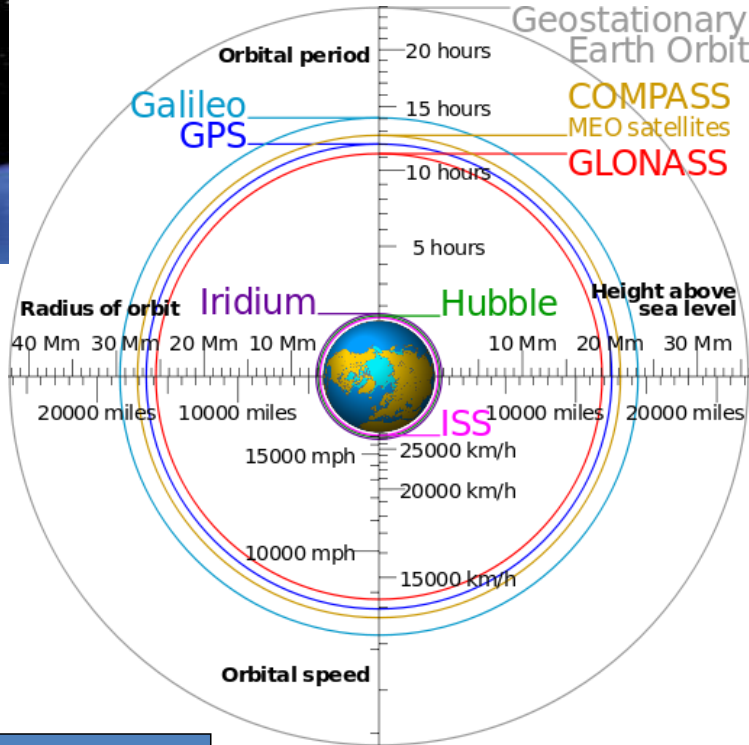


GPS IIR



GIOVE-B

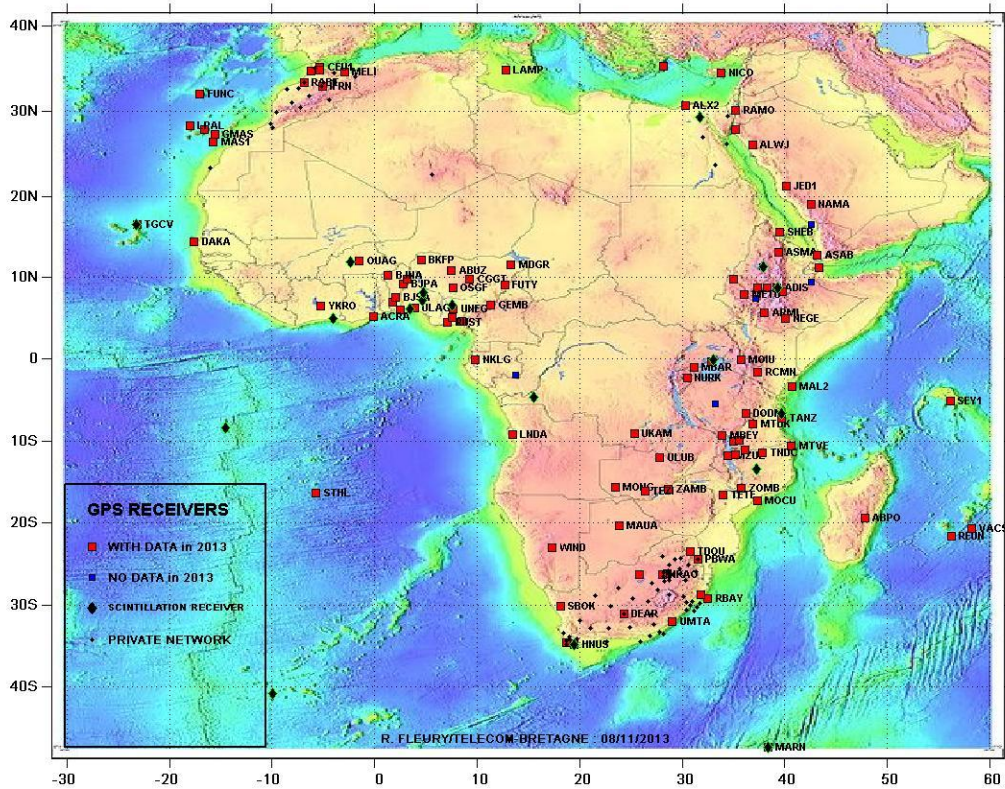
GLONASS K1



BEIDOU

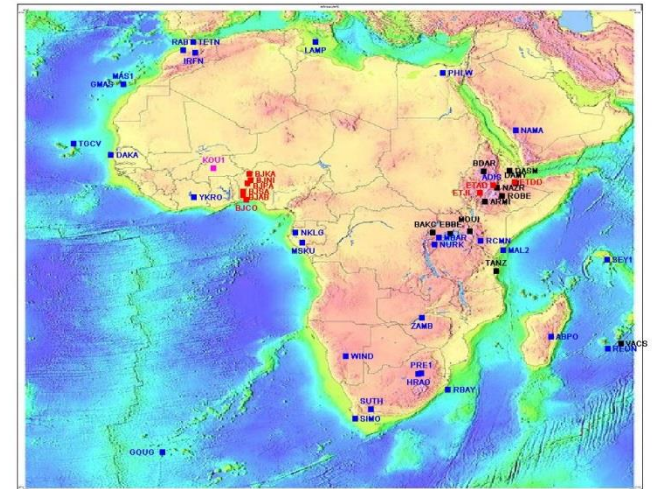


End of 2013



GPS / on the web for all
many GNSS data are not
available for all

2010



IGS

<http://sopac.ucsd.edu>

<http://cddis.gsfc.nasa.gov> or <http://igs.ensg.ign.fr>

NOAA et UNAVCO

<http://www.ngs.noaa.gov/CORS>

<http://www.unvaco.org>

Recommendations of Quito, September 2012 are always available

It is important to increase:

- **SCINDA GPS network**, even the data are not yet share on the web => constitution of a data base for scintillation
- **National networks of GPS** with all the users of GPS in the different fields of research
 - Ionosphere, Atmosphere, Geography, Geodesy etc...
- **GPS Networks available on the Web** Contact UNAVCO
<http://www.unvaco.org>

Sharing practices => African Geophysical Society

Outlines

- **Tools**
- **Capacity building**
 - *UN schools => GNSS Master since 2013 (Nigeria and Morocco)
 - *ICTP
 - *Boston University
 - *GIRGEA/ National school of Telecommunications Brest/France
- **Outreach**

Training activities ICTP/ 2015



2-13 March 2015; Workshop on Ionospheric Effects on SBAS and GBAS Applications at Low Latitudes, Trieste, Directors: S. M. Radicella, P. Doherty, B. Nava

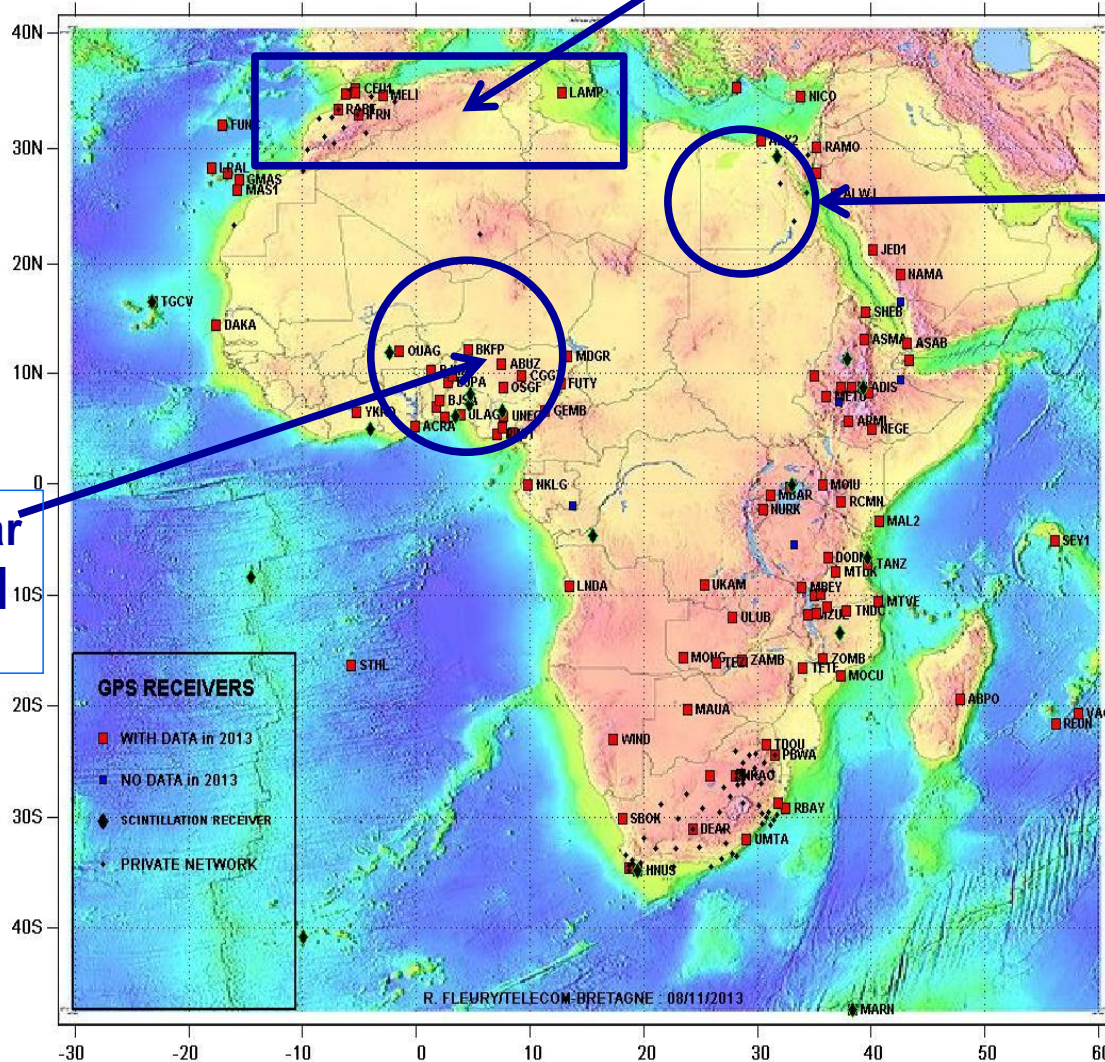
4 - 8 May 2015; Workshop and Conference on NeQuick Latest Developments and Advanced Uses, Trieste, Directors: S. M. Radicella, B. Nava (**Deadline for Applications: 22 February 2015**)



GNSS MASTER -> UN SCHOOLS in MOROCCO and NIGERIA



GIRGEA MAGHREB ISWI SCHOOL - each 2 years
Rabat [16-21 February 2015]- A. Touzani and N. Zaourar



Egypt, each year
[September 1-10, 2015]
A. Mahrous

Nigeria each year
[May 6-10, 2015]
B. Rabi

Workshops organized by African Professors

GNSS and Space Weather Ionosphere-Atmosphere-Earth's magnetic field

School ISWI Craste-LF

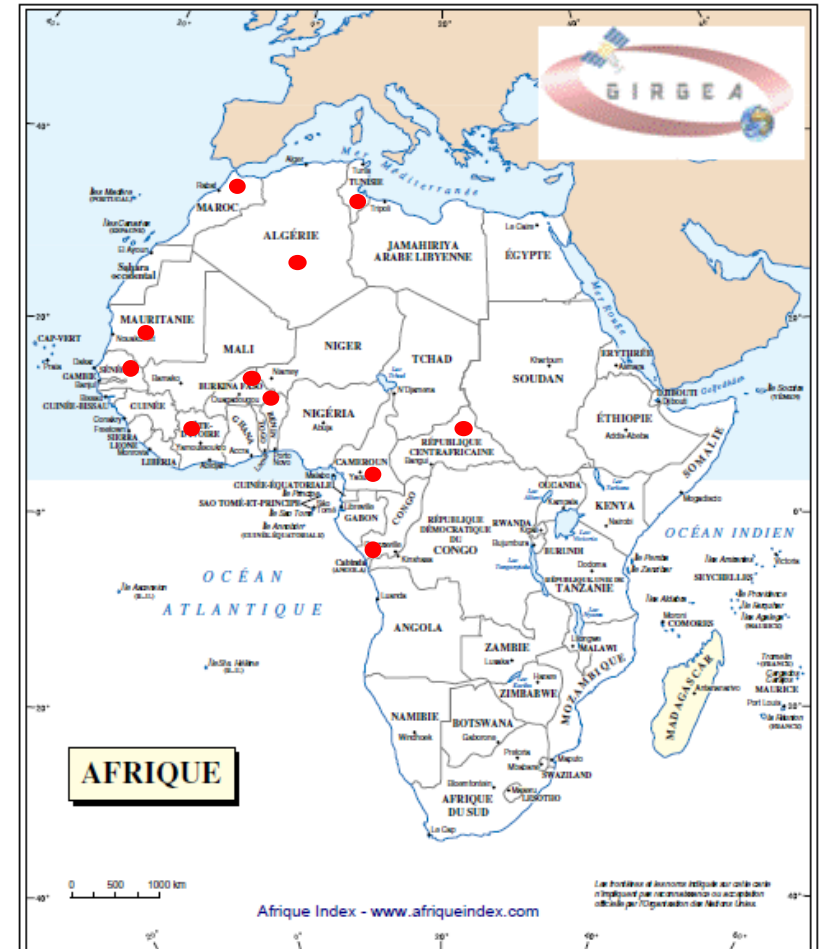
February 16-21 2015

Maghreb

Algeria
Mauritania
Morocco
Tunisia

West Africa

Benin
Burkina Faso
Cameroun
Côte d'Ivoire
Republic of Congo
Republic Centre Africa
Senegal



Each 2 years

ISWI-Maghreb -West Africa

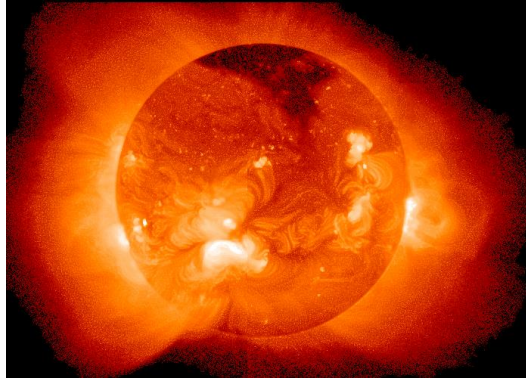
Next school in Côte d'Ivoire in 2017

Map No. 4040 (2) Rev. 4 UNITED NATIONS January 2004
Department of Processing Operations Cartographic Section

- **Outlines**

- **Tools**
- **Capacity building**
- **Outreach [2013-2014]**
Côte d'Ivoire - 2013,
Nigeria- 2014,
RDC-2014

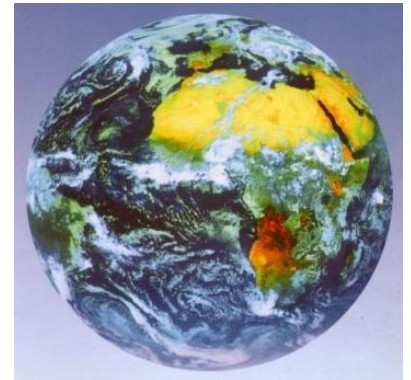
**Scientific conference for Teen agers
available for all**



**Relations TERRE SOLEIL
METEOROLOGIE DE L'ESPACE - GNSS**

**SUN EARTH connections
SPACE WEATHER -GNSS**

soon in Spanish



CMML secondary school
Anyigba



Nigeria 2014
Royal success
Academy Anyigba



Isah memorial Islamic
Academy Anyigba



School Mt Amba /RDC -2014



School St Marie /Côte d'Ivoire 2013
during the MAGDAS School



Conclusion

To continue the deployment of scientific tools in Africa
(GNSS teams and national networks)

To develop observatories (to maintain tools)

Many statistical studies must be done in Africa for previsions

-Example : statistical studies on scintillations-> space weather previsions,
particularly on the precursors of scintillations

Training / transfert of knowledge

- Example : statistical studies on scintillations -> space weather previsions,
particularly on the precursors of scintillations
- To continue workshops lead by African Scientists
- Training on plasma physics in African Universities
 - Study of plasma irregularities

Operational systems

- to connect research to operational systems