CSSTEAP Newsletter

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Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP) (Affiliated to the United Nations)

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..... on a mission of capacity building, under the initiative of the United Nations, for Asia and the Pacific Region in Space Science and Technology, through Excellence in Education, Training, and Research.

From Director's Desk

Dear Readers,

With this issue we are introducing CSSTEAP Newsletter in a new format covering news and views from member countries, UN-OOSA and alumni, in addition to the usual information such as activities being carried out at CSSTEAP. We would like the newsletter as a medium to keep in touch between us and share exciting experiences in the area of space science and technology. We would like to have as regular features (i) News from member countries (ii) News from UN-OOSA (iii) Achievements of our alumni, especially those aspects how they have used the knowledge/ skills acquired at CSSTEAP for national development back home. In order to turn this dream into reality, I appeal through this to all concerned to contribute articles concerning your area. Hereafter the newsletter will be published every January and July. Material for January should reach by 1st November, while for July issue by 1st May. We also intent to have one scientific (technical) article of general interest (curiosity) to the readers. In this issue you will find why Pluto has been demoted from the status of planets.

I also encourage you to visit our website (www.cssteap.org) which has been restructured more user friendly and many new features have been added. My sincere appeal to our alumni is to register in the website, which also entitles the registered alumni some privileges. You can also use the website to publish short scientific papers based on your research work.

At CSSTEAP we are committed to provide best possible education, in the chosen fields of space science and technology, to gain good theoretical understanding, while focusing to develop practical skills to apply the theoretical knowledge to 'real-world' issues.

From all of us from CSSTEAP, I wish each one of you a prosperous new year with many opportunities in your way, for great achievements.

Dr. George Joseph
Director

Inside this issue .....

Wishing all the Readers a very Happy & Prosperous New Year 2008

ELEVENTH POST GRADUATE COURSE ON RS & GIS

The 11th Post Graduate Course on RS & GIS of CSSTEAP, which started at IIRS on October 01,2006 concluded on June 30,2007. A valedictory function was organised at IIRS on June29,2007. Shri G.Madhavan Nair, Chairman, Governing Board, CSSTEAP & ISRO, and Secretary, Dept. of Space, Govt. of India, graced the occasion as a Chief Guest. Dr. K.Radhakrishnan, Director, NRSA, graced the function as Guest of Honour. The programme started with a welcome address by Dr. V.K. Dadhwal, Dean, IIRS. Dr George Joseph, Director, CSSTEAP appraised about the activities of the Centre, and specifically, about the RS & GIS educational programs of the Center. Dr. S.K. Saha, Course Director gave a brief account of 11th RS & GIS course of CSSTEAP.

The Chief Guest, Shri G.Madhavan Nair, in his address expressed hope that the participants will use the skills gained through RS & GIS course for the development of their respective countries. He complimented the faculty & staff of IIRS - one of the host Institute for conducting the RS and GIS courses of CSSTEAP and contributing to the efforts in making CSSTEAP a center of excellence.

Dr. K. RadhaKrishnan Director, NRSA Guest of Honour to the function in his address highlighted the importance of use of geo-spatial technology for natural resources and environmental management. He also emphasized that the participants equipped with RS & GIS technology and the knowledge gained through this course will be of significance in carrying out relevant development activities in their respective countries. The Chief Guest gave Post Graduate diploma certificates to the participants and Guest of Honour released the memoir of the course. The valedictory function came to an end with a vote of thanks by Course Coordinator, Dr. S.P. Aggarwal.

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Chairman ISRO and GB, Mr. G.Madhavan Nair, addressing the gathering.

11th RS & GIS course participants with dignitaries on dias

SIXTH POST GRADUATE COURSE ON SATELLITE COMMUNICATIONS

The sixth Post Graduate course on Satellite Communications started on 1st August 2007 at Bopal campus of Space Applications Centre, Ahmedabad. Twenty participants from ten countries of Asia-Pacific region are attending this course namely Azerbaijan-1, Bangaldesh-1, Bhutan-1, India-2, Indonesia-1, Kyrgystan-3, Mongolia-5, Myanmar-1, Nepal-4 and Uzbekistan-1. The inaugural function of the course was held on 3rd August 2007 at a function in the auditorium of Bopal campus. Shri N. Pant Member Space commission of India and the former Deputy Chairman ISRO was the Chief Guest. Dr. George Joseph, Director CSSTEAP, Dr. R.R. Navalgund Director, SAC, Prof. G.S.N. Raju of Andhra University, senior scientists from SAC, faculty members and all the participants of the course attended the function. Director, SAC welcomed the Chief Guest and the participants.

This course consists of Nine Modules to be conducted between August 2007 to April 2008. Each module covers specific areas of Satellite Communications. Broad structure of these modules is given below

- Communications system - an overview.
- Satellite communication system & DSP.

- Earth station Technology.
- Modulation, multiplexing and multiple-access.
- Satellite communications for broadcasting.
- Applications and Future trends in Sat-Communications
- Operational Issues of Satellite Communications
- Networking planning/Management/operational issues of Satellite communications systems.
- Satellite communications for development, education & training.
- Pilot projects, the topics covered in the pilot project will be oriented towards the one year project to be carried out in the Home country.

Mr. N.Pant, Chief Guest addressing the gathering.

Till date three modules have been completed which includes theory, practical experiments and evaluation. Students are asked to give seminars on societal applications using satellite communication for example, communication for disaster management in Indonesia, Tele-health care in Azerbaijan, etc.

During this period the students attended the Independent Day Programme at SAC. They also met Chairman ISRO on October 10, 2007 at SAC. On field visit students were taken to Science City at Ahmedabad. As a part of educational tour they have visited some of the ISRO and other scientific organizations during October 20 to November 4, 2007. They also visited Step-well, Gandhinagar Akshar Dham Temple and Narmada Sardar Sarovar Dam.

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SHORT COURSE ON "APPLICATION OF SPACE TECHNOLOGY FOR DISASTER MANAGEMENT SUPPORT WITH EMPHASIS ON FLOOD RISK MANAGEMENT"

An International Training Course on "Application of Space Technology for Disaster Management support with Emphasis on Flood Risk Management" was organized by Indian Institute of Remote Sensing (IIRS), NRSA, Dehradun during August 20 – September 14, 2007 for Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP). The course was inaugurated on September 20, 07 by Dr. N. Ravishankar, Principal Secretary, Election, Irrigation, Environment and IT Government of Uttarakhand, Dehradun. This course was partly sponsored by Ministry of Finance, Govt. of India under TCS Colombo Plan, and International Institute for Geo-information Science and Earth Observation (ITC), The Netherlands

Eighteen Professional from 12 countries i.e. Bangladesh, India, Indonesia, Kazakhstan, Malaysia, Mongolia, Myanmar, Philippines, Tajikistan, Thailand, Vietnam, Sri Lanka participated in this programme. The participants came from different organizations such as operational agencies, research institutions, Universities etc. The course was designed keeping in view of the background of the course participants and utilization of space technology using remote sensing and also communication technology effectively for flood risk analysis and management.

The topics were delivered to the participants by expert faculty drawn from various Dept. of Space (DOS) centers such as Space Application Center (SAC), National Remote Sensing Agency (NRSA) including Indian Institute of Remote Sensing (IIRS) and also from various other central government organizations. International guest faculty were invited from International Institute for Geo-information Science and Earth Observation (ITC), The Netherlands and Danish Hydraulic Institute (DHI), Denmark.

In addition to the formal class room lectures, some

lectures were delivered as tele-lectures through video conference using Internet (SKYPE) by a faculty from ITC, The Netherlands and also through video conference from National Remote Sensing Agency, Hyderabad. At the end of this training programme, the participants were provided with the following material, which would help them to implement some of the activities relevant to them in their country.

- A CD ROM consisting of the lectures notes and presentations materials and also the public domain softwares (HEC-HMS and HEC-RAS) which were used extensively in this training programme.
- Two handouts which were generated exclusively for this training programme at Decision Support Centre (DSC), NRSA under Disaster Management Support Programme of ISRO were handed over to the course participants. They are -
  - Activities of Decision Support Centre including the details of the various disasters and detailed infrastructure established to support the national activities on various disasters.
  - A manual describing the flood inundation mapping including near real time flood mapping operational at DSC, NRSA.

The participants were also taken to Delhi Earth Station to get opportunity on hands on experience of the communication equipment used in the disastrous situation and also touristic site seeing of Delhi and Agra cities.

The summary of the final recommendations made by the participants are given below.

Academic Institutions

- The training will be useful in designing appropriate course curriculum addressing use of space technology for flood management.
- Introduction and hands on of HEC-HMS and HEC-RAS models with GIS inputs, will be useful in numerical modeling of flood routing and dam break, flood wave propagation etc. This application is of research work and appreciating policy issues.

Course participants with Director, CSSTEAP and Dean, IIRS

Operational Agencies

- The training was useful for understanding the role of space technology in hydrological studies in terms of flood prevention, risk assessment and relief works.
- Use of satellite remote sensing data and GIS for generation of flood related information can be an important component of operational activity.
- Planning and implementation of SATCOM communication system in flood prone areas and deployment of warning systems should be undertaken.
- Use of HEC-HMS and HEC-RAS models, where limited hydrological data is available and the information provided in near-real time.
- Use of Remote Sensing data for operational weather forecasting and Tropical cyclone track prediction using models.
- Carry out research in Flood risk assessment for respective National Disaster Management Centers.

A valedictory function was organized in which the certificates were distributed by Chief Guest, Dr. K.D. Sharma, Director, National Institute of Hydrology, Ministry of Water Resources, Roorkee, Uttarakhand, to the course participants.

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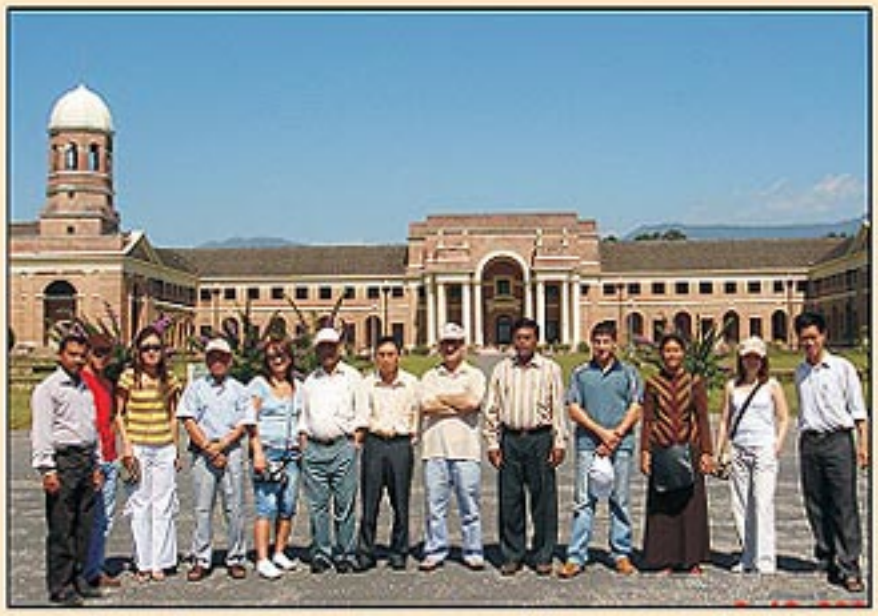
TWELFTH POST GRADUATE COURSE ON REMOTE SENSING AND GIS

The Twelfth Post Graduate Course on Remote Sensing and Geographical Information System (RS & GIS) of CSSTEAP commenced on October 1, 2007 at Indian Institute of Remote Sensing, Dehradun. The course was formally inaugurated by Dr. Jagdish Kishwan, Director General, Indian Council of Forestry Research and Education, Dehradun on 5th October, 2007 at a function in the auditorium of IIRS, Dehradun. Dr. George Joseph, Director, CSSTEAP, Dr. V.K Dadhwal, Dean, IIRS; Dr. S.K Saha, Course Director, RS & GIS; Dr. S.P Aggarwal, Course Coordinator, senior scientists of IIRS, faculty members and all the participants of the course attended the function. Total 18 participants from 11 countries of Asia Pacific region namely., Azerbaijan-2, India- 1, Kyrgyz Republic- 2, Mongolia- 3, Myanmar- 2, Nepal- 1, Sri Lanka- 2, Philippines -1, Thailand- 1, Uzbekistan- 1, Vietnam- 2 are attending this course. At the beginning of the function Dean, IIRS welcomed the Chief Guest as well as new course participants to the beautiful campus of IIRS which is one of the premier institutes in RS & GIS field. He gave a brief outline of IIRS and its academic activities. On this occasion, Director, CSSTEAP briefed about CSSTEAP activities specially to newly joined course participants. Course Director presented a brief outline about the twelfth RS GIS course. He also gave some details of the activities to be carried out in the respective modules. Each of the participants introduced themselves with a brief introduction of their organization and nature of work being carried out by them.

The course duration is of 9 months and is divided into two Semester. Semester-I consists of Module IA of 3 months and Module IB of one month and semester II consist of Module II of 2 months and Module III of 3 months duration. Chief Guest in his inaugural address spoke about the importance of the remote sensing application specially in forestry. He further emphasized about scio-economic factors of use of this Satellie based technology

In the first week of the course an induction module consisting of lectures on overview of Satellite



Course Participants at Forest Research Institute at Dehradun

Meteorology, Satellite Communication, Space Science and Technology and Remote Sensing & GIS applications in Natural Resources Management and Environmental Assessment followed by an introduction of Social, Cultural and historical aspect of India were organized. Director, CSSTEAP gave a lecture on the overview of Remote sensing and its application. Participants were also familiarized about Dehradun city and surrounding by conducting one day local sight seeing trip. The module IA covering theory, Practicals and tutorials on principal of Remote Sensing, GIS & GPS is now in progress and completing on 31st December 2007. Several field visits are also arranged during this module for ground truth collection utilized for interpretation and analysis of satellite data. During the module the participants were taken to Taj Mahal, Agra and various historic places at Delhi as part of educational tour to Delhi and Agra. To improve the English Communication and writing skills evening English classes for course participants are organized beyond office hours. These classes are taken by an English teacher of Dehradun having experience in teaching to national and international students. On the social front, the participants had glimpses of Indian festivities by their active participation in various festivals such as Dussehra, Diwali, Id-ul-Fitr, Christmas etc.

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HOW OLD IS THE UNIVERSE ?

Ever since Galileo turned world's first telescope skyward in 1609, astronomers were improving the telescope and focal plane detector system to understand the universe better. Light gathering power is an important performance parameter of a telescope. For astronomers to capture faint objects and farther deep in space require telescope with large optics, so that more light from object under observation can be gathered. Thus astronomers have been striving to make telescopes with bigger and bigger collecting optics. Currently the largest operating optical telescope (10 meters) is the Keck telescope in Hawaii. The resolution of a ground-based telescope is limited by the turbulent atmosphere through which the telescope has to see the object (seeing limit). The atmosphere also absorbs certain wavelengths of radiation – like ultraviolet, x-rays – before it reaches the earth. In order to reduce the atmospheric effect, the ground based optical observatory is placed at high altitude. Newer technologies like adaptive optics can partially correct atmospheric distortion, but there is no way to see the wavelengths the atmosphere prevents from reaching the telescope. The most effective way to avoid the atmosphere is to place the telescope beyond the atmosphere. Astronomers were looking forward to have an observatory above atmosphere. A large space telescope programme was initiated as early as 1979, however the launch of the telescope took place only in 1990. The telescope is named after the renowned American astronomer Edwin Powell Hubble (1889-1953), who discovered galaxies beyond the Milky Way and established that the universe is expanding.

Hubble Space Telescope (HST) is 2.4 meter aperture reflecting optical observatory orbiting at a height of about 600 km from earth. HST, apart from being the largest space borne optical telescope, it is the only space telescope to gather data in ultraviolet, visible, and infrared wavelengths. HST also has the unique distinction of having carried out in-orbit servicing by astronauts, to take care of failures. HST has allowed astronomers to peer into the outer limits of the universe. HST has revealed galaxies in all stages of evolution, including galaxies when universe was still young, helping scientists to understand how galaxies form. Among its many discoveries, HST has revealed the age of the universe to be between 13 and 14 billion years.

You can learn more on the exciting story of HST by viewing a DVD film produced by the European Space Agency as a part of the 15th Anniversary Celebrations of HST. It is available free from UN-OOSA. For more details please read the article below from UN-OOSA.

FROM UN-OOSA

DVD FILM ON HUBBLE SPACE TELESCOPE – An Educational Tool

As part of the 15th anniversary celebrations of the Hubble Space Telescope, the European Space Agency (ESA) has produced an exclusive, 83-minute DVD film, entitled "Hubble — 15 Years of Discovery". The documentary covers all aspects of the Hubble Space telescope project — a journey through its history, its troubled early life and its ultimate scientific successes, and also mentions the role of the Hubble Space Telescope project in facilitating some of the activities of the United Nations Office for Outer Space Affairs (OOSA). The new DVD film is one of the most widely available science documentaries, with more than 500,000 copies distributed worldwide. The Hubble Space Telescope, a project of international cooperation between the National Aeronautics and Space administration (NASA) of the United States and ESA, is one of the biggest scientific projects of all time. In its 15 years of viewing the sky, the Hubble has, among other things, helped astronomers calculate the precise age of the universe, provided sharp views of a comet hitting Jupiter, helped confirm the existence of a strange form of energy called dark energy and taken more than 700,000 exposures of celestial objects. Since 1991, OOSA has organized annual workshops on basic space science for the benefit of developing countries, in cooperation with ESA and within the framework of the United Nations Programme on Space Applications. (http://www.unoosa.org/oosa/en/SAP/bss/index.html)

The workshops have supported the operation of small telescope facilities, and have supported the processing of the imagery from the Hubble Space Telescope by developing countries. OOSA has supported the establishment and operation of the regional centres for space science and technology education, affiliated to the United Nations and located in India, Morocco, Nigeria and Brazil/Mexico (http://www.unoosa.org/oosa/en/SAP/centres/index.html).

The centres are open to scholars from developing countries in each region and offer long-term postgraduate courses in remote sensing, satellite

meteorology, satellite communications and space science. As part of the postgraduate courses, scholars of the regional centres have taken advantage of processing the images obtained from the Hubble Space Telescope.

The ESA DVD film can be obtained free of charge by sending an e-mail to OOSA at oosa@unvienna.org.

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FROM MEMBER COUNTRIES

KAZAKHSTAN DEFINES ITS SPACE STRATEGY

According to Kazinform, this year (2007), the 50th anniversary of mankind's first venture into space (Sputnik, the world's first satellite, was launched on 4th October 1957), could be the right moment for Kazakhstan to define its role in the international space industry. In an initiative headed by president Nursultan Nazarbayev, the country wants to equip itself with its own national space industry, notably in the domain of telecommunications satellites.

Preliminary studies show that launching Kazakhstan's own space industry will require investments of around USD 316million per year, and one billion dollars in the years 2008-2010 alone. An investment on this scale would place the country at the forefront of the big space nations, reports Kazinform. The director of Kazakh Space Agency KasCosmos, Dr. Talgat Musabayev, has proposed a list of measures including the creation of a complex on the Baikonur site, containing a vast technology park. When complete, the park will house laboratories for technology research and development, and several industrial design, assembly and testing centres. Between now and 2020, Kazakhstan hopes to construct a dozen telecommunications satellites and put in place a satellite navigation system for civil and military purposes, underlines Dr. Talgat Musabayev. Kazakhstan is now developing its Baiterek project, a 'clean' new generation - rocket launcher using less dangerous and less polluting fuel than that of the Russian Proton type boosters. The launcher will be capable of placing 30-tonne charges into orbit. Preliminary trials for a prototype are set for 2010, with more powerful versions to be tested one year later. Baiterek will be launched from a specially designated launch pad, the Baiterek Space Launch Complex, at the Baikonur site, construction of which will begin shortly.

H.E. Mr. Kairat Umarov
Ambassador of Kazakhstan to India

LAPAN - TUBSAT MICRO SATELLITE - First Indonesian Remote Sensing Micro-Satellite

LAPAN-TUBSAT micro-satellite is developed by National Institute of Aeronautics and Space (Lembaga Penerbangan dan Antariksa Nasional - LAPAN) of Indonesia in cooperation with Technische Universität Berlin (TU-Berlin) of Berlin, Germany. The design, integration and test of the satellite is carried out by LAPAN engineers with supervision of TU-Berlin experts. The development time of the satellite is about two years commencing in summer 2003. Its is a box shaped satellite with dimension of 45 x 45 x 27 cm (excluding communication antenna and camera baffle) and weight nearly 57 kg. The satellite is used for earth observation such as surveillance of natural resources, environment and land use, as well as natural disasters. The satellite also carry store and forward communication mission for fixed and mobile station communication. Two earth observation payloads carried are a high resolution video camera with 5 m resolution and 3,5 km swath width (from 630 km altitude) and wide angle video camera with 200 m resolution and 81 km swath width. Given that the earth observation payloads are video cameras some dynamic high resolution features of earth objects may be observed from space, such as moving aircraft and volcanic plumes.

LAPAN-TUBSAT micro-satellite was completed for launch in July 2005 and was launched as auxiliary payload by Indian PSLV C7 on Cartosat-2 and SRE mission on

Figure 1. Video stitch image of Amsterdam airport captured by LAPAN-TUBSAT satellite.

January 10, 2007 from Sriharikota, India. The satellite is inserted to an orbit altitude of 630 km with 97.9 degree inclination and orbit period of 99.039 minutes.

For monitoring the health of the satellite during its operation, as well as for satellite payload data acquisition prerequisites LAPAN developed Rumpin Main Spacecraft Control Center (SCC), near Jakarta. Another ground station is set-up at Rancabungur in Bogor regency. Currently LAPAN is also developing one more ground station in Biak island (in eastern Indonesia) in which Indian Space Research Organization (ISRO) is also locating the ground station for telemetry, tracking and control of satellites and launch vehicles. Both Rancabungur and Biak ground stations are nodes of Rumpin Main SCC, and serve as SCC.

During the in-orbit test performance and attitude stabilization soon after launch of LAPAN-TUBSAT satellite the results show that the satellite is in healthy condition. Initial video pictures taken from the satellite also show that many applications could be performed with the satellite video surveillance capabilities.

The satellite has acquired some significant data on urban development, volcano activity and other events. Figure 1 shows LAPAN-TUBSAT satellite image data capture of Amsterdam airport derived from high resolution video camera. One could easily see on the video stitch image the details like an aircraft is doing taxi to or from the runway, and also aircraft parking in airport terminal areas. Examining the actual LAPAN-TUBSAT satellite video streaming data more dynamic events such us movement of large flying aircraft could be easily captured. The direction and approximate speed of ships at sea could be estimated by the V-shaped wakes created from their movement in the water shown on the video data.

Figure 2 is a video stitch image of Mount Semeru in Java island taken using LAPAN-TUBSAT satellite volcanology applications, such us estimation of area effected by eruption.

The successful development, launch and operation of LAPAN-TUBSAT satellite in orbit shall provide an opportunity for LAPAN to implement further development of successive remote sensing microsatellites in the future.

In this opportunity LAPAN would like to convey its sincere appreciation to Indian Space Research Organization for the professional and successful launch of LAPAN-TUBSAT satellite as auxiliary payload to Cartosat-2 SRE missions on board PSLV C7 launch vehicle on January 10, 2007 from Sriharikota, India. LAPAN also takes this opportunity to convey its appreciation to the Technische Universität Berlin (TU Berlin) in Berlin, Germany for the cooperation in the transfer of knowledge, skill and experience on the design, manufacture, test, launch and operation of LAPAN-TUBSAT remote sensing micro-satellite.

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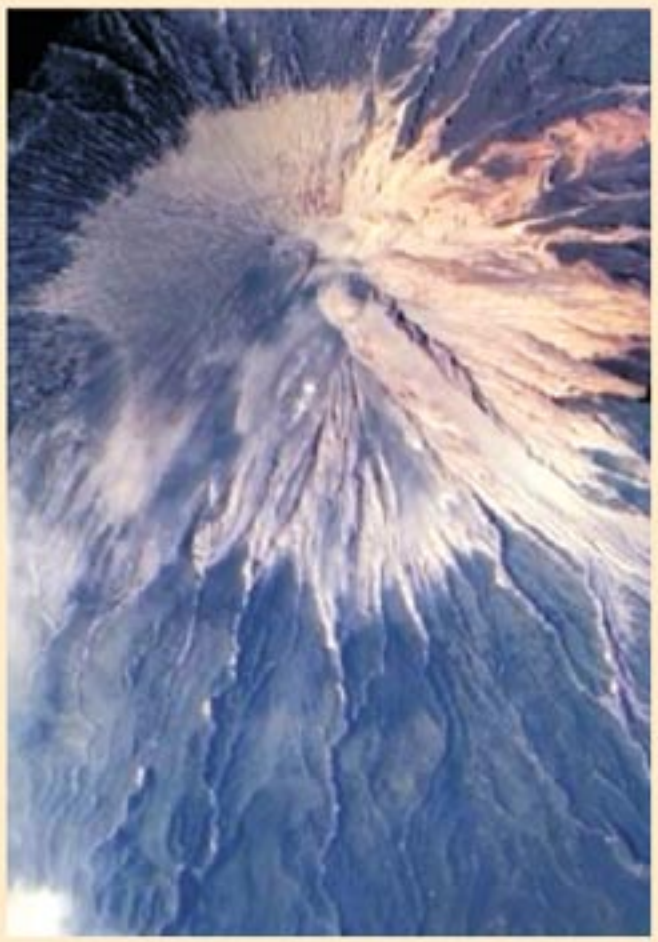

Figure 2. Mount Semeru active volcano.

TEXT BOOKS ON PLANETARY SCIENCE TO BE REWRITTEN!!

PLUTO : NO LONGER A PLANET

We grew up learning that there are nine planets in the solar system. A standard question in the examination was to name them in the order of the distance from the Sun. Most of us would have been told a mnemonic to easily remember the order – My Very Energetic MAmma Just Served Us Nine Pakodas (if you do not eat Pakodas you can replace it with Pizzas!!). Alas Pluto has been 'booted out' from the list of planets. Now we have only eight planets officially accepted by the astronomical community. We have now a new mnemonic to remember the order of planets –

My Very Energetic MAmma Just Served Us Noodles

Why Pluto is no longer considered a regular planet? Why did scientists change their mind? Answer to these questions can be found out in the following article by Dr. Neeraj Srivastava, scientist from Physical Research Laboratory, Ahmedabad.

Our solar system consists of a central star, the Sun, with several planets, a large number of satellites and other minor objects such as asteroids and comets. Although a precise definition of planet was lacking, the five solar system objects Mercury, Venus, Mars, Jupiter and Saturn were termed as "wandering stars" or planets by the Greek philosophers and astronomers who assumed Earth to be at the center of the Universe. Following the acceptance of the Copernicus's heliocentric model for the solar system, Earth was included in the list of planets. In 1781, William Herschel discovered Uranus, the seventh planet. Irregularities in the orbit of Uranus, appeared to be produced by gravitational effects, led to the search and discovery of the eighth planet, Neptune in 1846. Observations of Neptune's orbit by astronomers in the late 19th century led them to speculate that Uranus' orbit was perturbed by another planet in addition to Neptune. This led to the search for the ninth planet and an object discovered in 1930 by Clyde Tombaugh of Lowell observatory seems to fit in and was designated as a planet and named Pluto. However, it was found later that the inferred orbital perturbations were not due to Pluto but were observational errors. Nonetheless, Pluto was given the status of a planet and retained that status until recently. Broadly the nine planets are classified as inner rocky planets (Mercury, Venus, Earth, Mars) and outer planets, beyond 5 AU namely Jupiter, Saturn, Uranus, Neptune, and Pluto (AU stands for Astronomical Unit – the average distance between the Earth and the Sun ≈ 150 million km, and used as unit to measure distances in astronomy). Significantly, Pluto does not have much in common with the other four giant gaseous and icy planets.

In addition to the planets, several large objects were discovered in the early nineteenth century orbiting the Sun in a belt between Mars and Jupiter, called asteroid belt. In this belt the objects range widely in size from that of Ceres (≈ 933 km diameter) to bodies that are less than 1 km across. Although the larger ones were initially considered as new planets, the fact that several such bodies were orbiting the Sun at nearly the same radial distance made this proposition untenable and they were termed as asteroids. Most of the meteorites which fall on the Earth come from this particular belt. These are precious samples, since they provide important information about early solar system and formation of planets. In recent time another zone of the solar system, the disc shaped "Kuiper belt" located outside Neptune's orbit, has been found and is populated with a large number of icy bodies, usually referred as Kuiper Belt Objects (KBO's). Some measure more than 1000 km and some move in highly elliptical orbits. Much further out, a vast number of icy comet nuclei form the Oort Cloud, a spherical halo around the solar system. The comets we observe in the inner solar system originally come from the Kuiper Belt or the Oort Cloud.

It was apparent for quite sometime that "Pluto" located at ~ 40 AU from the Sun didn't fit in the general scheme of classification of planets. Though it is a member of the outer planets, it was the smallest object in the entire family of planets. A small planet (about half the size of our own moon) beyond Neptune appeared to be anomalous. Is Pluto a member of the planet family or it represents an entirely different class of solar system object? To answer this question, let us consider its physical characteristics, chemical composition and its possible mode of formation. Pluto has a radius of 1175± 25 km. Its mean density is 1.94 ± 0.12 g/cc similar to the satellites of outer planets namely Triton, Ganymede, Callisto and Titan. It is a differentiated body and

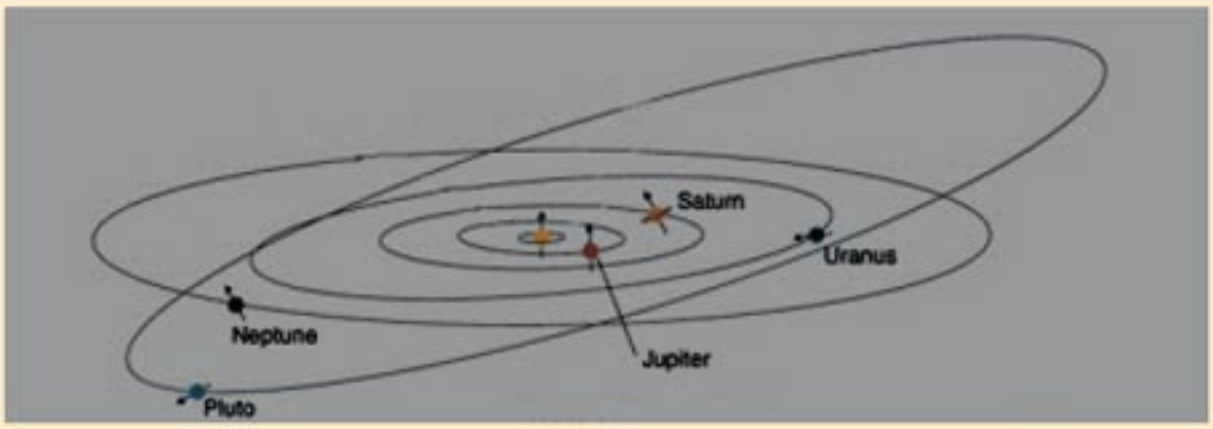

Figure 1: The peculiar orbit of Pluto

contains nitrogen ice, water ice and methane on the surface. It has a high content (~70%) of rock, the rest 30% being ice. The possibility of Pluto's origin at a place significantly different than its current location is ruled out on the basis of its composition that also qualifies it to be a representative of primitive solar system object. Its orbital characteristics, relative to Neptune, discard the possibility of it being an escaped satellite. However, its resemblance with the satellites of the giant planets made it a probable candidate for similar origin. Pluto enjoyed the status of a planet as it has certain characteristics common to most of the other planets, such as, a spherical shape, an orbit around the Sun and presence of three moons, Charon, Nix and Hydra.

The status of Pluto as a planet would have continued but for several peculiarities that were evident for quite some time. These include its low mass (5% of mass of Mercury), an unusually large satellite "Charon", (~ 1205 km in diameter) relative to its own size (~ 2306 km) and its orbit that extends from 29.7 AU to 49.5 AU. The orbital trajectory is highly eccentric (e = 0.250) with a high angle of inclination (i = 17.2°) to the ecliptic plane, very different from the other planets. In fact, its orbit sometimes crosses that of Neptune (Figure 1). Such crossing is generally a characteristic associated with minor objects such as comets and asteroids and not with planets. Further, the bizarre less eccentric and highly inclined orbit of its satellite Charon (~ 120° with the ecliptic) combined with fixed relative position of Pluto and Charon, make this duo a distinct pair in the solar system. These peculiarities clearly differentiate Pluto from the other members of the planet family.

To add to its woes, discovery in 1992 of the Kuiper Belt Object, (15760) 1992 QB_1 (size ~ 160 km) intensified the controversy regarding its planetary status. Further discoveries of Pluto-sized objects in the solar system during the 21st century such as Sedna (1800 km; 2004) and Quaoar (1280 km; 2002) started a serious debate amongst astronomers about definition of planets and status of Pluto as a planet. Finally, the discovery in 2005 of Eris, a Trans-Neptunian Object larger than Pluto, having a diameter of ~ 2600 km, compelled the scientific community to reconsider the classification of Planets in particular, and the solar system objects, in general.

The International Astronomical Union (IAU), founded in 1919, having professional astronomers as members serves as the internationally recognized authority for assigning designations to celestial bodies and surface features on them. The final verdict on the status of Pluto was pronounced at the IAU general assembly on August 24, 2006 at Prague, the capital city of Czechoslovakia. The meeting redefined the term "Planet" that led to the ouster of Pluto from the family of the planets. According to the new definition, a solar system object can be designated as a "Planet" if it satisfies the following three criteria:

1. It is in orbit around the Sun.
2. Is massive enough to assume a nearly spherical shape due to its own gravitational force.
3. Has cleared the neighborhood around its orbit.

Pluto satisfies the first two criteria but the third criterion eluded it since it shares its orbit with a number of Kuiper Belt Objects and Pluto finally lost its long-standing status as a planet. However, a complete consensus on this issue still evades the scientific community and also the general public due to the long-held view of Pluto as the last planet of our solar system.

The IAU has placed solar system objects such as Pluto in a separate category called "Dwarf planet", with Pluto as the prototype. A dwarf planet should have the following properties:

1. It is in orbit around the Sun.
2. Is massive enough to assume a nearly spherical shape due to its own gravitational force.
3. It could not clear the neighborhood around its orbit.
4. It is not a satellite.

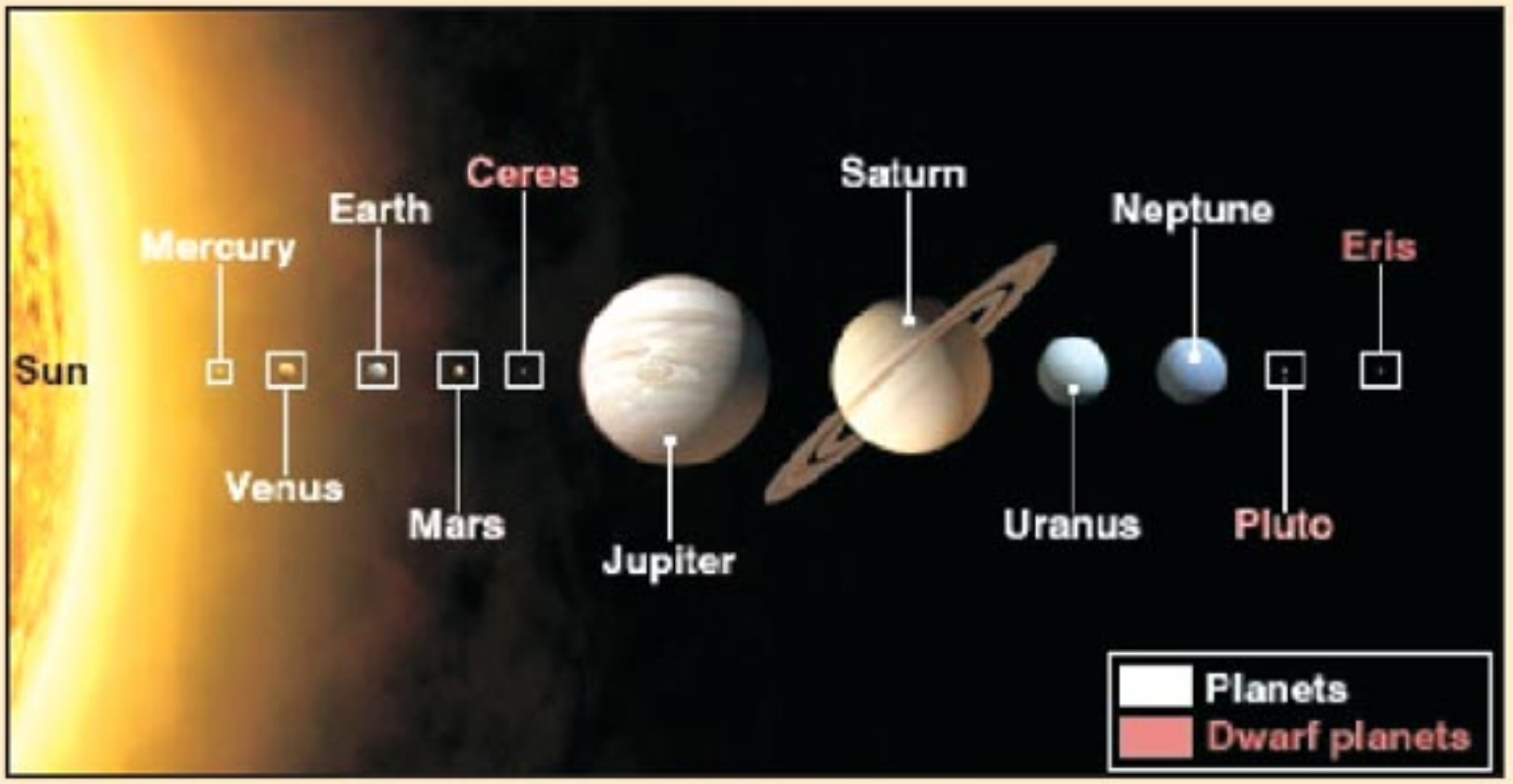

Figure 2: The New Planetary System

According to this new classification scheme the family of Dwarf planets currently contains three members: Pluto, the largest object in the Kuiper belt; Ceres, the largest object in the asteroid belt; and Eris, which is at a distance of around 97 AU from the Sun, beyond the traditionally defined range of the Kuiper belt. Many of the Trans-Neptunian Objects such as Sedna and Quaoar are other likely candidates for dwarf planets. Presently they are classified as "Small Solar System Bodies" along with comets and asteroids. In the new definition of solar system there are eight planets, three dwarf planets (Figure 2) and innumerable small solar system bodies.

In view of the above mentioned developments it is important to address the future role of Pluto in the solar system. Whether the new classification of Pluto as a "dwarf planet" is a degradation of its status often becomes a matter of personal opinion. Nonetheless, the new identity for Pluto provides it a better recognition in the sense that it is acknowledged as a prototype of a newly defined class of solar system objects, the "Dwarf Planets". Further, its documentation as the largest member of the Kuiper Belt Objects, more than a thousand of which have been discovered by now, adds to its status. These objects are primitive and thus recorded the earliest era of evolution of our solar system. NASA has launched a probe – 'New Horizons' in January 2006 to understand the 'edge' of our solar system. The craft is on its way to Pluto and will be approaching it in 2015 providing precious data on Pluto and its moon Charon such as its geology, surface composition etc. It will then continue on into the Kuiper belt, where it will fly by a number of Kuiper belt objects and return further data. The mission is expected to provide a wealth of exciting scientific knowledge required to unveil the mysteries of our solar system beyond the orbit of Neptune. Thus, Pluto will continue to play an important role in our endeavor to further our understanding of the solar system, irrespective of its designation.

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FOCAL POINTS FROM MEMBER COUNTRIES

Since the inception of the Centre, the esteemed Governing Board members from the member countries of CSSTEAP have been providing management support and guidance.

In order to have more pro-active role with the activities of the centre, CSSTEAP invites member countries in identifying nation specific training needs, identifying the need of training for the candidates. Hence there is a need for identifying focal points from each country to work with CSSTEAP as partners towards capacity building. Till date two GB members have communicated the focal point from their country.

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ALUMNI SPEAKS

Dr. Myint Myint Khaing was a student of CSSTEAP during 2002-2003 RS & GIS course (7th batch). She also completed her research work on 'Integration of Remote sensing sensor data and marine environmental parameters for identification of productive zones in the coastal waters of Myanmar' based on which she was awarded Master of Technology (M. Tech) Degree under CSSTEAP-Andhra University programme. She shares with us how she used the training back home.

-Editor

Dr. Myint Myint Khaing

After successful completion of my PG Course in 2002-2003 under the CSSTEAP Programme in India, I continued my Master Course and Ph.D course successively and successfully. I was awarded Ph.D degree from University of Computer Studies, Yangon, Myanmar. My Ph.D thesis title is on Ocean observation for fishery forecast using Remote Sensing & GIS technology. Later, I was appointed as Deputy Director of Remote Sensing Center, under the Ministry of Science and Technology. I could share my educational knowledge and technical skills gained from CSSTEAP for my country not only in intra- governmental training programme but also for the routine works of our department such as, feasibility studies in natural resources management, mineral exploration and site survey and mapping of infrastructure buildings.

I am currently a member of the technical committee of the national project 'Delineation of the outer limit of the extended continental shelf', as a RS & GIS expert. I am also serving as project co-ordinator of two activities taken up by my country. One project is on 'Establishing a benchmark for assessing the radiological impact of nuclear Power activities on the marine environment in the Asia-Pacific region', wherein remote sensing techniques are being utilized for the assessment of the coastal zone and inner shallow marine shelves of Myanmar to aid the monitoring of the contamination of radionuclides, and dispersion pattern of contaminated radionuclide. The other project is study on 'Extent of transfer of nuisance organisms in South/SE Asia region by shipping' to assess on the coastal zones by remote sensing for the classification and delimitation of the study areas, tracking the inversion pattern and dispersion pattern of the nuisance species. I also have been presenting research papers in number of scientific meetings.

Recently, our Center is restructured into the Remote Sensing Department, as a constituent of Mandalay Technological University and I am the Head of the Department. Now we have Post-graduate diploma degree program on RS and GIS and M.Sc program is under planning.

Moreover, I impart my knowledge to new recruits in our Center and hands-on training programme of RS and GIS technology by giving lectures and practical.

I would like to stress that the educational knowledge and skills that I gained at CSSTEAP surely benefited not only to me but also contributed to the development of my country as well.

Dr. Myint Myint Khaing
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Inviting Contributions from CSSTEAP Alumni

CSSTEAP Newsletter is planned to be published every January and July of the year. We will be very happy to include professional achievements of our alumni. Please send us your current assignment, publications or any other activity you are doing in the area of space science and technology for the development of your country. We also invite case studies giving success stories of how space input has helped decision makers. The inputs for publications in the Newsletter will be selected by the editorial committee and will be properly edited.
Please send the inputs:

(for January issue of Newsletter) : latest by November of the previous year
(for July issue of Newsletter) : latest by April of the year.
E-mail: cssteap@iirs.gov.in

-Editor

CSSTEAP Rejoices Prestigious Awards

Conferred To CSSTEAP Faculty

Dr. V K Dadhwal, Dean, IIRS (former Deputy Director, CSSTEAP) and CSSTEAP Faculty at IIRS has been conferred with ISRO-ASI Award 2005 in the field of Space ScienceApplications and also ISRO Merit Award 2006 in appreciation of his contribution to the Indian Space Program in the application of remote sensing to agricultural production forecasting.

Ms. Shefali Agarwal, Sc/Engr SE, IIRS (CSSTEAP Faculty at IIRS) has been conferred with ISRO-ASI Women Scientist Award 2005 for her contribution in the area of Remote Sensing and photogrammetry and to ISRO programmes.

These awards were conferred by H.E. Dr. APJ Abdul Kalam, then President of India on June 8, 2007 at Master Control Facility, Hassan, India.

CSSTEAP rejoices the recognition conferred on CSSTEAP faculty, which they richly deserve.

CSSTEAP Website Revamped

The Center's website has been providing updated information about the Center and the activities and is regularly read and viewed especially in the Asia-Pacific region. Subsequently, in order to give a dynamic look and to have more student and alumni interaction many new features are introduced. Some of the new features in the modified CSSTEAP website are mentioned below :

It provides an Alumni Forum wherein CSSTEAP alumni can register themselves and will be provided valid login ID. They can then login and access information pertaining to the database of the other students, alumni achievements, e-mail exchange with other students, query exchange between students and the faculty/centre, post their achievements etc. All these are done with the interactive navigation icons. There is a Discussion Forum wherein the views/reviews on a topic by alumni can be posted for discussion. The new website provides an interactive environment for users to effectively navigate in the website. There is an effective search module to search website based on subject/topic/keyword searches. Incorporation of high quality feedback system is introduced. There are instructions and guidelines for writing M.Tech thesis. We also invite short scientific articles from alumni based on their work for publication in the Website.

BACKGROUND OF CSSTEAP

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82 the United Nations Office for Outer Space Affairs (UN-OOSA) prepared a project document (A/AC.105/534) envisaging the establishment of Centres for Space Science & Technology Education in the developing countries. The Objective of the Centres is to enhance the capabilities of the member states in different areas of space science and technology that can advance their social and economic development. The first of such centres, named as Centre for Space Science & Technology Education in Asia & the Pacific (CSSTEAP) was established in India in November 1995. Department of Space, Government of India has made available appropriate facilities and expertise to the Centre through the Indian Institute of Remote Sensing (IIRS) Dehradun, Space Applications Centre (SAC) & Physical Research Laboratory (PRL) Ahmedabad. The Centre is an education and training institution that is capable of high attainments in the development and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and application programmes, linkage to global

programmes / databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level and short courses in the fields of (a) Remote Sensing and Geographic Information System, (b) Satellite Communications and GPS, (c) Satellite Meteorology and Global Climate, (d) Space and Atmospheric Sciences. A set of standard curricula developed by the United Nations is adapted for the educational programmes.

The Centre is affiliated to the United Nations and its education programmes are recognised by Andhra University, Visakhapatnam, India for awarding M.Tech degree (after completion of 1 year project).

ONGOING COURSES

1) Sixth 9 month Post Graduate course in Satellite Communications at SAC Ahmedabad from Aug. 1, 2007.
2) Twelfth 9 month Post Graduate course in RS & GIS at IIRS, Dehradun from October 1, 2007.

FORTHCOMING COURSES

1) Sixth 9 month Post Graduate course in Satellite Meterology & Global climate at Ahmedabad from Aug. 1, 2008.
2) Sixth 9 month Post Graduate course in Space & Atmospheric Science at PRL, Ahmedabad from Aug. 1, 2008.
3) Short Course on Satellite Navigation and Location based services at SAC, Ahmedabad during June-July, 2008.
4) Short course on Disaster Management for Drought at IIRS, Dehradun during July-Aug. 2008.
5) Thirteenth 9 month Post Graduate course in RS & GIS at IIRS, Dehradun from Oct. 1, 2008.

CSSTEAP Hqrs. at Debradun

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