June, 2010

orbit®

a bi-annual newsletter of African Regional Centre for Space Science and Technology Education ■ Volume 5 No 1, June, 2010 ■

from the Director

Education is a major indicator of human development. It occupies the centre stage of any development effort. An essential element of development in any nation, is its level of literacy and the training opportunities made available to its citizenry. There is no doubt that a well-educated society will be a direct beneficiary of technology development. The benefits of Space Technology, both direct and indirect, have introduced new dimensions into the study and understanding of Earth's processes towards improving the quality of life. An essential pre-requisite to partaking in these opportunities is the building of various indigenous capacities for the development and utilization of Space Science and Technology.

Several capacity-building programmes have taken place in the area of space technology applications for sustainable development in the Africa under ARCSSTE-E, many short- and medium-term training courses as well as post-graduate courses in space technology applications for development. The African Regional Centre for Space Science and Technology in English (ARCSSTE-E), OAU campus, Ile-Ife, affiliated to the United Nation Office for Outer Space Affairs (UNOOSA). The mandate of the Center is to develop the skills and knowledge of the students or participants, mostly from the English speaking African countries, in the applications of space science and technology. We already have XY from PSA and Nigeria participating in the programme for the 2010 session

The Centre is largely involved in the promotion of space education in Nigeria through the coordination of space-related education activities aimed at improving general awareness and with links to the curriculum and teachers. The Centre since the beginning of this year has been promoting space education awareness and outreach activities.

In order to achieve rapid capacity building in space technology in Africa, The Nigerian government through the African Regional Centre for Space Science and Technology education in English (ARCSSTE-E) has recognised that the implementation of distance education programme in Africa is a major step towards building the critical mass of space professionals needed for African development. In order to realise this objective, view of this it has been proposed that the NigComsat-1 communication satellite which will soon be launched into orbit will be used to implement the proposed distance learning programme.

For our future development, it is pertinent to commit ourselves to the development

contd. on page 2, col. 1 >>>

CONTENTS

OPENING CEREMONY OF 2010 PGD PROGRAM

The 2010 Postgraduate Diploma Programme in Space Science and Technology applications organized by the African Regional Centre for Space Science and Technology Education in English (ARCSSTE-E), commenced with an opening ceremony which took place on the 22nd of January, 2010, at ARCSSTE-E premises. The ceremony was attended by Management and staff of the Centre led by the Director/CEO, Dr. J. O. Akinyede, and the participants. Prominent guests that graced the occasion included several eminent scholars, coordinators of the programme, resource persons, representatives of Obafemi Awolowo University and Regional Centre For Training in Aerospace Surveys (RECTAS).

In his welcome/opening remarks, the Director, Dr. J. O. Akinyede said he was pleased to welcome all the participants to the 2010 PGD programme. He gave a brief history of the Centre, and informed the audience that ARCSSTE-E was one of the four regional centres established by United Nations Office for Outer Space Affairs (UNOOSA), to undertake the task of developing capacity in Space Science and Technology for English-

2010 Opening Ceremony group photograph

speaking African countries; the other three Centre located in Morocco for the French-speaking African countries, Brazil/Mexico for the Latin American and Caribbean countries, and India for Asia and the Pacific.

In view of the wide jurisdiction of ARCSSTE-E, the Director said the Centre is making arrangements to set up desk offices in strategic English-speaking countries to serve as information centres. To this end, he informed the audience that a visit was made to Uganda where useful discussions took place between ARCSSTE-E Management and senior Ugandan government officials to facilitate the setting up of a desk office that would serve the countries of East Africa.

The Director informed the participants that lectures would commence on Monday, 25th January, 2010. He went on to say that UNOOSA were in the process of developing curricular for two (2) more courses to be introduced; GNSS and Space Law. Commenting further on his plans to move the Centre forward, he said he was hopeful that in the next one or two years, MSc and PhD programmes would be introduced in the Centre.

On the development of infrastructure, the Director

contd. on page 8, col. 3 >>>

Message from the Director

>>> contd. from page 1, col. 1

and growth of information economy, which is presently been driven by space technology. Greater priority should be accorded to the development and transfer of knowledge and skills through capacity building, joint participation, knowledge sharing, and bilateral and international cooperation.

It is expected that the Centre's role in the region will continue, with more emphasis on promoting regional cooperative mechanisms for operational applications of space technologies in major fields of common concern, including disaster reduction and information sharing and connectivity for under-serviced areas. As at today in many parts of the world, space technology is now considered a vital component of information and communication technology infrastructure As ARCSSTE-E progresses towards building an information and knowledge society in the region, the role of space technology is likely to become even more central (especially for improved tele-density through broadband connectivity, in developing countries, primarily in least developed countries in the region.

In this issue of orbit we look at the 2010 ARCSSTE-E governing board meeting held in March this year. The meeting was especially remarkable due to presence of the new UNOOSA representative Dr. Takao Doi who for many years has been a Japanese astronaut. He called for a stronger commitment from other member countries in order for Africa to fully harness the opportunities provided by space technology for sustainable development. Other interesting topics in this edition include articles on current topical issues such as earthquakes, space weather, the advantage of equatorial plane for launching rockets and other light stuff all packaged for your reading and enjoyment. To this end, I urge you all to sit back and explore with us.

Space Club Launched in Ilesa

As one of the ways of sensitizing, educating and creating awareness for the school children at all levels in the aspect of space science and its benefits to mankind, Space Club was launched for schools in Ilesa and its environs on Tuesday 9th February, 2010 at Ilesa Grammar School.

Boys and girls from one hundred and forty two schools, both primary and secondary, were in attendance. Some important dignitaries were also present, these included: the Zonal Inspector of Education, Zonal Chairman, Ilesa East and West local Inspectors.

Water Rocket launching

DVD on space education themes - *Space Files, Toys in Space* and *Water Rockets* were shown to the students after which the Deputy Director gave a speech on space education outreach programme and its relevance to all disciplines.

Pupils Presentation

Four presentations were made by the scientific officers of the Centre, these included: a pictorial presentation on schools workshop and space education activities, stars, continental drift and rockets. Space club guidelines were presented to the schools and the school children were later taken outside the auditorium to witness and participate in the launching of the water rocket which signified the official launching of the Space Clubs.

A vote of thanks was given by the Vice Principal of Ilesa Grammar School.

SCHOOL'S EDUCATIONAL TOURS TO ARCSSTEE

Students from primary and secondary schools visited the Centre on an excursion. This provided an opportunity for the Centre to further continue her efforts in educating youths on space science and technology.

The educational tour provided an opportunity for those students who were not privileged to attend the Centre's workshop or outreach programmes to be educated about space related issues through exposure to resources and materials on space science and technology.

There were also interactive sessions where the students were

contd. on page 7, col. 3 >>>

SPACE EDUCATION OUTREACH PROGRAMME IN ENUGU & TARABA STATE

The Center for Space Science and Technology Education in English (ARCSSTE-E), in the spirit of carrying out part of its mandate of doing space education and outreach, simultaneously conducted two workshops in two different geo-political regions in Nigeria; either workshop was tagged Schools' Workshop on Space Education.

The two-day workshop, tagged "catch them young" was held on the 22nd and 23rd of June, 2010 at Enugu and Taraba States simultaneously.

The event in Enugu was organized in collaboration with the Centre for Basic Space Science, University of Nigeria, Nsukka. About six hundred and five (605) participants, comprising of two hundred and twenty seven (227) pupils from primary school category, three hundred and twenty (320) students from secondary school category, and fifty eight (58) teachers, drawn from schools in the five states of the south east zone of the country, participated at the workshop. The workshop took place at the main Auditorium of University of Nigeria Enugu Campus.

Prior to the kick off day of this programme, there was a courtesy call on His Royal Highness, Igwe (Dr.) J. I. Nnaji Ezenedozigbu, the Paramount Ruler of Nike area, where Dr. J. O. Akinyede, the Executive Director of the Centre briefed the fore-father on the reasons they were in the state and the activities of the centre.

The Director of Centre for Basic Space Science-Nsukka, Prof. Pius N. Okeke, represented by Dr. Friday B. Sigalo, a Consultant Astronomer for CBSS, presented the welcome address commended the effort of the centre for organizing this event the second time in the zone. He noted that the workshop was to stimulate and further inspire to develop the interest of the young children in Space Science and Technology. He concluded by saying that the young generation of today space scientists and engineers are leaders of tomorrow.

Participants during the workshop in Enugu

The Executive Director ARCSSTE-E, Dr. J. O. Akinyede, in his address recounted the history and purpose of the centre. He informed the audience that one of its major mandates apart from capacity building at the postgraduate level for English speaking African countries, is organizing of educational outreach programmes to nursery/primary and secondary schools; and even to the tertiary institutions on space education, thereby promoting awareness of the benefits of space technology especially to Nigerians

contd on page 8, col. 2 >>>

GOVERNING BOARD MEETING

The third annual Governing Board Meeting of the African Regional Centre for Space Science and Technology Education in English was held on Tuesday 23rd, March, 2010 at the

From left to Right; Dr. Takao Doi, Mrs. Iheanacho, Dr J. Akinyede, Mrs. Lami Ali-Fadiora, Mrs. P. Tokula & Mrs. M. J. Oluwagbamila

Zuma hall of Rockview Hotel, Abuja. The meeting had in attendance participants from ten (10) participating African countries including the United Nations Representative, Dr. Takao Doi who is an Expert on Space Applications and also an Astronaut. Also, present at the meeting was Mr. Agoro A. Olayiwola who represented the Permanent Secretary, Federal Ministry of Science and Technology.

The Chairman of the Governing Board, Dr. S.O. Mohammed (Director-General, National Space Research and Development Agency, NASRDA) was unavoidably absent. The opening remark was read by his representative, Mrs. Augusta Ihenacho in which the Chairman welcomed all participants and emphasized the need for

Director responding to questions from Pressmen

continued support and successful deliberations. The Director/Chief Executive of ARCSSTE-E, Dr. J.O. Akinyede, also emphasized in his speech, the impact of Space Technology on Information Communication Technology (ICT) which has resulted in space related and applications and spinoffs, internet facilities etc. He also allayed the fears of Nigerians by stating that the dust haze situation in the atmosphere then was not dangerous but a natural phenomenon. He affirmed that ARCSSTE-E, like the other regional Centres have the mandate to lecture and build capacity in the four core areas of Space Applications namely; Satellite Communication,

contd. on page 6, col. 3 >>>

Astronaut visits ARCSSTE-E & OAU

Dr. Takao Doi, (a Japanese Astronaut) visited the Obafemi Awolowo university on the 25th of March 2010. He is an Expert on Space Applications and has been to space twice. The Astronaut was accompanied by some management staff of the African Regional Space Science and Technology Education in English (ARCSSTE-E) during a courtesy visit to the office of the Vice-Chancellor.

The Astronaut was received by Prof. (Mrs.) Togonu-Bickersteth (Deputy Vice-Chancellor, Academics). She apologized

Deputy Vice-Chancellor in a meeting with ARCSSTE-E Executive Director & Dr. Takao Doi.

for the Vice-Chancellor's absence and expressed gratitude on behalf of the university management for the visit. Dr. Takao Doi, who came to Nigeria to represent the United Nations during the governing Board meeting of the ARCSSTE-E, shared his experience as an astronaut and space flight.

Group photograph of Dr. Takao Doi & 2010 PGD participants

The Deputy Vice-Chancellor commented on the willingness of the University to support the United Nations collaboration with ARCSSTE-E and the centre's activities. In an earlier visit to the Vice-Chancellor by the management of ARCSSTE-E on the 17th of March, 2010, Prof. Togonu-Bickersteth assured the

ARCSSTE-E staff courtesy call to RECTAS

Director of the Centre, Dr. J.O. Akinyede of the University's cooperation and support to the programmes of the Centre. The Astronaut also visited the Regional Centre for Aerospace Survey (RECTAS) where he was received by the Deputy Director and some management staff of the Centre. He was informed about the collaboration between RECTAS and ARCSSTE-E which he saw as a good development.

Dr. Doi was finally taken to ARCSSTE-E's permanent site to have a view of the construction work going on there. He was very excited and hoped that the job would be completed soon. He commented on the space Museum, which he said would be a good tourist centre for students and visitors to the university.

Visitation to the centre's permanent site.

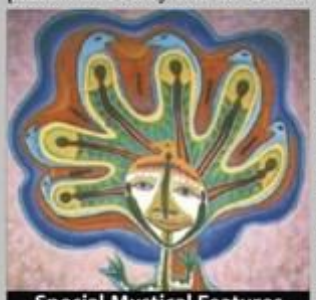
Myths, Legends and Folktales?

Human beings have been telling stories since they first learned to speak. And even before we could speak, we managed to tell stories by drawing and painting pictures on the walls of the caves we lived in.

Once upon a time, long, long ago, before even your teachers were born, there lived some really great storytellers. Their stories have been passed down, retold, translated, adapted and, more recently, written down, because everyone loves a good story! Do some of your favourites include haunting and murder, treasure and battle, wicked deeds and heroic actions? These stories probably include legends, myths and folktales.

What are legends?

A legend is usually based on a true event in the past. However, the story may have changed over time to take on some special 'mythical' features. Legends usually have a real hero at the centre of the story and they are often set in fantastic places. The story will have been passed on from person to person, sometimes over a very long period of time. The fact that so many people have taken the trouble to keep the story alive, usually tells you that it has some very important meaning for the culture or region in which the story was first told.



Special Mystical Features

What are myths?

A myth is not quite the same as a legend. Sometimes a myth is loosely based on a real event but, more often than not, it is a story that has been created to teach people about something very important and meaningful.

Myths are often used to explain the world and major events, which, at the time, people were not able to understand - earthquakes, floods, volcanic eruptions, the rising and setting of the sun, illness and death. Many of the myths relating to such events have survived for a very long time, sometimes for thousands of years, as it is only in recent times that we have begun to understand why some of these things happen.

>>> contd. from page 7, col. 1

Advantages of the Equatorial Plane for Space Rocket Launch

The equator can be lamely defined as the imaginary line on the Earth's surface equidistant from the North Pole and South Pole that divides the Earth into a Northern Hemisphere and Southern Hemisphere. The latitude of the Earth's Equator is 0° and the length is approximately 40,075.16 kilometers (Figure 1). Since the Earth is spherical in shape, the shortest distance between any two points on the globe therefore lies along its circumference. Of the five latitudinal circle of the Earth, only the equator is the great circle. Routes following the curves of the great circles appear much longer than those along a straight line joining two places. Therefore, it is common to find modern aircrafts following routes along sections of the great circles for speedy long-distance flights as a way of cutting down on flying time and thereby saving on aviation fuel cost.

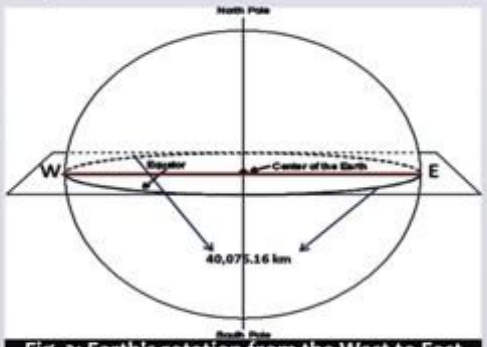


Fig. 2: Earth's rotation from the West to East

Rockets can most easily reach satellite orbits if launched near the equator in an easterly direction, as this maximizes use of the Earth's rotational speed (465 m/s) or approximately 1665 km per hour at the equator. If launched just 60 degrees north of the equator, the speed is halved while it is completely zero at the pole. For example, if a rocket starts to move in a straight path from the equator to the North Pole, its eastward speed (the earth rotates from west to east) will be 1665 km/hr. As it travels northward, its eastward movement will be faster than the eastward movement of the surface of the earth at higher

>>> contd. from page 6, col. 1

SPACE WEATHER AND ITS ECONOMIC/SOCIAL IMPACT

Modern society depends heavily on a variety of technologies that are susceptible to the extremes of space weather—severe disturbances of the upper atmosphere and of the near-Earth space environment that are driven by the magnetic activity of the Sun. Strong aurora currents can disrupt and damage modern electric power grids and may contribute to the corrosion of oil and gas pipelines. Magnetic storm-driven ionospheric density disturbances interfere with high-frequency (HF) radio communications and navigation signals from Global Positioning System (GPS) satellites, while polar cap absorption (PCA) events can degrade—and, during severe events, completely black out—HF communications along transpolar aviation routes, requiring aircraft flying these routes to be diverted to lower latitudes. Exposure of spacecraft to energetic particles during solar energetic particle events and radiation belt enhancements can cause temporary operational anomalies, damage critical electronics, degrade solar arrays, and blind optical systems such as imagers and star trackers.

The effects of space weather on modern technological systems are well documented in some part of the world Most often cited perhaps is the collapse within 90 seconds of northeastern Canada's Hydro-Quebec power grid during the great geomagnetic storm of March 1989, which left millions of people without electricity for up to 9 hours. This event exemplifies the dramatic impact that extreme space weather can have on a technology upon which modern society in all of its manifold and interconnected activities and functions critically depends.

Over two decades have passed since the March 1989 event. During that time, awareness of the risks of extreme space weather has increased among the affected industries, mitigation strategies have been developed, new sources of data have become available (e.g., the upstream solar wind measurements from the Advanced Composition Explorer), new models of the space environment have been created and USA and other technological advanced countries has a national space weather infrastructure providing data, alerts, and forecasts to an increasing number of users.

Impact of Space Weather

Modern technological society is characterized by a complex interweave of dependencies and interdependencies among its critical infrastructures. A complete picture of the socioeconomic impact of severe space weather must include both direct, industry-specific effects (such as power outages and spacecraft anomalies) and the collateral effects of space-weather-driven technology failures on dependent infrastructures and services.

Industry-specific Space Weather Impact

The main industries whose operations can be adversely affected by extreme space weather are the electric power, spacecraft, aviation, and GPS-based positioning industries. The March 1989 blackout in Quebec and the forced outages of electric power equipment in the northeastern United States remain the classic example of the impact of a severe space weather event on the electric power industry. Itemized below are other industries which have experienced impacts of space weather.

The outage in January 1994 of two Canadian telecommunications satellites during a period of enhanced energetic electron fluxes at geosynchronous orbit, disrupting communications services nationwide. The first satellite recovered in a few hours; recovery of the second satellite took 6 months and cost $50 million to $70 million.

The diversion of 26 United Airlines flights to non-polar or less-than-optimum polar routes during several days of disturbed space weather in January 2005. The flights were diverted to avoid the risk of HF radio blackouts during PCA events. The increased flight time and extra landings and takeoffs required

>>> contd. from page 6, col. 2

A NATURAL WAY OF DEFINING DWARF PLANETS

On August 24, 2006, the International Astronomical Union (IAU) reached the decision that Pluto should no longer be considered a planet – before then the celestial body was recognized as a planet. According to the IAU decision, Pluto would henceforth be construed as a dwarf planet.

In addition to the IAU decision categorizing a celestial body in the solar system as either a planet or a dwarf planet, celestial bodies in the solar system may also be regarded or categorized (according to the IAU) as small solar system bodies. This article discusses a quite natural way of defining a dwarf planet. Hence, what exactly is a dwarf planet?

While the IAU has come up with definition rules for planets, the definition of dwarf planets can be seen to be arbitrary – ranging from definitions like any trans-Neptunian object with a radius of at least 420 km to definitions like a non-satellite celestial body that meets all of the requirements for a planet, as defined by the IAU, except it shares its orbit with significantly large celestial bodies (i.e. it has not cleared the neighborhood of its orbit of these other large celestial bodies).

A recent work suggests a very apt way of defining dwarf planets, which integrates and harmonizes various ideas regarding such a definition. This work provides a standard or measurement – i.e. a threshold (a so-called potato-sphere threshold) – that separates potato-shaped objects in the solar system from spherical ones. This threshold is apt because both physical observation and theoretical investigation show that the threshold provides a separation means by which, naturally, potato-shaped objects fall on one side of the threshold while spherical objects fall on the other side.

On the one hand, the physical observation of images of objects in the solar system shows that potato-shaped objects have a radius generally smaller than about 200km while the radii of spherical ones are greater than 200km. On the other hand, the theoretical investigation of the forces acting on objects in the solar system shows that these forces – including gravitational forces and the forces associated with rapidly spinning bodies – squeeze and mould objects larger than about 200km into spheres.

This threshold results in a definition of dwarf planets that marries ideas and definition

contd. on page 7, col. 3 >>>

RISE IN EARTHQUAKE ACTIVITY
Is Humanity Facing A Global Catastrophe?

In recent times, the world has experienced series of devastating earthquakes. China's tragic magnitude 6.9 earthquake on April 13 and the recent devastating earthquakes in Haiti, Chile, Mexico, and elsewhere have got many wondering if this earthquake activity is unusual. There is a feeling of fear in certain quarters that these unusual earthquake activities are omens or signs that the world may soon experience a global catastrophe.

Causes of Earthquakes

An earthquake is the result of the sudden release of energy in the Earth's crust that creates seismic waves. They are recorded with a seismometer, also called a seismograph. Earthquakes of magnitude 3 or lower on the Richter scale are mostly imperceptible while magnitudes 6 or higher cause serious damage over large areas.

Aftermath of Earthquake in China

At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacing the ground. When a large earthquake epicentre is located offshore, the sea bed sometimes suffers sufficient displacement to cause a tsunami. The shaking in earthquakes can also trigger landslides and occasionally volcanic activity.

Causes of earthquakes have been explained by plate tectonics theory. This is a scientific theory that describes the large scale motions of the earth's lithosphere. The theory builds on the older concepts of continental drift developed by Alfred Wegener during the first decades of the 20th century, and sea-floor spreading developed in the 1960s.

Plate tectonics principle states that the lithosphere (comprising the continental and oceanic crusts) exists as separate and distinct tectonic plates, which ride on the fluid-like asthenosphere. The Earth is made up of 7 major and several minor tectonic plates. These are: African plate, Antarctic plate, Indo-Australian plate, Eurasian plate, North American plate, South American plate, and the Pacific plate.

These plates move in relation to one another. The location where two plates meet is called a plate boundary. There are three types of plate boundaries:

- Transform boundaries – occur where plates slide or grind past each other along transform faults. An example is the San Andreas fault in California. Majority of earthquakes originate from these faults.
- Divergent boundaries – occur where two plates move apart from each other. Mid-ocean ridges (e.g. Mid-Atlantic Ridge) and active zones of rifting (e.g. Africa's Great Rift Valley) are examples of divergent boundaries.
- Convergent boundaries (or active margins) – occur where two plates slide towards each other commonly forming either a subduction zone (if one plate moves under the other) or a continental collision (if the two plates contain continental crust). Deep marine trenches are typically associated with subduction zones.

The movement of tectonic plates described at the various boundaries are associated with different types of surface phenomena. Earthquakes, volcanic activity, mountain-building, and oceanic trench formation occur along plate boundaries. The lateral relative movement of the plates varies, although it is typically 0 – 100mm annually.

Effects of Earthquakes

- Shaking and ground rupture – results in more or less severe damage to buildings and other rigid structures. The severity of the local effects depends on the complex combination of the earthquake magnitude, the distance from the epicentre and the local geological and geomorphological conditions of the area.
- Landslides and avalanches – earthquakes, along with severe storms, volcanic activity, coastal wave attacks and wild fires can produce slope instability leading to the landslides, a major geological hazard.
- Fires – earthquakes can cause fires by damaging electrical power or gas lines. For example, more deaths in the 1906 San Francisco earthquake were caused by fire than by the earthquake itself.
- Soil liquefaction – this is when water-saturated granular material (e.g. sand) temporarily loses its strength and transforms from solid to liquid as a result of shaking. Soil liquefaction may cause rigid structures like buildings and bridges, to tilt or sink into the liquefied deposits.
- Tsunamis – these are long-wavelength, long-period sea waves produced by the sudden or abrupt movement of large volumes of water. These ocean waves are triggered by the movement of the ocean floor during an earthquake. Tsunamis can overrun nearby coastal areas in a matter of minutes and can

Devastating Earthquakes which rocked Haiti

contd. on page 8, col. 1 >>>

Advantages of the Equatorial Plane for Space Rocket Launch

>>> contd. from page 4, col. 2

latitudes. It will run ahead of any object at higher latitudes, and appear to an earth based observer to be curving to the right. Similarly, if the object traveled from the North Pole to the equator it would have no eastward movement, and would fall behind a lower latitude object whose eastward movement would be faster. This is because the W-E rotation of the Earth (Fig. 2) on its

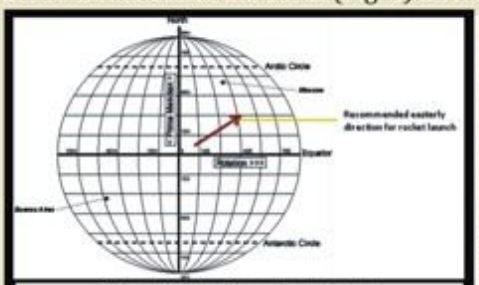


Fig. 1: Illustration of the Earth

axis is most felt at the equator. The velocity gain at this plane is being used in spacecraft launches as a means of aiding propulsion and reducing propellant cost. For example, the coincidence of Malaysia's RazakSat orbital inclination with the latitude of its launch at Kwajelin and the northernmost part of Malaysia ensures its launch was nearly due east which made the propulsion to be quite efficient. For Polar and Molniya orbits, which are completely far away from the equator, this does not apply. RazakSat, an Earth observation satellite was launched into the near equatorial orbit (NEqO), so that its closeness to the Earth surface will enhance its powerful sensors to obtain very high spatial and temporal resolution images.

Such rocket launches from spaceports located at the equator also give a good orientation for arriving at a geostationary orbit. Geostationary orbit is particularly good for national and regional communications system owing to its very high position. The high altitude, approximately 36,000 km allows for the total coverage of the Earth surface by a few satellites in constellation.

SPACE WEATHER AND ITS ECONOMIC/SOCIAL IMPACTS

>>> contd. from page 4, col. 3

by such route changes increase fuel consumption and raise cost, while the delays disrupt connections to other flights.

With increasing awareness and understanding of space weather effects on their technologies, industries have responded to the threat of extreme space weather through improved operational procedures and technologies. As just noted, airlines re-route flights scheduled for polar routes during intense solar energetic particle events in order to preserve reliable communications.

In addition, power grid operators take defensive measures to protect the grid against geomagnetically induced currents (GICs). Similarly, under adverse space weather conditions, launch personnel may delay a launch, and satellite operators may postpone certain operations (e.g., thruster firings). For the spacecraft industry, however, the primary approach to mitigating the effects of space weather is to design satellites to operate under extreme environmental conditions to the maximum extent possible within cost and resource constraints

The Collateral Impact of Space Weather

Due to the interconnectedness of critical infrastructures in modern society, the impacts of severe space weather events can go beyond disruption of existing technical systems and lead to short-term as well as to long-term collateral socioeconomic disruptions. Electric power is modern society's cornerstone technology, the technology on which virtually all other infrastructures and services depend. Although the probability of a wide-area electric power blackout resulting from an extreme space weather event is low, the consequences of such an event could be very high, as its effects would cascade through other, dependent systems. Collateral effects of a longer-term outage would likely include, for example, disruption of the transportation, communication, banking, and finance systems, and government services; the breakdown of the distribution of potable water owing to pump failure; and the loss of perishable foods and medications because of lack of refrigeration. The resulting loss of services for a significant period of time in even one region of the country could affect the entire nation and have international impacts as well.

Extreme space weather events are low-frequency/high-consequence (LF/HC) events and as such present—in terms of their potential broader, collateral impacts—a unique set of problems for public (and private) institutions and governance, different from the problems raised by conventional, expected, and frequently experienced events. As a consequence, dealing with the collateral impacts of LF/HC events requires different types of budgeting and management capabilities and consequently challenges the basis for conventional policies and risk management strategies, which assume a universe of constant or reliable conditions. Moreover, because systems can quickly become dependent on new technologies in ways that are unknown and unexpected to both developers and users, vulnerabilities in one part of the broader system have a tendency to spread to other parts of the system. Thus, it is difficult to understand, much less to predict, the consequences of future LF/HC events. Sustaining preparedness and planning for such events in future years is equally difficult.

(http://books.nap.edu/openbook.php?record_id=12507&page=3)

GOVERNING BOARD MEETING

>>> contd. from page 3, col. 1

Satellite Meteorology, Remote Sensing/GIS and Basic Space and Atmospheric Science to maximize the benefits of Space Science Applications. The Centre also carries out Outreach programmes for school children and the public. However, the Director remarked that lack of funds have posed some challenges which member states should deliberate on and propose possible ways of solving them.

The major topic for deliberations at the meeting among others was the modalities for the formation of a standing Governing Board involving the commitment of the government of member countries. According to the United Nations mandate, all member countries are to contribute material, human and financial resources together for the effective

ARCSSTE-E Governing Board 2010 group photograph

implementation of the programmes of the centre. The High Commissioners/Ambassadors present were charged with responsibilities of informing their home governments about the activities of the Centre and the need for them to be supportive.

Issues discussed also involved the amendment of a draft copy of the Memorandum of Understanding on the establishment of the Centre. The United Nations representative advised that a copy should be sent to the Office of Outer Space Affairs (OOSA) explaining the

Dr. Takao Doi making a presentation during ARCSSTEE Governing Board 2010 meeting

reason for the amendment. At the end of the deliberations, a communiqué was issued.

Myths, Legends and Folktales?

contd. from page 4, col. 1 >>>

What are folktales?

Folktales are usually stories that have been passed down from generation to generation in spoken form. Often we do not know who was the original author and it is possible that some stories might have been concocted around a campfire by a whole group of people. It is quite normal to discover that there are many versions of the tale, some very similar but others may have only one or two characters in common and take place in totally different settings.

Many of the stories we call 'fairy tales' are really folktales - Sleeping Beauty, Hansel and Gretel, The Three Little Pigs. These stories were probably inspired by events which happened so long ago that we no longer have a record of what those events were.

What is the difference between legends, myths and folktales?

It is very hard to list the differences between myths, legends and folktales. In fact, it is often easier to say what they have in common than to say what makes them different from one another.

The main difference is probably to do with how much the story is based on a true event (illustrated below).

What we call legends are generally stories, which have an actual historical event or person as their starting point. Myths are sometimes based on legends but are altered in a way that makes them useful to teach people how to behave or to give an explanation of the world around.

Folktales may also have started their life by being based on an event, but they are changed almost every time they are told and, as time passes, the story loses its connection to reality and the message or moral of the story becomes much more important.

It's not really so important to spot the difference between the three types. Just enjoy the stories for themselves and see if you can tell what the purpose of the story was originally. Why might the story have been told in the first place? Are you able to tell how it has changed over time?

jokes & fun

Paddy the Earthling: We put a man on the moon in 1969.

Paddy the Martian: Big deal! We're going to send a team to the Sun.

Paddy the Earthling: You're mad! They'll be burned up before they even get close.

Paddy the Martian: We're not that stupid! We're sending them up at night!

What do moon people do when they get married?
They go off on their honeyearth!

Two young Martians were travelling past Earth one day when they noticed two kids roller skating at breakneck speed along the footpath.

"How on Earth do they do that?" said one of the Martians?

The two young Martians were so impressed that they swooped down on the kids straight away and made off with their roller skates.

Their mother was angry with them when they got back to Mars.

"You're late for your dinner again and ... where on Earth did you get those?"

The Jupiter Beauty Contest Authorities have launched a bitter attack on their Earth counterparts. In a strongly-worded press release, they have pointed out that in the last 37 years every single winner of the Miss Universe competition has been an Earth woman !!

Freshmen in the general-science class at Mark Twain Middle School in Mar Vista, Calif., were studying astronomy.

"What do we call a group of stars that makes an imaginary picture in the sky?" the teacher asked.

"A consternation," one student replied.

Copernicus' parents: "Copernicus, young man, when are you going to come to terms with the fact that the world does not revolve around you?"

(Nicholas Copernicus (1473–1543)A Polish astronomer. He established in his writings the Copernican system, the first modern European theory of planetary motion that placed the sun motionless at the center of the solar system with all the planets, including the earth, revolving around it.)

Black Holes are where God is dividing by zero.

Question: How many astronomers does it take to change a light bulb?

Answer: Ten! One to change the bulb, and nine to argue how their own bulb gives better colour.

Once in Mr. J's class they were celebrating Galileo's birthday. The previous Friday he had given an hour long lecture on computing angular distances using star charts of the Mercator style. After the class sang Happy Birthday in Italian, he asked the following: "All right, who here can tell me the distance from Betelgeuse to Procyon using your standard chart?" A hand shot up immediately and his chest swelled with pride. "They had gotten it", He thought. "About an inch and a half," came the response.

Two astrophysicists are discussing their research in a bar one evening when a drunk who has been sitting and listening in at the next seat turns and says, in a very worried voice, "What was that you just said?"

"We were discussion stellar evolution, and I said to my colleague here that the Sun would run out of nuclear fuel and turn into a red giant star in about 5 billion years, possibly melting the Earth."

"Whew!" says the drunk, "You really had me worried. I thought you said 5 million."

A NATURAL WAY OF DEFINING DWARF PLANETS

>>> contd. from page 5, col. 1

criteria such as those furnished by the IAU and others – the dividing line between potato-shaped and spherical objects falls naturally between objects that are, respectively, smaller and larger than 200km in radius. By this way of defining dwarf planets, dwarf planets are essentially objects larger than 200km in radius – and are therefore spherical – that have not cleared their own orbit of other bodies. With a few exceptions, this definition for dwarf planets fits most objects in the solar system.

Even though the IAU now has definitions for planets, dwarf planets and small solar system bodies, thereby categorizing all bodies in the solar system into one or the other of these three major groups, a fierce debate still continues, among astronomers, planetary scientists, amateur space scientists and enthusiasts alike, on issues like Pluto's status, whether or not the IAU's introduction (on June 11, 2008) of a sub-category of dwarf planets, called plutoids, is useful, whether dwarf planets should be made to comprise only a sub-category of planets or an entirely different category, alternative definitions of a planet, etc. Judging by the way the process of determining and defining whether a body falls under what category has gone over the years, since solar system bodies have been discovered and categorized, I strongly think that the further discovery of even more bodies in the solar system, with various shapes, sizes and behaviors will cause the IAU to further redefine the various categories – or even create new categories (and maybe even sub-categories) – of solar system bodies.

Space Club Launched in Ilesa

>>> contd. from page 2, col. 2

allowed to express their minds by asking questions on space science and technology issues. They also visited the space museum.

These are the list of schools that visited centre in the first half of 2010:

1. Progress Group of schools, Ondo Road, Modakeke Ife (27th and 28th January 2010)
2. Federal Government Girls College, Kabba, Kogi State (2nd February, 2010)
3. Toppers Group of Schools Gbongan, Osun State (11th February, 2010)
4. Kingdom Treasures International Schools Oranfe, Ile-Ife (17th February, 2010)
5. Seventh Day Adventist Junior School, Ile-Ife (15th March,2010)

RISE IN EARTHQUAKE ACTIVITY

Is Humanity Facing A Global Catastrophe?

>>> contd. from page 5, col. 2

also travel thousands of kilometres on open ocean wreak destruction on far shores.

- Floods – occur usually when the volume of water within a body of water such as a river or lake exceeds the total capacity of the formation, thereby flowing beyond the normal perimeter of the body. Floods may be secondary effects of earthquakes if dams are damaged.
- Human impacts – earthquakes may lead to disease, loss of basic amenities, los of life, general property damage, road and bridge damage and collapse and destabilization (potentially leading to future collapse) of buildings. Earthquakes can also precede volcanic eruptions, which cause further problems.

How Stable Is The African Plate?

The African plate is a tectonic plate which includes the continent of Africa, as well as oceanic crust which lies between the continent and various surrounding ocean ridges. It comprises several continental blocks or cratons. These are stable blocks. These cratons are, from south to north, the Kalahari, Congo, Sahara and West African Craton (WAC).

Is Recent Earthquake Activity Unusual?

To answer the question of the title of this article, Geologists say 2010 is not showing signs of any unusually high earthquake activity. Dr. Michael Blanpied, the Associate Coordinator for Earthquake Hazards of the United States Geological Survey (USGS) asserted that the number of earthquakes is "within the normal range".

Conclusion

The number and intensity of earthquakes are not increasing. Earthquakes of the magnitude of the Haiti and Chile quakes happen on the average 2 to 3 times a year. It was just coincidence that these two occurred closely together. However, we note that:

- Our ability to detect earthquakes is greatly increasing. As more and more seismographs are installed in the world, more earthquakes can be and have been located. However, the number of large earthquakes (magnitude 6 and greater) has stayed relatively constant. The increase in the number of seismograph stations and the more timely receipt of data (via electronic mail, internet and satellite) has allowed us to locate earthquakes more rapidly, and to also locate many small earthquakes which were undetected in earlier years
- Earthquakes are being reported by the news media more rapidly and covered more widely as a result of tremendous improvements in global telecommunications. Because of these improvements and the increased interest in the environment and natural disasters, the public now learns about more earthquakes.

SPACE EDUCATION OUTREACH PROGRAMME IN ENUGU & TARABA STATE.

>>> contd. from page 2, col. 3

public. He encouraged secondary schools to form space clubs, as this will provide an enabling environment to grow and nurture innovative educational programmes.

The representative of the Hon. Commissioner for Education Dr. (Mrs) Eze, the permanent secretary of the ministry, in her opening address commended the centre on its effort to educate the school children and indeed the entire populace on the benefits of space technology to national development. She encouraged the participants to avail themselves of the opportunity given to them to learn and acquire new ideas that will be useful to their future life.

In her speech, Rev Sr. (Dr.) Nora Ezeliora, the facilitator of the workshop under the auspices of a non-governmental organization, the Young Scientist Club (YSC), commended the organizers of the event and requested that the next annual zonal workshop in the zone be held in Anambra state.

The main activities of the workshop commenced with presentations by the scientific officers of the two activity centers on each of the following themes: ARCSSTE-E'S outreach activities in Space Education, Solar system, The Earth: Day, Night and Seasons, Space exploration (satellite and Benefits), Rocket and Astronauts, Demonstration: Planetary Weighting Machine/Google Earth Visualization, Interactive Session, and Exhibition by schools /CBSS Telescope.

During this annual event also, a two-day seminar which ran concurrently with the workshop was organized for the teachers and certificates were issued at the end of the programme.

Group photographs were taken, and educational materials were donated by the Centre to all the participating schools. The event was later concluded with a demonstration for the students and their teachers of the launching of water rockets.

Similar activities were carried out at Taraba State with the full co operation of the State Ministry of Education. The event included the tertiary institutions in the state while the primary and secondary students had theirs the following day.

Students participated in Google Earth presentation and water rocket launch while the teachers also had their own session which dwelt on the benefits of Space Exploration. They were encouraged to participate in the centre's activities which also includes visitation to the centre and world space week which comes up every October.

Scientific Officer delivering a lecture

OPENING CEREMONY OF 2010 PGD PROGRAM

>>> contd. from page 1, col. 2

expressed his appreciation to the host University for providing the present complex housing the Centre. He however revealed that work has reached an advanced stage at the permanent site, and was hopeful that the Centre would move to the permanent complex before the end of June, 2010.

The Director wished all the participants a successful PGD programme and wished the foreign participants a happy stay in Nigeria. He hoped that the programme would transform the lives of the participants for good. He thanked the guests and resource persons for finding time to attend the opening ceremony.

2010 Opening Ceremony group photograph

As part of activities marking the opening ceremony, Prof. F. A. Fawole gave a very interesting talk on the 'Necessity for Inter – State Cooperation in Africa'. Another talk was delivered by Prof. Isis Okhurie (Director, RECTAS) on the 'Potentials of Remote Sensing/GIS', to whet the appetite of the participants and get them into the proper mood for the challenges ahead of them. The Director, RECTAS, magnanimously invited the participants to RECTAS for a guided tour of the facilities there.

In rounding off the opening ceremony, the Deputy Director, Mrs. Lami Ali-Fadiora, in her vote of thanks, was very appreciative of the guests and resource persons for their support over the years which has gone a long way in making the PGD programme a success. She also assured the Director, Dr. J. O. Akinyede, that staff were ready more than ever before to ensure the smooth running of the programme.

The ceremony came to an end with a closing prayer offered by Mr. Alaba Afolabi. The Director and other invited guests took group photographs with the participants.

ORBIT TEAM

Dr. Akinyede J. O., L. Ali-Fadiora (Mrs), Anih S. I., Oluwagbamila M.J. (Mrs), Adegbulugbe O.A., Famurewa O. R. (Mrs), Salu O., Dr. O. E. Mangete

CONTRIBUTORS

Obaguo S., Okon Eberyamba, Nyeng Gyang, Buba Felix, Bola Balogun, Tope Pascal, M. J. Yusuf, Toyin Ajayi, Seun Elemo, Erinfolami Funmi

For more details, please contact:
The Director, African Regional Centre for Space Science and Technology Education - English, Obafemi Awolowo University Campus, Ile-Ife, Osun State, Nigeria.
e-mail: director@arcsstee.org
arcsstee@oauife.edu.ng
anharcsstee@oauife.edu.ng
Website: www.arcsstee.org
Tel: +234-35-208-253

ISSN 978-078-325-2