

# Current endeavors to upgrade space weather research in Sudan

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## **I. Abstract**

It is obvious that today space weather research becomes an important task because of the recent revolution in space technology which has its impact on human life. And scientists have worked hard to a better understanding of all mechanisms and impacts of space weather, they use many sophisticated observation techniques to monitor the space environment, both in-situ and ground-based techniques. Within the context of the global efforts to upgrade space weather research, specifically, scientists from developing countries are expected to raise interest towards participating in activities to be implemented to improve space weather research in their countries, and that is because many tools are deployed in their countries and data become available for any scientist regardless of his native origin. A good strategy to upgrade research in the developing nations is to plan good capacity building programs, both national and international programs.

Many developing nations become involved in planning capacity building programs for their cadre who works in academics and research institutions. Our country Sudan has the privilege of hosting one important tool for space weather, i.e. a ground magnetometer station belongs to the Magnetic Data Acquisition System (MAGDAS) project of the International Center for Space Weather Science and Education (ICSWSE) of Kyushu University, Japan; this station is located within the vicinity of Sudan University of Science and Technology (SUST), the second biggest university in the country. And within the country also was established not long time ago a specialized institution in space research, i.e. the Institute of Space Research and Aerospace (ISRA). Recently representatives from both institutions in the country come together to reconcile differences in directions towards upgrading space weather research in the country and they together come out with a capacity building program (will be referred to as the Joint ISRA-SUST program) to build bases of space weather research in Sudan, and this program will soon be launched. Here, we report some details of this program and the progress so far.

## **II. About partners of the capacity building program in Sudan (The Joint ISRA-SUST program)**

The Institute of Space Research and Aerospace (ISRA) was established according to the State Minister of Science and Communication resolution and it become active in **6<sup>th</sup> of June 2013**. The institute plan is focusing on to nationalize the research and development of the different fields of space science and technology in Sudan (Daffalla 2015). One of the departments of (ISRA) is Astronomy and Physical Science Department, this department is now concerned with the current plan to improve space weather science and research in the country via a capacity building program.

On the other hand, Sudan University of science and technology (SUST) is the second biggest university in Sudan. The university hosts a ground magnetometer station part of the Magnetic Data Acquisition System (MAGDAS) project (Yumoto and group 2007) of the International Center for Space Weather Science and Education (ICSWSE) of Kyushu University, Japan. The current location of the magnetometer station is inside the campus of the college of engineering at SUST, which is known as the southern wing campus. MAGDAS magnetometer was installed inside this campus since **23<sup>rd</sup> of September 2008** (A. Yoshikawa 2016) and since that time the deanship of scientific research was the authorized administration in SUST to take care of the MAGDAS devices, a staff member of the university (SUST) got his Ph. D. in the common major of space weather science and physics( (Cardinal, et al. 2014) and (Yoshikawa, et al. 2013)), and he was appointed by the university and by the PI of the MAGDAS project as administrator of the MAGDAS observatory in Sudan. Therefore, students of SUST mainly from the College of Science, Physics Department afterward have become data users. They have used data in their graduation projects and research projects. The need then arose to have a comprehensive capacity building program with some partner to upgrade space weather research in the country; hence, the two institutions, i.e. ISRA (representatives affiliated to Astronomy and Physical Science Department) and SUST (representative is the MAGDAS administrator in Sudan) have planned to come out with a joint capacity building program to upgrade space weather research in Sudan, hereinafter will be referred to as the Joint ISRA-SUST program. In the following text, we will present details and the exact time of launching of this program.

### **III. Meetings held between representatives of ISRA and SUST**

Prior to establishing the joint ISRA-SUST program a couple of meetings were held to discuss how to put a cornerstone for a joint program between ISRA and SUST so as to improve space

weather research in the country, the first meeting was held at the building of the Astronomy and Physical Science Department at the Institute of Space Research and Aerospace (ISRA) on **14<sup>th</sup> of July 2016**. This meeting was very important since the roundtable was led by the director of ISRA, i.e. Dr. Moutaman Mirghani Daffalla. Two main tasks were mainly been discussed: how to establish a joint program to upgrade space weather research in Sudan and to plan to organize a joint regional workshop in the very coming future. Afterward, discussions and meetings were held in the same building of the Astronomy and Physical Science Department of ISRA; and also in the office of the MAGDAS administrator at the west wing campus of SUST. The last meeting was held at ISRA building on **24<sup>th</sup> of August 2016**, and in this meeting, negotiations have finalized the joint ISRA-SUST program to be launched in **September 2016**. Photo 1, here, was taken just after the meeting which was held on **24<sup>th</sup> of August 2016**.



**Photo 1 Stand from right to left: Uz. MOHAMMED YAHYA ALKENANI (coordinator of the joint ISRA-SUST program), Dr. MAGDI ELFADIL YOUSIF SULIMAN (the MAGDAS administrator in Sudan), Uz. GASSAN (the head of Astronomy and Physical Science Department of ISRA), Uz. ISHRAGA ADEL (a researcher in ISRA), this photo was taken just after the meeting held on 24<sup>th</sup> of August 2016 at ISRA building.**

#### **IV. The Joint ISRA-SUST program**

The joint ISRA-SUST program contains two hub items agreed upon to be worked on so as to upgrade the space weather research in Sudan, they are:

- i. To organize and plan continuous national and international training programs to train researchers of the Astronomy and Physical Science Department of ISRA, students in SUST and other national universities, amateurs and those who have a great interest in space weather and space science in general.
- ii. To participate in organizing space weather related events held annually in Sudan like the World Space Week (WSW); and participation in organizing local, regional and international workshops, conferences, seminars and summer schools like the MAGDAS school, in addition to organizing to held a periodic seminars in national universities, specifically universities of Sudanese states.

The joint ISRA-SUST program is then agreed upon to be launched on **17<sup>th</sup> of September 2016**, that is to start a training course for the staff of the Astronomy and Physical Science Department of ISRA, the course focuses on how to prepare and write a space weather report, the tentative schedule of this course is shown in the following **Table 1**.

In addition to this training course the next will be to participate in the world space week which will be in the first week of October, up to now the preparation for this week is going on well and public lectures were prepared for the week, moreover, some outreach program were prepared too. In the future, we will report the execution of both the training course and the world space week events.

**Table 1 Tentative schedule of the training course for staff of the Astronomy and Physical Science Department of ISRA.**

<b>Day</b>	<b>First session</b>	<b>Second session</b>
Saturday	<b>16:00 – 17:30</b>	<b>18:00 – 19:00</b>
土	<i>Sun &amp; Space Weather</i>	<i>Practical in Reporting Space Weather</i>
Sunday	16:00 – 17:30	18:00 – 19:00
日	#	#
Monday	16:00 – 17:30	18:00 – 19:00
月	#	#
Tuesday	<b>16:00 – 17:30</b>	<b>18:00 – 19:00</b>
火	<i>Earth's Magnetosphere</i>	<i>Practical in Reporting Space Weather</i>
Wednesday	16:00 – 17:30	18:00 – 19:00
水	#	#
Thursday	<b>16:00 – 17:30</b>	<b>18:00 – 19:00</b>
木	<i>Discussion on National Plans Related to Space Weather</i>	<i>Tutorials</i>
Friday	16:00 – 17:30	18:00 – 19:00
金	Holiday	Holiday

## V. Acknowledgement

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