2019 AFRICAN GEOPHYSICAL SOCIETY CONFERENCE ON SPACE WEATHER

25-28 March 2019, Cairo, Egypt

AFRICAN GEOPHYSICAL SOCIETY CONFERENCE on Space Weather 2019

AGS

25-28 March 2019, Cairo, Egypt

Space Weather field became one of the leading fields in research nowadays. Its impacts on technology and society attracted the attention of the importance of this field. The AGS Conference will present the interaction of the Sun with complicated systems (the Heliosphere, near-Earth space, space environments) to understand a wide range of impacts on our progressively technological society. To be able to address the challenges connected with space weather, the scientists and engineers should work thoroughly together, therefore, we come with this international platform to present and discuss the status of Space Weather Science research Specially in Africa, its impact on the satellite signals and GNSS, the modeling and forecasting of Space Weather elements (Sun, Ionosphere, Magnetism), Climate change and Space Weather hazards on our society

Topics

- Solar active phenomena
- Space Weather prediction and forecasting
- Ionospheric Irregularities and Geomagnetic Disturbances
- GNSS and Communication systems
- Space Environment effects on Satellite Systems
- Space Weather and Climate Change
- Space Weather Hazards

Who can apply?

Early researchers, undergraduate students and any related space science majors can apply.

Registration/Abstract
https://www.spaceweather.edu.eg/AGS2019.html

Registration Fees
Early Bird $250
Normal $300

Contact Us
Contact@spaceweather.edu.eg
secretariat@afgps.org

Deadlines
Early Bird Registration
31Jan 2019
Abstract Submission
15Feb 2019
Financial Support
30Dec 2018

Financial Support
A partial support (of Registration Fees) for early researchers \Undergraduate who had at least 2 years working in Space Field. No

International Organizing & Scientific Committee
Prof O. OBROU, AGS President, Université FHB Cocody, Côte d'Ivoire
Prof. A. B. RABIU, Director NASRDA / Center for Atmospheric Research Kogi State University, Nigeria
Prof. Christine MAZAUDIER, Senior Scientist, Chair of GIRGEA,), Pierre and Marie Curie University, France
Prof. Paul Baki, Dept. of Physics and Space Science, Technical University of Kenya
Dr. Y. Endawoke, Senior Scientist, Institute for Scientific Research, Boston College, USA
Dr. Rabia Salihu Sa'id, Department of Physics, Bayero University, PMB 3011, Kano. Nigeria
Dr. Michael Kosch, Senior Scientist, South African National Space Agency, South Africa
Local Organizers
Prof. El-Sayed Abdel-Satar El Melegy, President of Egyptian Scientists Authority
Prof. Nabil Yaseen, Vice President of Egyptian Scientists Authority
Prof. Ayman Mahrous, AGS Coordinator in Egypt

VarSITI SCOSTEP sansa SPACE AGENCY COSPAR ISWI IAGA

Summary

The African Geophysical Society AGS formally established on 2012 during the first Chapman Conference on Space Weather in Africa, organized by the American Geophysical Union AGU at Addis Ababa, Ethiopia. This year it was held in Cairo, Egypt from 25-28 March 2019. The workshop was attended by 80 participants: South Africa - 6, Japan - 1, Algeria - 1, Sudan - 2, USA - 2, France - 1, UK – 1, Kenya -1, Korea -1, Saudi Arabia -1, China -2, Norway -1, Egypt -60.

More than 180 applied for the workshop, 50 abstracts were accepted. After some cancellations, 36 oral and 8 posters were presented. A 20-min time slot was given for each oral talk. The following session themes were identified as Space Weather Capacity Building, Ionospheric Irregularities and geomagnetic disturbances, GNSS and communication systems, Space Environment effects on satellite systems and Solar Active phenomena and its impact on different aspects.

The meeting was supported by VarSITI, IAGA, ISWI, SANSA, SCOSTEP and COSPAR. A more detailed summary of the meeting including the program and abstracts can be found at http://www.spaceweather.edu.eg/AGS2019.html.

Contents

Introduction

Space weather is a global challenge that requires improved and sustained international coordination to respond to severe space weather events. There is a need for advanced space weather models, forecast tools and data-sharing, which is the main concern of AGS2019 sessions. AGS2019 sessions will discuss the global forecast, nowcast and space weather warning capabilities needed to improve predictions and preparedness for space weather events. In the context of that topic, AGS2019 will height the need of more international cooperation and effort toward establishing a global space weather warning network. In addition to the enrichment of scientific knowledge and research capability committed to the young African researchers, ASG2019 would be an effective tool to raise the awareness on impacts of space weather phenomenon among African policymakers, designers and engineers.

Objectives

The African Geophysical Society AGS is a dynamic, innovative, and interdisciplinary scientific association committed to the pursuit of understanding of Earth and Space for the benefit of mankind. It was formally established on Thursday 15th November 2012 during the first Chapman Conference on Space Weather in Africa, organized by the American Geophysical Union AGU at Addis Ababa, Ethiopia, between 12th and 16th November 2012. The first, second and third AGS annual conferences took place in Abuja (Nigeria), Nairobi (Kenya) and Abidjan (Côte d'Ivoire) in 2014, 2015 and 2016 respectively. The AGS steering committee decided the next AGS2019 meeting to be held in Egypt 2019.

The Conference Programme will consist of a series of Sessions with technical presentations, plenary presentation, panel discussions and working group meetings. The following session themes were identified, being held in a sequence:

- Space Weather Capacity Building
- Ionospheric Irregularities and geomagnetic disturbances
- GNSS and communication systems
- Space Environment effects on satellite systems
- Solar Active phenomena and its impact on different aspects.

2019 AFRICAN GEOPHYSICAL SOCIETY CONFERENCE ON SPACE WEATHER

Mon 25 March

8:30 to 9:30 am	Registration and Reception
9:30 to 10:20 am	Opening and Keynotes: Welcome Speech ***Prof. El-Sayed Abdel-Satar El Melegy,*** *President of the Egyptian Syndicate of Scientific Professions* ***Prof. Nabil Yaseen,*** *Vice President of Egyptian Syndicate of Scientific Professions* ***Ayman Mahrous,*** *AGS Coordinator in Egypt*
Session 1: Space Weather Capacity Building **Moderators: Pierre Cilliers (morning) & John Bosco (afternoon)**	
10:25 to 10:45 am	Space Weather Research in Egypt **Ayman Mahrous** *Space Weather Monitoring Center, Egypt*
10:50 to 11:10 am	Boston College Space Weather Research and Impacts at Mid-latitudes **Keith Groves** *Boston College, Boston, USA*
11:15 to 11:35 am	Novel technique to observe Travelling Ionospheric Disturbances by SuperDARN radar **Michael Kosch** *South African National Space Agency, south Africa*
11:40 to 12:00 am	Recent Development of MAGDAS Project **Shuji Abe** *International Center for Space Weather Science and Education, Kyushu University - Fukuoka - Japan*
12:00 to 1:00	**Lunch Break**
1:00 to 1:20 pm	On the necessity of GPS networking in Africa **Christine Amory-Mazaudier** *Sorbonne Universités, LPP, Polytechnique, France*

1:25 to 1:45 pm	Space weather and its impact on aviation in South African **Rendani Nndanganeni** *South African National Space Agency, south Africa*
1:50 to 2:10 pm	Space weather phenomena Observed by a temporal geomagnetic station at Ulu-Slim, Malaysia during the storm of March 27, 2017 **Tarek Arafa-Hamed** *National Research Institute of Astronomy and Geophysics, Egypt*
2:15 to 2:35 pm	Modulation of Equatorial Ionospheric Anomaly during the 19 - 24 December 2015 Space Weather Event **Ola Ahmed Abu Elezz** *Space Weather Monitoring Center, Egypt*
2:40 to 3:00 pm	Ionospheric response time over Africa to geomagnetic storms occurred during solar minimum on solar cycle 24 **Heba Salah Ahmed Mohamed** *Canadian International College - New Cairo - Egypt*
3:00 to 4:00 pm	*Poster Session*
6:30	**Welcome Party** *Venue: La Villa Terrace*

Tue 26 March

Session 2 : Ionospheric Irregularities and Geomagnetic Disturbances

Moderators: Michael Kosch (morning) & Stefan Lotz (afternoon)

9:30 to 9:55 am	Ionospheric Scintillation now casting for GNSS-based navigation support **Pierre Cilliers** *South African National Space Agency, South Africa*
10:00 to 10:20 am	Mid-latitude plasma depletions during recovery phases of a CME and CIR driven storms in 2016 and 2017 **Zama Katamzi-Joseph** *South African National Space Agency, South Africa*
10:25 to 10:45 am	On the parent strokes for sprites and halos observed near North America **Gaopeng Lu** *Institute of Atmospheric Physics, Chinese Academy of Sciences, China*
10:50 to 11:10 am	Characterizing ionospheric plasma irregularities with the measurements by the Swarm satellites **Wojciech J. Miloch** *Department of Physics, University of Oslo, Oslo, Norway*

11:15 to 11:35 am	Statistical Study on Ionospheric Scintillation in China Low Latitude Based on Multi-instrument Observation **Donghe Zhang** *School of Earth and Space Science, Peking University, China*
11:40 to 12:00 am	Space Weather Observation Unit in the Arabian Peninsula : First Results **Moqbil Salem Alenazi** *Northern Border University, Saudi Arabia*
12:00 to 1:00 pm	**Lunch Break**
1:00 to 1:20 pm	Comparison of ground based ionospheric scintillation observations with in situ electron density variations as measured by the SWARM satellites **Joseph Ouko Olwendo** *Pwani University- Kilifi, Kenya*
1:25 to 1:45 pm	Multi-space observations of magnetic field variations using satellite data **Nada Mohamed** *Faculty of Science, Cairo University*
1:50 to 2:10 pm	Geomagnetic pulsation associated to ionospheric disturbance dynamo: case study **Ibrahim Fathy** *Egyptian Academy of Engineering and Advanced Technology affiliated to Ministry of Military Production*
2:15 to 2:35 pm	Equatorial Ionospheric irregularities over the African Sector during geomagnetic storms using GNSS ground stations **Hager Mohamed Salah** *Canadian International College - New Cairo - Egypt*
2:40 to 3:00 pm	The Prediction of Disturbance Storm Time Index (Dst) Associated with Geomagnetic Storms **Aalaa Mohamed Samy** *National Research Institute of Astronomy and Geophysics , Egypt*
3:00 to 4:00 pm	*Poster Session*
6:30	**Conference Banquet** *Venue: Andria Nile Cruse*

Wed 27 March

Session 3: GNSS and Communication systems **Moderator: Keith Groves**	
9:30 to 9:55 am	Interhemispheric response of the ionosphere during geomagnetically disturbed conditions **John Bosco Habarulema** *South African National Space Agency, South Africa*
10:00 to 10:20 am	On imaging South African regional ionosphere using 4D-var technique **Yong Ha Kim** *Chungnam National University of Daejeon, S. Korea*
10:25 to 10:45 am	Space Weather Research and Education Activities at a 2-Yr College **Marie Chantale Damas** *Queensborough Community College of the City University of NY , USA*
10:50 to 11:10 am	Analysis of induced E-field orientation for GIC risk **Stefan Lotz** *South African National Space Agency, South Africa*
11:15 to 11:35 am	Preliminary Investigation of Tropopause Height over Egypt Using GNSS Radio Occultation Technique **Ashraf El Kutb Mousa** *National Research Institute of Astronomy and* Geophysics, Egypt
11:40 to 12:00 am	Using GNSS Radio Occultation to Characterize Water Vapor Distribution Over Egypt: Validation and Preliminary Study **Hala Gomaa** *Space Weather Monitoring Center, Egypt*
12:00 to 1:00 pm	**Lunch Break**
Session 4: Space Environment effects on Satellite Systems **Moderator: Rendani Nndanganeni**	
1:00 to 1:20 pm	Active Debris Removal with Electrodynamics Tether System **Islam Mustafa Hawash** *National Research Institute of Astronomy and Geophysics , Egypt*
1:25 to 1:45 pm	Qualification of operational amplifier used in satellite subsystem using pico second pulsed laser system **Amira Hamdy Hussein** *National Authority for Remote Sensing & Space Sciences*, Egypt

1:50 to 2:10 pm	Analysis of close approach between an operational satellite and space debris **Meirna Gamal El-Din** *National Research Institute of Astronomy and Geophysics , Egypt*
2:15 to 2:35 pm	Optimization of pulsed laser beam parameters to simulate the degradation effect induced space radiation on solar cell **Sara Ramadan Aziz** *National Authority for Remote Sensing & Space Sciences, Egypt*
2:40 to 3:00 pm	Low Earth Orbital (LEO) Effect of Atomic Oxygen (AO) on Cube-Sat Missions **Wael Mohamed** *National Authority for Remote Sensing & Space Sciences, Egypt*
3:00 to 4:00 pm	*Poster Session*

Thu 28 March

Session 5: Solar active phenomena and Impact
Moderator: Christine Amory

9:30 to 9:55 am	Exploring the Characteristics of the Type-II Radio Burst Event on 2 May 2013 in the Light of Machine Learning **Mohamed Nedal** *Space Weather Monitoring Center, Egypt*
10:00 to 10:20 am	Type II solar radio burst band-splitting: Measure of coronal magnetic field strength **Khaled Ali Eldeen** *Space Weather Monitoring Center, Egypt*
10:25 to 10:45 am	Verification of web-based online Services for GPS Precise Point Positioning Techniques **Ebtesam Abouelazaem** *Egyptian Academy of Engineering and Advanced Technology affiliated to Ministry of Military Production*
10:50 to 11:10 am	Aviation and GNSS applications **Haitham Mohamed Bakr** *National Air Navigation Services Company (NANSC), Egypt*
11:15 to 11:35 am	Ionospheric response to geomagnetic storm impact on radar system **Mahmoud Sayed Abdelghany Ali** *National Air Navigation Services Company (NANSC), Egypt*

11:40 to 12:00 am	Effect of the storm on ionosphere and magnetosphere at low latitude **Yara Ahmed** *Space Weather Monitoring Center, Egypt*
12:00 to 1:00 pm	**Lunch Break**
1:00 to 2:30 pm	Final Discussion: Observations, Recommendations and the Way Forward. *Chairs: Ayman Mahrous, Keith Groves, Christine Amory , Michael Kosch*
2:30 to 3:30 pm	Certificates
4:00 pm	Closing

INCOME

SUPPORT	amount	Currency	US$
SWMC*	1000	US$	1000
ESSP*	650	US$	550
ISWI*	2000	US$	2000
COSPAR*	1000	Euro	1130
VARSITI*	1500	US$	1500
IAGA*	714	Euro	825
TOTAL			**$7,005.00**
2) Registeration Fees			**$2,250.00**
TOTAL INCOME			**$9,255.00**

COST

Item	Cost/day	Total
Hall Rent	696	2088.17
Welcome Dinner for 20 Foreigener Guests (24/3)	14.5x20	290.02
Lunch for 80 persons (25/3)	14.5x80	1160.09
Dinner for 85 Persons (25/3)	14.5x85	1232.6
Cofee Drinks& Jouice (25/3)		37.12
Lunch for 89 persons (26/3)	14.5x89	1290.6
Lunch for 89 persons (27/3)	14.5x89	1290.6
Lunch for 73 persons (28/3)	14.5x73	1058.58
Conference Banquet Nile Cruse Dinner (26/3)	60 persons	823.67
TOTAL COST		**$9,271.45**

SWMC*: Space Weather Monitoring Centre, Helwan University, Egypt

ESSP*: Egyptian Syndicate of Scientific Professions

ISWI*: International Space Weather Initiative

COSPAR*: Committee on Space Research

VARSITI*: Variability of the Sun and Its Terrestrial Impact

IAGA*: International Association of Geomagnetism and Aeronomy

CATARACT
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Invoice to: **Syndicate of Scientific Professions**

Invoice No.	50319
Arrival Date:	24-03-19
Departure Date	28-03-19

3444 س.ت
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Invoice

Date: **28-03-19**

Room Type	No. of PAX	ACCOM	Meal Plan	No. of Nights	Rate	Amount L.E	Amount USD
Standard	24-03-19						
			DINNER	20	250.00	5,000.00	$ 290.02
	25-03-19					-	$ -
			LUNCH	80	250.00	20,000.00	$ 1,160.09
			DINNER	85	250.00	21,250.00	$ 1,232.60
			EXTRA F & B		640.00	640.00	$ 37.12
	26-03-19					-	$ -
			LUNCH	89	250.00	22,250.00	$ 1,290.60
	27-03-19					-	$ -
			LUNCH	89	250.00	22,250.00	$ 1,290.60
	28-03-19					-	$ -
			LUNCH	73	250.00	18,250.00	$ 1,058.58
	1	NILE CROUS	DINNER	1	14,200.00	14,200.00	$ 823.67
	4	HALL RENT		4	9,000.00	36,000.00	$ 2,088.17
Extras							
Grand Total						159,840.00	$ 9,271.46

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The following African researchers have been exempted from registration fees of (250 US$):

NAME	AFFILIATION
Joseph Ouko Olwendo	Pwani University, Kenya
MAZARI Aniss	CRAAG, Algeria
ESHRAGA ABDELSALAM	Institute of Space Research and Aerospace(ISRA), Sudan
Hiyam Ahmed	Institute of Space Research and Aerospace(ISRA), Sudan

The following European researchers have been exempted from registration fees of (250 US$):

NAME	AFFILIATION
Christine Amory	Polytechnique Institute, France
Wojciech J. Miloch	Department of Physics, University of Oslo, Norway

The following Egyptian researchers have been exempted from registration fees of (250 US$):

NAME	AFFILIATION
Abdalla Shaker Tawfik Abdalla	Egyptian Academy of Engineering and Advanced Technology, Egypt
Ebtesam Abouelazaem Gabr	Egyptian Academy of Engineering and Advanced Technology, Egypt
Hager Mohamed Salah Awad	Canadian International College, Egypt
Heba Salah Ahmed Mohamed	Canadian International College, Egypt
Ibrahim Fathy Abdel-ghafar	Egyptian Academy of Engineering and Advanced Technology, Egypt
Rabab Ramadan Mohamed	National Authority for Remote Sensing and Space Science (NARSS)
Ahmed Abdulnabi Ibrahim	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Ahmed Hassan Karrar	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Ahmed Mahmoud Yassen	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Doaa Umar Gelany	Space Weather Monitoring Center (SWMC), Helwan University, Egypt

Du'aa Ahmed Abd El-Maksoud	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Esraa Mohamed Zaki	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Essam AbdelRouf Abdel-Sattar	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Hala Eldosoky Gomaa	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Hasnaa Hossam Mohamed	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
Hassan M.Nour-eldeen	Space Weather Monitoring Center (SWMC), Helwan University, Egypt

The following Egyptian Undergraduate students have been exempted from registration fees of (250 US$):

NAME	**AFFILIATION**
Hebatallah Saber Mashhout	Space Devision,Faculty of Science, Helwan University, Egypt
Karim Khaled Zaki	Space Devision,Faculty of Science, Helwan University, Egypt
Khaled AliElden Darwish	Space Devision,Faculty of Science, Helwan University, Egypt
Mariem Gamal Saleh	Space Devision,Faculty of Science, Helwan University, Egypt
Laila Tareq	Space Devision,Faculty of Science, Helwan University, Egypt
Mohamed ElSayed Nedal	Space Devision,Faculty of Science, Helwan University, Egypt
Mostafa Nasser Sayed	Space Devision,Faculty of Science, Helwan University, Egypt
Nabila Mohamed Gomaa	Space Devision,Faculty of Science, Helwan University, Egypt
Nada Ahmed Mohamed	Space Devision,Faculty of Science, Helwan University, Egypt
Nadine Samir Shehata	Space Devision,Faculty of Science, Helwan University, Egypt
Nouran Mohammad Ebrahim	Space Devision,Faculty of Science, Helwan University, Egypt
Ola Ahmed Abu Elezz	Space Devision,Faculty of Science, Helwan University, Egypt
Omar Hesham Mohamed Nasr	Space Devision,Faculty of Science, Helwan University, Egypt
Rady Mahmoud Rady	Space Devision,Faculty of Science, Helwan University, Egypt
Rehab Abdel Mohdy	Space Devision,Faculty of Science, Helwan University, Egypt
Rehab Abdulmajed	Space Devision,Faculty of Science, Helwan University, Egypt
Samer Hisham Ayiad	Space Devision,Faculty of Science, Helwan University, Egypt
Sara Ragab	Space Devision,Faculty of Science, Helwan University, Egypt

Shereen Aly	Space Devision,Faculty of Science, Helwan University, Egypt
Summer Mahmoud Sayed	Space Devision,Faculty of Science, Helwan University, Egypt
Yara Ahmed Badawi	Space Devision,Faculty of Science, Helwan University, Egypt
Moheb Yacoub Saad	Space Devision,Faculty of Science, Helwan University, Egypt

The following African researchers didn't get the VISA on time, they was not able get use of the support for air tickets:

NAME	**AFFILIATION**
Daniel Okoh	Space Environment Research Laboratory, CAR NASRDA - Abuja Nigeria
Elijah Olukayode FALAYI	Department of Physics, Tai Solarin University of Education, Nigeria
Aderonke Adekemi Obafaye	NASRDA Center for Atmospheric Research, Anyigba Campus, Nigeria
Babatunde Rabiu	NASRDA Center for Atmospheric Research, Kogi State University, Nigeria
Fatma Anad	Centre de Recherche en Astronomie, Astrophysique et gÃ©ophysique, Algiers, Algeria

Feedback from Participants

For transparency, we asked all the participants to send their feedback on the website :

http://spaceweather.edu.eg/AGS2019_feedback.php

It was great that most of the feedbacks was positive, we show the response of foreign researchers below:

Contact name	Christine Amory-Mazaudier
Email	christine.amory@lpp.polytechnique.fr
Institution	Sorbonne Universités, LPP, Polytechnique, Paris, France
Feedback	This conference was very well organized andthe students were very efficient during the whole meeting It is also important to notice 1) the coherence and quality of the papers in the differents fields . 2) the good participation to the meeting : many interesting questions after the talks. It was also easy for a vegetarian to eat the delicious vegetables. Thank you also for the presentations of Egyptian dancers.

Contact name	Mike Kosch
Email	mkosch@sansa.org.za
Institution	SANSA
Feedback	All went well enough. The catering was excellent. The venue was good. The programme was good. The only real problem was the weak and intermittent wifi connection. International participants need good and continuous wifi please.

Contact name	Donghe Zhang
Email	zhangdh@pku.edu.cn

Institution	School of Earth and Space Science, Peking University
Feedback	Thanks Prof. Ayman Mahrous! Thanks AGS! It is a very fruitful and well organized conference.

Contact name	John Bosco Habarulema
Email	jhabarulema@sansa.org.za
Institution	South African National Space Agency
Feedback	The conference was very well organised, thanks to Prof Ayman and his team mainly of students. The talks were also very beneficial and it was encouraging to see presentations ranging from tropospheric water vapour to prediction of CME arrival time. It was a truly a space physics/space weather workshop. Of-course there may be areas of improvement. For example, the African continent has a number of space weather/science scientists who were unable to attend for a number of reasons. Despite lack of funding, visa issues made it difficult for some to attend. Also, some of the leadership members of AGS were unable to attend and this is very concerning for the future of an organisation. I suggest that in future, we perhaps think of some fundraising strategy that could support some people to attend, especially young researchers who will push the frontiers of research forward. I know it is difficult, nevertheless the AGS leadership should consider this option very seriously if AGS is to continue in the long-run

Contact name	Rendani Nndanganeni
Email	rnndanganeni@sansa.org.za
Institution	SANSA, Hermanus South Africa

Feedback There is always room for improvement, I will suggest that the programme be sent to the participants early enough so that they can prepare in advance. The registration process also will be much easier if it is design such that after registration for a conference you can immediately do electronic payments to the conference organisers. The location of the venue should be a place where is close to the city or shops and restaurants and also that have a better connectivity in terms of the internet. The advertisement of the workshop or conference must be done early enough so to maximize the exposure and to increase number of participants.

Concluding Remarks

The participants of the conference made the general observations and recommendations as follows:

1. There is a need to strength the cooperation between African countries to prepare for severe space weather events and mitigate their impacts.
2. Sustainability of African space weather capacity buildings and improving the quality of research from African young researchers.
3. Take the opportunity of Egypt as currently leading the African union to sustain the awareness of the importance of space weather between African country members.
4. Encouraging the work between African space weather research institutes and stakeholders.

No	Name	Istitute	
1	Christine Amory	Polytechnique Institute, France	
2	Donghe Zhang	School of Earth and Space Science, Peking University, China	
3	Gaopeng Lu	Institute of Atmospheric Physics, Chinese Academy of Sciences, China	
4	John Bosco Habarulema	South African National Space Agency (SANSA), South Africa	
5	Joseph Ouko Olwendo	Pwani University, Kenya	
6	Keith Michael Groves	Boston College Space Weather Research and Impacts at Mid-latitudes, USA	
7	Kent Miller	EOARD, London, UK	
8	Marie Chantale Damas	Queensborough Community College of the City University of NY (CUNY), USA	
9	MAZARI Aniss	CRAAG, Algeria	
10	Michael Kosch	South African National Space Agency (SANSA), South Africa	
11	Moqbil Salem Alenazi	Northern Borders University, Saudi Arabia	
12	Pierre Cilliers	South African National Space Agency (SANSA), South Africa	
13	Rendani Rejoyce Nndanganeni	South African National Space Agency (SANSA), South Africa	
14	Shuji Abe	International Center for Space Weather Science and Education, Kyushu University, Japan	
15	Stefan Lotz	South African National Space Agency (SANSA), South Africa	
16	Wojciech J. Miloch	Department of Physics, University of Oslo, Norway	
17	Yong Ha Kim	Chungnam National University-Daejeon-S, Korea	
18	Zama Katamzi-Joseph	South African National Space Agency (SANSA), South Africa	
20	ESHRAGA ADEL ALTYP ABDELSALAM	Institute of Space Research and Aerospace(ISRA), Sudan	
21	Hiyam Abobaker Yousif Ahmed	Institute of Space Research and Aerospace(ISRA), Sudan	
24	Abdalla Shaker Tawfik Abdalla	Egyptian Academy of Engineering and Advanced Technology affiliated to Ministry of Military Production, Egypt	
25	Alaa Mohamed Samy Ahmed Mohamed	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt	
26	Amira Hamdy Hussein Saloma	National Authority for Remote Sensing & Space Sciences, Egypt	

27	Ashraf El Kutb Mousa	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt
28	Ebtesam Abouelazaem Farid Gabr	Egyptian Academy of Engineering and Advanced Technology affiliated to Ministry of Military Production, Egypt
29	Hager Mohamed Salah Hussien Awa	Canadian International College, Egypt
30	Haitham Mohamed Mahmoud Ahmed Bakr	National Air Navigation Services Company (NANSC), Egypt
31	Heba Salah Ahmed Mohamed	Canadian International College, Egypt
32	Hussein Mohamed Farid	Faculty of Science, Cairo University, Egypt
33	Ibrahim Fathy Abdel-ghafar	Egyptian Academy of Engineering and Advanced Technology affiliated to Ministry of Military Production, Egypt
34	Islam Mustafa Hawash Mahmouda	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt
35	Mahmoud Sayed Abd-ElGany Ali	National Air Navigation Services Company (NANSC), Egypt
36	Meirna Gamal El-Din Farid Halawa	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt
37	Mohamed Ali Abd El-fatah Mohamed Darrag	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt
38	Nada Mohamed Mostafa Kamal Said Ahmed	Faculty of Science, Cairo University, Egypt
39	Rabab Ramadan Mohamed	National Authority for Remote Sensing and Space Science (NARSS)
40	Sara Ramadan Aziz Ghaleb	National Authority for Remote Sensing & Space Sciences, Egypt
41	Susan Wassem Samwel	space research lab/National research institute of astronomy and geophysics, Egypt
42	Tarek Arafa Hamed	National Research Institute of Astronomy and Geophysics (NRIAG), Egypt
43	Wael Mohamed Mahmoud	National Authority for Remote Sensing and Space Science (NARSS), Egypt
44	Abdelrahman Mohamed kamal El-Deen	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
45	Ahmed Abdulnabi Ibrahim	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
46	Ahmed Hassan Karrar	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
48	Ahmed Mahmoud Yassen	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
49	Doaa Umar Gelany	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
50	Du'aa Ahmed Abd El-Maksoud	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
51	Esraa Mohamed Zaki	Space Weather Monitoring Center (SWMC), Helwan University, Egypt

52	Essam AbdelRouf Abdel-Sattar	Space Weather Monitoring Center (SWMC), Helwan University, Egypt
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African Geophysical Society Conference on Space Weather (AGS 2019)

Organized by Space Weather Monitoring Centre

Cairo, Egypt

25-28 March 2019

Abstracts Book

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VI. Cosmic Ray

I. Space Weather

Space Weather Research in Egypt

Ayman Mahrous

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The (SWMC) has been established in 2008 in Egypt at Helwan University. The main objectives of it are: Establishing an early warning system against destructive geomagnetic storms to protect the Egyptian satellites and navigation systems, Supply methods to forecast the Ionosphere-Magnetosphere by simulation models and Provide reliable estimates for the current state of the space environment. Here we will first present the Space Weather Monitoring Centre research groups (Geomagnetism-Ionosphere- Cosmic Rays- Solar physics), what is the past, current and future research work and challenges in our centre, and what is the (SWMC) activities.

What makes thunderstorms in ocean so favourable for producing intense negative strokes?

Gaopeng Lu

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Energetic lightning strokes in the troposphere can ignite firework-like dielectric breakdown called red sprites in the mesosphere. The efforts based on the ground observations in the past two decades indicate that such phenomenon above continental thunderstorms is predominantly (more than 99%) produced by positive cloud-to-ground (CG) lightning strokes. Our analyses of space-born observations of the Imager of Sprites and Upper Atmospheric Lightning (ISUAL) onboard the FORMOSAT-2 satellite in the vicinity of North America during a 12-year period from 2004 to 2015 indicate the presence of a significant fraction (69 out of 395, or ~18%) of negative sprites, which were predominantly (>80%) observed over oceanic and coastal thunderstorms mostly in tropical areas. The investigation on a similar phenomenon of dielectric breakdown called halo reveals the even higher percentage (~75%) of energetic negative CG strokes produced by coastal/oceanic thunderstorms. However, many of these negative CG strokes fail to produce sprites due to the relatively short timescale of charge transfer. There is no considerable difference between positive and negative CG strokes on the threshold for producing halos, which confirms that both red sprites and halos are manifestation of conventional breakdown induced by tropospheric lightning strokes. We report on the first analysis of sprite genesis above a hurricane (Hurricane Matthew in 2016), finding no evidence for negative sprites. Further efforts are desired to explain the conditions favourable for oceanic/coastal thunderstorms to produce intense negative CG strokes.

(1) Space Weather Research and Education Activities at a 2-Yr College

M. Chantale Damas

Queensborough Community College (QCC) of The City University of New York (CUNY),USA

For the past three years, the Queensborough Community College (QCC) of the City University of New York (CUNY) has been successful at engaging undergraduate students in applied research and educational activities in solar, geospace, and atmospheric physics, under the umbrella discipline of space weather. Through the use of large data sets freely available on the Internet, undergraduate students are engaged in applied research that contribute to the fundamental understanding of space weather's impact on Earth's space environment, life and society. Engaging undergraduate students in space weather research and education activities has the following broader impacts: 1) long-term integration of space weather into the undergraduate curricula, thus exposing students to research early in their academic careers; and 2) increasing students' interest in and motivation to study science, technology, engineering and mathematics (STEM), as well as preparing them for choosing a career path in space science and related fields. This work describes the program, including collaboration with several partners, as well as best strategies that are used to build capacity in the space sciences at the undergraduate level.

Space weather and its impact on aviation in South African

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The impact of space weather on systems within the aviation sector has been long recognised globally, however research over the South African region began recently. Space Weather refers to conditions on the Sun and in the solar wind, magnetosphere, ionosphere, and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems. Space weather is a consequence of the behaviour of the Sun, the nature of Earth's magnetic field and atmosphere, and our location in the solar system. Solar flares and solar proton events are some of the space weather events that have an impact on HF communications, navigation and can contribute in enhancing the radiation exposure at aviation altitude. During adverse space weather conditions, communications and navigations can be interrupted and this is problematic since the space-based position and navigation enables position determination for all phases of flight from departure, en-route and landing. South Africa is experiencing a growing awareness of the regional impact from space weather events, and this has now spread to the aviation sector where users are becoming more aware of the potential risk that space weather can pose. Space weather has also been identified to have a potential impact on air traffic management and other aviation systems. In South Africa the key areas for the aviation sector that have been identified to be impacted by space weather are: High frequency communications, ground and air-based navigation systems and radiation exposure. This paper will discuss the space weather impact on the HF, GNSS/GPS and radiation with regard to the aviation industry in South Africa and possible mitigation measures.

Analysis of induced E-field orientation for GIC risk

Stefan Lotz

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Geomagnetic disturbances can cause anomalous currents to flow in grounded networks like power grids or oil or gas pipelines. Local variations in the geomagnetic field cause electric field to be induced in the earth surface which in turn induces a current in grounded conductor networks. The induction is maximised when the E-field vector and conductor is aligned. With this in mind, we analyse the orientation of induced electric field during intense geomagnetic disturbances at different latitudes over two solar cycles (SC 22 and 23). The aim of the analysis is to 1.) identify whether the induced E-field has a preferred direction; 2.) if the preferred direction changes with intensity of field magnitude; 3.) and if the preferred direction changes with latitude. Initial results of this study is presented.

II. Solar Physics

Exploring the Characteristics of The Type-II Radio Burst Event on 2 May 2013 in The Light of Machine Learning

Mohamed Nedal, Ayman Mahrous, M. Youssef

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We studied the type-II radio burst that occurred on 2 May 2013 through combined observations from the Solar and Heliospheric Observatory (SOHO) and the Solar Terrestrial Relations Observatory (STEREO), in parallel with the ground-based observation from the DARO-CALLISTO station in Germany. The type-II burst was preceded by a group of type-III radio bursts related to a preceding solar flare from the same location. We calculated the density jump and the Alfven Mach number by employing the clear band-splitting of the type-II burst. By using the 4-fold Newkirk electron density model we traced the height at which the emission has been produced. Then we traced the shock speed, the Alfven speed, and the coronal magnetic field strength at heights ranging from 1.961 – 1.988 Rs. The accompanied partial-halo Coronal Mass Ejection (CME) event was detected by STEREO-A (with a linear speed of 518 km s-1) and by SOHO (with a linear speed of 671 km s-1), and we traced the evolution of the event in the inner corona. We found a common behaviour in the shock parameters dependencies with height, in which the features were decreasing steeply with height until reaching the height of ~1.975 Rs where they decrease slightly. Finally, we designed an artificial neural network model to predict the arrival time (May 4th, 20:18) of the associated CME and compared it with the true arrival time (May 5th, 08:00).

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Cataloguing of Solar energetic electrons and protons during solar cycles 23 and 24

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We present two comprehensive catalogues of in situ solar energetic electrons and protons that covers the two solar cycles 23 and 24. The solar energetic electrons are detected by ACE/EPAM instrument with energy coverage 103-175 keV. The Solar energetic protons are detected by Wind/EPACT instrument for two energy channels, at about 25 and 50 MeV. For each catalogue, the onset time, peak time and peak intensity are evaluated, in addition to the associated solar flares and coronal mass ejections (CMEs). We performed correlation analysis of the properties of proton and electron events with the associated eruptive solar phenomena in order to distinguish between the effects from the different particle accelerators. These catalogues can be used by the space weather community in studying the effect of the solar energetic particles on the man-made systems and on the climate changes. In addition, studying such correlations is considered as essential ingredient of models by which solar observations are used to predict particle events.

III. Geomagnetism

Recent development of MAGDAS project

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International Centre for Space Weather Science and Education (ICSWSE), Kyushu University is the research institute for conducting research and education in space weather and related fields. Our magnetometer array named as "MAGDAS/CPMN (MAGnetic Data Acquisition System/Circum-pan Pacific Magnetometer Network)" (Principal Investigator: Dr. A. Yoshikawa) has over 70 magnetometers, including African region, and 4 FM-CW (Frequency Modulated Continuous Wave) radars around the world. MAGDAS instruments send observational data to ICSWSE in near real-time (each 10 minutes) via the Internet. One of our recent research topics is Equatorial Electrojet (EEJ). We developed EE-index (Uozumi et al, 2008; Fujimoto et al., 2016) for space weather nowcast/forecast using magnetometer data along the magnetic equator and update it at each hour on the website (http://data.icswse.kyushu-u.ac.jp/eeindex/). We investigated the relationship between plasma bubble and EEJ/CEJ using this index. To accelerate the understanding of EEJ structure, we constructed dense magnetometer array near magnetic equator at Peru and Malaysia in recent year. We are also interested in Geomagnetically Induced Current (GIC). We focus a Geomagnetically Induced Electric field (GIE), which is main electromotive force of GIC, and investigated the relationship between it and many space weather events. In this study, we found that field aligned current during sub storm generates the GIE at low, mid latitude. MAGDAS African array is important for our study, but unfortunately, almost instruments are malfunction now. We plan to rebuild them after next fiscal year. FM-CW radar is important instrument for MAGDAS project. We installed one new radar in Sicaya, Peru. We provide various information related to MAGDAS and others on our website (http://data.icswse.kyushu-u.ac.jp/). We also provide them on optimized metadata database system by IUGONET (Inter-university Upper Atmosphere Observation NETwork) Type-A (http://search.iugonet.org/). In addition, users can download and analysis verified MAGDAS data via our website, SPEDAS (Space Physics Environment Data Analysis System, http://spedas.org/wiki/), ERG-SC (https://ergsc.isee.nagoya-u.ac.jp/), and SuperMAG (http://supermag.jhuapl.edu/) in near future. For education and capacity building, we held many lecture courses for geomagnetism and integrated data analysis hands-on using IUGONET products. We believe we can make better and better collaboration, and research.

Potential GIC occurrence in mid latitude area; Results from sudden impulse (SI) events analysis in Medea (AMBER) station, Algeria

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The Geomagnetically Induced Currents (GIC) is defined as electrical currents generated from a disturbance caused by the Space Weather activities on the Earth Magnetic Field. Indeed, during strong Sudden Impulse (SI) events, the impact of geomagnetic disturbance may extend to mid latitude regions, thus leading to GIC activity. Knowing that the GIC is strongly related to the time derivative of the horizontal geomagnetic field component (dh/dt), we use a geomagnetic data obtained from Medea observatory, located at mid latitude, to investigate the possibility of GIC occurrence. To do, we examine the events (SI) occurred during the Solar Cycle 24 (SC 24) (2012-2017). This time period covered the ascending and the peak of (SC 24). Of the events selected, only two events (on 23 December 2014 and 07 July 2017) are classified as sudden impulse. The analysis of the Solar Wind Speed (Vx) component, Interplanetary Magnetic Field, (IMF Bz) component and magnetic indices (AU, AE and DST) was also conducted to reveal the behaviour of each of those parameters during the events.

Our results show the effects of (SI) event that manifest large amplitude (higher than 30 nT/min) of magnetic field changes, (dh/dt) at Medea observatory. A sudden increase in the ground magnetic impulse associated with the solar wind speed, (Vx), can lead to high magnetic changes, (dh/dt), and thus increases the possibility of GIC occurrence at that station. Ground magnetic observations associated with the changes in IMF Bz, AU and AL can be interpreted as the effect of the prompt penetration of the magnetospheric convection electric field. These results give a strong possibility for GIC activities to occur in our study area.

The Effect Geomagnetic Disturbances on Power grid Transformers Located at Geomagnetic Low Latitude: Sudan as Case Study

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Ground-based observations of geomagnetic field (B-field) are usually a superposition of signatures from different source current systems in the magnetosphere and ionosphere. Fluctuating B-fields generate geoelectric fields (E-fields), which drive geomagnetic ally induced currents (GIC) in technological conducting media at Earth's surface. Geomagnetic ally induced currents (GIC) can occur in ground-based technical networks, such as electric power transmission grids, oil and gas pipelines, telecommunication cables and railway circuits. Solar events, such as geo-effective coronal mass ejections, create disturbances within the Earth's magnetosphere, which can give rise to geomagnetic storms and sub storms. In high-latitude regions, damages to power transformers are reported where storm time geomagnetic variations are very rapid and large (>1000 nT), and hence the GICs as large as or even greater than 100 A end up flowing through the windings of power transformers. At low latitudes, geomagnetic variations are less severe, and hence much smaller GIC values are generally reported there.

Monitoring the GIC in the middle and southern African regions generally particularly in Sudan is limited by the lake of adequate monitoring equipment's (magnetometer, GIC monitoring, etc...) the implies that GIC studies based on reliable modelling techniques. The aureate model depends on ionosphere currents and the ground conductivity.

This study is an investigation of the effects of GIC on Sudanese national power grid transformers during geomagnetic sub storms; the results interpret the possible contribution of space weather effects on the stability of the national power grid.

Key words: geomagnetic disturbances, geomagnetically induced currents GICs, low magnetic latitudes.

Geomagnetic Pulsations Associated to Ionospheric Disturbance Dynamo

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In this study we analysed the geomagnetic field variations (pc5) associated with mechanism of prompt penetration of magnetospheric convection of coupling between high and low latitudes associated with the magnetic variation DP2 along European-African sector during initial, main and recovery phase of storm 5th April 2010 (the strongest effect is observed in the European-African longitude sector due to the local time location at the time of SSC onset) using MATLAB program band pass filter.
The Pc5 amplitudes decreased sharply away from the auroral zone (SOD) but were enhanced in the dayside equator (AAE), in a manner that resembled the latitudinal profile of a DP 2.
The global observational results suggest that the dawn-dusk electric field in the polar ionosphere accompanying a pair of field-aligned currents extends instantaneously to the equatorial ionosphere and completes a DP 2 – type ionospheric current system responsible for the global coherent Pc5.

The Prediction of the Disturbance Storm Time Index (Dst) Associated with the Geomagnetic Storms

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The Disturbed Storm Time (Dst) index is widely used to determine the intensity of the geomagnetic storms. The goal of this research is the forecasting of the geomagnetic storms through the prediction of the Dst index using solar wind parameters. The used data are covering the solar cycle number 23 and the earlier part of the solar cycle number 24 extending over the period from the 1^{st} of January 1996 to the 31^{st} of May 2017. The solar wind parameters data are the solar wind speed (V), the interplanetary magnetic field (B), and the south-ward component of the interplanetary magnetic field (Bz), and the solar wind electric field (Ey). We examined the correlation between the Dst index and the different solar wind parameters to construct Dst index prediction algorithm. We estimated the regression equation between the Dst index and the different solar wind parameters. In addition, we performed the prediction of the Dst index by another method: the artificial neural networks we divided the study period to many sets to get more accurate results for the performance of the neural networks. So, the ANN has been explained during the extreme storm in each set. The applied ANNs showed a good performance in the prediction of the Dst index during the onset, initial phase and the main phase.

Study of ionospheric disturbance associated to Geomagnetic variation at low latitudes During the storm of December, 20,2015

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This research presents a case study of geomagnetic variation (H-component, long period geomagnetic variation (Pc5(200-500) sec), Equatorial electrojet (EEJ) and its effect on ionospheric variation (Ionospheric disturbance dynamo (Diono) and vertical total electron content (VTEC) during moderate geomagnetic storm of December 20,2015. We found a correlation between H-component, Pc 5, Diono, EEJ and VTEC. The band-path filter has been used to filter and analyse the horizontal H-component of the geomagnetic field and EEJ in one-minute data.

Multi-Space Observations of Magnetic Field Variations using Satellite data

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A series of different solar activities of massive amounts of ionized particles (plasma) came to the earth in September 2017 in all directions of interplanetary (IP) space which make disturbance in geomagnetic activities, which in turn affects the navigation systems. A class of these activities happened sudden variation in the global magnetic field namely, geomagnetic sudden commencement (SC) and can be detected by magnetometers on the ground and in space. The current study concerns with the SC measurements obtained from several satellites distributed around the earth during September 2017 to have a global feature of the magnetic field at different local times and different altitudes.

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Keywords: Plasma; Magnetic field; Sudden commencement

IV. Ionosphere

On the necessity of GPS networking in Africa

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During the last decades, Global Navigation Satellite System [GNSS] has become a powerful instrument for terrestrial environmental sciences: geodesy, seismology, studies of ionosphere and atmosphere, space weather, meteorology, climate, etc. But it remains necessary to cover all of Africa with GNSS and thus to have access to regional and continental scientific studies….

In a first part we will recall some scientific works that can be done with GNSS, we will present the diversity of existing networks and the problems posed to maintain these networks and archived the data.

There is a data collection and archiving centre in Africa with free access to a user anywhere: The African geodetic Reference Frame (AFREF) is a project designed to unify the many geodetic reference frames for Africa using data from a network of GNSS stations (http://www.afrefdata.org).

We will propose a resolution to the AGS that each concerned scientist in Africa will have to defend in his country in order to develop a continental approach to terrestrial studies related to the use of GNSS
Resolution: if you have such data from permanent/non-permanent stations, send them to this website!

Ionospheric Scintillation now-casting for GNSS-based navigation support

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Global Navigation Satellite System (GNSS) are vulnerable to space weather impacts. Space weather may adversely affect GNSS by increasing the error of computed position as a result of cycle slips, loss-of-lock and loss of signal through solar noise and scintillation. Ionospheric scintillations are rapid fluctuations in the amplitude and phase of radio signals caused by small-scale irregularities in the ionosphere. Loss-of-lock occurs in GNSS receivers when strong ionospheric scintillation is present can make the proper acquisition and continuous tracking of the signal impossible. This study presents the first results from near-real time ionospheric scintillation monitoring using dedicated scintillation receivers in Pwani, Kenya and in Hermanus, South Africa which are equatorial and mid-latitude stations respectively. The process for obtaining near real-time updates and the ongoing statistics on the distribution of the amplitude scintillation index (S4) over both stations will be presented.

Interhemispheric Response of the Ionosphere during Geomagnetically Disturbed Conditions

John Bosco Habarulema, Zama Katamzi-Joseph

South African National Space Agency (SANSA), Hermanus, South Africa

Ionospheric electron density changes during storm conditions are driven by different physical processes. This is more pronounced when undertaking regional/global approach in understanding the driving mechanisms even for one storm event. This in turn complicates the accurate representation of appropriate inputs to modelling efforts which are empirical in nature. This talk will discuss the recent understanding of dynamic and electrodynamics processes in different latitude regions in influencing storm-time electron density changes for selected events in both hemispheres.

Comparison of Ground Based Ionospheric Scintillation Observations with in situ Electron Density Variations as measured by the Swarm Satellites

Joseph Ouko Olwendo

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Ionospheric scintillation is known to be associated with irregularities in electron density which manifests as rapid fluctuations in the amplitude and phase of radio signals traversing the ionosphere. The scintillations caused by irregularity structures in the ionosphere can be directly measured using specialised ground-based GPS scintillation measurement receivers. In this work we have used in situ measurements of electron density by means of the Langmuir probe on the Swarm B satellite to derive an index called the Rate of Density Index (RODI). Using a ground based dedicated scintillation measurement receiver, we have examined if we can identify ionospheric scintillation events which are correlated with space-based electron density variations characterised by the RODI index for cases when the Swarm B satellite orbital track traverses the ground-based station. The selected Swarm satellite passes over Africa have been limited to the longitudes within 7 degrees of longitude relative to the position of the dedicated scintillation receiver located at Pwani, Kenya (Geo. Lon: 39.78oE, Geo. Lat: 3.24oS). Our results show that RODI could be a useful index for detecting irregularities associated with scintillation events that can also be observed from the ground. This work shows the potential of using space based in situ measurement for scintillation detection and mitigation for operational purposes particularly for regions where terrestrial scintillation measurement are not possible like over oceans and deserts.

Novel technique to observe Travelling Ionospheric Disturbances by Super DARN radar

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Using the ion-momentum equation in the F-region ionosphere, simplified for field-perpendicular ion motion only, we derive an expression for the ion-neutral collision frequency that depends primarily on the temporal and spatial variability of the ion velocity. The ion-neutral collision frequency is primarily a function of neutral density in the thermosphere. Super DARN HF radars are very suited to this type of observation because of their large coverage of the F-region ionosphere, mesoscale range resolution and frequency agility. Trial observations have been performed on some Super DARN radars using a special mode. These show that realistic estimates of thermospheric neutral density, compared to the MSIS model, can be obtained. This shows significant altitude variability due to Travelling Ionospheric Disturbances, which cause HF radio wave propagation refraction in the F-region ionosphere.

Characterising Ionospheric Plasma Irregularities with the measurements by the Swarm Satellites

W. J. Miloch and IPIR Team

Department of Physics, University of Oslo, Norway

Dynamical process in the Earth's ionosphere can lead to irregularities in the ionospheric plasma density. Irregularities are commonly observed at high geomagnetic latitudes (in the auroral oval and in the polar cap), and at low latitudes where they are often related to the plasma bubbles. These structures result from plasma instabilities and turbulence, depend on the geomagnetic activity, and can impact the propagation of trans-ionospheric radio signals [1]. As such they are an important element of the space weather, which can lead to increased uncertainty of positioning with the Global Navigation Satellite Systems (GNSS), such as GPS, Galileo or GLONASS. Examples of measurable effects are radio wave scintillations in the phase and amplitude, which are significant issues at low geomagnetic latitudes and in the polar regions. A comprehensive characterization of ionospheric irregularities over all geomagnetic latitudes is important for both research and operations that rely on trans-ionospheric radio signals.

To carry out a global study and to identify, monitor, and quantify regions with the strongest variations in the electron density we employ in-situ data from the European Space Agency's Swarm mission. Swarm is a constellation of three satellites with a primary goal to study the Earth's magnetic field, upper atmosphere, and ionosphere. Based on the Swarm data, we have developed the Ionospheric Plasma Irregularities (IPIR) product for a global characterization of ionospheric irregularities along the whole satellite track [2]. This new level-2 data product combines complementary datasets from the Swarm satellites, i.e. the electron density from the electric field instrument, the GPS data from the onboard GPS receiver, and the magnetic data from the vector field magnetometer. In this work, we present the first datasets of the IPIR-product and how it can be used as a new tool for the global studies of ionospheric irregularities and turbulence.

Midlatitude plasma depletions during recovery phases of a CME and CIR driven storms in 2016 and 2017

Zama Katamzi-Joseph, John Bosco Habarulema, Michael Kosch

South African National Space Agency (SANSA), Hermanus, South Africa

Post sunset plasma bubbles were observed over South Africa during the recovery phases of coronal mass ejection (CME) and corotating interaction region (CIR) driven storms on 3 Aug 2016 and 31 Jan 2017 respectively. The characteristics of the bubbles are determined from observations of intensity of the 630 nm airglow images, global navigation satellite systems (GNSS) total electron content (TEC) and ionosonde electron density profiles. The main features and generation of the bubbles will be explored using these measurements as well as in-situ observations form SWARM's electron density and solar wind and geomagnetic data.

Statistical Study on Ionospheric Scintillation in China Low Latitude Based on Multi-instrument Observation

Zhang Donghe

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The morphological characteristics of ionospheric scintillation in China low latitude were studied based on the observations of GNSS scintillation monitor (22.59Â°N, 113.97Â°E) and GNSS receiver (22.37Â°N, 113.93Â°E) from 2011 to 2016. Result indicates that the ionospheric scintillation represented with amplitude scintillation index (S4), phase scintillation index (Ïƒ Ï†) and rate of TEC index (ROTI) mainly occurs during 19:00-02:00 LT. For the seasonal dependence, there are two scintillation peaks occurrence, one peak is about day number 60-120, another peak is about 270-330 days. The correlation coefficients of the monthly occurrence rate for S4, Ïƒ Ï†, and ROTI with monthly SSN from 2011 to 2016 are 0.351, 0.337, 0.336, respectively. The correlation coefficients of the yearly occurrence rate for these three-scintillation index with yearly SSN are 0.984, 0.911, 0.934 that are obviously larger than the monthly correlations. As for the azimuth distribution of the scintillation, it is found the ionospheric scintillations occurs more frequently in the direction of south by west with low elevation, with solar activity increase, ionospheric scintillations extend to high elevation angle. In addition, the correlation among these scintillation indexes is also studied. The correlation coefficient between yearly phase scintillation and ROTI is 0.992, between yearly amplitude scintillation and ROTI is 0.976 and the significant positive correlation coefficient of monthly ROTI and amplitude scintillation, phase scintillation is 0.964, 0.994.

On imaging South African regional ionosphere using 4D-var technique

Nicholas Ssessanga, John Bosco Habarulema, Yong Ha Kim[1]

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Over recent decades, particularly in the communication sector, technological systems have become more interdependent with a high demand in precision, both on a global and regional scale. Consequently, one of the major research areas in the space weather community is the ability to understand, characterize and model a time-space variant ionosphere through which trans-ionospheric signals propagate. In this paper a strong constraint four dimensional variational data assimilation (4D-var) technique was used to more accurately estimate the South African regional ionosphere (bound latitude 20Â° S - 35Â° S, longitude 20Â° E - 40Â° E and altitude capped to 1336 km; a JASON-1 satellite orbital altitude set for purposes of eliminating the plasmasphere contribution hence reducing the computation expense). Background densities were obtained from an empirical internationally recognized ionosphere model (IRI-2016), and propagated in time using a Gauss Markov filter. Ingested data were slant total electron content (STEC) obtained from the South African GNSS (Global Navigation Satellite System) receiver network (TrigNet). Reconstructions in time and space were validated using independent data-sets from ground based regional ionosondes (Hermanus (34.25Â° S, 19.13Â° E), Grahamstown (33.3Â° S, 26.5Â° E), Louisvale (21.2Â° S, 28.5Â° E) and Madimbo (22.4Â° S, 30.9Â° E)). Results show that assimilation has a profound improvement on the estimation of ionospheric parameters specifically maximum electron density of the F2 layer (NmF2) which recorded improvements above 60% at location with a fair distribution of GNSS ground receivers.

Exploring the Modulation of Total Electron Content over the Equatorial Ionospheric Anomaly during the 19-24 December 2015 Space Weather Event: Comparing Swarm A Satellite data with IONEX results

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The current study aims to explore the modulation of the TEC over the equatorial ionospheric anomaly (EIA) during the space weather event during 19 - 24 December 2015, using TEC data from the SWARM-A satellite and IONEX data over the Asian, African and American longitudinal sectors. We have found that the IONEX TEC is about twice the Swarm TEC which means about half of TEC is bottom side TEC below Swarm altitude. Also, we have observed that the EIA appears in the top-side TEC in certain sectors and not in others. We have also observed a longitudinal variation in the nature of the storm effects. We noted a positive storm effect on the western part of the American sector in the TEC values of Swarm A and IONEX. On the other hand, a negative storm effect appeared in the whole of the Asian sector and in and middle part of African Sectors.

Equatorial Ionospheric Scintillation over the African Sector during geomagnetic storms using GNSS ground stations

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We investigated the ionospheric response to several geomagnetic storms during the maximum phase of the current solar cycle 24, through the observations of the behaviour of VTEC, ROTI index and the L-band ionospheric scintillation S4 index at the low latitude region over the African Sector. We used ground-based GNSS (SCINDA-GPS receiver, and IGS) to perform this study. Some of these observations were supported by a geomagnetic one using Interment stations. All features of geomagnetic storms were achieved. The K_p planetary index of all the geomagnetic activities had values greater than 8. The z-component of the interplanetary magnetic field (IMF) was strongly northward at the beginning of the storms on SSC time and then altered to southward direction. Our results show that the geomagnetic storms investigated are associated with a positive phase of ionospheric storm followed by a negative phase. The enhancement of VTEC is mostly associated with ROTI index enhancement, and scintillation activity occurrence. The disturbance which happened in the interplanetary electric field produced at the same time a disturbance in the magnetic field of the Earth and the geomagnetic pulsation Pc5.The magnetic variations is in coherence with the ionospheric variations and scintillation activity occurrence.

Key words: Geomagnetic storm; TEC (Total Electron Content); ROTI Index; Ionospheric Scintillation.

Verification of the Web-Based Online Service for GPS Precise Point Position (PPP) Tropospheric Zenith Delay Technique Over Egypt

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Nowadays, Global Positioning System (GPS) has been used effectively in several engineering applications for the survey purposes by multiple disciplines. Web-based online services developed by several organizations; which are user friendly, unlimited and most of them are free; have become a significant alternative against the high-cost scientific and commercial software on achievement of post processing and analysing the GPS data. When centimetre (cm) or decimetre (dm) level accuracies are desired, that can be obtained easily regarding different quality engineering applications through these services. In this paper, a test study was made at Helwan (SCINDA station) in Egypt, to discover the accuracy analysis of the most used web based online services around the world (CSRS-PPP, APPS, magic GNSS) to estimate the Zenith Tropospheric Delay (ZTD). These services use precise point positioning (PPP) solution approaches. In this test study, the Zenith Tropospheric Delay of Helwan SCINDA station were estimated by using of both online services and Radiosonde as a truth data for 27 days (February 2015), and then the zenith tropospheric delay differences and correlation factor between the online services and radiosonde were computed. From the evaluations, it was seen that the results for each individual difference were less than (11 cm) regarding precise point positioning service, the correlation factors are 0.53, 0.76, 0.78 for APPS, CSRS-PPP, and magic GNSS respectively. The results gathered from the delay differences and standard deviations and correlation of the obtained zenith tropospheric delays from Radiosonde and GPS analysis by these online services show that the zenith path delay accuracies obtained by associated online services provide high accurate solutions that may be used in many engineering applications and geodetic analysis.

Investigation of the Travelling Ionospheric Disturbances and their Associated Ionospheric Scintillation During 28th May 2017 Strong Geomagnetic Storm

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In this research, we have observed the Traveling Ionospheric Disturbances (TIDs) over the European-African sector and Ionospheric Scintillation at low latitude and equatorial region over the African sector during the strong geomagnetic storm of May 28th, 2017, which is the third strongest storm in that year, by using 16 stations form the International GNSS Service (IGS Network). Our results show fluctuations in the total electron content (TEC) through different latitudes in the Northern and Southern hemisphere over Africa and Europe, associated with ionospheric scintillation over the low latitude and equatorial region over Africa. The storm produced different types of TIDs. In the northern hemisphere, we detected several Large Scale TIDs (LSTIDs) propagating toward the equator with typical wave speeds of 330 m/s and 383 m/s. Besides, we detected a Small Scale TIDs (SSTIDs) with a speed of 50 m/s. In the southern hemisphere, a positive ionospheric storm occurred during the morning, and we observed one LSTID occurred in the morning and propagating toward the equator, having very large wave parameters with speed of 477 m/s, associated with a scintillation activity in S4 index with (S4 > 0.4). During the night-time, a negative ionospheric storm was detected and a Medium Scale TID (MSTID) with a speed of 142 m/s, in coherent with the occurrence of the night-time scintillation with (S4 > 0.5).

The Effect of Geomagnetic Storms on The Ionosphere During Solar Cycle 24 Declining Phase at The Equator

A study of Ionospheric response, Total Electron content (TEC), Interplanetary parameters and solar parameters

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Our research aims to study response time in solar cycle 24 declining phase of geomantic storms in ionosphere in terms of total electron content (TEC) at the equator.
The ionospheric disturbance is measured by GPS stations using IGS Network, the stations located in 3 contents Kour in French Guiana, Adis in Africa and (Pbri, Cusv) located at India and Thailand in sequence.
Δ TEC shows a positive and negative ionospheric response to the geomagnetic storms in some events, this is explained by PPEF, DDEF & seasonal variation, taking into consideration the longitudinal variation.
Three major storms during the period of (2014-2017) are investigated in detail using solar parameter and magnetic indexes. showing the response time in ionosphere since the SSC in universal times (UT). The V TEC and Δ TEC have been showed for each event using different station due to their time of occurrence on day time. The mean response time calculated to 28 hr which is correlated with previous studies. some had investigated the response time on few events at the current solar cycle, and others with a large number of events on the previous solar cycles.
Correlation parameters and equations for each content are configured.
The presented results are important for forecasting models and show great significance in the navigation system.

Investigation the Ionospheric TEC using IRI and CTIPe models over Africa during the Geomagnetic storm of 28th May 2017.

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Our study aims to compare the VTEC behaviour from IRI and CITPe models with GPS measurements during the geomagnetic storm of 28th May 2017 over African sector. We have been compared the storm day results with the VTEC behaviour during the quiet day of 3rd of May 2017. We have found that the IONEX data and the CTIPe model maps are comparable during the 2 days with dtec = 40 tecu. the IRI model has been showed realistic results, where the Ne values for the quiet day is higher than the storm day due to the negative storm effect over the African region. Also, The VTEC-IRI values have been increased as the stations are in equatorward. Additionally, by comparing the VTEC-GPS and VTEC - IRI, the model has been presented the same behaviour as the VTEC-GPS. the difference between them has been appeared during the sunrise to the noon. the high difference observed at the Equatorial region since VTEC-IRI was higher than the VTEC-GPS values.

Using GNSS Radio Occultation to Characterize Water Vapor Distribution over Egypt: Validation and Preliminary Results

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Water vapor plays an important role as a basic climate variable in the thermodynamics and dynamics of the storm systems at the atmosphere and in hydrological cycles of local, regional and global scales. Moreover, the distribution of atmospheric water vapor is difficult to solve because of its rapid change in spatial and temporal scales. Global Positioning System (GPS) Radio Occultation (RO) is the first technique that can provide a high-vertical-resolution all-weather refractivity profile, which is a function of pressure, temperature, and moisture. By placing a GPS receiver on board, a low earth-orbiting satellite, the bending of radio signals transmitted by GPS satellites as they set or rise behind the earth can be measured. From the measurement of the bending angles, vertical profiles of atmospheric refractivity can be derived. The Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) is a joint Taiwan and USA satellite program and was launched into orbit in April 2006. In this study the COSMIC GPS RO vapor pressure profiles over Egypt (24° to 38° longitude / 21° to 33° latitude) are validated to those measured using three Radiosonde (RS) stations from May 2014 to December 2014. The horizontal distance between the Radiosonde stations and the occultation event is within 100 km, and the time window is 1 h. The results indicated that the cosmic vapor pressure data agreed well with the Radiosonde data. The variation of vapor pressure profiles and temperature profiles and mean monthly variation from GPS RO are presented.

Seasonal Variation of Plasma Bubbles irregularities using SWARM Satellite over Africa

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Ionospheric scintillation occurs when radio signals propagate through an irregular ionosphere (e.g., plasma bubbles). Since plasma bubbles are regions of depleted ion and electron densities, a plasma bubble located on the satellite-to-ground signal path will cause radio signals to fluctuate in phase and amplitude. The seasonal, annual and solar cycle variation of scintillation occurrence is investigated together with the Total Electron Content (TEC), to put in evidence the relation between the electron density gradients and the ionospheric irregularities causing scintillation. Emphasis will be placed on characterization of the relevant phenomena under geomagnetic quiet and disturbed conditions due to space weather phenomena, which are the main cause of increased ionospheric variability, and their associated consequences which will enable the mitigation of the deleterious ionospheric propagation effects on practical terrestrial, Earth-space communication and navigation systems. This is of considerable interest for space programs. This study aims to evaluate and improve ionospheric models for the region to facilitate better ionospheric predictions.

V.Space Environment

Single Event Transient Characterization for LM124 Operational Amplifier Using Picosecond Pulsed Laser System

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Space radiation environment may cause single event effect on satellite electronics. Single-Event transient is analog devices have caused anomalies in several spacecraft. Picosecond Pulsed Laser System for simulate Single Event Effect Test was implemented in Egypt to simulate the single event effect caused by space heavy ions. The advantages of the system are both, the availability to carry out the tests avoiding the inconvenience of a long wait and limited timeframe and the repeatability in a safe environment. After the full scanning for the die's surface of operational amplifier LM124, we will determine the sensitive nodes by mapping and characterizing LM124 using picosecond pulsed laser system. So, single event effect in LM124 operational amplifier is determined. An operational amplifier can be distorted by focusing, high energy optical pulses. A sensitive map is plotted after a complete laser scan for the LM124.

Keywords: Single Event Effect (SEE), Single Event Transient (SET), High Atomic number and Energy particles (HZE particles), Picosecond Pulsed Laser System (PPLS)

Analysis of close approach between an operational satellite and space debris

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Space debris is a growing concern with high increasing in orbit, even relatively small pieces of debris can damage or destroy satellites in a collision, so we are studying the close approach to avoidance collision between satellites and the objects.
This paper develops a numerical model to calculate the minimum distance between two objects (satellites and/or debris) in case of high accuracy orbit propagation of the two objects, then compare the distance between them at closely spaced instants of time to determine the instant of close approach. An algorithm for finding object pairs that have a low chance of collision has been developed.
The resulting algorithm is applied to real sample (collision between the Cosmos2251 and Iridium33 satellite) by modelling their orbit propagation and predicting their closest approaches and the simulation showed a significant decrease in execution time, as well as rapid convergence on minimum distances between two objects.

Impacts of Solar Events on Lifetime of Low Earth Orbit Satellites

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The upper-atmosphere perturbation and the geomagnetic field enhancement are consequences of changes in the Sun's behaviour (solar activity). These disturbances increase the temperature and density of the atmosphere due to the high energy released from the Sun. accordingly, it increases the drag force on the low Earth orbit satellites (LEO) during the times when the Sun is active; this is obviously observed in the satellite lifetime. This paper using space weather data during the current solar cycle beside atmospheric model and software. To study the effect of solar events on ISRASAT-1 cube satellite by calculate the orbital decay and estimate the lifetime.

Keywords: space weather, solar events, satellite lifetime.

Optimization of pulsed laser beam parameters to simulate the degradation effect induced by Space Radiation on solar cell.

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The natural space radiation environment has a catastrophic impact on the performance of space solar cells, that degrade their electrical and physical properties which may be causing a failure to the satellite mission. To overcome this issue, displacement damage dose test is needed to determine efficiency degradation. The main objectives of the research are utilizing Picosecond Pulsed induce degradation in the electrical parameter of the solar cells ,optimization of the Exposure Procedure and the laser parameters Experienced with Several Different conditions to reach to the electrical degradation. Mono-crystalline Silicon solar cell exposed to pulsed laser beam with different wavelengths (1064, 532) nm. Using different pulsed laser power at different locations on the solar cell, so as to optimize damaging exposure conditions. The dark I-V curve was measured before and after laser exposure. The rear side in the middle area of the solar cell exposure shows highly increase in the dark current, ideality factor and series resistance with no inhalation after exposure with wavelength 532 nm.

Active Debris Removal with Electrodynamic Tether system.

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Growing the number of space debris has recently become a topic of eminent concern. Therefore, orbital debris removal has become a very grave issue for both of scientific and commercial space management in order to avoid loss any operational satellite. To prevent loss of spacecraft due to debris collision, it is very essential to address the aggregate risk which need an efficient way to remove or avoid collision with operating satellites.

This work develops a semi-analytical method for orbital decay using Electrodynamics tether system (EDT) as a technique of active debris removal to avoid collision with operational satellites. This efficient method can change the orbit of a satellite to be more elliptical in near polar orbits due to the higher-order perturbation of Earth's magnetic field and Lorentz force. Gaussian form of Lagrange Planetary equations is used to evaluate the orbital motion of EDT with environmental perturbations of electrodynamic force, aerodynamic drag and the effect of Earth's oblateness. Differential equations for the induced voltage-current across EDT are derived and solved with boundary conditions determined by mission objectives and duration of the deorbit. The change in electric current in the EDT due to its plasma environment and thermal conditions are considered. Analyses of different parameters of EDT dynamics with variations in the mass, type of the materials of the wire of tether, and the tether length were studied to classify the range of eccentricity of the elliptical orbit for possibility of deorbit the desired missions. Applied the current model of the EDT find that the orbit of a satellite deorbited will become elliptical in near polar orbits due to the higher-order perturbation Earth's magnetic field and Lorentz force. The effects of polarity on reverse of the induced voltage/current across EDT in near polar have been discussed. Comparison between air drag only EDT for orbital decaying time in case of equatorial and polar orbit are introduced.

VI. Cosmic Ray

Cosmic Rays measurements for Scintillation Detectors' Calibration

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We introduce the experimental technique to calibrate two paddles of scintillation detectors that are received from CERN using cosmic rays as a radiation source, how the noise issue of the scintillators was fixed, and how to set the appropriate threshold of the discriminator that filter the signal readout from the scintillators from noise.

To measure the cosmic ray's rate, two paddle plastic scintillators of 10 cm× 10.5 cm dimensions, have been used. The detectors are placed vertically. The signals from the scintillators have been fed to the leading-edge discriminator. The digitized signals are sent to the coincidence module. The two-fold coincidence output is counted using a scalar counter. This count has been recorded for different PMT biasing voltages to identify the working point of each of the two scintillators. The threshold of the discriminator channels has been identified as well using cosmic rays' measurements.

Appendix

Venue of the Conference

The excellent Conference Venue is located in Cataract Pyramids Resort ; five star international standard hotel; which has unique location with beautiful panorama of the great Pyramids.

Excursion and Banquet

Pharaohs Show

Nile Cruse Dinner