

CSSTEAP Newsletter

January, 2015



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

..... 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.

MARS ORBITER MISSION SUCCESSFULLY INSERTED INTO MARS ORBIT

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India's first inter-planetary mission - Mars Orbiter Mission (MOM) or 'Mangalyaan' was successfully placed into the Martian orbit in the very first attempt by Indian Space Research Organization (ISRO) on 24 September 2014. Honorable Prime Minister of India Mr. Narendra Damodar Modi witnessed the historical event in Bengaluru and congratulated the team ISRO. ISRO's Mars mission success has placed the country in the elite club of Mars explorers such as US, Europe and Russia. Over the past decades, of the 51 missions carried out across the world so far, only 21 have succeeded.

MOM was launched on November 5, 2013 from the First Launch Pad at Satish Dhawan Space Centre (SHAR), Sriharikota, Andhra Pradesh, using a Polar Satellite Launch Vehicle (PSLV C-25) rocket. One of the main objectives of this mission to Mars was to develop the technologies required for design, planning, management and operations of an interplanetary missions, as detailed below:

- Design and realization of a Mars orbiter with a capability to survive and perform Earth bound maneuvers, cruise phase of 300 days; Mars orbit insertion / capture, and on-orbit phase around Mars.
- Deep space communication, navigation, mission planning and management.
- Incorporated autonomous features to handle contingency situation.
- Exploration of Mars surface features, morphology, mineralogy and Martian atmosphere by indigenous scientific instruments.

Payloads of Mars Orbiter Mission

- Lyman Alpha Photometer (LAP)
- Methane Sensor for Mars (MSM)

Inside this issue

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- LVM3-X/Care mission launch
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- GNSS-New Post Graduate course from August 2015.
- Master Degree Research Programme
- 19th Post Graduate Course on Remote Sensing & Geographic Information System.
- 9th Post Graduate Course on Satellite Meteorology and Global Climate
- 9th Post Graduate Course on Space and Atmospheric Sciences
- 3rd International Training Course on Navigation and Satellite Positioning Systems (NAVSAT)
- SAARC Regional Training Programme on GIS and Remote Sensing Technology in Disaster Risk and Emergency Management in South Asia with SAARC DMC
- Expert Group Meeting (EGM) and Specialised Training on Disaster rapid impact assessment using space-based information with UNESCO

- Mars Exospheric Neutral Composition Analyzer (MENCA)
- Mars Color Camera (MCC) by the Indian Deep Space Network (IDSN), located near Bengaluru. IDSN's 32 m and 18 m diameter antennas are complemented by NASA - JPL's Deep Space Network.

ISRO's Mars Orbiter Mission captured spectacular portrait of the Red Planet and swirling dust storms with the on-board Mars Color Camera from an altitude of 74,500 km on Sept. 28, 2014. The images were taken by the tri-color camera as MOM swooped around the Red Planet in a highly elliptical orbit whose nearest point to Mars (periapsis) is at 421.7 km and farthest point (apoapsis) at 76,993.6 km.

3-D view from MOM which expands upon the initial 2-D global color view of Mars. The 3-D image was generated from multiple pictures acquired by MOM's on-board Mars Color Camera on Sept 28, 2014, from the very high altitude of approximately 74,500 kilometers as the spacecraft orbited Mars. The 3-D of Red Planet was captured nearly at apoapsis. And being three dimensional, it gives a stereo sense of the huge dust storm swirling over a large swath of the planet's Northern Hemisphere set against the blackness of space.

Launch of Geosynchronous Satellite Launch Vehicle Mark III- LVM3-X/CARE Mission

Indian Space Research Organization (ISRO's) first sub-orbital flight and India's latest generation launch vehicle- Geosynchronous Satellite Launch Vehicle-Mark III (GSLV Mark-III) successfully lifted off from Satish Dhawan Space Centre, Sriharikota, Andhra Pradesh on December 18, 2014 and injected the Crew Module CARE at an altitude of 126km. The Crew Module splashed down near Andaman and Nicobar Islands in the Bay of Bengal about twenty minutes after liftoff. It was recovered by the Indian Coast Guard. This flight of LVM3 had a passive cryogenic stage for testing purpose.

LVM 3 is a heavy launch capability launcher being developed by ISRO. It will allow India to achieve complete self-reliance in launching satellites as it will be capable of placing 4 tons class Geosynchronous satellites into orbit. The LVM3 will have an India built cryogenic stage with higher capacity than GSLV.

GSLV Mk-III was carrying payload - Crew module Atmospheric Reentry Experiment (CARE) weighing 3775 kg. It was a suborbital experimental flight mission which aimed to test the vehicle's performance during the critical atmospheric phase of its flight and thus carried a passive (non-functional) cryogenic upper stage.

The GSLV-Mark III is a three stage/engine launch vehicle. Its first stage comprises of two identical S-200 large solid boosters with 200 tons solid propellant that are strapped on to the second stage, the L110 re-startable liquid stage.



Prime Minister Mr. Narendra Modi and ISRO Chairman Dr. K Radhakrishnan in jubliant mood after Mars Orbiter Mission successfully enters the Red Planet's orbit.



Portrait of the Red Planet and swirling dust storms with the on-board Mars Color Camera from an altitude of 74,500 km on Sept. 28, 2014.

19th Meeting of CSSTEAP Governing Board

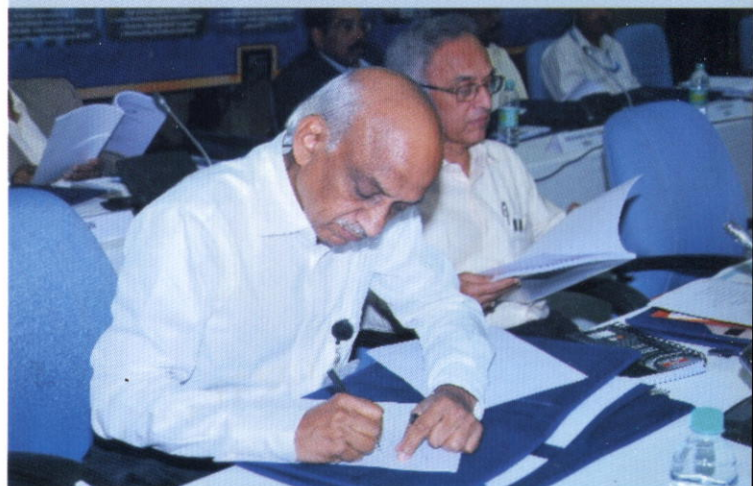
The 19th meeting of CSSTEAP Governing Board (GB) was held at ISRO Hqrs., Bengaluru on October 31, 2014. The meeting was chaired by Dr. K. Radhakrishnan, the Chairman, ISRO Secretary, Department of Space and Chairman CSSTEAP GB and the participants were H.E. Mr. Kye Chun Yong, Ambassador of DPR Korea; Mr. August Hidayat, Head Cooperation & Public Relations Bureau, Indonesia; Prof. A.A. Abdykalkovich, President, International University for Innovation Technologies, Kyrgyz Republic; Mr. Tsenddavaa Davaadorj Deputy Director, Mongolian Academy of Sciences, Mongolia; Mr. Thirtha Raj Wagle, Minister-Counsellor, Embassy of Nepal, New Delhi; Ms. Maria Agnes Cervantes, Charge d' Affairs, Embassy of Philippines, New Delhi; Mr. Ok-Kyu Lee, Principal Engineer, International Relation Team, Korea Aerospace Research Institute, Republic of Korea. Dr. Y.V.N. Krishna Murthy, Director CSSTEAP and Secretary GB. Other members who participated included Dr. Hong Pong Gi, 1st Secretary, Embassy of DPR Korea, New Delhi; Mr. Ulugbeg Begaliev, Rector, International University for Innovation Technologies, Kyrgyz Republic; Mr. A.S Kiran Kumar, Director, Space Applications Centre, Ahmedabad; Prof. J.N Goswami, Director, Physical Research Laboratory, Ahmedabad; Mr. S.K Shiva Kumar, Director, ISRO Satellite Centre, Bengaluru; Mr. A. Vijay Anand Additional Secretary, ISRO Hqrs., Bengaluru; Mr. V. Koteswara Rao, Scientific Secretary, ISRO Hqrs., Bengaluru; Dr. D. Raghava Murthy, Director, EOS, ISRO Hqrs., Bengaluru; Mr. G.R.K. Murthy, Chief Controller of Accounts, ISRO Hqrs., Bengaluru; Mr. Shantanu Bhatawdekar, Assistant Scientific Secretary, ISRO Hqrs., Bengaluru; Dr. Sarnam Singh, Programmer Coordinator, CSSTEAP; Dr. Gowri Sankar, Dy. Director Intl. cooperation, ISRO Hqrs., Bengaluru; Dr. B. Simon, Course Director, SATMET; Dr. Hari Om Vats, Course Director, Space & Atmospheric Science; Dr. Raghunadh K. Bhattar, Course Director, Satellite Communication; Dr. Yogesh Kant, Course Coordinator RS & GIS; Dr. Harish Karnatak, Scientist IIRS; Dr. Puneet Swaroop, Scientist IIRS and other officials.

While welcoming the GB members, representatives, Directors of host institutions and special invitees, Dr. K. Radhakrishnan, the Chairman, GB apprised the members about the recent activities of the Centre and ISRO's current and future space programmes.

Chairman, GB informed members that under the leadership of Dr. Y.V.N. Krishna Murthy, Director CSSTEAP in the last one year, the Centre conducted regular PG programmes on RS & GIS, SATCOM, SATMET and SAS. Short courses were organized for the decision makers and senior managers in the



India's GSLV Mark-III Rocket and 1st Crew Capsule-taking off



Mr. A.S Kiran Kumar, current Chairman, ISRO and Chairman CSSTEAP Governing Board during the meeting

areas of Microwave RS, Navigation & Satellite Positioning System (NAVSAT) and Small Satellite Missions (SSM) and these are becoming very popular. He also mentioned the organization of special courses on 'Application of GIS and RS Technology in Disaster Risk & Emergency Management for South Asia alongwith SAARC Disaster Management Centre, New Delhi.

He also informed the august gathering that 3rd short course on Small Satellite Missions is to start in November 2014 and special short course on Disaster Damage Assessment using Geo-spatial Technologies with UN-ESCAP for SAARC countries in December, 2014 at IIRS, Dehradun.

Dr. Y.V.N Krishna Murthy Director CSSTEAP presented report of the Centre highlighting Centre's programmes, activities, host country support, etc.

- He reiterated that centre is involved in capacity building in space science, technology and applications in four assigned areas and also special theme-based short courses. Year 2014 has seen the successful completion of 18th RS&GIS, 9th SATCOM PG courses; short courses on Microwave RS & its application, NAVSAT and Small Satellite Missions. He also highlighted the special course on 'GIS & RS technology in Disaster Risk Emergency Management in South Asia jointly organized by ISRO and SDMC in September 2014 and a special course in December, 2014 on 'Disaster Damage Assessment using Geo-spatial Technologies' in collaboration with UN-ESCAP Bangkok for SAARC countries.
- Dr. Krishna Murthy stated that the centre has conducted 43 PG and 35 short term short courses during the last 18 years in the four areas benefitting 1371 participants from 34 countries of Asia-Pacific region and 29 participants from 18 countries outside Asia-Pacific region. A total of 122 students from 15 countries were awarded M.Tech degree with seven students in year 2014 including technical guidance for Ph.D student from Nepal. He also highlighted the research areas taken up by students using latest satellite data and advance research in the four disciplines.
- Director CSSTEAP mentioned on the responses of cumulative alumni feedback and apprised that 27% of the responses were received. He outlined the summary of the alumni feedback on aspects of course structure, management and on utilization and importance of knowledge gained. He also mentioned about the future academic programs in 2015.



*Dr. K. Radhakrishnan, Chairman CSSTEAP GB and
Dr. Y.V.N. Krishna Murthy, Director CSSTEAP during GB meeting*



Participants of 19th GB Meeting of CSSTEAP

New Post Graduate Course on Global Navigation Satellite Systems

Centre has announced a new integrated course for Post Graduate Diploma in Global Navigation Satellite Systems and Master degree. This is fifth subject offered by the Centre. The course will be conducted by the faculty of Space Applications Centre, Ahmedabad from 1 August 2015. It will held every odd year along with PG Course on Satellite Communications. Navigation and communication has become one of the major requirements of the developing world in almost all walks of life. The course will cover space as well as ground segments of this programme, by the faculty who have been involved in Indian Space programme. Indian Regional Navigation Satellite Systems (IRNSS) and GAGAN developed by India will enhance the navigation for space flights, surveying, aircrafts, maritime navigation, tracking of vehicles, traffic, bikers, climbers, tracking, during natural disasters, natural resources management, etc. This will also be very effective for communication, navigation and surveillance location-based services, military applications, precision agriculture, disaster early warning and emergency response, aviation, land transportation, etc. It will also be useful for climate change studies, geological, atmospheric, oceanographic, radio occultation techniques for monitoring terrestrial weather, etc.

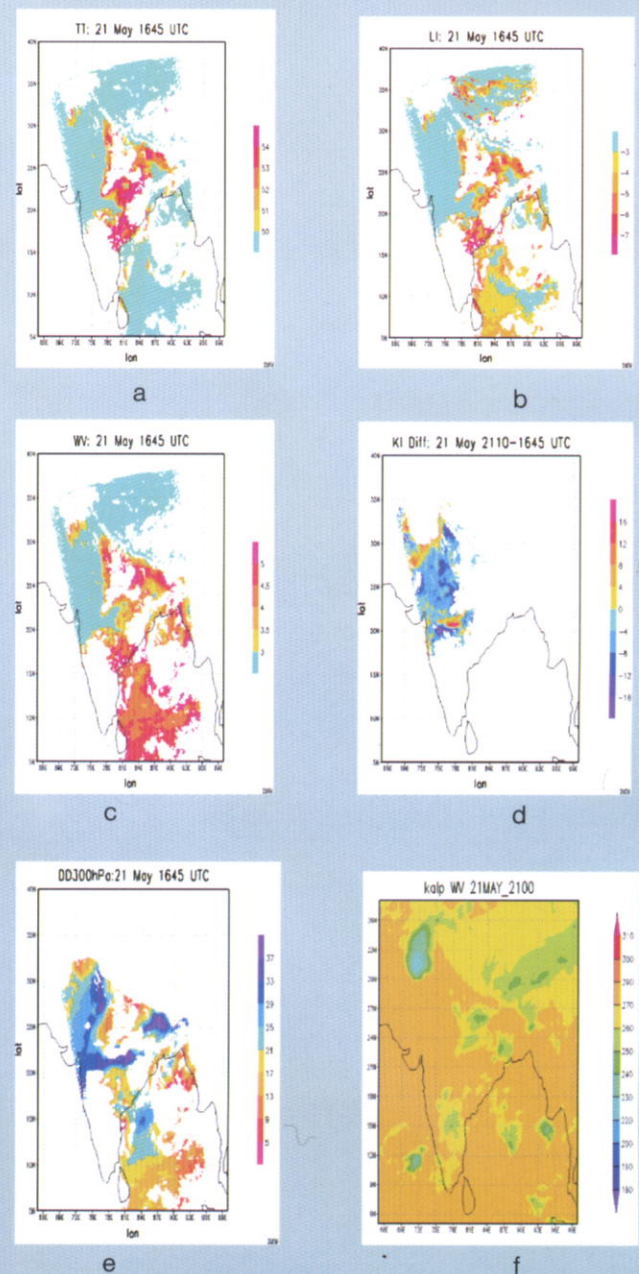
Admission process is on. Reader is advised to visit website (www.cssteap.org) for further details on the syllabus, course, and other information. Centre will offer a few fellowships to meet international travel and living expenditure during the course.

Master Degree Research Programme

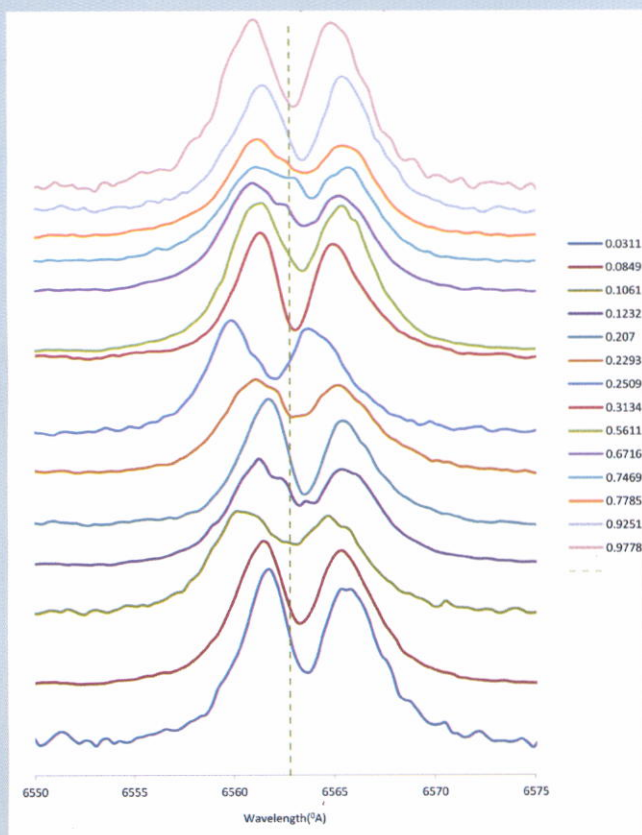
Nowcasting Mesoscale Convective Systems during the Indian Pre-Monsoon Seasons using Satellite data

Due to the violent and destructive nature of the Indian Pre-Monsoon thunderstorms, meteorologists are required to provide prompt, accurate, site and time specific nowcast. Under weak synoptic forcing, as observed in the Indian Pre-Monsoon season, thermodynamics plays a very dominant role in activating mesoscale systems that produce convective storms.

In this project, an attempt was made to study the influence of thermodynamic parameters and indices, derived from MODIS satellite data, on the evolution of convective storms during the Indian Pre-Monsoon season over East Coast of India, West Bengal and Bangladesh. Total Precipitable Water (TPW) and stability indices such as TT, LI and KI were found to be of immense nowcasting value. Threshold values were set for these indices as clear indicators of convective developments, three to six hours ahead. Threshold values tend to vary with



Derived Product Images: 21 May 08 : a. Total Total Index
b. Lifted Index, c. Total Precipitable water Vapour d. K Index,
e. Dew Point depression at 300 h Pa,
f. Kalapna VHR brightness temperature.



V367 H Alpha line profiles

season. TPW exhibited a very consistent relationship with convective development. Among the stability indices, TT was found to be the most reliable. Mid-tropospheric level (700-500 hPa) mean dew point depression, by itself, qualified to be an excellent predictor of thundery development. Trend of KI and dew point depression at 300hPa were also examined for their role as potential predictors but with less success.

Heuristic Nowcast Rules for the time of occurrence of thunderstorms were developed from the CTT-Time plots that were prepared using the sequential geostationary data of Kalpana-Very High Resolution Radiometer (VHRR). Topography-dependent diurnal bias on the peak intensity of the convective development was evident. Over coastal regions, the occurrence commences in the late afternoon and peaks in the evening hours. Development of convection over inland exhibited a bias towards late-night and early morning hours.

- Mr. LE Joseph/ India/ SATMET 2008-09

Study of the Binary System V 367 CYGNI

Spectral energy distribution of the V367 Cygni was derived from the magnitudes provided in the previous studies of the system. Near infrared excess flux was found beyond $3\mu\text{m}$. Free-free emission is attributed to the excess flux and the electron density of the mass accretion disk ($9.0 \times 10^{11} \text{ cm}^{-3}$) was found of the same order as β Lyrae systems.

$H\alpha$ line was found in emission with central absorption at all observed phases. The $H\alpha$ emission region in the accretion disk was found to be greater than $21R_8$. No clear systematic variation of the V/R ratio with the phase was found. The velocity of the central absorption of $H\alpha$ profiles relative to the primary was found similar to that obtained by Heiser (1961).

The $\text{Pa}\beta$ profile was found to be single-peak at all the observed phases. The observed ebbs and flows in the $\text{Pa}\beta$ profiles can be attributed to the density fluctuations in the gas stream of the accretion disk. The $\text{Br}\gamma$ line was to be single-peak at all the observed phases. By rough estimation, the region of the accretion disk where $\text{Pa}\beta$, and $H\alpha$ arising was found such that the $\text{Br}\gamma$ arises from the inner regions of than the $\text{Pa}\beta$ and the $H\alpha$ originates from the outermost regions. $\text{Pa}\beta$ and $\text{Br}\gamma$ lines were found to be optically thick and varying with the phase. It was found that the optical depth of the center of the $\text{Pa}\alpha$ line of V367 Cygni should be between 10 and 100, near phase 0.4. The Brackett member H-11 was found to be arising from gas, which is optically much thinner than that $\text{Br}\gamma$ line originates from.

The Fe II (16883.4Å) line was detected in emission at all observed phases and found that the fluctuation of the equivalent width of the line with the phase is somewhat erratic.

- Mr. R.A.S. SarajGunasekera/Sri Lanka/ SAS 2004-2005

Compositional Characterization of Morphological Features on the Moon: Insights from Imaging Spectrometry

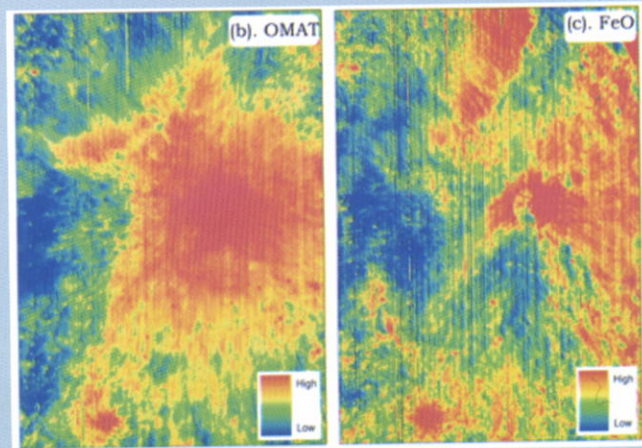
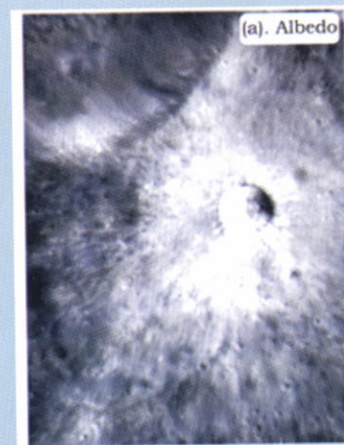
The mapping of compositional characteristics of morphological features of a planetary surface is an essential key to understand the origin of the planet through its geologic evolution. Compositional characterization of morphological features of the moon as well as the earth. Mineral mapping of the moon surface at high spatial/ spectral resolution has been a long standing goal of lunar exploration. Since multispectral Clementine era through the Earth based telescope era, different mapping techniques have been attempted to map complex mineral mixture of the Moon surface.

In this research, two mapping methods formulated in multispectral and hyperspectral era were applied for the hyperspectral Moon Mineralogy Mapper (M3) data covering five different morphological features in farside and nearside of the moon and later mapping results were compared. Selected morphological features include; the impact melt at Mare Orientale basin, Lineament, sinuous rille and wrinkle ridge at Procellarum KREEP terrain and ray crater at Feldspathic highland terrain. Lucey et al., (1998) method mostly used for the Clementine data was modified and successfully applied to map FeO and TiO₂ abundance with Optical maturity of the area. Combination of Spectral Angle Mapper (SAM) and modified Gaussian Method (MGM) was able to identify and locate high-Ca and low-Ca pyroxene, plagioclase feldspar and mature lunar soil regolith of the area.

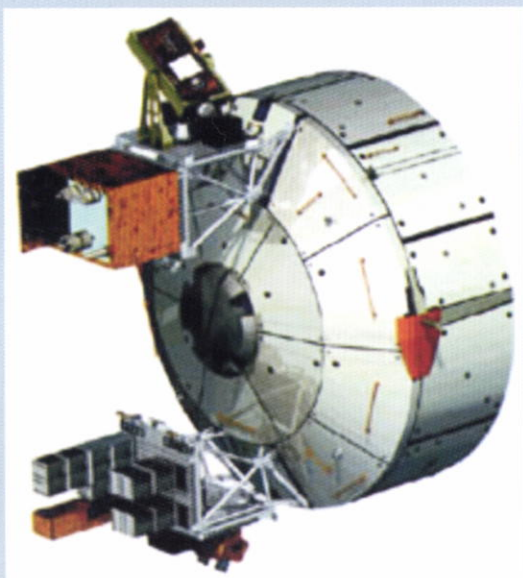
Modified Gaussian Model (MGM) and Spectral Angle Mapper (SAM) along with Lucey et al., 1998 method enhanced our theoretical and empirical understanding of image spectra and it illuminated the knowledge about the area and led to a more complete determination of the compositional makeup of the Lunar surface. In addition to that overall study demonstrates the imaging spectroscopy with mineral mixture analysis and mapping of end members are the ideal methods to identify and map extraterrestrial surface minerals according to their absorption characteristics.

Keywords: Moon Mineralogy Mapper (M³), OMAT, FeO abundance, TiO₂ abundance, Modified Gaussian Model, Spectral Angle Mapper.

- Mr. GayanthaLokuKodikara/ Sri Lanka/ RS&GIS 2010-2011



Chandrayaan-1 M3 750 nm albedo image of simple ray crater area, (b) optical Maturity (OMAT) showing fresh (high) and mature (low) material, (c) Derived FeO abundance image of the area.



*Solar Monitoring Observatory
(SOLAR/SMO)*

Solar Monitoring Observatory (SOLAR/SMO)

SOLAR is an ESA science observatory on the Columbus Laboratory, which is part of the International Space Station. SOLAR was launched with Columbus on February 2008 aboard STS-122. It was externally mounted to Columbus with the European Technology Exposure Facility (EuTEF).

- SOLAR has three main space science instruments:
- SOVIM - Solar Variations and Irradiance Monitor
- SOLSPEC - Solar Spectral irradiance measurements
- SOL-ACES - Auto-calibrating Extreme Ultraviolet and Ultraviolet spectrometers

Together they provide detailed measurements of the Sun's spectral irradiance. The SOLAR platform and its instruments are controlled from the Belgian User Support and Operations Centre (B.USOC), located at the Belgian Institute for SpaceAeronomy (BISA) in Uccle, Belgium.

SOVIM instrument is based on an earlier instrument (SOVA) which flew aboard the European Retrieval Carrier, launched on STS-46 in 1992. It is designed to measure solar radiation with wavelengths from 200 nanometers - 100 micrometers. This covers near-ultraviolet, visible and infrared areas of the spectrum.

SOLSPEC is designed to measure the solar spectral irradiance in the 165 - 3000 nanometer range with high spectral resolution.

SOL-ACES consists of four grazing incidence grating spectrometers. They are designed to measure the EUV/UV spectral regime (17 nanometers - 220 nanometers) with moderate spectral resolution.

By Chanaka Sandaruwan Haggalla
9th SAS Course participant at PRL, Ahmedabad

Status of M. Tech Degree Award

Name	: Mr. Hedjadj El Oualid
Country	: Algeria
CSSTEAP Reg No	: PSC-11-110 (SATCOM-8)
Dissertation Title	: Study and Simulation of Wavelet Based Step Tracking System
CSSTEAP Guide	: Shri. Prakhar Srivastava (SAC, India)
Country Guide	: Mrs. Bazine Razika (NICT, Algeria)
External Examiner	: Dr. Nagendra P Gajjar (Nirma University, India)
Status	: M.Tech Degree Awarded from AU in 2014



Rangoli by Course participants on the occasion of Deepawali

Name : Mr. Manish Kumar
 Country : Indian Navy (India)
 CSSTEAP Reg No : PSC-09-97 (SATCOM-7)
 Dissertation Title : Study and Design of a Stabilised
 KU Band Antenna for Ships
 CSSTEAP Guide : Mr. Rajeev Jyoti (SAC, India)
 Country Guide : CptSudhir Singh (Indian Navy, India)
 External Examiner : Dr. K. R. Subhashini (NIT, Rourkela,
 India)
 Status : Viva-Voce is conducted successfully

Name : Mr. Milan Kumar
 Country : Indian Navy (India)
 CSSTEAP Reg No : PSC-11-114 (SATCOM-8)
 Dissertation Title : Design and Simulation of Combined
 Differential Detection Scheme for
 GMSK
 CSSTEAP Guide : Mr. S. N. Satashia, (SAC, India)
 Country Guide : CdrSiddharth Dubey (Indian Navy,
 India)
 External Examiner : MrJeyamani (Ex.SAC, India)
 Status : Viva-Voce is conducted Successfully

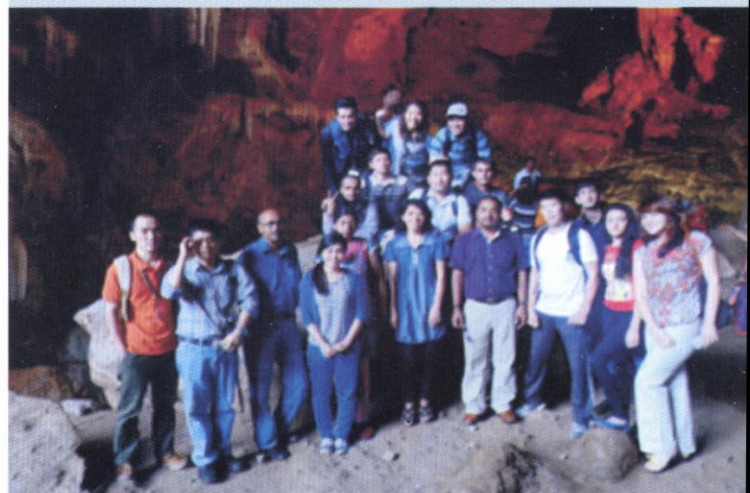
19th Post Graduate Course on Remote Sensing & Geographic Information System

The 19th Post-Graduate Course on Remote Sensing and Geographic Information System (RS&GIS) of CSSTEAP commenced on July 1, 2014 at Indian Institute of Remote Sensing (IIRS), ISRO, Dehradun, one of the host institutions of CSSTEAP. Total 21 participants from 9 countries of Asia-Pacific Region viz. three participants from India, Mongolia, Thailand, Uzbekistan and Viet Nam, two participants from DPR Korea, Nepal and one participant each from Kyrgyzstan and Tajikistan have joined the course. The participants are mainly from Hydrology, Watershed Management, Environment, Meteorology, Urban and Regional Planning, Geoinformatics, Surveying, Cartography and Agriculture background.

The inauguration of the 19th PG course was held on July 7, 2014 at IIRS, Dehradun. Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences and current Chairman ISRO was the Chief Guest of the function. -On this occasion, Director, CSSTEAP



Visit to Doppler Radar station at Visakhapatnam during their education visit



Course participants of RS & GIS at Borra Caves near Visakhapatnam during educational visit

briefed about the objectives and the activities of the Centre. Dr. Shailesh Nayak outlined the importance of capacity building and application of remote sensing & geospatial technology in national development and particularly in the region of Asia-Pacific.

Semester-I dealt with fundamentals of geospatial technologies, recent trends in RS & GIS technology, natural disasters, environmental analysis, monitoring and management. Several field excursions were taken up during this module for ground truth collection and for interpretation and analysis of satellite data. The module ended on September 27, 2014. To improve the English language proficiency of some students, English coaching was imparted to students to improve spoken and written English proficiency with more emphasis on pronunciation/accent, grammar and vocabulary. Module-1B semester-I was of one month duration on recent trends in RS & GIS and environmental analysis and management.

Module-II of semester-II out of 21 participants, six participants have opted for Satellite image analysis & photogrammetry, 5 for Water resources, 4 each for Geoinformatics and Urban & Regional studies/planning while 2 participants have opted for Agriculture and Soils discipline.

Dr. B.L. Deekshatulu, Former Director, CSSTEAP delivered specialized lectures on 'Advances in digital image processing' and 'Research methodology and role of engineers in the changing world' during September 29-30, 2014. Dr. George Joseph, Former Director, CSSTEAP and Distinguished Professor, ISRO was invited to deliver specialized lectures on 'EO system- sensor platform and orbits' and 'High resolution imaging' during October 7-8, 2015.



19th RS & GIS course participants with Prof. G.S.N. Rao, Vice Chancellor & other officials of Andhra University



Course participants at ISPRS symposium in Hyderabad with Dr. Y.V.N. Krishna Murthy, Director CSSTEAP and delegates from ICIMOD, Nepal



Dr. Sarnam Singh
Course Director



Dr. Yogesh Kant
Course Co-ordinator

9th Post Graduate Post Course on Satellite Meteorology and Global Climate

The 9th Post Graduate Courses on Satellite Meteorology and Global Climate under the aegis of the UN affiliated CSSTEAP, is being conducted at Space Applications Centre (Bopal)

Campus), Ahmedabad during August 1, 2014 to April 30, 2015. Seventeen participants representing eight countries of the Asia Pacific region are attending the Courses, viz Bangladesh-2, India-3, Kazakhstan-4, Kyrgyzstan-1, Malaysia-1, Mongolia-3, Tajikistan-2, Vietnam-1. The course commenced on August 1, 2014 at the Bopal Campus of (SAC), Ahmedabad

A joint inaugural function of the two courses i.e. the Satellite Meteorology and Global climate conducted by Space Applications Centre and the Space and Atmospheric Sciences conducted by Physical Research Laboratory was held at K.R. Ramnathan Auditorium, PRL on 4th August 2014. This function was presided over by Mr. A.S. Kiran Kumar, Director SAC, Dr. Y.V.N. Krishna Murthy, Director CSSTEAP, and Dr. A. Sarkar, Dean PRL. Senior Officers from SAC and PRL graced the function.

This SATMET-9 course has 2 semesters spread in 3- modules. The 1st module covers the fundamentals of Satellite Meteorology and Global climate, and 2nd module deals with Advance Concept of Satellite Meteorology, e.g. Geophysical Parameter Retrieval and Satellite Products and their application in NWP, etc. The 3rd module, called Pilot project module (duration: 3 months), the participants have to do project on a topic relevant to their own country under the guidance of an expert scientists from SAC.

Initially SAMET & SAS course had one week common orientation module, covering various topics related to Space Technology, Remote Sensing, GIS & Satellite Meteorology.

During Module I and Module II there were theory classes and practicals. In theory classes lectures were given by the eminent faculty from SAC, and other research institutes in the country. Theory classes covered topics like; Mathematical techniques, Satellite orbits and instrumentation, Dynamic Meteorology, Statistics, Active and Passive Microwave Remote Sensing, Radiation Balance of Earth, Image processing techniques, Image interpretation, Tropical Cyclone, Radar and Aviation Meteorology, GIS, Climatology, Application to Weather forecasting, Radiative transfer & geophysical parameter retrieval, Precipitation, Vegetation index, GPS Meteorology and satellite data calibration, Basics of assimilation, NWP, Assimilation of satellite derived data, Monsoon variability, NWP role of satellite data for



19th RS & GIS Course participants learning digital photogrammetry



19th RS & GIS Course participants at Taj Mahal, Agra

parameterization, Ozone and other trace gases, Paleo climatology, polar science and climate change, etc. Afternoon sessions involved practical's on; INSAT-VHRR data handling; cloud characteristics, NOAA-AVHRRR data handling; feature extraction and applications, estimation of rainfall from INSAT- Meteorological Data Processing, Cloud Vector Motion and Tropical cyclone ; Humidity profiles from SAPHIR, Geophysical parameters from MT, SST and thermal features from IR sensors, Cloud radiative forcing, SARAL-ALTIKA data processing, and Agro meteorological applications.

Lectures were also arranged by foreign faculties.,i.e., Prof Dev Niyogi, from Purdue University, West Lafayette, USA, gave a lecture on Land surface process and Climatology. Dr. D.G.K. Murty, Sr. Scientist, IMG Inc. (working for NOAA/NESDIS), Maryland delivered lecture on Satellite retrieval and validation, and details of Joint Polar Satellite System (JPSS) to SATMET-9 Students. Prof. R.R. Rao, Director ICMPO, IITM gave lectures on Global Climate Change and Arabian Sea warm pool. Prof Eric D Asro, University of Washington gave lectures on Ocean interaction with Tropical cyclones and Turbulence and mesoscale processes.

There were weekly weather discussions with SATMET-9 students where they discussed the current weather, and weather forecasting for the next week for the Asia Pacific region. Weekly Climate seminars were given by SATMET-9 students, where they described the climate, flora, fauna, and cultural heritage of their country, in the Asia Pacific region.

Pilot project discussion with the scientists concerned was held and topics for their three months project work were finalized As part of their study tour the students visited mount Abu Observatory and Monuments and land marks in and around Ahmedabad. This course will be concluding on 30th April 2015.



Dr. B. Simon
Course Director



Ms. Yogini Vanikar
Course Co-ordinator



Joint Inauguration of SATMET-9 & SAS-9 at PRL,
Ahmedabad



SATMET-9 Students at Mount Abu Observatory
as part of their study tour

9th Post Graduate Post on Course Space and Atmospheric Sciences

Ninth CSSTEAP courses on Space and Atmospheric Sciences (SAS-9) started on 1 August 2014 and will end on 30 April 2015 at Physical Research Laboratory (PRL) Ahmedabad, India. A total of 12 participants from five countries in Asian and Pacific region are participating.

The course has three modules. Module-0 was an introductory course, it was also a joint programme with SATMET participants. In this module very interesting talks were given by the faculty members from PRL, SAC and IIRS. The topics covered were Electromagnetic Spectrum, Universe, Atmosphere, Ionosphere, Satellite Communications, Geographic Information System and Remote Sensing. In this course the emphasis was to make student aware about the space science and its wide ranging application. On completion of this module, there was a seminar wherein each student made a presentation of ~20 minutes each. The presentations were evaluated by a senior faculty member. The students made very good and complete presentation.

The regular teaching of the first semester began on 11-08-2014. There are five theory papers on (a) Atmosphere, (b) Ionosphere, (c) Ground Based Techniques, (d) Space Instrumentation and (e) Space Exploration. In each of these they had 40 lectures by the specialized faculty for each topic and sub-topics. There were tests, assignments and short seminars in each of these papers and their sub-sections. The education model is very interactive. During the course of Semester I and II there were total of 15, 20, and 7 tests, seminars and assignments by different faculty members, respectively. All these were graded and used for internal assessment of the students.

There were 5 and 7 special lectures by 12 senior scientists and visitors to PRL and SAC on the related topics of space science. Based on the recommendation of the board of studies, the emphasis on practical work was enhanced during the labs and field visits as well as in the classes. There were ten practical in each semesters and these had a weightage of 50% of theory papers. The practical work was carried out at SAC Bopal Campus and at four campuses of PRL namely, Main, Thaltej, Mt Abu and Udaipur Solar Observatory. Students also visited experimental laboratories of PRL Ahmedabad, SAC Ahmedabad and IPR Gandhinagar. There was observational of CSSTEAP



Dr. George Joseph, Ex. Director SAC / CSSTEAP giving lectures to SATMET-9 students



Participants of 9th SAS Courses during invited lecture session

participants and Atmospheric science group of the Saurashtra University Rajkot. In this MICROTOP of PRL and GIRISM of Saurashtra University Rajkot were used, The students took observations at various locations in Saurashtra region. Twelve special guest lecture were arranged for the benefit of the participants.



Prof. Hari Om Vats
Course Director

3rd International Training Course on Navigation and Satellite Positioning Systems (NAVSAT)

The 3rd international short training Course on Navigation and Satellite Positioning Systems of CSSTEAP started on June 16, 2014 and concluded on 11 July, 2014 at SAC Ahmedabad. Nineteen participants from eight countries of Asia Pacific region, namely Bangladesh, India, Indonesia, Kyrgyzstan, Mongolia, Myanmar, Nepal, and Vietnam attended this course. The Valedictory function was held on 11 July 2014 at Bopal Campus, SAC Ahmedabad Shri K. S. Parikh, DD, SNAA welcomed the participants and guests. Programme Coordinator, CSSTEAP, Dr. Sarnam Singh in his address to participants emphasized on the applications of GNSS. Shri A. S. Kiran Kumar, Director, SAC, said that the course is useful not only to participants but also to the host institution in sharing and improving their knowledge. Dr. Raghunadh K. Bhattar, Course Director, NAVSAT presented the course report. Finally two participants from the NAVSAT course gave their feedback and thanked India and SAC for conducting such a wonderful course and they said that they got benefitted by the course. The function was concluded with the vote of thanks from Shri V.N.Parekh, Course Co-ordinator, NAVSAT-2014.



Dr. Raghunadh K. Bhattar
Course Director



Mr. V.N. Parekh
Course Co-ordinator



Participants during practical exercises of SAS Courses



Prof. UR Rao (Chairman PRL GB Council) with participants of SAS Courses

SAARC Regional Training Programme on GIS and Remote Sensing Technology in Disaster Risk and Emergency Management in South Asia

Natural disasters cause extensive damage to life, property and environment across the world each year. During the last few decades have witnessed a general increase in the frequency and intensity of disasters owing to increased exposure of the community and assets to natural hazards. In contrast to developed nations, the frequency and severity of natural disasters is however more in the developing countries because of their poor capacities to cope with the natural hazard events. The South Asian region is one of the most disaster prone regions in the world. Different types of geological, hydro-meteorological hazards and forestry such as earthquakes, landslides, floods, droughts, forest fires, cyclones, etc. frequently occur in the region. Despite the serious human efforts, the rise in socio-economic loss due to natural disasters highlights the need for continuous and organized efforts in effectively and efficiently managing the disaster situations. There has been a tremendous advancement in Earth Observation (EO) capabilities and geospatial technologies in recent years and damage due to cyclones such as Hudhud and Phailin could be reduced due to data/information available from satellite data. Therefore, it is imperative for all stakeholders to keep abreast of new technologies and their application potentials. It is important that all the organisations responsible for managing disasters institutionalize the mechanism for assimilating and capacity building in using the data in advance so that the information obtained from Geographic Information System (GIS) and Remote Sensing (RS) technologies will be effectively utilized.

Considering the need for capacity building in South Asia Association for Regional Cooperation (SAARC) countries a special short course on GIS and Remote Sensing Technology in Disaster Risk and Emergency Management in South Asia for SAARC Countries sponsored by SAARC Disaster Management Centre (DMC), New Delhi was organized from July 14-25, 2014. The programme was jointly conducted by SAARC DMC, CSSTEAP and Indian Institute of Remote Sensing (IIRS), Indian Space research organization in Dehradun. The basic objectives were: (a) to understand the basic principles, terminologies and approaches for Disaster Risk and



Participants of 3rd NAVSAT Course with dignitaries



Participants with faculty after valedictory function of special short courses, SAARC Regional Programme on GIS and RS Technology for Disaster Risk and Emergency Management in South Asia

Emergency Management (DREM); (b) to understand the potentials and constraints of GIS and RS technology for DREM; (c) to use geospatial methods and tools required in different phases of DREM; and (d) to plan effective preparedness, mitigation measures and emergency management to manage the disasters.

The subjects covered were Hyogo Framework, Earth Observation satellites, basics, methods for hazards & vulnerability assessments and monitoring for earthquakes and landslides, floods, glacial lake outburst, forest fires, agricultural drought, etc. The participants were also exposed to different aspects of disaster risks and emergency management as mentioned above, data integration, application of geospatial tools, satellite positioning systems, satellite communication technologies, crowd sourcing, WebGIS techniques in different phases of disaster management cycle and were also given hands-on training. The programme was funded by SDMC, New Delhi. A total of 21 from 6 countries participated in the programme. A total of 23 lectures and 14 hands-on sessions were organized. Subject experts Dr. V. Bhanumurthy, NRSC, Hyderabad and Dr. Virender Kumar, Space Applications Centre Ahmedabad were invited to share their experiences. Dr. Y.V.N. Krishna Murthy, Director, CSSTEAP and IIRS and Dr. Santosh Kumar, Director, SAARC DMC, New Delhi distributed the certificates.



Participants with faculty during inaugural function of special short courses, SAARC Regional Programme on GIS and RS Technology for Disaster Risk and Emergency Management in South Asia



Participants with faculty in classroom of special short courses, SAARC Regional Programme on GIS and RS Technology for Disaster Risk and Emergency Management in South Asia



Dr. Sarnam Singh
Course Director



Dr. S.K. Srivastav
Course Co-ordinator

Expert Group Meeting (EGM) and Specialised Training on Disaster Rapid Impact Assessment Using Space-based Information

The Asia Pacific region accounted for more than 74.6 % of the global human fatalities due to natural disasters between 1970 and 2011, while South Asia and South West Asia emerged as the sub-regions with the largest share of human fatalities. South Asia is home to 23% of the world population though it accounts to only less than 2% of the world's income, reflecting the poverty, deprivation and vulnerability of its

people facing the onslaught of recurring natural disasters. Some of the major disasters faced by the South Asian countries in the recent past include the Bhutan earthquake in 2009, the Pakistan floods in 2010, the Sikkim earthquake in India in 2011, the building collapse in Dhaka in April 2013, the devastating floods in Uttarakhand (India) in June 2013, Cyclone Phailin (Odisha, India) in October 2013, Badakhshan (Afghanistan) mudslides in April 2014, Landslide across the Saptakoshi River (Nepal) in August 2014, Oct 2014, Floods in Northern India (Jammu and Kashmir) and Pakistan and Cyclone Hudhud (Andhra Pradesh and Odisha, India) in Oct 2014.

The post-disaster damage and loss assessments have been conducted by the affected countries for emergency response, recovery and reconstruction. However, many times, due to lack of standardized methodologies, these assessments are not precise and often not multi-sectorial. The UN Global Assessment Report 2013 observes that direct disaster losses are at least 50 percent higher than internationally reported figures. The quality of timely and multi-sectorial assessments contribute substantially to the recovery and reconstruction, which is an important window for the ex-post investments towards mainstreaming disaster risk reduction into sustainable development. The UN ECLAC Damage and Loss Assessment (DaLA) based Post-Disaster Needs Assessment (PDNA) serves as important tool for the valuation of physical damage and economic losses to support the financing needs for recovery and reconstruction. With the standardized methodology adopted by several development partners, the PDNA enables sector-wise damage and loss assessment and helps the affected countries to mobilize the financial resources for recovery and reconstructions including the assistance from the donors and development partners. However, lack of institutional capacity has been one of the constraining factors to adopt and institutionalize DaLA methodology into the national disaster damage and loss assessment system. The rapid assessment is also driven by the advances in Science, Technology and Innovations particularly space applications, Geographical Information System (GIS), statistical time-series analysis/simulations and semi-empirical loss assessment models such as ShakeCast, Early Post-Earthquake Damage Assessment Tool (EPEDAT) for potential earthquake damage assessment. With the smart geospatial tools and techniques, the rapid assessment needs to be designed in the manner that it contributes substantially to the PDNA process in case it's taken up by the Government and development partners in the due course.

Considering the need for capacity building rapid assessment of losses due to disasters in SAARC nations the Centre



Participants of Expert Group Meeting (EGM) and Specialised Training on Disaster Rapid Impact Assessment using Space-based Information during practice session



Participants of Expert Group Meeting (EGM) and Specialised Training on Disaster Rapid Impact Assessment using Space-based Information during feedback discussion session

organized one week programme for SAARC countries from 1-5 December 2014, Dehradun, India on Expert Group Meeting (EGM) and Specialised training on Disaster Rapid Impact Assessment using Space-based Information jointly by UNESCAP Bangkok and IIRS Dehradun with the following objectives:

- To exchange information on best practices, institutional arrangement on post disaster impact assessment, and to identify needs and gaps, with the help of consultants hired by ESCAP secretariat and senior experts from SAARC DMC CSSTEAP and ISRO.
- To recommend the ESCAP secretariat on possible next steps on enhancing the capacity of countries on using innovative technologies for rapid disaster assessment.
- To understand the concept, data sets, models and methodology for post-disaster rapid damage and loss assessment;
- To learn how to use space, GIS, navigation and crowd sourcing application products for post-disaster rapid damage and loss assessment;
- To learn from the real life experiences of post-disaster rapid damage and loss assessment in South Asia by having the hands-on practices;
- To develop the content for technical manual of 'Rapid Assessment of Damage and Loss' by capturing the essence of expert deliberations during the Expert Group Meeting/group training.

The programme was funded by UNESCAP and conducted by the faculty of IIRS. Subject experts such as Dr. Santosh Kumar, SAARC DMC, New Delhi, Dr. Bhatt National Remote Sensing Hyderabad, and Dr. Sunil Aggrawal from Space Applications Centre, Ahmedabad were also invited to share their experience as subject experts. The case studies using geospatial tools and techniques for rapid assessment in the recent disasters were discussed to develop the rapid assessment methodology. Twenty participants from six countries participated in the programme. The Dr. S.K. Saha, Dean (Academcis), IIRS presided over the valedictory and distributed the certificates.



Dr. Y.V.N. Krishna Murthy Director CSSTEAP addressing the participants of Expert Group Meeting (EGM) and Specialised Training on Disaster Rapid Impact Assessment using Space-based Information



Participants with faculty members during Expert Group Meeting and specialised training on Disaster Rapid Impact Assessment using space-based information



Dr. Sarnam Singh
Course Director



Dr. Harish Karnatak
Course Co-ordinator

News

Ms. Simonetta Di Pippo has joined as Director of the Office for Outer Space Affairs (UNOOSA) United Nations Office at Vienna for March 2014.

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 centre, 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 and ISRO Satellite Centre (ISAC), Bengaluru. The Centre is an education and training institution that is capable of high attainments in the developments and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and application programmers, linkage to global programmers / databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level as well as short courses in the fields of (a) Remote Sensing and Geographic Information System, (b) Satellite Communication and GPS, (c) Satellite Meteorology and Global climate, (d) Space and Atmospheric Science, (e) Small Satellite Missions, 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 recognized by Andhra University, Visakhapatnam, India for awarding M.Tech. degree (after completion of one year project).



CSSTEAP Headquarter building

Future Courses

- 20th Post Graduate course in Remote Sensing & Geographic Information System at IIRS, Dehradun from July 1, 2015 to March 31, 2016.
- 10th Post Graduate course in Satellite Communication at SAC, Ahmedabad from August 1, 2015 to April 30, 2016.
- 1st Post Graduate course in Global Navigation Satellite Systems at SAC, Ahmedabad from August 1, 2015 to April 30, 2016.
- Small Satellite Mission short course from October - November at IIRS, Dehradun and ISAC Bengaluru.
- Short course on Coastal and Marine Disasters and Climate Change at IIRS, Dehradun during May 5-29, 2015 in collaboration with UNESCAP, Bangkok.
- Special short course for Bhutanese Government officials on Disaster Response, Recovery and Preparedness at IIRS, Dehradun during April 13-17, 2015.

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CSSTEAP welcomes views and opinions of the readers on the Newsletter. Short communications on space science and technology education which may be relevant to Asia Pacific Region are also welcome. Views expressed in the articles of the newsletter are those of the authors.

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