****
* ISWI Newsletter - Vol. 17 No. 001 6 Jan 2025 *
* Editor: George Maeda, georgemaeda3[at]gmail.com
* Archive of back issues: ISWI Website https://iswi-secretariat.org/
* Send subscription request to: iswisupport@bc.edu
****

Dear ISWI Newsletter Subscriber:

The December 2024 issue of this newsletter was never issued to due various factors.

This issue is the January 2025 issue of the ISWI Newsletter.
It is the start of Volume 17. Volume 01 goes back to the year 2009.

Please be sure to read the first item of this issue: The annual end-of-year (or start-of-year) message from the ISWI Executive Director, Dr. Nat Gopalswamy. It is dated 30 December 2024. The message mentions things that have occurred in 2024 -- and things that we can expect looking forward.

ISWI is alive and well -- so in 2025 please continue to send in to me anything related to space weather!

Also, this is mentioned in Nat's message, but please be aware that (as usual) the annual **ISWI Steering Committee** meeting will take place in Vienna on 7 Feb 2025. If you are in Vienna for COPUOS or something else, please consider attending this meeting. The meeting agenda is inside Nat's message at the end.

To view this newsletter with all attachments, please go here:
https://iswi-secretariat.org/
and click on "NEWSLETTERS". The email version of the newsletter does not have attachments.

This year encourage your space weather friends and colleagues to subscribe to this newsletter. Just write to the email address shown above.

Cordially,
George Maeda
Editor of the ISWI Newsletter, since 2009.

CONTENTS OF THIS ISSUE:

. 10-14 June 2024; Neustrelitz, Germany; a photo report.

[04] Two new members of the ISWI Data Subcommittee

[05] 2024 Photo Report on **ISWI School in Nepal**; by Dr. Rezy Pradipta

[06] REPORT: SPACE WEATHER SUMMER SCHOOL: Physics and use of tools;
. October 14-25 2024 Conakry, Guinea.

[07] Seasonal Message from the AGS, African Geophysical Society.

[08] Total number of solar radio bursts observed in 2024
. within the ISWI instrument network e-Calisto

[09] *Open Cosmos* to Build 3 Satellites for ESA to Monitor
. Earth's Magnetic Field; by Rachel Jewett | December 2, 2024

[10] Parker Solar Probe Makes History With Closest Pass to the Sun;
. News from the *John Hopkins Applied Physics Lab, Laurel, Maryland.*

****

[01]----------

ANNUAL MESSAGE FROM THE ISWI EXECUTIVE DIRECTOR TO ALL ISWI MEMBERS

Please see this file:
Dear Colleagues (30 DEC 2024).pdf
001

[02]----------

JAPANESE ARTICLE ABOUT PSP FROM JULY 2018 （日本経済新聞）
Back in 2018 there was already substantial interest in this historic mission to explore the Sun.

Please see this file:
Parker Solar Probe; 01-July-2018; in Japanese.pdf
002

[03]----------

United Nations/Germany Workshop on the International Space
Weather Initiative: Preparing for the Solar Maximum;
10-14 June 2024; Neustrelitz,Germany; a photo report by Maeda and Ranasinghe.

Please see this file:
ISWI Germany - June 2024 - Photo Report.pdf

003

[04]----------

FROM: Fung, Shing F. (NASA; GSFC-6750)
TO: Editor, ISWI Newsletter
DATE: 3 Dec 2024

Dear George,
Please post the following message to the next ISWI Newsletter.
Thanks, Shing

The ISWI Data Subcommittee (see current members at
https://iswi-secretariat.org/home-page/organization/steering-committee/)
welcomes two new subcommittee members:

[1] Dr. Yenca Migoya-Orue from the ICTP
(https://www.ictp.it/member/yenca-olivia-migoya-orue#biography)
and
[2] Dr. Kirolosse Girgis from the Kyushu University
(https://hyoka.ofc.kyushu-u.ac.jp/html/100024501_en.html).

[05]----------

2024 Photo Report on ISWI School in Nepal; by Dr. Rezy Pradipta
(Boston College, Institute for Scientific Research, Newton, MA, USA)

Please see this file:
nepal-iswi-2024-photo-report.pdf
004

[06]----------

REPORT: SPACE WEATHER SUMMER SCHOOL: Physics and use of tools;
October 14-25 2024 Conakry, Guinea. Submitted by Dr C. Amory.

Please see this file:
GUINEA_2024-report_total.pdf
005

[07]----------

Seasonal Message from the AGS, African Geophysical Society

Please see this file:

AGS greetings.pdf
006

[08]----------

Total number of solar radio bursts observed in 2024 within the ISWI instrument network e-Calisto

Please see this file:
CALLISTO NEWS of 31-DEC-2024.pdf
007

[09]----------

VIA SATELLITE MAGAZINE
Open Cosmos to Build 3 Satellites for ESA to Monitor Earth's Magnetic Field
By Rachel Jewett | December 2, 2024

Open Cosmos won a 35 million euro ($37 million) contract from the European Space Agency (ESA) to build three satellites to monitor Earth's magnetic field in the NanoMagSat mission. The first satellite is expected to launch by late 2027 with the second and third to follow.

Open Cosmos will serve as the prime contractor and satellite manufacturer. CEA-Léti in France will contribute the payload development and magnetometer manufacturer and Comet Aerospace in Spain will deliver the deployable boom and optical bench. NanoMagSat is part of ESA's Scout framework, a small satellite component of the ESA Earth Observation FutureEO program.

See the full article here:
https://www.satellitetoday.com/imagery-and-sensing/2024/12/02/open-cosmos-to-build-3-satellites-for-esa-to-monitor-earths-magnetic-field/?utm_source=Via+Satellite+Email&utm_medium=email&utm_campaign=DNF+Email&oly_enc_id=1850A1927423E4F

[10]----------

Parker Solar Probe Makes History With Closest Pass to the Sun

.....Dec 27, 2024

BY: Michael Buckley and Mara Johnson-Groh

NASA's mission to "touch" the Sun has confirmed that it survived its record-breaking closest approach to the Sun's surface on Dec. 24.

Breaking its previous record by flying just 3.8 million miles (around 6.1 million kilometers) above the surface of the Sun, NASA's Parker

Solar Probe hurtled through the solar atmosphere at a blazing 430,000 miles per hour (692,000 kilometers per hour) — faster than any human-made object has ever moved. A beacon tone, received in the mission operations center at the Johns Hopkins Applied Physics Laboratory (APL) late on Dec. 26, confirmed the spacecraft had made it through the encounter safely and is operating normally. APL designed, built and operates the spacecraft from its campus in Laurel, Maryland.

"Getting this close to the Sun is a historic moment in our quest to uncover the mysteries of our nearest star," said Nicky Fox, associate administrator for NASA's Science Mission Directorate. "By studying the Sun up close, we can better understand its impacts throughout our solar system, including on the technology we use daily on Earth, as well as learn about the workings of stars across the universe."

"This accomplishment is a testament to the dedication and innovative spirit of the entire Parker Solar Probe team," said APL Director Ralph Semmel. "Their incredible technological breakthroughs enabled this amazing mission, and they have delivered **critical new insights that are revolutionizing our understanding of heliophysics and space weather."**

READ THE ENTIRE ARTICLE HERE:
https://www.jhuapl.edu/news/news-releases/241227-parker-closest-approach

**********[End of this issue of the ISWI Newsletter]**********

Dear Colleagues,

Season's Greetings!

Hope you have plans for having good times during the holidays after an extraordinarily productive 2024, working hard, doing more research, and spreading the acquired knowledge to the space weather community. It is an exciting time for the space weather community because the Parker Solar Probe (PSP) touched the source of space weather – the solar corona. Last Tuesday, PSP passed through the Sun's atmosphere to get within about 6 million kilometers of the solar surface, marking the closest approach to the Sun in space history.

This year's activities started with an ISWI instrument/poster exhibit in the rotunda of the Vienna International Center in February during the UNCOPUOS/STSC session. It was great to see instruments displayed and posters presented from a large number of national coordinators.

This UN/Germany workshop on ISWI was held in Neustrelitz, Germany during June 10-14, 2024. It was well organized by the German team and the international scientific organizing committee. We had invited talks by international experts, contributed talks, and poster presentations. There were also interesting field trips during the workshop, including a trip to the radio observatory of DLR nearby that hosts instruments from the ISWI network (CALLISTO). We had the UNOOSA director, mayor of Neustrelitz, government officials, and the scientific leaders of DLR attending the inaugural session of the workshop. A key highlight of the workshop is that the papers presented at the workshop will be published in open-access proceedings by Springer. Most of the manuscripts have been accepted. The book is expected to come out soon.

ISWI supported the COSPAR capacity building workshop (CBW) hosted by the Samarkand State University (SamSU) during August 16-30, 2024. The CBW involved lectures during the first week followed by data analysis during the second week. During the workshop, A CALLISTO instrument was installed with the help of engineers from SamSU. A large CME-related type II radio burst was observed during the workshop. A field trip was arranged to the radio telescope installation.

The 2024 ISWI School on Space Science was organized in Kathmandu in collaboration with the Harvard Smithsonian Center for Astrophysics and Nepal Physical Society. There were lectures covered all aspects of space weather science from solar interior to Earth's surface. International experts gave lectures in the morning and conducted hands-on activities in the afternoons. About 40 students (domestic and international combined) attended the school. Participants had the opportunity to enjoy the rich culture of Nepal.

We had an incredible set of ISWI webinars organized during this year. The recordings are now hosted by NASA/GSFC's CDAW Data Center. Please feel free to download them and spread them to the community: https://cdaw.gsfc.nasa.gov/webinars/ISWI/

We are excited that the next two UN/ISWI workshops are being organized in Nigeria (2025) and South Korea (2026). Stay tuned for more information.

Our important annual organizational event is the ISWI Steering Committee meeting, which will be held on February 7, 2025. This meeting provides an excellent opportunity for the national coordinators to advertise their space weather activities such as instrument hosting, national meetings, and research highlights. The meeting agenda is provided in the annexure. Please feel free to suggest modifications.

I would like all of you to think about the exciting opportunity that the 25th anniversary of the International Heliophysical Year (IHY) provides. I would like to organize a brainstorming session during the ISWI steering committee to discuss how we can make use of the opportunity to advance our field and what activities to undertake. I would like to form a committee consisting of early career/mid-career space weather scientists to plan for the IHY 25th anniversary. Please suggest names and send in your ideas.

Warm regards,

Nat Gopalswamy

2024 December 30.

Annexure I

ISWI Steering Committee Meeting: Tentative Agenda

February 7, 2025 9 am to 6 pm

Vienna International Center

Vienna, Austria

1. Introduction & Report (Nat Gopalswamy, Chair)
2. Secretariat Update (Nat Gopalswamy, Kathleen Kramer, George Maeda, Graciela Molina)
3. Steering Committee Update (Nat Gopalswamy)
4. SCOSTEP/PRESTO/COURSE (Kazuo Shiokawa)
5. UN/Germany ISWI Workshop report (Daniela Banys)
6. ISWI/Nepal School report (Nishu Karna)
7. ISWI/NOAA Report (Elsayed Talat)
8. COSPAR Space Weather Roadmap and ISWAT activities (Mario Bisi)
9. UNOOSA Report (Sharafat Gadimova)
10. Reports from ISWI Regional & National Coordinators (lead: Christine Amory)
11. ISWI Instruments Update (Shing Fung and Instrument PIs); Data subcommittee report
12. ISWI/NASA report (M. Guhathakurta)
13. Discussion on IHY+25
14. Any other business

米衛星「太陽に触れる」旅

太陽は地球から最も近い恒星だ。光り輝き熱いため、近くに寄って詳しく観測できなかった。その壁を打ち破ろうと米航空宇宙局（NASA）が8月、新たな観測衛星を打ち上げる。太陽を取り巻く高温のガス、コロナの中に初めて入る。地球に大きな影響を及ぼす太陽風の発生する仕組みや、コロナが太陽本体よりも高温になる謎の解明に挑む。

この衛星は、「パーカー・ソーラープローブ」という。NASAは「太陽に触れる」とうたい文句を掲げる。計画では、8月4日に打ち上げ、途中にある金星の重力を利用して太陽に接近する。2024年に太陽に約600万キロメートルまで近づく軌道に入る。600万キロメートルは太陽を取り巻くコロナと呼ばれるプラズマガスの中まで入り込む距離だ。

これまで最も太陽に近づいた衛星は、米国と旧西独が協力して1976年に打ち上げた「ヘリオス2」で、距離は約4300万キロメートルだった。太陽に最も近い水星の内側に入る軌道に乗ったが、今回はさらにこの7分の1以下の距離まで接近する。

パーカー・ソーラープローブの大きな目的は、太陽を取り巻く高温のコロナの謎に迫ることだ。太陽表面の絶対温度は約6000度。コロナは100万度もの高温になる。なぜこれほど高温になるのか、その仕組みはまだはっきりしていない。

さらにコロナからプラズマガスなどが噴き出す太陽風が、どのようにして起きるかを詳しく調べる。高速の太陽風や太陽表面の爆発などで突発的に起きる「コロナ質量放出」が地球を直撃すると、オーロラなどを発生させるとともに通信や電子機器の障害、大規模な停電などを引き起こす恐れがある。発生の機構や高速に加速される仕組みを突き止め、発生を予測し対策を準備できるようにする。

太陽から600万キロメートルの距離は、太陽の半径（約70万キロメートル）の約9倍に当たる。太陽風は太陽半径の約10倍の距離のコロナの中で加速されて噴き出している。国立天文台の一本潔教授は「コロナの磁場やプラズマの粒子の種類などを直接観測できる」と期待を寄せる。

これまでの太陽の観測は、地上の望遠鏡や地球の近くにある観測衛星を活用した例がほとんどだ。太陽本体がとても明るく、太陽表面から太陽半径の2倍程度の範囲の詳しい観測は難しかった。

コロナの加熱には色々な仮説がある。太陽表面に生じた磁場などが作用しているとか太陽表面で小さな爆発が多数起きて加熱しているなどが議

日本経済新聞　サイエンス 22　2018年（平成30年）7月1日（日曜日）

コロナや太陽風の謎に迫る

パーカー・ソーラープローブはコロナの中まで入り込む

2018年8月4日
打ち上げ（予定）

2024年
太陽に最接近

太陽探査の主な衛星

- 1960年 **パイオニア5号（米）** 地球と金星の間で太陽風の粒子や磁場などを観測
- 1976 **ヘリオス2号（米、西独）** 水星軌道の内側に入り、太陽風や太陽表面の活動を観測
- 1990 **ユリシーズ（米、欧）** 太陽の北極と南極を観測
- 1995 **SOHO（米、欧）** 地球軌道上で太陽風や太陽表面の活動を観測
- 2006 **ひので（日）** 地球を回る軌道から太陽表面やコロナを観測
- 2010 **SDO（米）** 地球を回る軌道から太陽大気などを観測

グラフィックス 佐藤季司

2/3

論されている。磁場による加熱説では「アルフベン波」と呼ばれる特殊な波が関係していると考えられている。太陽風を加速する過程でアルフベン波は音波に変わることも理論的に分かっている。東京大学の鈴木建教授は「磁気波動と音波が観測できれば、コロナ加熱や太陽風の加速の仕組みがかなりはっきりする」と説明する。

こうした観測のためパーカー・ソーラープローブは、プラズマなど太陽をとりまく様々な粒子を調べる装置や、太陽やコロナを撮影する広視野角のカメラを搭載する。様々な機器が故障しないよう、耐熱性の高い炭素複合材でできた大きな防護板も取り付けた。この板を太陽に向けて広げ、太陽から放射されている強烈な熱を防ぎ、観測衛星を高熱から守る。

太陽に極めて近い距離に到達すると、太陽風が発生したとき太陽の全体像をとらえることが逆に難しくなる。連携して太陽の全体像を調べる観測衛星も欧州や日本で計画されている。

一つは、欧州宇宙機関（ESA）がNASAと協力して今年10月にも打ち上げる「ソーラー・オービター」だ。軌道に特色があり、これまでの観測衛星からは見えなかった太陽の南極や北極の様子を詳しく観測できる。

日本は、紫外線を利用する観測衛星の構想を練っている。現在、太陽観測衛星「ひので」が活躍している。新たな衛星はその10倍の高解像度をもつ。一本教授は「順調にいけば、24年にも打ち上げられるのでは」と話す。

軌道の違う欧州と日本の衛星が連携すれば、太陽の全体像を立体的にとらえられる。パーカー・ソーラープローブの観測データと組み合わせ、様々な角度から太陽の活動を分析できる。

夜空を見上げると、輝く星々が目に入ってくる。恒星はたくさんあるが、直接観測できるのは、太陽だけだ。恒星の研究は天文学の重要なテーマで、パーカー・ソーラープローブによる観測は、大きな前進をもたらしそうだ。

（編集委員　小玉祥司）

キーワード

太陽風

高温のプラズマガス

太陽を取り巻くコロナから宇宙へと流れ出している高温のプラズマガスの流れのこと。1958年に米国の天文学者、ユージン・パーカーが理論的に予想し、命名した。米航空宇宙局（NASA）が打ち上げる観測衛星の名称は、この天文学者の名にちなんでいる。

太陽から噴き出す太陽風の量は、毎秒100万～200万トンに達すると見積もられている。速度によって低速タイプと高速タイプに分けられ、高速のものは秒速800キロメートルにも達する。

また、フレアと呼ばれる太陽表面の爆発などをきっかけに大量のプラズマが突発的に噴き出すことがあり、コロナ質量放出と呼ばれる。噴き出すプラズマの量は10億トンにのぼることもある。

3/3

United Nations/Germany Workshop on the International Space Weather Initiative:

Preparing for the Solar Maximum

10 - 14 June 2024
Neustrelitz, Germany

003

https://www.unoosa.org/oosa/en/ourwork/psa/schedule/2024/2024-iswi-workshop.html

A 12-page photo report by

G. Maeda (editor of the *ISWI Newsletter*) and
Manjula Ranasinghe (researcher in Sri Lanka)

3 December 2024

UNITED NATIONS
Office for Outer Space Affairs

INFORMATION NOTE

United Nations/Germany Workshop on the International Space Weather Initiative: *Preparing for the Solar Maximum*

Organized by
the United Nations Office for Outer Space Affairs (UNOOSA)

Supported by
the German Aerospace Centre (DLR)

Sponsored by
the International Committee on Global Navigation Satellite Systems (ICG)

Neustrelitz, Germany

10 – 14 June 2024

←This 4-page document was issued before the workshop took place. Nevertheless, it contains useful background info regarding the event.

https://www.unoosa.org/documents/pdf/psa/activities/2024/ISWI2024/InfoNote_ISWI_2024_v.1.1.pdf

Workshop took place at *Park Hotel Fasanerie*, Karbe-Wagner-Straße 59, D-17235 Neustrelitz, Germany

Monument of a Grand Duke in castle garden Neustrelitz.

← Palace Church, Neustrelitz.
This building was constructed in the 18th century.

Aarti HOLLA-MAINI, United Nations Office for Outer Space Affairs (UNOOSA)

Holger WANDSLEB, State Authority in Science and Research, Germany

Andreas GRUND, Mayor of Neustrelitz, Germany


KSWC Supporting Spacecraft Launch
New Launch of KSLV(Korea Space Launch Vehicle) – May 23, 2023
RAPPORTEUR


Summary & Conclusions
ISWI

Programme Committee Co-chairs (left to right)

Natchimuthukonar Gopalswamy (NASA, United States of America)

Sharafat Gadimova (United Nations Office for Outer Space Affairs [UNOOSA], Austria)

Daniela Banyś (German Aerospace Center - DLR e.V, Germany)


Sources of Solar Energetic Particles
RAPPORTEUR
CHAIR
INTERNATIONAL SPACE WEATHER INITIATIVE
ISWI

One group of participants gathered in the **Orangery Garden**, a beautiful historical park on the grounds of **Neustrelitz Palace**, before dinner at the Orangeries on June 11th, 2024.

The garden was originally designed in the 18th century; the garden provided a peaceful setting for guests to enjoy before the evening meal.

Group of participants at the workshop venue, Park Hotel in Neustrelitz, Germany.

I am Manjula Ranasinghe, a PhD student at the University of Colombo, Sri Lanka. The workshop was exceptionally well-organized, combining educational sessions with engaging entertainment. It brought together leading scientists in the field, providing an invaluable opportunity to engage in discussions and receive insightful feedback.

The workshop featured a diverse range of talks, covering various areas of research, which allowed me to gain extensive knowledge. The topics were thoughtfully arranged, and the session schedule was logical and easy to follow. Numerous presentations showcased cutting-edge research, making it an excellent platform to stay informed about the latest advancements in the field.

The hospitality was outstanding, and I believe everyone had a wonderful experience, just as I did. The workshop not only enhanced my knowledge but also offered an excellent opportunity to expand my professional network.

END OF PHOTO REPORT

United Nations/Germany Workshop on the International Space Weather Initiative:

Preparing for the Solar Maximum

10 - 14 June 2024

Neustrelitz, Germany

004

Photo Report on ISWI School

2024 in Nepal

by Dr. Rezy Pradipta

Boston College, ISR

Submitted to the
ISWI Newsletter on
7 December 2024

International Space Weather Initiative (ISWI) School on Space Science 2024:

From the Sun's Interior to the end of the Heliosphere

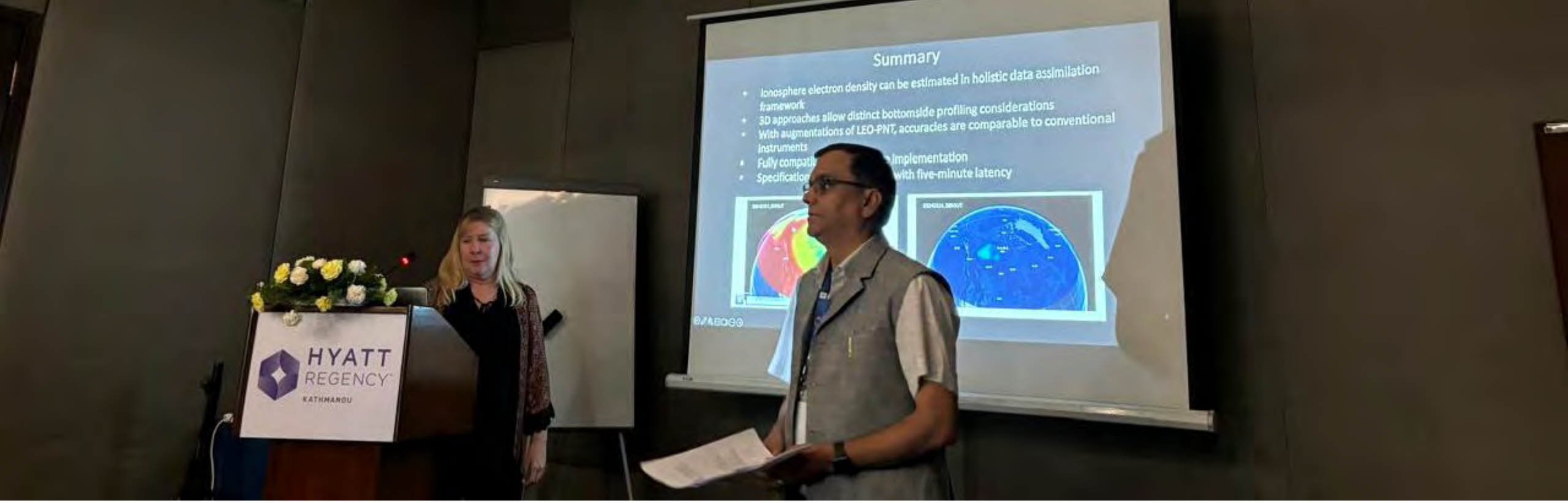
16-20 September 2024
Kathmandu, Nepal


HYATT
REGENCY
KATHMANDU
Boe et al. 2022


N
E


W. Dean Pesnell
SDO Project Scientist
Nepal Academy of Science and Technology
September 2024
12th National Science Day


agi
Predicted debris trajectories
Statistical model (Gaussian distribution)
1 km/s delta-V
Az +90 deg, El +/-38 deg
JGM2 (12x12) gravity field
is not to scale
HYATT
REGENCY
KATHMANDU


Summary
Ionosphere electron density can be estimated in holistic data assimilation framework
3D approaches allow distinct bottomside profiling considerations
With augmentations of LEO-PNT, accuracies are comparable to conventional instruments
Fully compati implementation
Specificatio with five-minute latency
HYATT
REGENCY
KATHMANDU

005

REPORT: SPACE WEATHER SUMMER SCHOOL

Physics and use of tools

October 14-25 2024 Conakry, Guinea

René Tato LOUA and Jean Moussa KOUROUMA

GIRGEAA[1] Editorial Committee

[1] GIRGEAA : Groupe International de Recherche en Géophysique Europe Afrique Asie

Organized by

National Meteorological Agency
Directorate General for Innovation

With the support

International Space Weather Initiative (ISWI)

and

ICG (International Commission of GNSS)

Under the High Patronage of

The Minister of transport and government spokesperson of the Republic of Guinea
Mr. Ousmane Gaoual DIALLO

Contents

I. THE COMMITTEES

- **HONORARY COMMITTEE**

Mr. Alpha Bacar BARRY, Minister of Higher Education, Scientific Research and Innovation of the Republic of Guinea, President
Mr. Ismael NABE, Minister of planning and International cooperation, Vice-President

-

- **ORGANIZING COMMITTEE**

KOUROUMA Jean Moussa (ANM/Guinea), President
DIOUBATE Kaba Higher Education Department, Vice-President
SYLLA Mabinty Bagui (ANM/Guinea)
DIALLO Ibrahima Sorry (ANM/Guinea)
BANGOURA Alhassane Denis (ANM/Guinea)
KOIBA Goikwia (ANM/Guinea)
KOMAH Mohamed (Ministry of transport/Guinea)
WOROKIATOU Kaba (ANM/Guinea)
BAH Ibrahima Mbemba (ANM/Guinea)
DIALLO Fatoumata Binta (ANM/Guinea)
CONTE Oumou (ANM/Guinea)
DIAWARA Finou (ANM/Guinea)
GUILAVOGUI David (ANM/Guinea)
DORE Souwala (ANM/Guinea)

SCIENTIFIC COMMITTEE

LOUA René Tato President (ANM/Guinea)
GNABAHOU Allain Vice-President (MESRSI/Burkina Faso)
GAYE Idrissa Vice-President (University of Thiès/ Senegal,)
LAMAH Daniel (University of Kindia /Guinea)
AMORY-MAZAUDIER Christine (LPP/Polytechnic/UPMC/France)
LECONTEL Olivier (LPP/France)
PITOUT Frédéric (IRAP/ France)
HABA Siba (UGANC/Guinea)
ZAOURAR Naima (University Hari Boumediene/Algeria),

FACULTY TEAM

AMMAR Ahmed ((LSAMA, Tunisia)
COISSON Pierdavide (IPGP, France)
EL YOUSSOUFI Hajar (CRASTE-LF/Morocco)
FLEURY Rolland (IMT Atlantique, Brest /France)
KANTE Ibrahima Kalil (AGAC, Guinea)
KEITA Ibrahima (CERESCOR/Guinea)
GRODJI Franck (University Houphouët Boigny/Côte d'Ivoire)
IBIASSY Geoffroy (University Marien Ngouabi/ Congo)
KAFANDO Pétronille (University Joseph Ki-ZERBO /Burkina Faso)
LECONTEL Olivier (LPP/France)
LE HUY Minh (Institut de géophysique de Hanoï /Vietnam)
LOUA René Tato (ANM/Guinea)
PITOUT Frédéric (IRAP/ France)
Dr GUILAVOGUI Kolly Prospère (UZ/Guinea)
SOULA Serge (University Paul Sabatier/France)
ZAKA Komenan (University Houphouët Boigny/ Côte d'Ivoire)
ZERBO Jean Louis (Université Nazi BONI/ Burkina Faso)

II. INTRODUCTION

As part of the international ISWI (International Space Weather Initiative) project, in collaboration with GIRGEA, the 6th IMA (ISWI Maghreb Africa) school will be held in Conakry in October 2024.

The main aim of this school is to raise the level of expertise of students and professionals from the sub-region, enabling them to participate in and contribute to international projects. The two key points are :

1) Competence in the use of existing datasets and tools for terrestrial environmental studies; a large amount of environmental and geophysical data is available. The use of existing data is estimated at less than 10%. These data, using new technologies, knowledge of physical phenomena and various models, are the source of original scientific work.
2) The development and use, by Maghreb and West African scientists, of the results of studies combining environmental sciences and sustainable development by combining ground data with satellite data - e.g. for geophysical studies, telecommunications, positioning etc...

To achieve these objectives the courses will include:
1) A scientific part for understanding the measurements, information that can be extracted from the data and examples of applications in different fields.
2) A computer part on the algorithms used, their performance, and their installation.
3) Practical computer work for the use of algorithms and ground and satellite databases.
4) The use of models like TIEGCM, CTPIM, IRI, NeQuick, IGRF.
5) Presentations of information on new technologies used in this field such as Grid computing, Web services, databases

Therefore, we offer a school to use and discover:
1) All the possibilities of measurements from the ground network of GNSS stations, radar and other instruments located in Africa and around the world, as well as measurements available via Internet:
a. Studies of the ionosphere and the Sun's impact on the Earth's ionized environment (International Heliosphere Year and ISWI project);
b. Exploiting other instruments for development.

2) Geographic information systems to manage and visualize spatial data in all fields

3) The development of local databases and the use of existing databases via the Internet and an introduction to new technologies.

The aim of this school is to develop data analysis in Africa, and thus make the most of numerous existing projects (IHY: International Heliophysical Year, ISWI: International Space Weather Initiative, etc.).

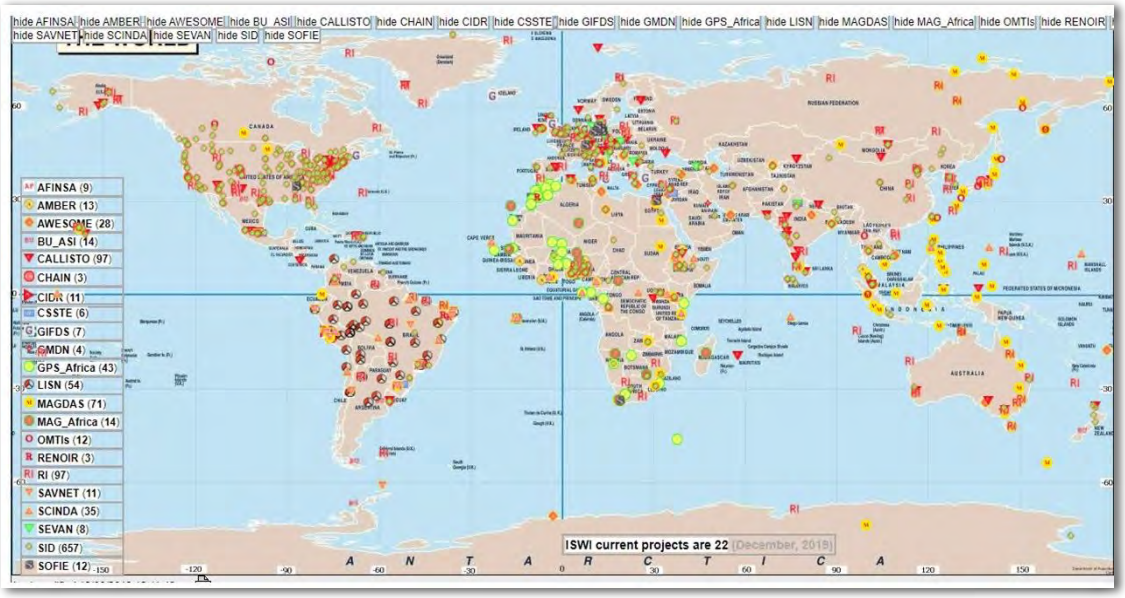
It will also provide an opportunity for researchers and scientists from the Maghreb and West Africa who wish to learn or acquire the skills to use existing datasets and tools related to Space Weather studies, to participate in and contribute to international projects.

The IMA schools also bring together young researchers from different Africa countries to forge lasting and fruitful collaborative relationships.

III. MOTIVATIONS

1. Instrument networks in Africa and worldwide

Following on from the International Heliophysical Year 2007-2009 project, the International Space Weather Initiative ISWI program (2010-2012) has continued to develop instrument networks on the African continent and worldwide, including networks of GNSS stations, magnetometers, radars, etc.... (See figure below from http://www.iswi-secretariat.org).



GIRGEA (Groupe International de Recherche en Géophysique Europe Afrique www.girgea.org) has been present in Africa for over 30 years, and has developed research teams in various countries in Africa (Algeria, Burkina Faso, Côte d'Ivoire, Egypt, Guinée, Morocco, DRC, Senegal, etc.) and Asia (Vietnam, Nepal, Pakistan, etc).

In tropical and equatorial zones, it is necessary to know the contributions of the ionosphere (ionized layer surrounding the earth and located between 90 and 1000 km) and the atmosphere to the GNSS signal for numerous and diverse applications, as the crossing of these two media disturbs the signals received.

This school will focus on
- GPS applications to study the impact of the sun on the ionized layers of the atmosphere;
- Ocean-atmosphere interface and climate variability;
- Meteorological applications for sustainable development;
- GIS and remote sensing;
- EGNOS.

The adoption of information and communication technologies (ICT) and access to the Internet are booming in Africa, but because of their rapid growth worldwide, the digital divide between Africa and the rest of the world persists. So it's important to inform and train scientists and students about new database management techniques (creating and using existing ones): Data warehousing, data mining, mass data analysis, etc. We need a better understanding Internet network monitoring methods, to check its evolution, and accessing computers and the computing grid to enable them to exploit their data, run their simulations, and collaborate with teams from all over the world.

2. Formation : ECOLE de METEOROLOGIE DE l'ESPACE

GIRGEA has already organized schools in Côte d'Ivoire (1995, 2017, 2022), Republic of Congo (2009), Egypt (2010), DRC (2011), Algeria (2013), Morocco (2011, 2014, 2015), Senegal (2019). All previous school reports can be found at www.girgea.org.

The schools aim to:
1) to introduce students to Sun-Earth relations and Space Meteorology with specialists from different disciplines (Sun physics, solar wind, magnetosphere, ionosphere, troposphere and internal and external magnetic field), to Ocean-atmosphere interaction.
2) analyze existing data from these different disciplines, using digital tools such as computing grids, data servers, the Internet and intensive computing resources,
3) develop student scientific mini-projects on a given event,
4) learn how to manage a project, write a thesis and publish scientific papers, and take part in national and international calls for tenders,
5) promote exchange and cooperation between students of different nationalities,
6) to publish in refereed journals, despite the sometimes difficult-to-find costs.

3. The project

The school is open to 40 participants from universities in west, central and east Africa and North Africa. Participants must already have a basic knowledge of computers and databases.
The aim of the school is to enable participants to :
- Master GPS handling and information gathering in the field;
- Master the use of GPS data according to their field of expertise and possible applications;
- Introduction to cartography and mastery of basic and advanced GIS functionalities using various standard software packages;
- Enhance knowledge of climate variability and ocean-atmosphere interaction;
- Promote synergy between GIS and GPS in different fields of application.

At the end of the course, participants should be able to:

<u>For Space Weather</u>
- Analyze solar activity and its impact on the Earth's environment and related systems.

<u>For GNSS</u>
- Know how to use a GPS (different instrument functions, installation);
- Quantify the various errors in positioning accuracy and analyze correction systems such as local differential GNSS or geostationary satellites,
- Exploit measurements on the ground or on board satellites/sondes for morphological studies of the atmosphere, ionosphere and geodesy,
- Analyze existing satellite navigation systems and their evolution;
- Know the different fields of application.

<u>For SIG</u>
- Build a geographic database (opening and creating layers, scanning, digitizing, structuring and organizing geographic data, modifying or deleting graphic objects, changing coordinates and

manipulating projection systems, geo-referencing, integrating GPS points into an existing base map);
- Carry out thematic and spatial analyses (cartographic rendering);
- Know the equivalences between software (principles and terminology).

For GPS and GIS
- Know how to handle: recording, identifying, storing, searching for coordinates of points in the field, transferring points, etc. ... ;
- Know the databases of interest in the various fields covered;
- Know how to collect field data from a GPS and transfer it to a GIS.

For new technologies
- Know the calculation resources available and the underlying techniques,
- Know how to create databases and portals to access them,
- Technical support for network monitoring,
- Participate and collaborate in the global effort for new technologies.

Practical applications should be based on a variety of thematic data and concern areas of national interest.

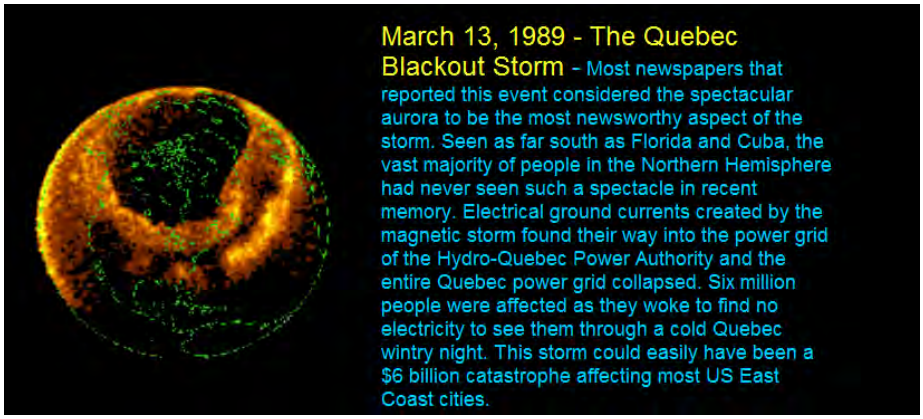
An analysis of the targeted needs of the participants and their level will be made as soon as registration opens.
We recommend that registered students bring their own laptops.
Course content is generally provided at the end of each session.
Participants will include master's students, thesis students and staff from universities and other organizations requiring training upgrades.

IV. COURS

Introduction

Definition: Space weather is the physical and phenomenological state of natural space environments. The associated discipline aims, through observation, monitoring, analysis and modeling, to understand and predict the state of the sun, interplanetary and planetary environments, and the solar and non-solar disturbances that affect them, as well as to predict and anticipate possible impacts on biological and technological systems.

It was following the magnetic storm of March 13, 1989, which plunged Quebecers into darkness for several hours, that Space Weather developed strongly, as our new technologies are affected by magnetic storms caused by solar storms.



To understand how solar storms can impact the Earth's environment, it is necessary to bring together studies of the sun, magnetosphere, ionosphere and atmosphere in a single discipline - space weather.

Table of lectures given by teachers

Sun and Geomagnetism Sun	Jean-Louis ZERBO University Nazi BONI/ Burkina Faso
Plasma Physics Magnetosphere	Olivier LECONTEL LPP/ Sorbonne University/ France
Reflections on science Auroral ionosphere	Frédéric PITOUT IRAP/ France
Ionosphere - Ionospheric propagation Using GNSS to study the ionosphere and troposphere	Rolland FLEURY IMT Atlantique, Brest /France
Electrodynamic coupling between high and low latitudes	Zaka KOMENAN University Houphoüet Boigny / Côte d'Ivoire
Equatorial electrojet	Franck GRODJI University Houphoüet Boigny / Côte d'Ivoire
Magnetic field and ionosphere studies in Vietnam	Minh Huy LE Institut of Geophysics Hanoï /Vietnam
Dynamos of the Earth-Sun system The Equatorial Fountain External geomagnetism	Christine AMORY-MAZAUDIER LPP/ Sorbonne University/ France
Internal geomagnetism	Pierdavide COISSON IPGP/ France
Geographic Information System GIS	Hajar EL YOUSSOUFI CRASTE-LF/Morocco
Atmospheric electricity	René Tato LOUA ANM / Guinea
Atmospheric thermodynamics	Pétronille KAFANDO University Joseph Ki-ZERBO /Burkina Faso
Analysis of rainfall dynamics in the Republic of Guinea	Ibrahima Kalil KANTE AGAC, Guinea
Indicators of Spatio-Temporal Changes in Rainfall in Forest Guinea	Piou Dobo GUILAVOGUI UZ/Guinea
Internal and external climate variability Climate change	Geoffroy IBIASSI MAHOUNGOU University Marien Gouabi/Congo
Introduction to Artificial Intelligence	Ahmed AMMAR et Mohamed Hedi RIAHI ESPRIT, Tunisia

IV.1 Jean Louis zerbo's course
[jeanlouis.zerbo@gmail.com]

Geomagnetism and solar activity 1h30
Lecture: The Sun and Geomagnetism (Classification of geomagnetic/solar activity)

The Sun: (6 hours lecture + practical work)

Lecture 1: The Sun: internal structure and atmosphere
- Internal structure
- Solar atmosphere
- The solar wind

Lecture 2: The Sun: magnetic field
- Observational evidence and plasma interaction
- Photosphere-chromosphere-crown coupling, heating processes in the solar atmosphere

Lecture 3: The Sun: eruptive activity and high-energy particles
- Solar flares
- Overview of energy storage and dissipation processes
- Coronal mass ejections ("CMEs")
- High-energy particles

Lecture 4: The Sun: activity cycle(s)
- Solar activity: sunspot index, F10.7, corona shape, heliospheric magnetic field
- Long-term variations in solar activity
- Active regions and the Sun's global magnetic field
- A qualitative overview of a dynamo mechanism (Babcock-Leighton)

TP1: Crown and solar wind
- Interactive questions :
- Imaging the solar corona and associated solar winds

TP2: Coronal mass ejections
- Evolution of an active region
- Eruptions in an active region

IV.2 Olivier Le Contel's course
[olivier.lecontel@lpp.polytechnique.fr] 2 classes : 3h, 2 practical sessions : 3h

Part I: Introduction to plasma physics
The aim of this introductory lecture is to present the plasma physics concepts needed to understand the description of the Earth's magnetosphere that follows.
- What is a plasma?
- How are plasmas described?
- The dynamics of charged particles

Part II: The structure of the magnetosphere
The aim of this lecture is to present the overall morphology of the Earth's magnetosphere, and the physical origin and nature of the different regions that make it up.
- A few notions about the solar wind
- The upstream shock and the magnetogain
- The magnetopause
- Magnetospheric convection
- High-latitude currents and regions

- The inner magnetosphere

Part III: Magnetospheric dynamics
The aim of this course is to present the various dynamic modes of operation of the Earth's magnetosphere, so as to be able to identify them in a data set.
- Magnetospheric substorms
- Magnetic storms

Practical exercises 1&2 - Installation (Linux and Windows) and use of the freely available pyspedas (python) library (https://github.com/spedas/pyspedas) to visualize and analyze space and ground weather data. IV.3

Frédéric Pitout's course
[frederic.pitout@irap.omp.eu] 2 classes : 3h, 2 practical sessions : 3h

A few methodological points (45 min)
- What does it mean to "do research"?
- Good research practices: ethics, integrity and deontology
- Publications: why, how and where to publish
- Data interpretation: trends and error bars, correlation and causation
- Cognitive bias and critical thinking

Introduction to the auroral ionosphere (45 min)
- Atmospheric layers
- Photo ionization and Chapman's model
- Ionospheric layers
- Collisions and conductivities

High-latitude ionosphere and VS-M-I coupling (45 min)
- Energy balance
- Particle precipitation
- Light emissions
- Magnetospheric convection
- Couplings for various IMF orientations

Ionospheric observation (45 min)
- Ground-based instruments
- Space instrumentation

TP1: CDPP (2h)
Presentation of Plasma Physics Data Center tools
Handling of AMDA
TP2: Halloween storm (2h)
Observation and effects of a flare on the Earth's space environment
Coronal mass ejection and its effects
Doses received in commercial flights

IV.4 Rolland Fleury's course
[rolland.fleury@telecom-bretagne.eu] 6h, (2 lectures + 2 practical sessions)

Course 1: GPS and ionosphere (1h30)
- The ionosphere
- Trans-ionospheric propagation (frequencies, indices, paths)

- vTEC calculation (equations)
- Scintillation (occurrence, ROTI index, EPB)
- RINEX format and IGS measurements

TP1 (1h30): Use of my Matlab software (tec_not_igs.m) to calculate the single-station VTEC from pseudo-distance measurements during the May 2024 magnetic super-storm; downloads of the data used.

TP2 (1h30): continuation of TP1 + use of LEICA software to display GIM maps

TP3: Troposphere and GPS (1h30)
- Morphology
- Influence on GNSS propagation
- IWD/PWD with ground measurements
- ZTD with GNSS
- Internet files of IGS results

IV.5 Zaka Komenan's course
[komzach@yahoo.fr] 1 lecture 1h30

Electrodynamic coupling between the auroral zone and the equatorial zone
- Mechanism of direct penetration of the magnetospheric convection electric field PPEF May 27, 1993 storm
- Mechanism of the disturbed ionospheric dynamo DDEF : storm of May 10 - 11, 1993
- Study of the latitudinal variations of these disturbances.

IV.6 Franck Grodji's course
[franckgrodji@gmail.com] 1 lesson : 1h30

Conductivities of the ionosphere
- densities of neutral and charged particles in the ionosphere
- forces acting on electrons and ions
- movements of electrons and ions in the presence of an electric field
- Ohm's law: direct, Pedersen and Hall components of conductivity
- variation of conductivity components with altitude
- variation in conductivity as a function of local time, season and solar cycle

The ionospheric dynamo mechanism
- Maxwell's equations
- assumption of electrostatic electric field
- assumption of direct current
- electric field in the moving gas reference frame
- polarization field generation

The equatorial electrojet
- establishment of vertical polarization electric field
- electrojet electric current
- magnetic disturbances associated with the electrojet
- influence of plasma irregularities on polarization field and current
- two-dimensional electrojet model
- influence of an east-west wind, variable in altitude, on the electrojet

Telluric currents/Solar Flare effect

IV.7 Le Huy Minh's course
[lhminhigp@gmail.com] 2 courses : 3h

Use of GNSS in Vietnam

- GPS network in Vietnam
- Ionosphere studies
- Studies of crustal motion
- Tropospheric water vapor studies

Magnetic and ionospheric data studies in Vietnam

- Magnetic and ionospheric observatories in Vietnam
- Some results from low-latitude magnetic field studies
- Some results from ionospheric studies in Vietnam

IV.8 Christine Amory-Mazaudier course
[christine.amory@lpp.polytechnique.fr] 2 classes + 1 practical (3h30)

Dynamos

- The dynamo process in the Earth-Sun system: Introduction to the school
- The equatorial fountain

External geomagnetism

- The terrestrial dynamo
- Electric currents in the ionosphere and magnetosphere
- Equivalent electric currents
- Magnetic indices

IV.9 Course by Pierdavide Coisson
[coisson@ipgp.fr] lecture 1h30

Internal geomagnetism

- Definitions of magnetic field and its vector components.
- Sources of the Earth's magnetic field and time scales of magnetic variations.
- Measuring the Earth's magnetic field, instrumentation, observatories, variation stations, satellites.
- Magnetic observatories in Africa.
- Data access: BCMT, INTERMAGNET, WDC, SuperMag...
- Global magnetic field modeling using spherical harmonics
- Magnetic power spectrum, distinction between main field and crustal field.
- Global magnetic models: IGRF, etc.
- Core dynamics and modeling.
- Crustal magnetic field model: WDMAM.

IV.10 Hajar El Youssoufi's course
[hajarelyoussoufi@yahoo.com] 1 class : 1h30, 1 practical : 1h30

Geographical Information Systems (GIS)
Course aim: Introduce students to the fundamentals of GIS, with particular emphasis on mobile GIS and GNSS data. The course provides an in-depth understanding of theoretical concepts and includes hands-on training in the use of mobile GIS for the collection, analysis and visualization of geospatial data.

Introduction:

Theoretical part:

Basic GIS concepts:

- Definition and main functionalities
- Different types of GIS
- GIS data types

Mobile GIS :

- Overview of mobile GIS and its benefits
- Examples of popular mobile applications (Collector for ArcGIS, QField, SuperMapiTablet)

Case studies

Practical part: Practical workshop on Mobile GIS:

- Introduction to a Mobile GIS application (SuperMapiTablet)
- Practical exercise: data collection in the field
- Data integration on QGIS
- Visualization of collected data
- Discussion on the integration of this data into space weather-related projects

Conclusion and questions :

IV.11 Serge Soula's lecture presented by René Tato Loua
[rene.tloua@gmail.com] 1 lecture of 1h30

Atmospheric electricity

-Development, organization, electrification and electrical activity of thunderclouds
- Development of thunderstorm clouds
- Dynamics and organization of thunderstorms
- Electrification of the thundercloud
- Lightning
- Lightning detection
- Lightning climatology
- Altitude discharges - TLE (Sprites, Elves, Jets)

IV. 12 Pétronille Kafando's course
[kafandopetronille@yahoo.fr] 1 class: 1h30 and 1 practical: 1h30

Lecture: Atmospheric dynamics (1h30)
Characteristics of the Earth's atmosphere

- Subdivisions of the atmosphere
- Chemical composition of the atmosphere
- Atmospheric state variables
- Space-time scales

Atmospheric dynamics

- Energy exchanges within the Earth-Ocean-Atmosphere system
- Radiation balances in the Earth-Ocean-Atmosphere system
- Atmospheric circulations
- Wave motions within the atmosphere

TP Lower atmosphere (1h30)

- Atmospheric air transformations
- Stability and instability in the atmosphere
- Getting to grips with the 761 emagram

- Exercises
- Exercise 1: Plotting the state curve for a radiosonde; Graphical determination of mixing ratio and saturating mixing ratio; Analysis of cloud formation conditions;
Determination of cloud base and cloud top; Determination of the mass of condensed water in a cloud.
- Exercise 2: Analysis of the saturation state of an air parcel; Graphical determination of dew point, condensation point and mass of condensed water.

IV. 13 Course by Ibrahima Kalil Kante
[ibrahimakalil@gmail.com] 1 lesson 1h30

Analysis of rainfall dynamics in the Republic of Guinea
Introduction
The atmosphere is a thermal machine whose physical and chemical processes give it a certain complexity, which is the subject of numerous investigations (Alkadee, 2011). In this course, we will look at one of the physical processes that can help us analyze the dynamics of precipitation.
Objective
To analyze the rainfall dynamics observed in Guinea and explain the origin of the rainfall maxima recorded in Conakry and at certain Guinean synoptic stations.
Points to be covered
In this course, we will address the following points:

- - *Seasonal variability* of rainfall, enabling us to understand the onset and cessation of rainfall and to identify the wettest months at Guinea's various synoptic stations (Kanté et al., 2020).
- - *Precipitable water* is the integrated water vapour content of a column of atmosphere (Duvel et al., 2009). It can also be calculated by integrating the specific humidity (q) over the vertical column, which is how we proceed in this course. We calculate it at different levels of the atmosphere, as precipitable water maxima mark the rainiest potential, i.e. the location of the ITCZ (Inter-Tropical Convergence Zone).
- - *Moisture flux divergence* is calculated at three atmospheric levels (1000 - 850 hPa, 850 - 500 hPa, 500 - 100 hPa) considered in our course. The results of its calculation give two signs: positive (divergence) and negative (convergence). This parameter is used to determine the zones where flows are divergent (subsidence) or convergent (convection or advection) (Boudevillain et al., 2009). In other words, it indicates where moisture tends to accumulate or become rarefied. Moisture flux divergence and convergence can be interpreted as moisture sources and sinks respectively (Meynadier et al., 2010).
- *Moisture flux transport* indicates the direction from which the flows come. On the continent, it plays an important role in triggering convection (Dione et al., 2013). It is one of the determining factors behind the formation of deep convection zones on the continent during the early part of the rainy season, when soil evaporation is almost nil.

Practical work
Participants will work on these different points using Excel for some and Matlab for others.

IV. 14 Piou Dobo Guilavogui's class
[guilaopiou0@gmail.com] 1 lesson 1h30

Spatio-temporal change indicators for rainfall in Forest Guinea

General information on rainfall indicators
- Definition
- Climatic/meteorological variables
- Climatic/meteorological indices

Indicators of spatio-temporal changes in rainfall
- Materials
- Results

General objective:
The general objective of this study is to analyze rainfall patterns in order to identify changes in indicators relating to extreme hydroclimatic events in Forest Guinea.
Specifically, it aims to :

- Review the current state of knowledge of hydroclimatic variability and the geographical location of the study area;
- Identify the evolution of extreme hydro-climatic events in Guinée Forestière;
- Carry out a frequency analysis of extreme hydro-climatic events.

IV.15 Geoffroy Ibiassi Mahoungou's course
[triompheom7@gmail.com] Class: 1h30, practical: 3h

Internal and external climate variability/climate change

Course 1: Fundamental concepts of climate variability, climate extremes, climate change

- Basic concepts of climate variability
- Concepts of climate extremes
- Climate change concepts

Course 2: Methods for analyzing climate variability, climate extremes, climate change.

- Methods for analyzing climate variability,
- Methods for analyzing climate extremes,
- Methods for analyzing climate change.

Course 3: Methods for analyzing climate impacts, climate vulnerabilities and sectoral climate risks

- Sectoral climate impact analysis methods ;
- Sectoral climate vulnerability analysis methods;
- Sectoral climate risk analysis methods.

Practical work (3h): Analysis of internal climate variability

TP1: Setting up multi-scale spatio-temporal climate parameter databases

- Setting up multi-scale spatio-temporal climate parameter databases.
- Interactive questions

TP2: Analysis of multi-scale spatio-temporal climate variability

TP2: Analysis of multi-scale spatio-temporal climate variability

- Analysis of spatio-temporal multiscale climate variability using statistical tests;
- Analysis of trends and spatio-temporal changes in multi-scale climate using statistical tests;
- Interactive questions

IV. 18. Mohamed Hedi Riahi and Ahmed Ammar 3h (Lecture + Practical work)
[mohamedhedi.riahi@esprit.tn, ammar.ahmed@esprit.tn]

Artificial intelligence
What is Artificial Intelligence?

- Definition of Artificial Intelligence
- Fields of application of AI

Machine Learning
Definition and principles of Machine Learning
Types of Machine Learning

- Supervised learning
- Unsupervised learning
- Reinforcement learning

Main algorithms

- Regressions
- Decision trees
- k-Nearest Neighbors (KNN)

Use cases and applications of Machine Learning

Deep Learning

Introduction to Deep Learning and neural networks

Types of neural networks

- ANN architecture
- Generative Adversarial Network (GAN) architecture
- Convolutional networks (CNN)
- Recurrent networks (RNN)

Machine Learning VS Deep learning

Lesson plan

- Dataset: Presentation of the Seattle weather dataset
  - Data loading
  - Statistical description
  - Correlation matrix
  - Scatter Plot
  - Data pre-processing
  - Splitting the dataset into trains and testing
- Supervised learning: Applications of classification models
  - Model 1: K-Nearest Neighbors (KNN)
  - Model 2: Decision Tree

V. SCHEDULE WEEK 1

Hours	Monday 14	Tuesday 15	Wednesday 16	Thursday 17	Friday 18	Saturday 19
09h 9h45		Sun Jean-Louis	Magnetosphere Olivier	Magnetosphere TP Olivier	Magnetism Internal Pierdavide	Ionosphere auroral Frédéric
9h45 10h30	Opening Ceremony	Sun Jean-Louis	Magnetosphere Cours Olivier	Magnetosphere TP Olivier	Magnetism Internal Pierdavide	Ionosphere auroral Frédéric
10h30 11h	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
Lunch	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch
11h45 12h30	Intro : 4 dynamos Christine	Magnetosphere Olivier	TP Sun Jean-Louis	Thinking about science Frédéric	Magnetism External Christine	TP CDPP Fréderic
12h30 14h	Lunch	Lunch	Lunch	Lunch	Lunch	Lunch
14h 14h45	Geomagnetism Jean-Louis	TP Sun Jean-Louis	Attente du bus	Equatorial Fountain Christine	introduction to AI Ahmed & Hedi	Guided tour of the autonomous port of Conakry
14h45 15h30	Geomagnetism Jean-Louis	TP Sun Jean-Louis	Visit to the Meteorology Agency Gala Dinner	Ionosphere GPS Rolland	introduction to AI Ahmed & Hedi	
15h30 16h	Coffee break	Coffee break		Coffee break	Coffee break	
16h 16h45	Sun Jean-Louis	Magnetosphere TP Olivier		TP Frédéric CDPP	introduction to AI Ahmed & Hedi	
16h45 17h30	Sun Jean-Louis	Magnetosphere TP Olivier		TP Frédéric CDPP	introduction to AI Ahmed & Hedi	
17h30 18h00				Poster Session	Poster Session	

WEEK 2

Hours	Monday 21	Tuesday 22	Wednesday 23	Thursday 24	Friday 25
9h 9h45	High and low latitude coupling Zaka	Ionospheric data study Vietnam Minh	Piou Dobo Guilavogui Indicator of spatio-temporal changes in rainfall in Forest Guinea	Precipitation dynamics in Guinea Kante	Atmosphere TP - Pétronille
9h45 10h30	High and low latitude coupling Zaka	Ionospheric data study Vietnam Minh		Precipitation dynamics in Guinea Kante	Atmosphere TP - Pétronille
10h30 11h	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
11h 11h45	Electrodynamics Equator - Franck	Ionosphere TP GPS Rolland	Atmosphere Climate Geoffroy	Atmosphere Pétronille	
11h45 12h30	Electrodynamics Equator - Franck	Ionosphere TP GPS Rolland	Atmosphere Climate Geoffroy	Atmosphere Pétronille.	
12h30 14h	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
14h- 14h45	GNSS - Vietnam Minh	SIG El Youssoufi	Atmosphere Climate TP Students Geoffroy	Atmosphere Climate TP Students Geoffroy	Closing of the school
14h45 15h30	GNSS - Vietnam Minh	SIG El Youssoufi	Atmosphere Climate TP Students Geoffroy	Atmosphere Climate TP Students Geoffroy	Closing of the school
15h30 16h	Lunch	Lunch	Lunch	Lunch	Lunch
16h 16h45	GPS ionosphere TP Rolland	SIG-TP El Youssoufi	GPS troposphere TP Roland	Atmospheric electricity René	
16h45 17h30	GPS ionosphere TP Rolland	SIG-TP El Youssoufi	GPS troposphere TP Roland	A tmospheric electricity René	
17h30 18h00	Poster Session	Poster Session	Poster Session	Poster Session	

PARTICIPANTS and their presentations

VI. 1 Table of non-Guinean participants

21 participants from 12 different countries attended the Space Weather School.

country	Affiliation and name	e.mail
Algeria	**IPGP** OUAR Ines Dahlia,	ouar@ipgp.fr
Benin	**University National (UNSTIM)** TOKPANOUDE Judicaël AWADJO Samson	tokpanoudejudicael@gmail.com samsonawadjo2@gmail.com
Burkina Faso	**University Norbert ZONGO** OUBDA Edouard OUATTARA Sié Alexandre TRAORE Ibrahim, **University Nazi BONI** KI Issamaïl	,edouardoubda97@gmail.com nsi828130@gmail.com ibrahimsietraore2205@gmail.com smael.ki226@gmail.com
Cameroon	**Université de Yaounde** TCHANA Christian Brice,	tchana.christianbrice@yahoo.fr tchana.christianbrice@yahoo.fr
Côte d'Ivoire	**Université Houphouët Boigny** KPLE NGORAN Paul	ngoranpaulkple89@gmail.com
Pakistan	**Sorbonne University** AL QEEQ Soboh	soboh.alqeeq@lpp.polytechnique.fr
Republic Congo	**University Marien Ngouabi** BOUNGOU POATY Jocelyn Franck-Patient MANIAKA Fred William DZIENGUE Martial	Jocelynfranck67@gmail.com fmaniaka@gmail.com dzienguemartial@gmail.com
Democratic Republic Congo	**University de Kinshasa** ISSA NDEKE Blandine NSIMBA MASUNDA Jean-Claude	blandinendeke9@gmail.com jcnsimba1967@gmail.com
Senegal	**University Iba Der Thiam, Thies** NDAO Amath DOUMBIA Haby,	amath.ndao@univ-thies.sn haby.doumbia@univ-thies.sn
Tchad	**University N'djamena** ALI Mahamat Nour, RAKSEUNBE Miscal Keumo,	nouralimht@yahoo.fr rmiskalkeumo@gmail.com
Togo	**CRASTE-LF** KOUTOUMBOGA Bakota,	koutoumbogajules@gmail.com
Tunisia	**Faculté des Sciences de Tunis** RIAHI Mohamed Hedi,	mohamedhedi.riahi@esprit.tn

VI.2 Table of 17 Guinean participants

Firts and last names	Institutions	Domains	E-mail
Amadou Oury SOW	UZ	Meteorology	asow21000@gmail.com
Gbaya 2 KPOGHOMOU	ANM	Meteorology	gbaya2kpoghomou.9@gmail.com
Ouo Ouo 1 KOLIE	ANM	Meteorology	ouoouokobelak@gmail.com
Seydouba SOUMAH	ANM	Meteorology	soumahseydouba10@gmail.com
Aminata Sylla	ANM	Meteorology	aminatasylla013ata@gmail.com
Abdoulaye SIDIBE	UZ	Meteorology	abdoulaye.sidibe.199536@gmail.com
Manamba BERETE	UZ	Meteorology	manambaberet55@gmail.com
Pauline HABA	UZ	Meteorology	pauline6@gmail.com
Abdoul Karim Bah	ANM	Meteorology	karimbah009@gmail.com
Aboubacar Bailo SOW	CERESCOR	Physics	sowboubacarbailo@yahoo.fr
Tamba Bernard LENO	UGANC	Physics	bernard.tambaleno224@gmail.com
Mamadou Alpha DIALLO	DNMM	Physics	alphacat@gmail.com
Aboubacar CAMARA	DNMM	Navy	Khissabou36@gmail.com
Marcel KOUROUMA	UGLC S	Geography	marcelkourouma7@gmail.com
Vone BEAVOGUI	UJNK	Physics	Vonebeavo75@gmail.com
Mariama BAH	IST Mamou	Physics	m.mariama45@gmail.com
Koumba Hawa TINGUIANO	UZ	Meteorology	gracekoumbahawateinguiano@gmail.com

VI. 3 19 presentations by participants

Prénom et Nom	Etablissement	Pays	Titre
Amath NDAO	University Iba Der Thiam, Thiès -	Senegal	Climatology of plasma irregularities in Dakar: study based on the ROTI index and variations in the Earth's magnetic field.
Idrissa GAYE	University Iba Der Thiam, Thiès -	Senegal	STP (Solar Terrestrial Physics) activities in Senegal (Space meteorology and GNSS)
Ines Dahlia OUAR O	UPC/IPGP	Algeria France	Creation of an empirical model of itinerant ionospheric disturbances generated by different geophysical phenomena
Edouard OUBDA	University Norbert ZONGO	Burkina Faso	Study of equatorial ionospheric scintillation from the Koudougou GPS station
Marcel KOUROUMA	University Général Lansana	Guinea	Adaptation practices/Resilience of populations living near the Kobaya plains to the effects of climate change
Fred William MANIAKA	University Marien NGOUABI	Congo Brazzaville	Estimation of the energy balance and energy stock in Brazzaville from Landsat images
N'goran Paul KPLE	University Félix Houphoüet Boigny	Côte d'Ivoire	Design of a Low-cost GNSS system for civil aviation in Côte d'Ivoire
Issamaïl KI	University Nazi BONI	Burkina Faso	Turbulence in the solar wind, energetic solar particles and dynamics of the magnetosphere
Mariama BAH	Institut Supérieur de Technologie de Mamou	Guinea	Evolutions of the electrical parameters of the two solar PV modules (polycrystalline and monocryataline) as a function of meteorological parameters
Judicaël TOKPANOUDE	UNSTIM	Benin	Fractal analysis of the speed of the solar wind at different scales temporal
Abdoul Karim BAH	ANM	Guinea	Impact of climate change on rainfed rice cultivation and adaptation strategies in Guinea, Case of Lower Guinea
Vonè BEAVOGUI	University Julius Nyerere de KANKAN	Guinea	Study of the production of ecological charcoal from agricultural waste: (stalks, cobs, husks) of corn; (coks and stem) of peanuts in the commune. Impacts of climate change on the climate of the Republic of Guinea
Tamba Bernard LENO	University Gamal abdel Nasser	Guinea	Impact of climate change on rainfed rice cultivation and adaptation strategies in Guinea, Case of Lower Guinea
Haby DOUMBIA	University Iba Der Thiam, Thiès	Senagal	Establishment and validation of a regional TEC model over Africa
Franges Martial DZIENGUE-	University MARIEN NGOUABI	Congo Brazzaville	Climate change, vulnerabilities and current and future adaptation measures of the tourist area of the Department of Brazzaville from 1991 to 2080
Ibrahim TRAORE	University Norbert Zongo	Burkina Faso	On the use of the GNSS network of Burkina Faso applied to space meteorology. Comparison with space data
Boubacar bailo SOW	CERESCOR	Guinea	Evaluation of pollution by some heavy metals of water and sediments in the Tinguilinta estuary (Rio nunez) Boke Republic of Guinea
Sié Alexandre Ni. OUATTARA	University Norbert ZONGO	Burkina Faso	Critical analysis of the prediction of solar events by the pixel diagram
Jocelyn- Franck-Patient BOUNGOU POATY	University Marien NGOUABI	Congo Brazzaville	Estimation of disturbances of ionospheric activity due to solar parameters on telecommunications

VII. BUDGET and FINANCING

VII. 1 Local budget paid by Guinea

N°	DESIGNATION	MONTANT GNF
1	Organization of the Gala Dinner at the marquee by issa	58 800 000
2	ONOMO Hotel Fees for Foreigners	568 720 000
3	Excursion fees	5 300 000
4	Hotel costs for locals	98 161 000
5	Bus rental	21 600 000
6	Catering for 12 days	456 000 000
7	Beverage costs (water)	4 230 000
8	The Good	2 000 000
9	Rental fees for the ONOMO room for one day	4 600 000
10	Fuel for the bus and small cars for shopping	5 020 000
11	Costs of preparing communication materials and others	147 060 000
12	Microphone installation costs	1 390 000
13	RTG	4 500 000
14	Beverage fees for the day of the Gala Di	2 000 000
15	Security Fees	5 000 000
16	Visa regularization fees	2 500 000
17	Audiovisual equipment purchase costs	3 900 000
18	Maintenance costs of the training room at GAMAL	4 000 000
19	Menu expenses of the president of the organizing committee	1 730 000
20	Purchase Costs of Extension Cords for the training room	2 500 000
21	Clothing costs for reception girls	3 000 000
22	Transportation to display the banners, identify the locations of the Gala dinner	450 000
23	Gift Purchase Fees	6 000 000
24	Student transportation costs	18 700 000
25	Communications costs	300 000
26	Device repair costs for coverage	800 000
27	Costs related to the reception and transportation of foreigners to the airport	1 350 000
28	Internet	61 000 000
29		1 450 611 000 163 840€

VII. 2 Budget for air tickets

Student tickets are paid for by various organizations (PNST, CNRS, SCOSTEP, ICG, University Thiès/ senegal, Esprit/Tunisia).

Sponsor	Sum allocated	Tickets paids
CNRS	30 000€	**22 student tickets** 1 ticket AR Paris Conakry 2 ticket AR Dakar Conakry 3 tickets AR Brazzaville Conakry 1 ticket AR Tunis Conakry 2 tickets AR Kinshasa Conakry 2 tickets AR Cotonou Conakry 2 tickets AR Algiers Conakry 2 tickets AR D'jamena Conakry 1 ticket AR Conakry 1 ticket AR Yaounde Conakry 4 tickets AR Ouagadougou Conakry 1 ticket AR Abidjan Conakry **2 teacher tickets** Ouagadougou Conakry
LPP	1810€	2 Tickets AR Paris Conakry
SCOSTEP	5000USD ~ 4665€	2 tickets AR Alger Conakry 1 ticket AR Hanoï Conakry 2 tickets AR Abidjan Conakry
PNST	3200€	1 ticlets AR Brest Paris Conakry 1 ticketsToulouse Paris Conakry
ICG	~2600€	1 ticket AR Paris Conakry 1 ticlet AR Rabat Conakry
University Thiès	370€	1 ticket AR Dakar Conakry
IPGP	905€	1 ticket AR Paris Conakry
ESPRIT, Tunisia	754€	1 Ticket AR Tunis Conakry
total	44 299€	

VIII. BENEFITS and PROSPECTS

The IMAOC schools bring together scientists and students from the French-speaking region of Africa. They also provide researchers with the opportunity to analyze data from instruments installed in different countries.

1) Contact with scientists in Senegal and Cameroon to strengthen scientific collaboration around two new IPGP magnetic observatories, with training courses at IPGP.

- **Senegal:** following the closure of the M'bour observatory in 2020, the magnetometers have been installed near the village of Sop, in the Niakhar district. This is the only observatory of its kind in West Africa. Access to the data is public and constitutes a continuation of the M'bour data (1952-2020). After the school, contact was established with the University of Thiès for scientific collaboration.

- **Cameroon**: a new magnetic observatory was set up at the end of 2017 on the CTBTO site in Édéa. These data are available to the public. A student from the University of Yaoundé will be trained to exploit them scientifically.

2) Contact with scientists in Senegal and Côte d'Ivoire to set up GNSS stations donated by Thalès.

The 2 scintillators have been donated by TAS as part of the project management for phase 2 of the ANGA ('Augmented Navigation for Africa') ground network. The choice of the 2 sites was dictated by several imperatives:

- Senegal: the existing IGS station in Dakar was closed at the end of 2020 after several years of operation, and has not been replaced. The University of Thiès already supervises several masters and PhD students in GNSS and Space Meteorology. This choice will strengthen the team's skills and collaborations with neighboring countries.

- **Côte d'Ivoire**: the country has an IGS station in Yamoussoukro under NASA supervision. The receiver will provide additional measurements of ionospheric scintillation parameters. It will be installed at Korhogo, close to the northern crest of the equatorial anomaly, where strong scintillation is present.

3) This is the first time that scientists from Chad, Guinea and Togo have taken part in an ISWI school.
- Chad: training of a team in space meteorology with Professor ALI Mahamat Nour, who will now be the ISWI coordinator for Chad.

- Guinea: 2 co-supervisory scholarships are offered by the French Embassy.
A request has been made to deploy GNSS stations near weather stations throughout Guinea, in order to refine climate modeling of tropospheric water vapor.

- Togo: a Master's degree in Physics with an option in Space Science is required for the student involved.

4) Ongoing bilateral cooperation

Burkina Faso (Jean-Louis Zerbo) - **Benin** (Judicaël TOKPANOUDE), Theme: *Solar wind studies*
Burkina Faso (Jean-Louis Zerbo) - **Republique du Congo** (Jocelyn Franck Patient Boungou Poaty), *Theme: Estimation of ionospheric activity disturbances due to solar parameters: impacts on telecommunications*.
Vietnam (Le Huy Minh) - **Burkina Faso** (Tinle Pahima), Theme: *GNSS data processing*
France (Frédéric Pitout) - **Burkina Faso** (Ibrahim Traore), Theme: "*The use of the Burkina Faso GPS network applied to space meteorology: comparison with space data*"
France (Rolland Fleury Christine Amory-Mazaudier) - **Senegal** (Amath Ndao), *Theme: Study of irregularities in the ionospheric plasma at Dakar using the ROTI index*

France (Olivier Le Contel)- **Republic of Congo** (Jocelyn franck Patient Boungou Poaty), *Theme collaboration on the themes of Sun-Earth Relationship and space meteorology*.
France (Rolland Fleury) – **Senegal** (Penda Guyede), Theme: *Study of the morphology of the Equatorial Anomaly of the ionosphere (EIA) at the longitude of Senegal using the GIM/CODG daily mapping of vertical TEC.*
France (Rolland Fleury) – **Burkina Faso** (Estelle Valérie Tapsoba), Theme: *Study on the automated detection of equatorial plasma bubbles EPB*
France (Rolland Fleury) **– Senegal** (Haby Doumbia), *Theme: Establishment and validation of a regional TEC model over West Africa*

Each student has a director in his country associated with the foreign co-supervisor.

5) Master in Physics with Space Physics option in creation in Burkina Faso by Frédéric Ouattara with Rolland Fleury and Christine Amory-Mazaudier

The next IMAOC 7 school will take place in Tunisia in 2026 it will be organized at the **ESPRIT engineering school, Tunis**, **Tunisia (1 week)**
by **AMMAR Ahmed**
ammar.ahmed@esprit.tn
and **RIAHI Mohamed Hedi**
mohamedhedi.riahi@esprit.tn

ATTESTATION

Le comité scientifique de la 6ème édition de l'Ecole Internationale de la Météorologie de l'Espace ISWI - Maghreb Afrique de l'Ouest et Centrale (IMAOC) organisée par le Ministère des Transports – Agence Nationale de la Météorologie de la **Guinée**, du 14 au 25 Octobre 2024 à l'Université Gamal Abdel Nasser de Conakry (UGANC), atteste que :

Monsieur Franges Martial DZIENGUE

A fait une Communication Orale sur le sujet :

« Changements climatiques, vulnérabilités et mesures d'adaptations actuelles et futures de la zone touristique du Département de Brazzaville de 1991 à 2080 »

La présente attestation est délivrée pour servir et valoir ce que de droit.

Fait à Conakry, le 25 octobre 2024

Directeur de l'Agence Nationale de la Météorologie de la Guinée

Dr René Tato LOUA

Le Directeur Général

Présidente du Comité Scientifique de IMAOC – 2024

Pr Christine Amory MAZAUDIER

Christine Amory - Mazaudier

ATTESTATION

Le comité scientifique de la 6ème édition de l'Ecole Internationale de la Météorologie de l'Espace ISWI - Maghreb Afrique de l'Ouest et Centrale (IMAOC) organisée par le Ministère des Transports – Agence Nationale de la Météorologie de la **Guinée**, du 14 au 25 Octobre 2024 à l'Université Gamal Abdel Nasser de Conakry (UGANC), atteste que :

Monsieur Ahmed AMMAR

A participé activement en qualité de **Formateur** aux enseignements, consacrés aux thèmes suivants :

« Soleil, Relations Soleil Terre, Magnétosphère, Magnétisme, Ionosphère, Basse atmosphère, GNSS, Système d'Information Géographique et Intelligence Artificielle. »

La présente attestation est délivrée pour servir et valoir ce que de droit.

Fait à Conakry, le 25 octobre 2024

Directeur de l'Agence Nationale de la Météorologie de la Guinée

Dr René Tato LOUA

Le Directeur Général

Présidente du Comité Scientifique de IMAOC - 2024

Pr Christine Amory MAZAUDIER

Christine Amory - Mazaudier

X. LOGISTICS - PHOTOS

Opening Ceremony

Mr. **Ousmane Gaoual DIALLO**, Minister of Transport, Spokesperson for the Government of the Republic of Guinea

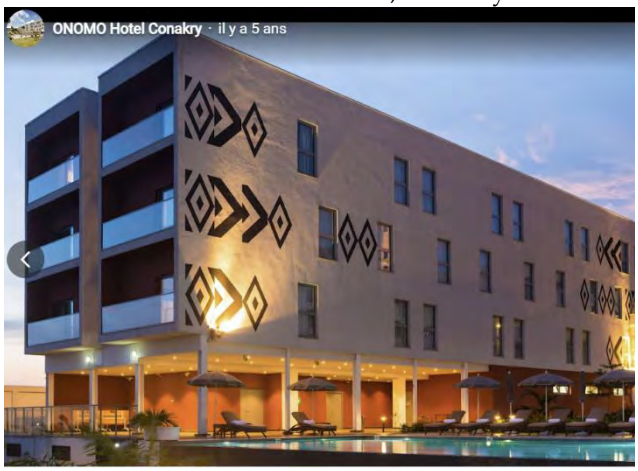
Mr. **Alpha Bacar BARRY**, Minister of Higher Education, Scientific Research and Innovation of the Republic of Guinea

School poster

Professors
LE Huy Minh (Vietnam)
FLEURY Rolland (France)
ZERBO Jean-Louis (Burkina Faso)
KOMENAN ZAKA (Côte d'Ivoire)

Professors
René Tato LOUA (Guinea)
Olivier LE CONTEL (France)
Pierdavide COISSON (France)
Idrissa GAYE (Senegal)

Hotel OMONO, Conakry



Breakfast buffet

Lunch on the site oft he school

catering

Transport by bus (5 to 10 minutes)

XI MEDIAS

N°	Médias	liens
1	RTG	https://youtu.be/GrkxDEOdyww
2	Mediaguinee.com	https://mediaguinee.com/2024/10/meteorologie-de-lespace-conakry-accueille-la-6eme-edition-de-lecole-internationale/
3	Africaguinee.com	https://www.africaguinee.com/meteorologie-climatatmosphere-la-guinee-abrite-une-rencontre-scientifique-majeure-qui-reunit-17-pays/
4	Infopremiere.com	https://infospremieres.com/la-guinee-accueille-la-6eme-edition-de-lecole-internationale-de-la-meteorologie-de-lespace/
5	Kaback TV	https://www.facebook.com/share/v/4QT439V2eaqbxq2s/?mibextid=oFDknk
6	Flashguinee.infos	https://flashguinee.info/meteorologie-de-lespace-sommet-international-des-scientifiques-a-conakry/
7	DIG (Direction de l'information du gouvernement	https://www.facebook.com/share/v/mgHbX7vP19YvjT1V/
8	Média Afrique infos	https://www.linkedin.com/posts/alpha-oumar-diallo-092041128_alertes-et-gestion-des-catastrophes-naturelles-activity-7252271573410140160-Gxse?utm_source=share&utm_medium=member_desktop
8	First Tv	https://youtu.be/A4ItBvQuhOU?si=nFzYK-MVXjUmu6ic

Gmail

Joji Maeda <georgemaeda3@gmail.com>

Season Greetings

1 message

AGS Secretariat <secretariat@afgps.org> Tue, Dec 24, 2024 at 3:03 AM
Reply-To: AGS Secretariat <secretariat@afgps.org>
To: georgemaeda3@gmail.com

View this email in your browser

006

AGS
African Geophysical Society

Our mailing address is:
African Geophysical Society
National Space Research and Development Agency (NASRDA)
km 17 Umar Musa Yara'dua Expressway (old Airport Road)
Abuja, Nigeria. 100211
Nigeria

Gmail Joji Maeda <georgemaeda3@gmail.com>

Callisto news

1 message

Christian Monstein <cmonstein@swissonline.ch>
Reply-To: Callisto news <callisto@lists.phys.ethz.ch>
To: Callisto List Server ETH <Callisto@lists.phys.ethz.ch>

Tue, Dec

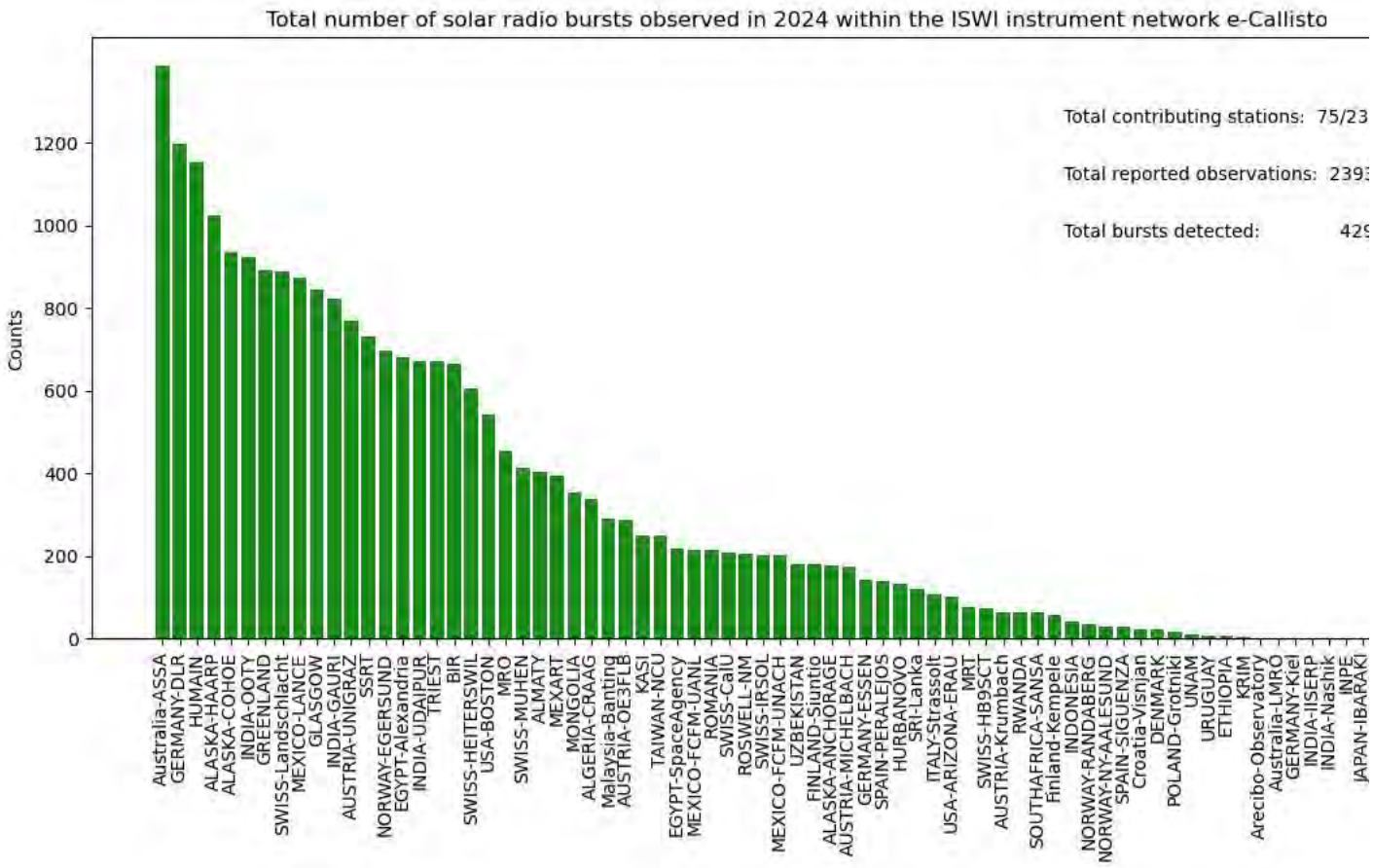
007

Dear Callisto user

I generated the monthly event-lists during 18 years, see here (Event lists YYYY-YYYY): https://e-callisto.org/Data/data.html
Now, due to several health issues I have to stop visual inspection of thousands of files every day as it takes up to 8 hours per day.

I hope, that in the future we will get new types of event-lists, generated by AI and ML.
Several projects are under development by University of Applied Sciences FHNW in Brugg/Windisch, Switzerland as well as by University of Alcalá, Spain.

Here my last yearly burst-plot of 2024:



Several stations did not provide any data due to several reasons. I hope that one or the station will spend some time to investigate and to set their instrument back into operation.
If you encounter hard- or soft-ware issues let me know. I can help via AnyDesk, AnyView or RDP and I'm able to repair broken CALLISTO as well as broken LNA.
And, there are still instruments on stock, see here: https://e-callisto.org/Products/Products.html

Also follow Callisto news on Facebook here: https://www.facebook.com/groups/788389237975335

Happy New Year 2025

Christian Monstein
Monstein Radio Astronomy Support
Wiesenstrasse 13
CH-8807 Freienbach
Switzerland

END OF ISWI NEWSLETTER
VOL. 17, NO. 001