

Progress on the Development of GNSS station network in West Africa

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Table of contents

- 1 Introduction
- 2 The first few IGS stations in the region
- 3 The Networks operating in the Region
- 4 Summary

The region of West Africa

- The region of West Africa is located west of north-south axis lying close to 10° east longitude.
- The Atlantic Ocean forms the western as well as the southern borders of the West African region.
- The northern border is the Sahara Desert, with the Ranishanu Bend generally considered the northernmost part of the region.
- The eastern border lies between the Benue Trough, and a line running from Mount Cameroon to Lake Chad.

Colonial boundaries are still reflected in the modern boundaries between contemporary West African states, cutting across ethnic and cultural lines, often dividing single ethnic groups between two or more states

The West African region is made up of fifteen countries. These countries have both cultural and geopolitical ties and shared common economic interest through the regional organization, the so called ECOWAS.



Figure: Map of the members states of ECOWAS

The region is crossed by the magnetic equator. Making it under the influence of the equatorial electrojet and its subsequent effects

The IGS station at the beginning

Location	Country	Year	Partners
Cotonou	Benin	2008	UNAVCO-JPL/IGN
Dakar	Senegal	2011	CDDIC/DTGC
Toro	Nigeria	2011	UNAVCO-JPL/CGGN
Yakro	Cote d'Ivoire	1999	UNAVCO-JPL/CCT-BNETD



- 1 CCT-BNETD : Centre de Cartographie et de Télédétection
- 2 CGGN : Center for Geodetic and Geodynamics of Nigeria
- 3 DTGC : Direction des Travaux Géographiques et Cartographie

Observations

- The raw data are on RINEX Format and freely accessible
- Non of the Universities were involved in the project
- All of the stations were established for the Development of GIS and survey
- The station were established through partnership between National institution and International ones

SAGAIE



Figure: SAGAIE Station network
(Secretan et al., 2014)

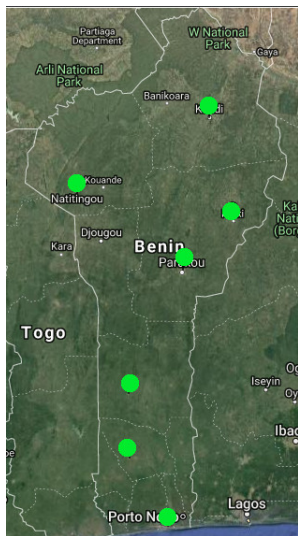
SAGAIE : Stations ASECNA GNSS
pour l'Analyse de la Ionosphère
Equatoriale (GNSS ASECNA
Stations for the Analysis of the
Equatorial Ionosphere)

- Implemented by CNES and ASECNA, with the support of Thales Alenia Space
- The stations are all installed at major airports of the region: Dakar, Lomé, Ouagadougou, Douala, and N'Djamena.
- The data are not publicly released

The GNSS stations network in Ivory-Coast

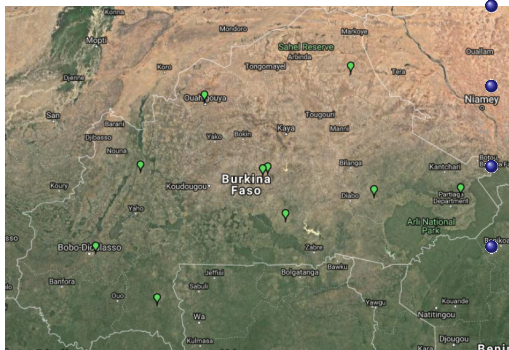
Location	Access	Year	Partners
Abidjan-Cocody	SCINDA	2006	BC/UFHB/CCT-BENETD
Korhogo	Monitor	2017	ESA/UFHB/UGPK
Man	UFHB	2018	UFHB/UMAN
Yakro	IGS	1999	UNAVCO-JPL/CCT-BNETD
Abidjan-Cocody	Not	2014	GLOBEESPACE/CCT-BNETD
Abidjan-Vridi	Not	2015	SEA PORT/CCT-BNETD
Abidjan-Cocody	Not	2018	OXYGEO (PC)
Abidjan-Yopougon	Not	2016	IVOIRTRAVAUX/CCT-BNETD

The station network in Benin



- This network is composed of 7 stations
- Data are stored under RINEX Format
- The data are freely accessible via (www.ign.bj)
- The network is managed by the Institut Géographique National (IGN) of Benin

The station network in Burkina Faso



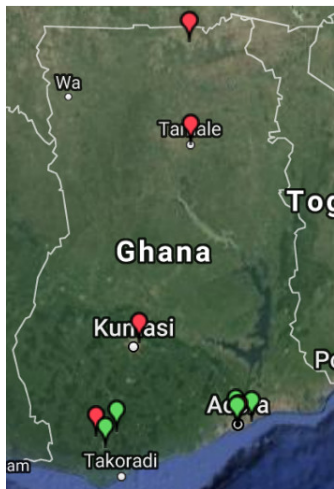
- This network is composed of 9 stations

- Data are stored under RINEX Format

- The data are accessible through an authorization

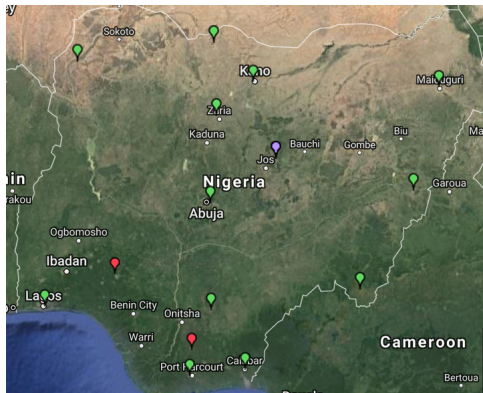
- The network is managed by the Institut Géographique du Burkina

The station network in Ghana



- This network is composed of 9 stations
- Data are stored under RINEX Format
- The data are accessible through an authorization
- The network is owned, maintained and operated by Survey and Mapping Division of Ghana Lands Commission.

The station network in Nigeria



- This network is composed of 15 stations
- Data are stored under RINEX Format
- The data are accessible through an authorization grant by NigNet
- The network is owned, maintained and operated by Presidential Technical Committee on Land Reform and the Office of the Surveyor General of Federation, as part of NigNet

The Competence in Space Sciences in West Africa

- ① BURKINA-FASO
 - University of Kodougou
- ② GHANA
 - University of Accra
 - Ghana Space Agency
- ③ COTE-D'IVOIRE
 - University FHB Cocody
- ④ NIGERIA
 - Space Agency
 - CAR
 - FUTA
 - University of Ilorin
 - University of Lagos

Summary

- Most of this existing network are primarily established for survey and land management purposes
- There is a need to strengthen our link with Surveyors.
- Most of this Networks results from collaboration in the framework of IHY and ISWI
- Keep on collecting data for science education and outreach on space weather
- Extending this Network to other countries in the region for a better coverage
- The creation of a regional network taking into account the objectives of scientist and Surveyors

THANKS FOR YOURS ATTENTION !