



EMI



MENESFCRS of Morocco

**SCHOOL ON SPACE WEATHER**  
 Rabat/Morocco [5-16 December, 2011]  
 Brief report

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Christine Amory-Mazaudier  
 Scientific secretary

Abderrahmane Touzani  
 Director of the CRASTE-LF

Nicole Vilmer  
 President of the French  
 National ISWI Committee

## I. ORGANIZING COMMITTEES

### Local Committee

CRASTE –LF

**Centre Régional Africain des Sciences et Technologies de l'Espace– Langue française**

EMI

**Ecole Mohammadia d'Ingénieurs**



MENESFCRS

**Ministère de l'Education Nationale, de l'Enseignement Supérieur, de la Formation des Cadres  
de la Recherche Scientifique**

### International Scientific Committee

C. Amory-Mazaudier -> scientific secretary

Jean-Luc Attié

Mohammed Bendouida

Karine Bocchialini

Dominique Fontaine

Jean-François Georgis

Samir Kadir

F. Pitout

Serge Soula

Art Richmond

Hamid Touma

Nicole Vilmer

## II. OBJECTIVES

In the framework of the international ISWI (International Space Weather Initiative <http://www.iswi-secretariat.org>), a school on Space Weather was held at Rabat from December 5 to 16, 2011 at the CRASTE-LF.

The main objective of this school was to perform research in the African countries (French Language) in order to permit the participation of many African scientists to International project as ISWI.

The two key points were:

- 1) To learn how to use the existing data sets and the scientific tools related to space weather.
- 2) To use the data recorded in Africa since several years by the instruments deployed in the framework of international project as International Heliophysical Year (IHY 2005-2009) and still deploy in the framework of ISWI. **At that time less than 10% of the data sets recorded in data bases are used**
- 3) To combine data from satellites to ground data to develop a sustainable research on Space weather in the African countries ( *for example to use the GPS data for Geophysics studies, navigation ...*)

To reach these objectives the training included:

- 1) A scientific part to understand the data and all the informations extracted from the data useful for space weather applications
- 2) Practical work on computers to use the data from existing data base SOHO, SPIDR, IGS1; IGRF etc...

The scientific part concerned:

- 1) The knowledge on the impacts of solar activity and solar events on the Earth's environment : magnetosphere ionosphere atmosphere,
  - a. Knowledge on the recent discoveries concerning the sun,
  - b. Study of the impact of the sun on the Ionized layers around the earth,
  - c. Understanding of the sun impacts on the terrestrial atmosphere,
  - d. Understanding of the use of tools as GPS for applications other than scientific applications as for example navigation.
- 2) The use of existing data in the different data bases (old data) and the new data recorded with the instruments deployed in the framework of International projects.

**This school had for main object to develop the data analysis in Africa and therefore to have benefit of all the scientific projects base of the deployment of scientific instruments in Africa as IHY (International Heliophysical Year) or ISWI (International Space Weather Initiative) etc...**

#### IV. PROFESSORS

1 <sup>ère</sup> week 5-10 December		
	NAME	LABORATORY
1	BOCCHIALINI Karine <a href="mailto:Karine.bocchialini@ias.u-psud.fr">Karine.bocchialini@ias.u-psud.fr</a>	Institut d'Astrophysique Spatiale Bât 121 Université Paris 11, 91405 Orsay cedex, France
2	FONTAINE Dominique <a href="mailto:Dominique.fontaine@lpp.polytechnique.fr">Dominique.fontaine@lpp.polytechnique.fr</a>	Laboratoire de Physique des Plasmas (LPP) Ecole Polytechnique, Route de Saclay 91128 Palaiseau cedex, France
3	HILGERS Alain <a href="mailto:Alain.Hilgers@esa.int">Alain.Hilgers@esa.int</a>	ESTEC Keplerlaan, 1, PO Box 299, 2201 AZ, Noordwijk, Pays Bas
4	KLEIN Karl-Ludwig <a href="mailto:Ludwig.klein@obspm.fr">Ludwig.klein@obspm.fr</a>	Observatoire de Paris 5 Place J. Jansen 92195 Meudon, France
5	PITOUT Frédéric <a href="mailto:frederic.pitout@cesr.fr">frederic.pitout@cesr.fr</a>	Institut de Recherche en Astrophysique et Planétologie (IRAP) 9 avenue du Colonel Roche BP44346 Toulouse cedex 4, France
6	VILMER Nicole <a href="mailto:Nicole.vilmer@obspm.fr">Nicole.vilmer@obspm.fr</a>	LESIA Observatoire de Paris 5 Place J. Jansen 92195 Meudon, France
2 <sup>nd</sup> week 12-16 December		
1	AMORY-MAZAUDIER Christine <a href="mailto:Christine.amory@lpp.polytechnique.fr">Christine.amory@lpp.polytechnique.fr</a>	Laboratoire de Physique des Plasmas (LPP) Polytechnique UPMC, 4 Avenue de Neptune 94107 Saint-Maur-des-Fossés, France
2	BLANC Elisabeth <a href="mailto:Elisabeth.blanc@cea.fr">Elisabeth.blanc@cea.fr</a>	CEA/ Département d'analyse et de suivi de l'environnement, Bruyères le Chatel, 91297 Arpajon cedex, France
3	GEORGIS Jean-François <a href="mailto:geojf@aero.obs-mip.fr">geojf@aero.obs-mip.fr</a>	Université Paul Sabatier Observatoire Midi Pyrénées Laboratoire d'Aérodologie, 14 avenue Belin 31400 Toulouse, France
4	RICHMOND Art <a href="mailto:richmond@ucar.edu">richmond@ucar.edu</a>	National Center for Atmospheric Research, High Altitude Observatory, Boulder, CO 80301, USA
5.	OUATTARA Frédéric <a href="mailto:fojals@yahoo.fr">fojals@yahoo.fr</a>	Université de Koudougou/Burkina Faso he will work at NCAR/HAO in 2012
6.	SOULA Serge <a href="mailto:sous@aero.obs-mip.fr">sous@aero.obs-mip.fr</a>	Observatoire Midi Pyrénées Laboratoire d'Aérodologie, 14 avenue Belin 31400 Toulouse, France

## V.TRAINING

PROGRAMME		
1 <sup>st</sup> week 5-10 December		
1	BOCCHIALINI Karine <a href="mailto:Karine.bocchialini@ias.u-psud.fr">Karine.bocchialini@ias.u-psud.fr</a>	Sun : General presentation
2	FONTAINE Dominique <a href="mailto:Dominique.fontaine@lpp.polytechnique.fr">Dominique.fontaine@lpp.polytechnique.fr</a>	The magnetosphere
3	HILGERS Alain <a href="mailto:Alain.Hilgers@esa.int">Alain.Hilgers@esa.int</a>	Space Weather : the effects
4	KLEIN Karl-Ludwig <a href="mailto:Ludwig.klein@obspm.fr">Ludwig.klein@obspm.fr</a>	Sun : Radio observations
5	PITOUT Frédéric <a href="mailto:frederic.pitout@cesr.fr">frederic.pitout@cesr.fr</a>	Ionosphere : magnetic storms
6	VILMER Nicole <a href="mailto:Nicole.vilmer@obspm.fr">Nicole.vilmer@obspm.fr</a>	Sun : solar activity
2 <sup>nd</sup> week 12 -16 December		
1	AMORY-MAZAUDIER Christine <a href="mailto:Christine.amory@lpp.polytechnique.fr">Christine.amory@lpp.polytechnique.fr</a>	The transient variations of the terrestrial magnetic field
2	BLANC Elisabeth <a href="mailto:Elisabeth.blanc@cea.fr">Elisabeth.blanc@cea.fr</a>	Atmosphere : dynamics and perturbations
3	GEORGIS Jean-François <a href="mailto:geojf@aero.obs-mip.fr">geojf@aero.obs-mip.fr</a>	Radiometry of the atmosphere
4	OUATTARA <a href="mailto:fojals@yahoo.fr">fojals@yahoo.fr</a>	GNSS: Use of GPS to study the equatorial ionosphere
5	RICHMOND Art <a href="mailto:richmond@ucar.edu">richmond@ucar.edu</a>	Ionosphere : Electrodynamics
6	SOULA Serge <a href="mailto:sous@aero.obs-mip.fr">sous@aero.obs-mip.fr</a>	Atmospheric electricity

## V. PARTICIPANTS

There were 28 participants from 11 African countries supervised by 12 professors (see list above): see below the list of the participants and on the next page the map with the countries of all the participants.

Participants		
	NOM	Pays
1	ACKAH Jean Baptiste <a href="mailto:jeanbaptisteackah@yahoo.fr">jeanbaptisteackah@yahoo.fr</a>	Côte d'Ivoire
2	ADECHINAN Adebisi Joseph <a href="mailto:adechinanjoseph@yahoo.fr">adechinanjoseph@yahoo.fr</a>	Benin
3	ANAD Fatma <a href="mailto:f_anad@yahoo.fr">f_anad@yahoo.fr</a>	Algeria
4	AZZOUZI Ilyasse <a href="mailto:ilyasse.azzouzi@gmail.com">ilyasse.azzouzi@gmail.com</a>	Morocco
5	BARRO Fabé Idrissa <a href="mailto:Fabe.barro@ucad.edu.sn">Fabe.barro@ucad.edu.sn</a>	Senegal
6	BENGHANEM Karima <a href="mailto:kbenghanem@yahoo.fr">kbenghanem@yahoo.fr</a>	Algeria
7	DAASSOU Ahmed <a href="mailto:Daassoul@yahoo.fr">Daassoul@yahoo.fr</a>	Morocco
8	ENOW Richard Agbor <a href="mailto:enow_r@yahoo.fr">enow_r@yahoo.fr</a>	Cameroon
9	GAYE Idrissa <a href="mailto:idrissagaye3@hotmail.com">idrissagaye3@hotmail.com</a>	Senegal
10	GRODJI Franck <a href="mailto:franckgrodj@yahoo.fr">franckgrodj@yahoo.fr</a>	Côte d'Ivoire
11	GUEMENE DOUNTIO Emmanuel <a href="mailto:eguemene@yahoo.com">eguemene@yahoo.com</a>	Cameroon
12	HOUNGNINOU Bodoun Etienne <a href="mailto:houngb@yahoo.fr">houngb@yahoo.fr</a>	Benin
13	KAFANDO Pétronille <a href="mailto:kafandopetronille@yahoo.fr">kafandopetronille@yahoo.fr</a>	Burkina Faso
14	KAHINDO Bruno <a href="mailto:bkahindo@gmail.com">bkahindo@gmail.com</a>	RDC
15	KASMI Atika <a href="mailto:kasmiatika@gmail.com">kasmiatika@gmail.com</a>	Morocco
16	KOUASSI Komenan Benjamin <a href="mailto:benjamin.kouassi@gmail.com">benjamin.kouassi@gmail.com</a>	Côte d'Ivoire
17	MADOUGOU Saïdou <a href="mailto:nassara01@yahoo.fr">nassara01@yahoo.fr</a>	Niger
18	MBANE César <a href="mailto:cesar.mbane@yahoo.fr">cesar.mbane@yahoo.fr</a>	Cameroon
19	MALKI Khalifa <a href="mailto:mkprocedure111@gmail.com">mkprocedure111@gmail.com</a>	Morocco
20	NDOMBI TSHISUNGU Christian <a href="mailto:chris_ndombi@yahoo.fr">chris_ndombi@yahoo.fr</a>	RDC
21	OUATTARA Frédéric <a href="mailto:fojals@yahoo.fr">fojals@yahoo.fr</a>	Burkina Faso
22	RANDRIANARINOSY Fanomezana <a href="mailto:fano.rn@gmail.com">fano.rn@gmail.com</a>	Madagascar
23	SIDI CHEIKH Mohamed Ahmed <a href="mailto:ouldsidicheikh@yahoo.fr">ouldsidicheikh@yahoo.fr</a>	Mauritania
24	TANOÛ Serge <a href="mailto:Serge.koua@yahoo.fr">Serge.koua@yahoo.fr</a>	Côte d'Ivoire
25	TIERMONDO LONGANDJO Georges <a href="mailto:georgesnoeltiers@yahoo.fr">georgesnoeltiers@yahoo.fr</a>	RDC
26	ZAOURAR Naima <a href="mailto:naimazaourar@gmail.com">naimazaourar@gmail.com</a>	Algeria
27	ZERBO Jean-Louis <a href="mailto:Jeanlouis.zerbo@gmail.com">Jeanlouis.zerbo@gmail.com</a>	Burkina Faso
28	ZOUNDI Christian <a href="mailto:zounchr@yahoo.fr">zounchr@yahoo.fr</a>	Burkina Faso



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Department of Peacekeeping Operations  
Cartographic Section



## VI. SPONSORS

This school was financially supported by

French Institutions

**CNES:** Centre National d'Etudes Spatiales

**French Embassy** in Algeria,

**French Embassy** in Côte d'Ivoire,

**French Embassy** in Morocco,

**CEA:** Commissariat à l'Energie Atomique,

**NASA:** Spatial US Agency,

**ICG/UN-OOSA:** International Committee of GNSS - Office for Outer Space Affairs of United Nations,

**CRASTE-LF:** African Regional Centre of Space Sciences and Technology Education in French Language,

**EMI:** Ecole Mohammadia d'Ingénieurs,

**ISESCO:** Islamic Education Sciences and Culture Organization,

**RDC :** Republic Democratic Congo

**Cost : 47405,49€**

	French Institutions	NASA	ICG/UN-OOSA	CRASTE-LF	ISESCO +RDC
Transport	10479,67€	2464€	7375,44€	0€	1244€
Accommodation + meals	8182,93€	11618€	0€	458€	0€
Rooms	0€	0€	0€	6041,45€	0€
Total	18662,93€	14082€	7375,44€	5970,51€	1244€
Percentage	39,36%	29,7%	15,55%	12,74%	2,62%

1 € -> 1,33\$

1 € -> 11,06 DH



VII.PHOTOS

Photo: 1<sup>st</sup> week



Photos : 2<sup>nd</sup> week



## Lecture room



## Computer room

