

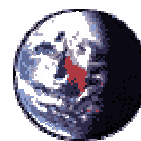
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SLAC
NATIONAL ACCELERATOR LABORATORY



Université Kinshasa



Unité de Physique
appliquée à l'espace



Université



Microsoft
Research



Délégation Générale à la Recherche
Scientifique et technologique



SCHOOL ON SPACE WEATHER GIS, GPS Data Base, Internet and Grid Computing Kinshasa September 11 to 24, 2011

Plan

I.	Introduction	page 2
II.	Committees	page 3
III.	Place of the school and logistic	page 4
IV.	Teachers	page 10
V.	Programme	page 12
VI.	Schedule	page 15
VII.	Participants	page 17
VIII.	Certificate	page 20

This school was financially supported by RDC (75,2%)/ Ministry of Education and Universities of RDC, Ministry of Hydrocarbon and the University of Kinshasa/, the French embassy of Kinshasa (9,45%), MICROSOFT (9,14%), AUF (4,57%) and GIRGEA (1,64%) total cost : 54701€ for 90 participants.

The school took place at the ERAIFT school.

Bruno Kahindo
Coordinator ISWI of RDC
Local scientific secretary

Marcelline Ngomba
Scientific secretary assistant

Christine Amory-Mazaudier
International scientific secretary of the school

I. Introduction

In the framework of the ISWI (International Space Weather Initiative) project colleagues from RDC requested the contribution of International scientists involved in the space weather field and related domains to the training of young scientists from RDC. We proposed and organized a Space Weather school.

The main objective of this school was to increase the level of expertise of the students from RDC in order for them to participate and contribute to international programmes. Then the two important key points of this school are:

- 1) The ability to use already existing data sets and tools related to the Earth's environment by RDC Scientists. There are a lot of existing data on environmental and natural resources and less than 10% of these data are used. Those data, using new technologies, are a source of original scientific work.
- 2) The development and the use, by RDC Scientists, of results connecting Environmental Sciences and sustainable development by using data from instruments ground-based as well as onboard satellites for geophysics, telecommunications, etc...

To reach these objectives the lectures included:

- 1) a scientific part necessary to understand the observations and their data processing, and applications using them in different disciplines;
- 2) an informatics part on the algorithms, their performance and their installation;
- 3) a training part on computer for the use of algorithms and data bases as SPIDR, IRI, IGRF, etc...
- 4) an information part on new technologies in use in this field like Grid, Web services, databases, monitoring of network...
- 5)

To fulfil those objectives in the school we proposed the following topics:

- 1) the network of GPS stations, radars and other tools installed in Egypt and in other place of Africa:
 - a) to study the ionosphere and the impact of the sun on the ionised Earth's environment (IHY International Heliophysical Year and ISWI);
 - b) to study geodesy;
 - c) other application domains;
- 2) the geographic information system (GIS) which allows the management and the visualisation of spatial data in many domains;
- 3) the development of local data bases, the use of existing data bases via internet and the initiation to the new technologies.

II. COMMITTEES

Honorary Committee

Minister of Superior training and Universities (ESU)
Rector of Kinshasa University
General Academic Secretary

Local Committee

Prof. Lubunga Pene Shako – Fac Polytechnic/UNIKIN (President)
Bruno Kahindo – Un. Physics applied tp Space / Fac Polytechnic/UNIKIN (scientific secretary)
Marcelline Ngomba –Fac. of Agronomy/UNIKIN (scientific secretary)
Prof Baudouin Michel -ERAIFT
Prof. Bertin Bagula Chibanvunya- Fac Polytechnic/UNIKIN
Prof. Tozin Rosemond- Fac Polytechnic/UNIKIN
Prof. Jean-Marie Moanda Ndeko- Fac Polytechnic/UNIKIN
Prof. Albert Kazadi Mukenga- Fac of Sciences/UNIKIN
Prof. Jean-Pierre Nzuru Nsekere- Fac Polytechnic/UNIKIN
Muyaya Bruno- ERAIFT

International Committee

Dr Christine Amory-Mazaudier (France) - scientific secretary
Dr Nicolas Bergeot (Belgium)
Prof. Télesphore Brou (France)
Dr Les Cottrell (USA)
Bienvenu Dinga (Congo Brazzaville)
Dr Frédéric Ouattara (Burkina Faso)
Dr Viviane Pierrard (Belgium)
Dr Monique Petitdidier (France)
Dr Mikhael Zhizhin (Russia)

III. Place of the school and logistic

Opening Ceremony : September 12 at 10h



The choral of the University of Kinshasa



Two ministers participating to the opening ceremony

Minister of Education and Universities : Léonard Mashako Mamba

Minister of Hydrocarbon : Célestin Mbuyu kabango

General Academic Secretary : Prosper Kanyankogonte Mpangazehe



Bruno Kahindo : ISWI coordinator for RDC presenting the school activities



Photo at the end of the opening ceremony

Lecture room of the ERAIFT



Rooms for practical work



Room of OSFAC



Room of ERAIFT

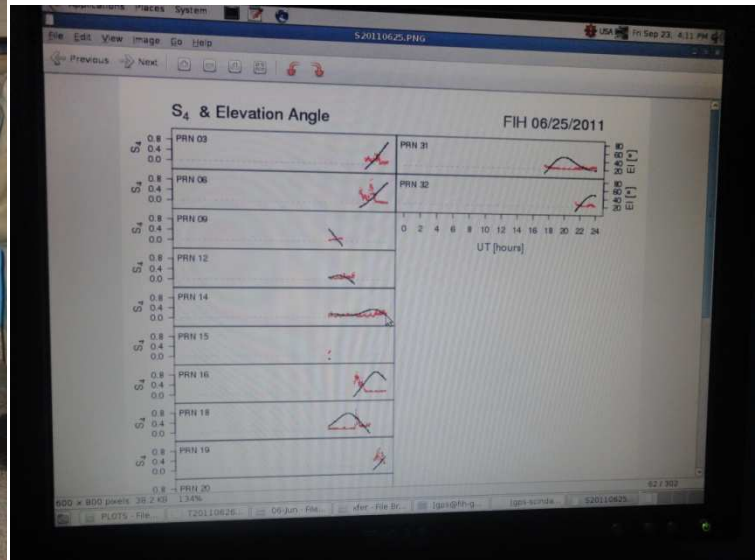
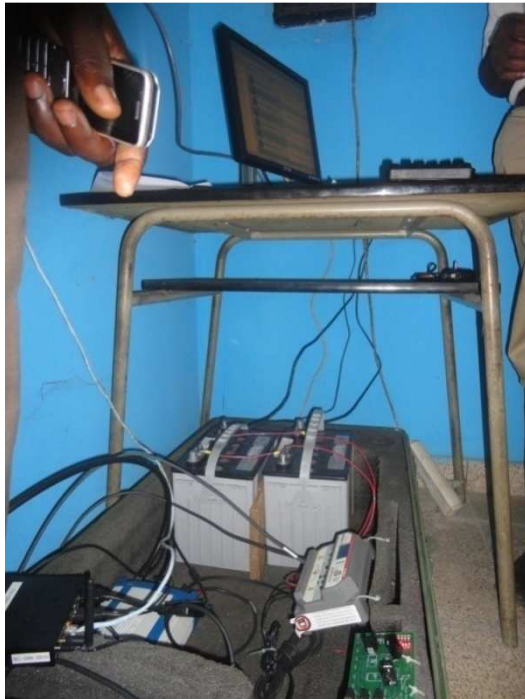
Transport



Lunch



Visit of the Unit of physics applied to Space, Faculty of Engineering
(UNIKIN/Kinshasa) : SCINDA experiment



Day on computer resources at the faculty of pharmacy

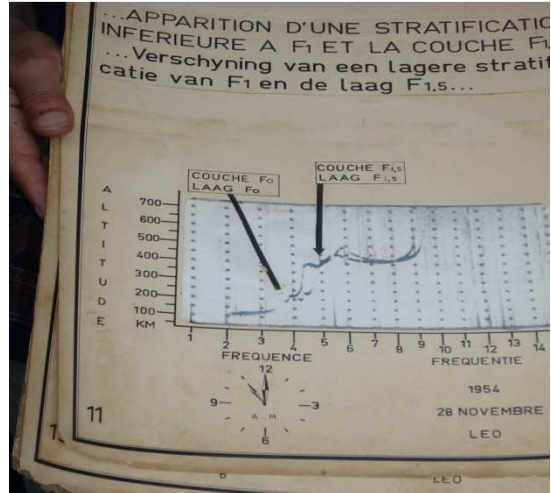


Visit of the observatory near Kinshasa

This observatory was operating during the International Geophysical Year 1957



Papa NDUAZU was working at the observatory in 1957



Ionogramme of November 28, 1954

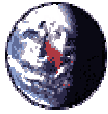


Photo : closing ceremony

All the students received a certificate and the CD of the school

IV. TEACHERS

Burkina Faso, Côte d'Ivoire, France, RC, RDC, Réunion, Russie, USA

AMORY-MAZAUDIER Christine , FRANCE 	Scientific secretary of the school Laboratoire de Physique des Plasmas (LPP) UPMC , 4 Avenue de Neptune 94107 Saint-Maur-des-Fossés, France Christine.amory@lpp.polytechnique.fr
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KAHINDO Bruno, RDC  	Coordinator ISWI of RDC and local scientific secretary Faculty of Kinshasa, Unit of Physics applied to Space, Kinshasa, democratic Republic of Congo (RDC) bkahindo@gmail.com
NGOMBA Marcelline, RDC  	Faculty of Agronomy OSFAC /University of Kinshasa, Democratic Republic of Congo (RDC) ngombalina@yahoo.fr
PETITDIDIER Monique, FRANCE 	LATMOS, Institut Pierre et Simon Laplace , 11 Boulevard d'Alembert, 78280 Guyancout, France monique.petitdidier@latmos.ipsl.fr
OUATTARA Frédéric, BURKINA FASO 	Coordinator ISWI of Burkina Faso Ecole Normale Supérieure, University of Koudougou, BP 376 Koudougou Burkina Faso fojals@yahoo.fr
ZHIZHIN Mikhail , RUSSIA 	Space Research Institute (IKI) Russian Academy of Sciences 84/32 Profsoyuznaya Str., 117997, Moscow, Russia Mikhail.zhizhin@gmail.com

Teachers Team

From left to right : Mikhail, Marcelline, Bienvenue, Bruno, Monique, Les, Frédéric
Télésphore was missing



Guest house for the professors



V. SUMMARY OF THE PROGRAMME

Training on GIS by Prof. BROU Télésphore and NGOMBA Marcelline

- GIS : Geophraphic Information System

Training on a Combination of SIG and GPS, by DINGA Bienvenu

- GPS applied to navigation on the Congo River

Training on internet and mobile computing by Dr COTTRELL Les

1. The Internet Digital Divide: the emergence of Africa, see <http://www.slac.stanford.edu/grp/scs/net/talk11/kinshasa.pptx>
2. Internet History, trends and futures, see <http://www.slac.stanford.edu/grp/scs/net/talk11/internet-history.pptx>
3. How is the Internet performing, see <http://www.slac.stanford.edu/grp/scs/net/talk11/perform.pptx>
4. Cell Phones, see <http://www.slac.stanford.edu/grp/scs/net/talk11/cellphone-work.pptx>
5. Smart phones & other Mobile computing, see <http://www.slac.stanford.edu/grp/scs/net/talk11/smartphones.pptx>
6. Diagnosing network problems for non-networkers, see <http://www.slac.stanford.edu/grp/scs/net/talk11/diagnosis.ppt>

Others

1. Geolocation, see <http://www.slac.stanford.edu/grp/scs/net/talk10/geolocation.pptx>
2. How does the Internet work, see <http://www.slac.stanford.edu/grp/scs/net/talk09/ictip-tcpip.ppt>
3. Network Measurements, see <http://www.slac.stanford.edu/grp/scs/net/talk10/internet-measure.pptx>

Training on SPIDR (Space Physics Interactive Data Ressource) by Dr ZHIZHIN Mikhail

The Space Physics Interactive Data Resource (SPIDR) (<http://spidr.ngdc.noaa.gov>) is a de facto standard data source for solar-terrestrial physics, functioning within the framework of the World Data Center System. It is a distributed database and application server network, built to select, visualize and model historical space weather data. SPIDR can work as a fully-functional web-application (portal) or as a

Grid of web-services, providing functions for other applications to access its data holdings.

The hands-on training included basic course for interaction with the SPIDR web portal as well as in-depth lessons for web service use with SOAP and REST clients (Java, Matlab, IDL), installation and management of a SPIDR node, database architecture, and metadata management in SPIDR Virtual Observatory.

Day on intensive computing by PETITDIDIER Monique & KALENDA Dibungi :

The agenda was divided in 4 parts :

- *Introduction to various compute means:* HPC (High Performance Computing) Grid and cloud
- *Internet network* overview in sub-saharian Africa and in RDC with eb@le (new partner in Ubuntunet) – important to access databases, journals, and for collaboration
- *Compute Resources:* description of the resources available in the digital Campus at AUF, [eb@leGrid](#) presented by RDC computer science students, European Grid (EGI) : important due to new applications ; introduction to parallel computing used in many simulations.
- *Applications:* 4 domains that need a reliable fast internet and compute resources
 - o Earth science and environmental applications ported on the European Grid, EGI
 - o SPIDR that permits to extract data to be included into softwares
 - o Geographical information system applications
 - o Space weather applications based on GPS

Most of the speakers and conveners are from RDC ; the others were professors at the school.. This day gathered more than 100 participants

Training of Dr PIERRARD Viviane on Space Weather made by Dr Christine Amory-Mazaudier and Bruno Kahindo

The Sun

Interplanetary medium

The Interactions between the Sun and the Magnetosphere

Ionosphere and Plasmasphere

Motions of particule in a magnetic field

Neutral Atmosphère (statosphere, toposphere ..)

Effects of the solar radiations

Training of Dr AMORY-MAZAUDIER Christine on The Earth's magnetic field

Transient variations of the Earth's magnetic field associated to the different sources

- Regular source : atmospheric tides
- Irregular source : magnetic storms and all the kind of solar events

Use of the geomagnetic indices to characterize the event

Indices presented : AU,AL, Aa, Dst, Am

Training of KAHINDO Bruno : Tools of the ISWI programme SID et GPS

In the framework of the ISWI (International Space Weather Initiative), different scientific tools were deployed in Africa. The RDC received one SID (Sudden Solar Ionospheric Disturbance) monitor from Stanford University and 2 SCINDA GPS stations from the Boston University. This training presented the tools the data obtained, which are the ionospheric solar flare signature for SID and the Total Electron Content for GPS. The first results are also presented.

Training of Prof. OUATTARA Frédéric : Equatorial Ionosphere and the use of GPS

- Generalities on the Equatorial Ionosphere
- GPS : GNSS
- Systems of measure of Ionosphere
- Use of GPS for the determination of the TEC
- Method to determine the TEC from one stations

VI. SCHEDULE OF THE SPACE WEATHER SCHOOL SEPTEMBER 11-24, 2011

First Week September 12 to 17 : Space Weather, GIS, Data base Internet 34.5h

	Monday 12	Tuesday 13	Wednesday 14	Thursday 15	Friday 16	Saturday 17
9h-10h30	Opening Ceremony	Space Weather Introduction Christine	Space Weather : The sun Bruno	Space Weather GIRGEA Christine	Data Base Mikhaïl	Computer ressources And Grid Monique
10h30-11h00	Coffee Break					
11h00-11h15	GIS Marcelline	Internet Les	Contribution of ERAIFT at the management of natural ressources in Sousaharienne Africa Reinforcement of capacities Prof Baudouin Michel	Internet Les	Internet Les	Computer ressources and Grid Monique
11h15-12h30			Practical work On data base Group of Geopgraphy Mikhail			
12h30-14h00	Lunch					
14h00-15h30	Internet Les	Data base Mikhail	Practical work On data base Group of Physicists Mikhail	Internet Les	Poster session	Computer ressources and Grid Monique
15h30-16h00	Coffee Break					
16h30-17h30	Data Base Mikhail	Data Base Mikhail	Space Weather Christine	Practical work On data base Group of the engineers Mikhail	Poster session	Computer ressources and Grid Monique

Second Week September 19 to 24 GIS, GPS/ GNSS , Ionospheric studies 30h

	Monday 19	Tuesday 20	Wednesday 21	Thursday22	Friday 23	Saturday 24
9h-10h30	GIS Télesphore + Marcelline	Equatorial Ionosphere /GPS Frédéric	Equatorial Ionosphere /GPS Frédéric	GPS/applications Bienvenu	Equatorial Ionosphere /GPS Frédéric	Closing ceremony
10h30-11h00	Coffee Break					
11h00-12h30	GIS T+M	Lecture GIS T+M	Lecture GIS T+M	Lecture GIS T+M	GPS/applications ISWI Instruments SID and GPS Bienvenu+ Bruno	
	Presentation of OSFAC Florence					
12h30-14h00	Lunch					
14h00-15h30	GIS T+M	Practical work GIS T+M+B	Practical work GIS T+M+B	Terrestrial Magnetism Christine	Poster session	
15h30-16h00	Coffee Break					
16h00-17h30	GIS Bienvenu	Practical work GIS T+M+B	Practical work GIS T+M+B	Meeting	Visit of a Laboratory SCINDA GPS Bruno	

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VIII. Le CERTIFICAT de participation



Spécialité Géographie
2011-2012

CERTIFICAT DE PARTICIPATION



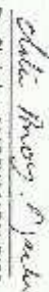
Université de
Kinshasa

L'Université de Kinshasa, en collaboration avec le Groupe International de Géophysique
Europe Afrique (GIRGEA), certifie que

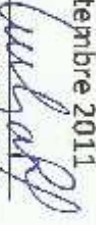
a participé activement, du 12 au 24 septembre 2011, à la première Ecole d'été de Météorologie
de l'Espace : Théories et Utilisation des outils GPS, SIG et Grille de Calcul.
Ce certificat lui est délivré pour faire valoir ce que de droit.



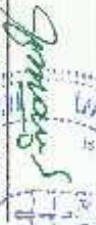
— Bruno KAHINDO MURUYBA
Responsable ISWI et GIRGEA en RDC



Dr. Christine AVOUY MAZALDIER
Secrétaire Scientifique du GIRGEA



Prof. LUBUVEA PELLE SHAKO
Doyen de la Faculté Polytechnique



Prof. LABAÏYA TCHAKA ABAR
Recteur de l'Université de Kinshasa

Fait à Kinshasa, le 24 septembre 2011



Ministère de l'Enseignement Supérieur
et de la Recherche Scientifique



Ministère de l'Environnement
et du Développement Durable



Ministère de l'Intérieur



Ministère de l'Economie
et des Finances



Ministère du Plan



Ministère de l'Agriculture
et de l'Elevage



Ministère de la Santé



Ministère de l'Enseignement
Secondaire



Ministère de la Culture
et du Patrimoine



Ministère des Sports
et de la Recréation



Ministère de l'Enseignement
Supérieur et de la Recherche
Scientifique



Ministère de l'Environnement
et du Développement Durable



Ministère de l'Intérieur



Ministère de l'Economie
et des Finances



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et de l'Elevage



Ministère de la Santé



Ministère de l'Enseignement
Secondaire



Ministère de la Culture
et du Patrimoine



Ministère de l'Enseignement
Supérieur et de la Recherche
Scientifique



Ministère de l'Environnement
et du Développement Durable