



कॉन्टैक्ट CONTACT

अंक 16 संख्या 2/ Volume 16 No. 2

दिसम्बर 2014/December 2014

...on a mission for transferring technology through education, research and capacity building

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Recent Advances in Geospatial Technologies

The geospatial technologies and the realms of applications are surging at a rapid pace. The internet GIS is in vogue and geospatial data availability on portals in the form of services e.g., Bhuvan (www.bhuvan.nrsc.gov.in) is increasing rapidly to fulfil

From Director's Desk

geospatial governance. The Free and Open Source GIS (FOSS4G) is gaining popularity. The increasing availability of geospatial related Application Programming Interfaces (APIs) and data from several sources, provide immediate spatial mash-up solutions. The interoperability among the datasets are achievable with the process of data standardisation which is also gaining importance in order to integrate geospatial data from different sources. These APIs are facilitating GIS-based customization and provide powerful analytical tools for advanced geospatial modelling. A wide spectrum of programming languages (e.g., C/C++, Python, and JAVA) are used for geodata modelling, processing and provide building blocks of customized GIS based tools. As the geospatial technology and applications are expanding, manpower needs to be trained to meet the demand from industry and academia. IIRS in its endeavour to transfer the geospatial technology through education, research and capacity building has trained more than 26800 professionals from 93 countries through various education and training programmes namely, Certificate, PG Diploma, M.Sc., M.Tech., e-learning and EDUSAT based distance learning programmes. IIRS till date, has collaborated with 217 universities across the country for imparting geospatial education through EDUSAT-based distance learning programme. To further enhance the outreach of geospatial science and technology, IIRS has recently introduced e-learning based certificate course on 'Remote Sensing and Geo-information Science'. The e-learning programme was inaugurated by Shri A.S. Kiran Kumar, Chairman, ISRO on 18th October 2014. Readers are encouraged to visit IIRS website for the details of above programmes.

The present issue of CONTACT newsletter contains technical articles that utilize remote sensing data from wide range of electromagnetic spectrum under multispectral or hyperspectral regime for better understanding of our environment and human settlements. The geospatial data from close-range photogrammetry are providing inexpensive solutions for 3D modeling. Advanced instruments e.g. Terrestrial Laser Scanner and Differential Global Positioning System (DGPS) help to draw information about terrain at high precision, and also useful to model 3D environment. The IIRS faculty with the support from students and researchers are vigorously pursuing their research in geospatial modelling. IIRS also conducts special training programmes for the capacity building of user organisations in geospatial technologies.

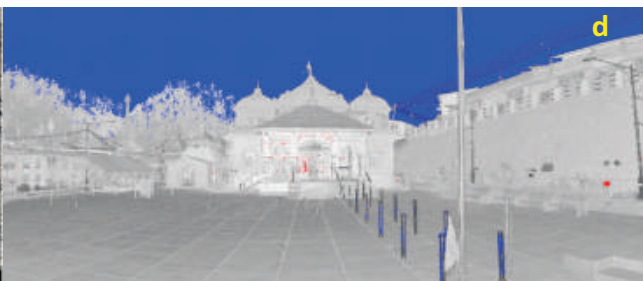
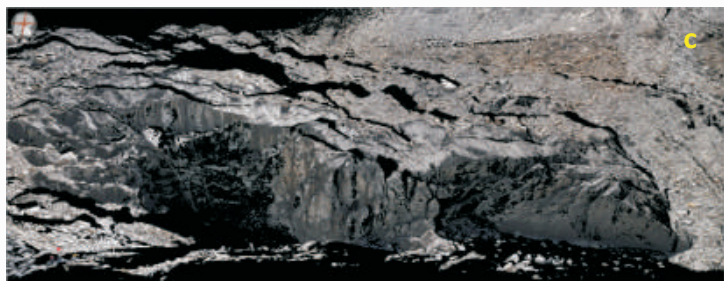
- Dr. Y.V.N. Krishna Murthy

TECHNICAL COMMUNICATIONS

Gangotri Glacier Ground Survey Using TLS, DGPS and Fuel Cell based Power Systems

Gangotri glacier is one of the largest valley glaciers of India, second only to Siachin glaciers in terms of total length and volume of glacier ice. A team consisting of scientists and students from Indian Institute of Remote Sensing (IIRS), Dehradun and Vikram Sarabhai Space Centre (VSSC), Trivandrum of Indian Space Research Organisation (ISRO) visited Gangotri glacier during 12-17 September 2014. The detailed survey of glacier was conducted using Terrestrial Laser Scanner (TLS) and Differential Global Positioning System (DGPS) instruments with power support from solar panels and fuel cells. TLS survey just downstream of river Bhagirathi near Gangotri snout (N30°55'46.588" E79°04'34.844") dated 15 September 2014 was done using Riegli-VZ400 TLS system. The system consists of a rotating prism with a laser and sensor assembly in the main body. This assembly is mounted over a motored base housing internal battery, also containing a Wi-Fi system mountable camera for overlay picture and sockets for GPS, LAN and external battery. It comes with an undetachable screen for field operation and internal electronic MEMS (Micro Electro-Mechanical System)

based inclination sensor. A low density scan with panoramic view (Angular Step width; vertical = 0.10° , horizontal = 0.25°) covering the Gangotri glacier was used. During the entire survey, total 27 TLS scans and 25 DGPS points were taken. Using RiSCAN Pro software and high density scan (Angular Step width; vertical = 0.01° , horizontal = 0.01°), the intended area was completed in about 16 minutes. DGPS reading of the point was taken using fast static mode of Trimble R7 GNSS System. The laser used in the system, works in the IR (780-2500 nm) wavelength of the spectrum. As such reflectance from debris covered ice and melting ice near snout is rarely detectable at range more than 200m, irrespective of the scan density. Therefore, another TLS survey nearer to the snout (N30°57'00.162" E79°03'03.725") was done on 16 September 2014. Detection of features near snout increased a little for the same scan resolution, therefore panoramic view for overall view capture and fine long-range scan with angular step of 0.01° for both horizontal and vertical axis was taken. The third and final scan of the snout was taken on 17 September 2014 nearer to the snout (N30°55'37.749"



a: Gomoukh snout as on 15 September 2014, b: Survey Team Consisting of VSSC, Trivendrum and IIRS, Dehradun Scientist and students with Hydrogen Fuel Cell and DGPS, c: TLS high density close range scan of Gomoukh snout with images draped over point cloud (dark area on glaciers indicate presence of crevasse), d: TLS high density scan of Gangotri Temple without any image draping

E79°4'54.988) at an elevated position due to non-availability of safe operation area near snout. Same TLS settings were used this time too. A final scan was conducted for the Gangotri temple premises for field validation of TLS. Herein, high-speed scan using scan density of Angular Step width, vertical = 0.01° , horizontal = 0.01° was done. Then, random object length were measured using a measuring tape. These object lengths were then calculated from RiSCAN Pro software and correlated with the field data. The correlation achieved was 0.999. Then, the snout height was measured using RiSCAN Pro software using the measure tool for two points. Snout height was measured 69.98m to 72.00 m, width of snout was measured as 248.47m, and identifiable crevasses width were also measured from the close range TLS scans. Hydrogen based fuel cell system developed by VSSC Trivandrum was used for charging of electronic systems taken during field visit (DGPS, TLS, Laptop and Mobile phones). The system performed satisfactorily as it was able to charge DGPS battery (6-15W, 11-28 V DC), TLS (11-32 V DC, 65-80W) and Laptops (12W) for 5 hours per one small gas cylinder of approximately 2.5 kg. Depending on the total duration planned, the required quantity of fuel can be carried, without giving room for any uncertainty or fixation with respect to time of the day, as in the case of solar

charging. This leads to lot of flexibility and provides us with new avenues of field charging in remote areas, as it uses fuel with highest calorific value (H_2), has a low thermal signature, achieves a conversion efficiency of over 50%, produces DC output which can directly charge devices without the need of an inverter and, above all, produces water as the only by-product resulting in no pollution to the environment. Since, it works on continuous supply of fuel and there is no need for electrical recharging, the new system provides electric power in truly grid independent mode and free of climate variations. This system can hence be used, independently or in conjunction with solar panels, to charge electronic devices to setup a permanent unmanned observation posts in difficult terrains for ground truth collection purposes. Acknowledgements are due to Forest Department of Uttarakhand state, and Photogrammetry and Remote Sensing Department of IIRS, Dehradun for providing necessary support/permissions during field survey and in operations/handling of TLS and DGPS.

- Praveen K. Thakur (praveen@iirs.gov.in),
Shaneeth M., Sanjay Bisht, Samrat Deb
Choudhury, Sukant Jain and Manojkumar C.K.

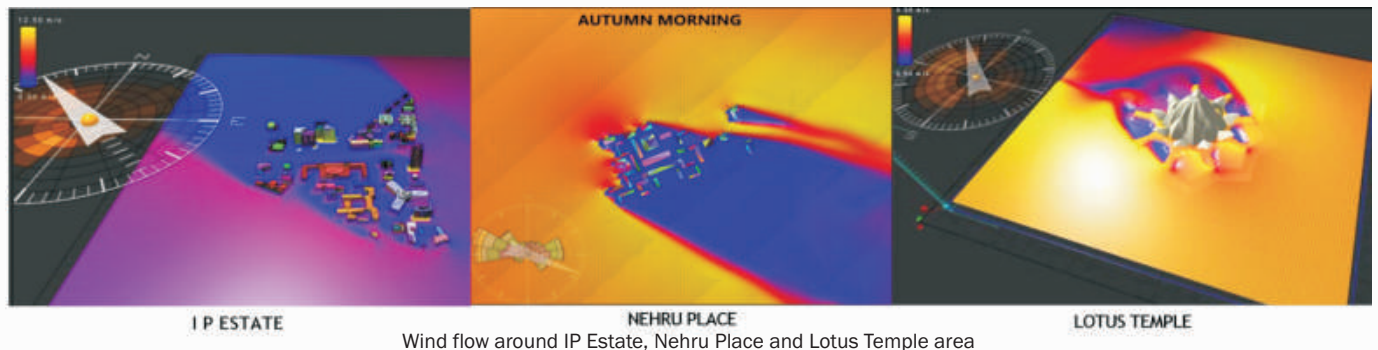
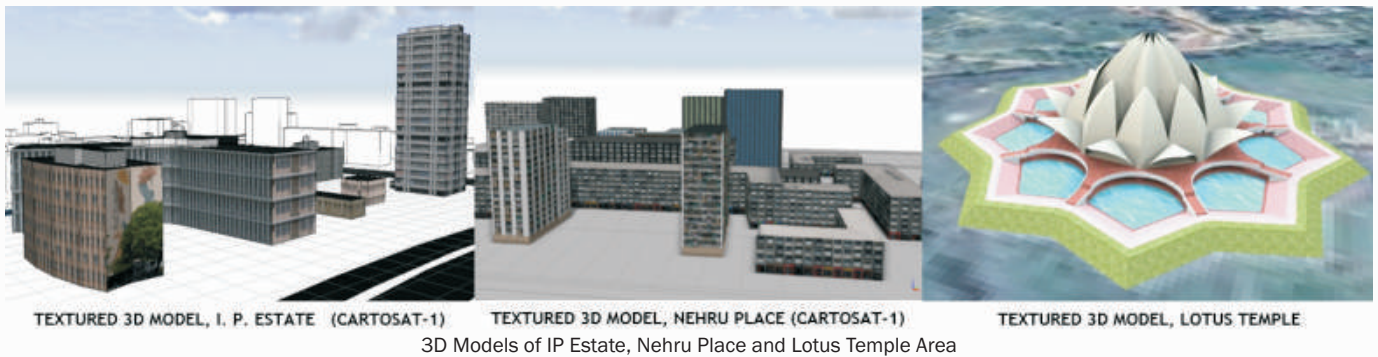
Modelling Wind Flow in Urban Areas

Rapidly growing urbanisation is resulting in urban growth in both horizontal and vertical directions and proliferation of high-rise buildings. Areas having high-rise buildings alter flow of wind to the other areas with low or mid-rise in their vicinity or even beyond. It results in turbulent wind flow at pedestrian level or accumulation of pollution in areas due to improper ventilation. Scale of these problems vary during different weather and climatic conditions and the people dwelling in lower floors are devoid of proper wind flow which is essential for movement of air and regulation of atmosphere. 3D models can be used for analysing wind flow in urban areas. Availability of variety of remote sensing data and software tools for generating the 3D models of urban areas has given an impetus to the growing number of studies for analysing the variation in microclimatic conditions due to variation in height, orientation, and arrangements of buildings. The present study has been carried out in different parts of Delhi as shown in the table. The 3D models for Nehru Place and IP Estate were prepared using Cartosat-1

Characteristics of study areas

Study Area	Land use	Building height	Complexity of structure
Nehru Place	Commercial	High rise	Less complex
IP Estate	Institutional	Medium to high rise	Less complex
Lotus Temple	Institutional	High rise	More complex

data. The buildings' footprints were generated and the heights of the buildings were measured using photogrammetric software in 3D environment. The heights were also validated on ground and it was found that the average error is 1.9 m which is below one pixel of Cartosat-1 data. Further, procedural rule based modelling was applied to generate the 3D models of various buildings. The 3D model of Lotus Temple was generated using Google Sketch up. The generated models were exported in compatible formats for analysing the wind flow in a freeware around the group of buildings. The Computational Fluid Dynamics (CFD) based



analysis of wind flow reveals that there is a large wake region in Nehru Place and IP Estate area. The arrangements of buildings and presence of high-rise structures in the wind direction is responsible for large wake regions. In contrast, although Lotus Temple is a complex structure, but due to its geometry, the wake region is much smaller. It may also be due to the number of buildings and their arrangements. In other sub-study areas, the height of structures as well the number of structures are more as compared to Lotus

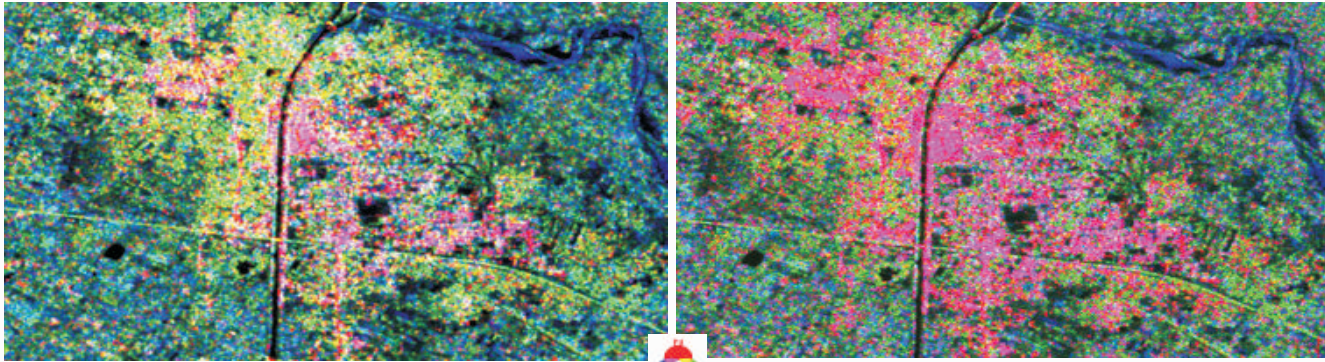
Temple area. Besides, the cell size of the mesh for modelling the wind flow in this study is much larger (~90m), which is insufficient to resolve the spaces in between the buildings. Hence, further modelling of wind flow and its analysis is required by applying finer cell size to resolve the spaces in between the buildings for detailed assessment.

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Model-based Scattering Power Decomposition for LULC Features Extraction using PolSAR Data

SAR sensors (e.g. ERS-1, ERS-2, RADARSAT-1 etc.) play a very important role in Land Use/Land Cover (LULC) features extraction especially in cloudy and hazy conditions. However, these sensors acquire data in single polarization due to which the feature extraction is not completely accurate and some confusion exists. PolSAR data which acquire signal in all four polarization gives more information pertaining to the targets and provide better interpretable results. Nowadays, various Polarimetric Target Decomposition techniques (PTD) using PolSAR data are evolved for feature extraction as it is simple to implement and highly useful for classifying both man-made and natural targets. This work presents the utility of four component scattering power decomposition technique

(G4U) using modified volume scattering by dihedral structures and special unitary transformation of coherency matrix. The advantage of including volume scattering by dihedral structures is that the back scattered cross-polarized HV response of oriented urban areas is decomposed into double bounce scattering instead of the volume scattering of the previous models. The Unitary transformation eliminates the T_{23} element and takes into account both real and imaginary part of T_{13} element of the coherency matrix which was not used in the previous four component scattering power decomposition models. The Unitary transformation reduces the number of observed independent parameters of the 3×3 coherency matrix from eight to seven and thus,



a) Before rotation of the coherency matrix

b) After rotation of the coherency matrix

Four component and modified G4U four component scattering power decomposition results for Roorkee City

modified scattering power decomposition model utilizes all elements of the coherency matrix. The model improves the double bounce scattering in urban areas and produces better results in both natural and man-made areas. This modified model is applied on Radarsat-2 C-band quad-pol data acquired over Roorkee and surrounding area. The various back scattering targets like urban area, wetlands, plantations, road, river sand, etc. were studied and discriminated based on different scattering mechanisms such as single bounce, double bounce and volume scattering for various application purposes. Figure given above shows the RGB image of

results obtained before and after rotation of the coherency matrix. In the modified model, after rotation of coherency matrix, the double bounce scattering in urban areas of Roorkee city has improved. This model is able to demonstrate that how efficiently it can be applied for differentiating various LULC features. This modified model produces better feature extraction results in comparison to other existing models and can be applied for change detection of the target under study.

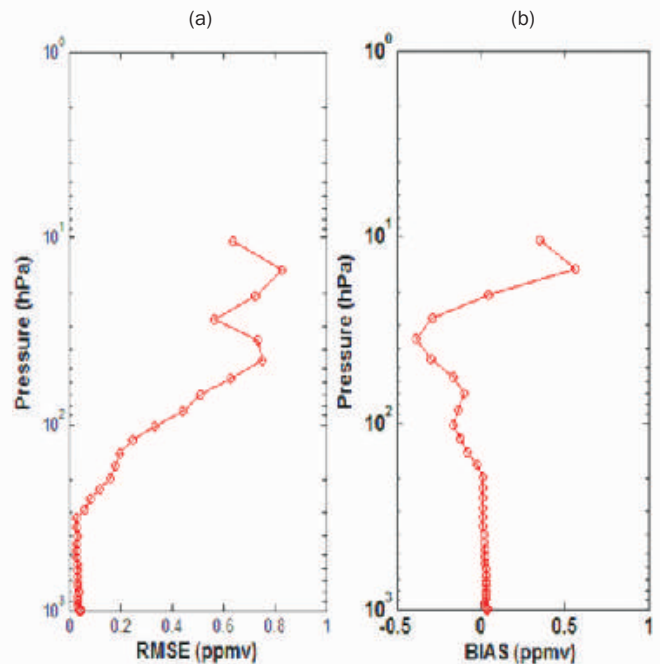
- Abdul Qadir, Vinay Kumar (vinaykumar@iirs.gov.in),
Prateek Srivastava, Shefali Agrawal

Ozone Profile Retrieval from Geostationary Infrared Sounder Observations

In the absence of three dimensional information of ozone with high spatial and temporal resolution, it is very difficult to study transport and mixing phenomenon of ozone spread over larger tropical area. Satellites are the best alternative to provide ozone profiles over vast geographical regions at a regular time interval. In the present study, the potential of infrared sounder observations from Geostationary satellites, such as GOES (Geostationary Operational Environmental Satellite) and INSAT-3D (Indian National Satellite-3D), for the estimation of ozone profile has been examined. With present state of the art, single ozone channel measurements on-board Geostationary Infrared (IR) sounders, either provide only total column ozone as a product or use complex regression based methodology with a large number of predictors to derive ozone profile. The present work proposes a new idea to derive vertical profiles of ozone from single channel IR measurements on-board Geostationary sounders. The methodology is

based upon the method of Principal Component Analysis (PCA) which has been applied over tropical region (45°S to 45°N). We have used the SeeBor dataset for the purpose and found that Principal Component of order 1 (PC1) is highly correlated with ozone at 10 hPa ($r = 0.95$) while Principal Component of order 2 (PC2) is highly correlated with ozone at 30 hPa ($r = 0.85$). It was also found that first PC explains 59.5% and first two Principal Components (PCs) together explain 76% of the total variance in the ozone profiles. Moreover, first two PCs have been found to be statistically significant and stable therefore, they have been used for profile construction. PC1 is found to be well correlated with brightness temperature of Geostationary IR sounder channel no. 3, 4, 9, 13, 14 and 15 while PC2 is well correlated with total column ozone (TOZ). This fact has been utilized to propose algorithms for retrieval of first two PCs, using brightness temperature of

geostationary IR sounder channel no. 3, 4, 9, 13, 14 & 15 and TOZ, which can be used to reconstruct ozone profile. Algorithm developed here is applied to GOES sounder data to retrieve ozone profile. Accuracy of retrieval technique is demonstrated in terms of BIAS and RMSE. This is done by comparing retrieved profiles with ozonesonde profiles. The figure shows the RMSE and BIAS between retrieved ozone profiles and ozonesonde profiles. From the figure, it can be seen that RMSE varies from about 0.05 to 0.8 ppmv and BIAS varies from about -0.4 to 0.5 ppmv at various levels of the atmosphere. Also, the positive BIAS from 20 hPa to 10 hPa shows the underestimation of retrieved ozone at these levels while negative BIAS from about 100 hPa to 20 hPa shows the small overestimation of retrieved ozone at these levels. It can also be noticed that the RMSE and BIAS are available up to 10hPa and there are no values above it. This is because the ozone profiles from ozonesonde were available up to this level only.



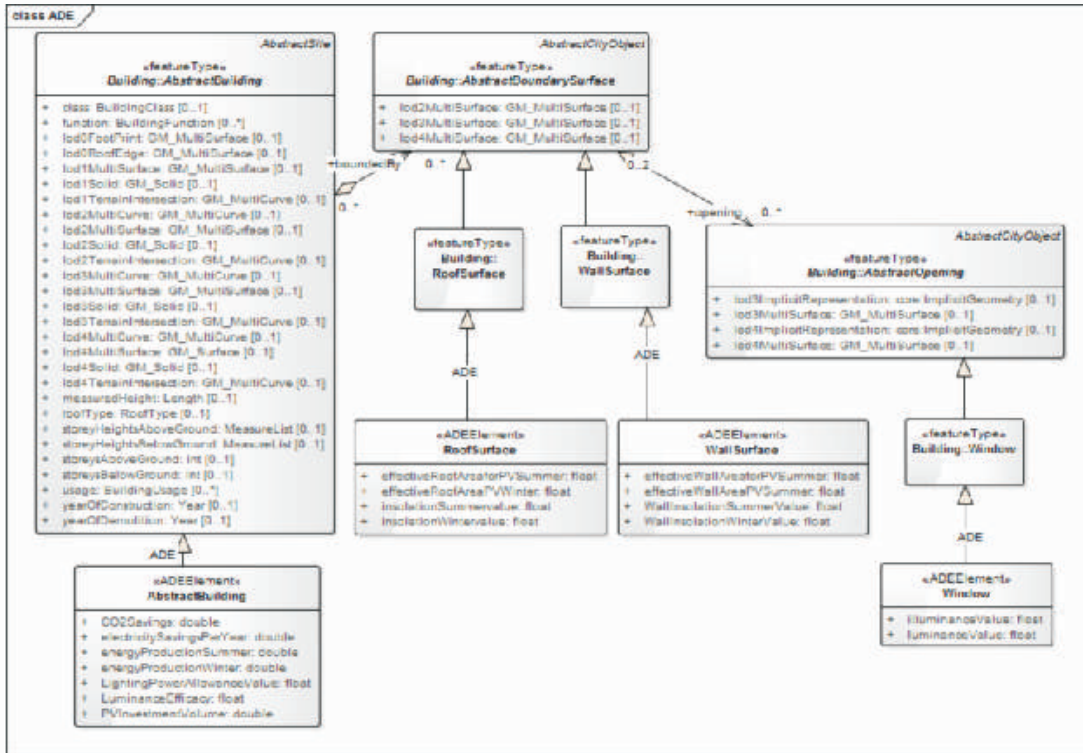
(a) RMSE and (b) BIAS between retrieved ozone profiles and ozonesonde profiles.

- Pooja Jindal (pooja_j@iirs.gov.in)

Design of CityGML ADE for Integration of Urban Solar Potential Indicators

With the advent of energy rating systems (e.g. LEED - Leadership in Energy and Environment Design) and energy efficiency requirements for built environment, the assessment of energy performance of new buildings and refurbishment rates of existing buildings have gained importance. In order to analyze and simulate the effects of energy efficient measures for building, it is essential that spatio-semantic information interoperability between Building Information Model (BIM) software and energy modelling software must exist. Data interoperability facilitates the different domain teams (design, engineering and energy modelling) to interact with single building model and to make necessary changes in design depending upon the analysis of “what-if” scenarios. The process workflow has been implemented using Green Building XML schema (referred to as “gbXML”) to export the building information model into solar shading and tracking program of energy modelling software. In order to benefit the BIM from solar energy simulation results, the process of integration of energy

simulation results with spatio-semantic features from CityGML based building model was attempted. The integrated CityGML model was used as basis for formulation of urban solar potential indicators in design of conceptual schema for CityGML Energy Application Domain Extension (ADE). The CityGML ADE mechanism simplifies the presented workflow by providing XML based exchange of information with BIM and energy simulation softwares. In the context of present study, the geometrical properties of building semantics such as effective areas exposed to certain amount of total incident radiation were used as indicators for assessment of seasonal solar potential of building. The figure depicts integration of key urban solar potential indicators with bounding and opening components of building marked as <ADEElement> stereotype. The CityGML instance document derived from proposed Energy ADE conceptual schema designed using UML could be used as common interoperable model for both design softwares and energy simulation systems.



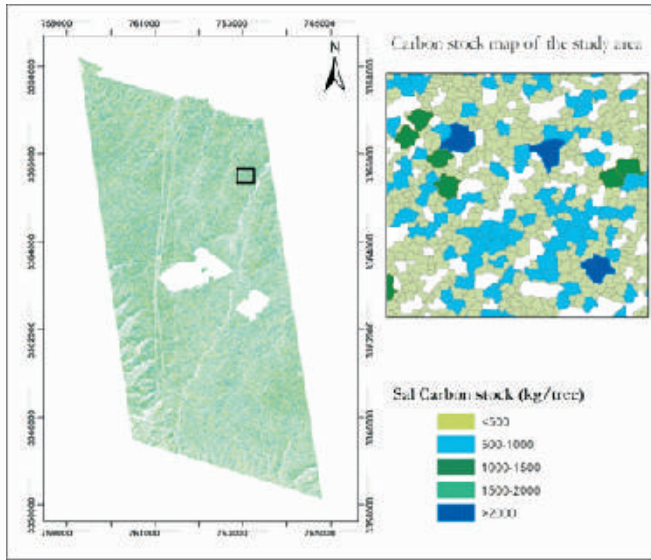
UML diagram of CityGML Energy ADE for Urban Solar Potential Indicators

-Parag Wate and Sameer Saran (sameer@iirs.gov.in)

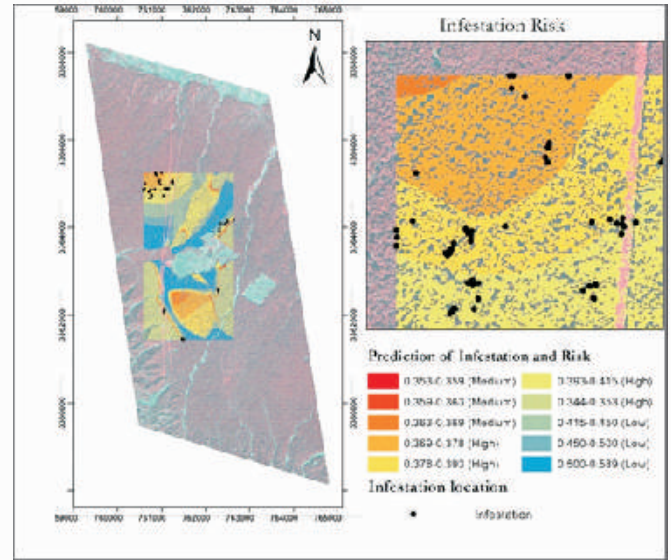
Impact of Sal Heartwood Borer (*Hoplocerambyx spinicornis*) Infestation on the Carbon Stock of Sal (*Shorea robusta*) Forests of Doon Valley

Forests' capability to sequester and store large amount of carbon, makes it imperative to assess the carbon stocked in the forest. Monitoring loss of carbon from forests due to various natural or anthropogenic causes is vital to keep a check on the increasing concentration of atmospheric carbon dioxide (CO₂) and maintain the balance between sink and source of forest carbon. The present study aimed at estimating the carbon stock of sal (*Shorea robusta*) forests of Doon valley using high resolution satellite imagery (*WorldView-2*) and field data. The study further assessed the loss of carbon from the forest due to sal heartwood borer infestation and predicting the infestation probable areas which are at high risk of attacks. For precise estimation of carbon at individual tree level, the study evaluated different pan-sharpening techniques of high resolution imagery and found that High Pass Filter (HPF) resolution merge technique was better compared to other techniques. The object-based image analysis (OBIA) used to

delineate individual tree crown and calculate canopy projection area (CPA), achieved good segmentation and classification accuracy viz., 72.12% and 84.82%, respectively. The study showed that there exists a strong relationship between diameter at breast height (dbh) and CPA of trees, and CPA and tree carbon, which indicated that remote sensing can be a useful tool for the assessment of forest carbon stock. The average forest carbon in the study area was found to be 108 Mgha⁻¹. The carbon stock of the area is presented in figure. For infestation modelling, universal kriging was used. As dbh presented best trend with infested trees, dbh was predicted using Infrared Percent Vegetation Index (IPVI), Normalized Differential Red-Edge Index (NDRE) and distance to settlements values. Based on the trend, dbh values of range 0.35 to 0.45 m were found to be vulnerable to infestation. In the prediction, trees with dbh value falling under this range were



Carbon stock



Pest infestation risk

classified as trees at high risk of infestation. A general trend can be observed from prediction that areas near to village and areas with high moisture (e.g. near to water channel or river) are at high and medium risk of infestation. The results are in agreement with theory that the areas with more human interventions are

prone to infestation. Above figure shows pest infestation risk map. The loss of carbon due to sal heartwood borer infestation, during 2011-2014, was estimated to be 112 Mg.

- Neha Singh, S. Nandy (nandy@iirs.gov.in) and L.M.Van Leeuwen

Characterization of Soil Salinity and Its Impact on Wheat Crop Using Space-borne Hyperspectral Data

Soil salinity is major soil quality indicator in arid and semi-arid areas which adversely affect plant growth and development. Facing the risk of soil salinization worldwide, there has been a growing interest in identifying rapid and inexpensive tools for soil salinity. Remote sensing has shown great advantages in this field during recent decades. As a remotely sensed indicator, the type and growing conditions of vegetation can provide a spatial overview of salinity distribution which thus, helps land managers to reduce the risk of salinization. In the present study, Hyperion data (EO-1) was used for characterization and mapping of salt-affected soils, to generate crop inventory map and to evaluate soil salinity impact on wheat crop growth in parts of Mathura district of Uttar Pradesh representing Indo-Gangetic plain. Narrow bands can discriminate critical spectral differentials in detail and can assess the salinity hazard over crop. A detailed field survey was carried out in the study area in order to identify the salt-affected soils and to collect soil samples, groundwater table depth, chlorophyll content and Leaf Area Index



Soil salinity mapping (a) Modified Red Edge NDVI (b) Structure Intensive Pigment Index

(LAI) to characterize impact of soil salinity over crop. Various wheat crop spectra were collected for calculation of narrow band indices to discriminate various stress conditions. Hyperion data was corrected for abnormal pixels, stripping and smiling effects prior to the atmospheric correction. The endmembers were selected by performing minimum noise fraction (MNF) transformation and pixel purity index (PPI) on Hyperion (EO-1) data with reference to high resolution LISS-IV data. Spectral Angle Mapper (SAM) was used to generate crop inventory map using satellite data of February month. The same technique (SAM) was used to map various categories of salt affected soils (using May month satellite data) represented by spectral endmembers of normal, slightly, moderately and highly salt-affected soils. The results showed that various severity classes of salt-affected soils could be reliably

mapped using SAM analysis with an overall accuracy of 74.24%. Empirical relationships developed between crop & soil parameters and vegetation indices could show its possibility with an R^2 of 0.52 and 0.41 to predict LAI and Chlorophyll Content Index (CCI), respectively. Validation results showed the RMSE of 0.8 and 5.2 to predict LAI and CCI. Partial least square regression (PLSR) statistical model (using spectro-radiometer derived narrow band indices) was developed to assess different stress level with varying crop and soil parameters. Different narrow band indices calculated from Hyperion data could capture the variability of the crop condition affected by soil salinity.

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COURSE REPORTS

M. Tech. in Remote Sensing and Geographic Information System

The 11th M. Tech. course in RS and GIS started on 22nd August 2012. A total of 28 participants joined the course. Three candidates after the completion of module 1, opted for PG diploma programme. Master of Technology (M.Tech.) is a 24 months programme and consists of 4 semesters. M. Tech. syllabi was revised in 2011 with the inclusion of topics on current trends and technological advancements in Earth observation, data processing algorithms and modelling; Emphasis on information dissemination, integration, location based services, real time processing and programming skills; Focus on climate change, modeling aspects, and to address policy issues of adaptation and mitigation and to promote and integrate mainstream and advanced research in all areas of technology and application. The revised syllabi was implemented from this batch of students. Semester I was of 4 months duration and was conducted by Remote Sensing & Geoinformatics Group and covered fundamentals of remote sensing, Photogrammetry, Digital image processing, GIS and advanced mathematical concepts and programming. It has a blend of theory, practical and field demonstration. Semester II is of 6 months duration divided into 2 modules each of 3 months duration. M. Tech. is offered in 8 specializations. Based on their chosen specialization, the participants joined their respective departments for Module II of Semester II. Out of 25 trainees, 3 joined Sustainable Agriculture, 4-



Forest Ecosystem and Analysis, 3-Geosciences, 3-Human Settlement and Analysis, 2-Water Resources, 4-Satellite Image Analysis and Photogrammetry, and 6 in Geoinformatics stream. Module III is a common module on advance topics and includes recent trends like Web GIS, Data visualization, Research Skill and Climate and Environment.

Participants also carried out a 3-week-case study module where they did, a small project on the topic of their interest. Semester III and IV contain project work of 14 months duration. The project carried out were in the areas of Carbon flux monitoring and modelling, Climate change impact on species habitat, Synergistic use of LiDAR and high resolution satellite data for forest biomass estimation, Crop water stress detection and its impact on productivity, Development of framework for soil quality assessment in mountain ecosystem, Downscaling

of climate change scenario and its impact on crop productivity and hydrology, Characterization of soil, biophysical characterization of agro-forestry system using hyperspectral data, Ground water depletion scenario and its impact in NW India, Seismicity and geodynamics investigation in India, Crustal deformation studies, Web based utility management system, Urban regeneration studies, Flood modeling, Use of open source data for 3D modeling, PolinSAR based studies for height extraction, GNSS and

computer vision algorithm for 3D point cloud georeferencing, Nonlinear unmixing and super resolution mapping using Hyperspectral data, Simulation studies using SAR, Real time emergency response system using open system architecture, Agent based modeling and simulation for land cover change studies, 3D GIS modeling and Geodata management in Multi user access environment. 24 candidates have successfully defended their thesis.

- Shefali Agrawal

PG Diploma in Geo-Information Science and Earth Observation (Specialisation: Geoinformatics)

The 12th Postgraduate Diploma course (2013-14) in Geo-Information Science and Earth Observation (Specialisation in Geoinformatics) offered within the framework of IIRS-ITC Joint Education Programme was completed on July 24, 2014. The course objectives are to: develop a critical understanding of appropriate tools; exposure to new methods and techniques; gaining competence in developing tools for the acquisition, processing, transformation, analysis, modeling, storage and presentation of spatial data; using geo-information in identifying and responding to development problems and in drafting development policies. The course is divided into 14 modules (each module of three-weeks duration), 10 modules of teaching and 4 modules of independent pilot project by each participant. Five participants obtained their Diploma on the graduation day. For the pilot project, participants worked on different topics related to Geoinformatics, such as: geospatial modeling for prediction of potential areas of floral & faunal species; urban growth modeling; WebGIS based multi-mode transport network modeling; development of decision scenarios using disaster damage data. The pilot projects were



evaluated by an examination committee consisting of members from IIRS and ITC, the Netherlands. Dr. Nicholas Hamm, Assistant Professor, ITC, visited IIRS as a member of the examination committee and to attend the valedictory function of the course.

Apart from IIRS faculty, invited faculty from DST and ADRIN have also shared their knowledge and experience with participants. Thanks to all invited faculty and their Heads of organisations and colleagues of IIRS and ITC for their full cooperation and support in conducting the course successfully.

- S. K. Srivastav

PG Diploma in Geo-Information Science and Earth Observation (Specialization: NHDRM)

13th Post-Graduate Diploma course in Earth Observation and Geoinformation Science with specialization in Natural Hazards and Disaster Risk Management (NHDRM) has commenced on 23rd September 2013 and concluded on 24th July 2014. It is organized as a part of Joint Education Programme (JEP) between IIRS and Faculty of Geo-Information Science and Earth Observation (formerly,

known as ITC), Twente University (TU), The Netherlands. The PG Diploma course is modular in structure with 10 course work modules and 4 project modules (each module is of 3 weeks duration) spread over 10 months. The course started with 3 M.Sc. students and 8 PG Diploma students in 2013. The initial three modules are the core modules on Principles of Remote Sensing, Principles of GIS and Principles of Databases. The

module 4 on Mathematics and Programming in Geoinformatics for Disaster management was offered as a regular module for the 3rd time for PG Diploma students. Earlier, it was available only for M. Sc. students and PG Diploma students of earlier batch have attended it as an optional module. After completion of 4 technology modules, 2 common application modules were followed: Module 5 (Natural Hazards and Disaster Management: Concepts and overview) and Module 6 (Image Interpretation and Analysis for Natural Hazards Assessment). These were followed by one specialization Module 7 (Application of Geoinformatics to Natural Hazards Mapping and Monitoring with three specializations: Environmental, Hydro-Meteorological, and Geological Hazards). The Module 8 on Advances in Remote Sensing for Natural Hazards study and Module 9 on Advances in GIS for Natural Hazards study were common modules with wide ranging topics such as Fuzzy image classification, image segmentation, texture analysis, image fusion, change detection, hyperspectral image analysis, InSAR, LiDAR, Web-GIS, Multi-criteria based analysis, Spatial Decision Support System (SDSS), Multi-variate statistics and Geostatistics. These modules on advanced techniques are followed by Module 10: Application of Geo-informatics to Natural Hazards Modelling with three specializations: Environmental, Hydro-Meteorological, and Geological Hazards wherein students apply modeling techniques in natural hazard study. After the completion of Module 10, Project modules 11 to 14 were followed from 12th May 2013 to 24th July 2013. This is the most important part of the



programme wherein students apply their knowledge in solving a real world problem. This year students have chosen very challenging topics in consultation with IIRS faculty and have undertaken collection of relevant satellite and ancillary data, ordering and purchasing of new satellite data, data interpretation, analysis, field verification, data collection and finally reporting of results. It was evaluated by board of examiners consisting of Dr. S.K. Saha, Dean (A), faculty from ITC (Dr. Nicholas Hamm), guides from IIRS, and respective Heads of Departments of IIRS. Research work included relevant topics on hazards e.g. drought, modeling of landslides & floods, glacial vulnerability, etc. The course concluded on 24th July 2014 with a valedictory function; wherein all successful candidates were presented Diploma by ITC/UoT faculty, Dr. Nicholas Hamm and Dr. Y.V.N. Krishna Murthy, Director, IIRS.

- P. K. Champati Ray

Special Course on Application of Remote Sensing and GIS for Natural Resources Management for ISS Officers

Central Statistical Office (CSO), Ministry of Statistics and Programme Implementation, Govt. of India is the apex body for coordinating statistical activities including training of statistical personnel in the country. The National Statistical System Administration (NSSTA) (formerly NASA) of CSO is mandated with the task of organizing refresher training programme for in-service officers of Indian Statistical Service. They requested IIRS to organize 5 days programme on RS and GIS for Natural Resource Management during the month of July, 2014. Sixteen participants in the cadre of Deputy Director General and Directors' level attended this course during 14-18th July 2014. Since, IIRS has two technology and six thematic disciplines,



therefore, one lecture and one demonstration was kept from each department. Presentation on MANU and Bhuvan was also organized to give them an overview about crowd-sourcing of

data and facilities available at Bhuvan platform. Field visit was organized at Mussoorie on 17th July 2014 to expose them on GPS techniques and ground verification of image elements.

Lecture notes have been provided in the hard copy form to all the participants at the beginning of the programme and the softcopy of the presentations delivered by the faculties have been given on the

valedictory day. The course participants also interacted with the faculty in the classroom or during break-hours and exhibited their zeal to learn geospatial technology. They have rated the course as very good to excellent and tendered minor suggestions for further improvement in future courses.

- D. Mitra

Special Course on Image Interpretation and Remote Sensing for IAF Personnel

The course commenced on 2nd June 2014 and 15 officers from Indian Air Force attended the programme. The course curriculum was designed based on the requirement of the user department with an overall objective to provide awareness about the concept of Remote Sensing, Image interpretation, Image processing and GIS Concepts. The course was designed in a modular structure and provided a blend of theory and hands on practical exercise. It consisted of two modules. Module I consisting of 4 weeks duration and covered topics on: Remote Sensing (optical, thermal, microwave and hyperspectral), Image Interpretation, Photogrammetric, Terrain Analysis and Visualization, GPS, Digital Image Processing, Feature Extraction and SAR data interpretation in snow and glacier areas. Theory lectures were supplemented with 2 Field visits. Module II was also of 4 weeks duration and covered topics on Overview of GIS, Map Projection for OSM/DSM Series, GIS database creation, Spatial Data Models, Spatial Data Analysis, 3D GIS, Network Analysis and Free and Open Source Software. Two guest lectures were organized on SAR data processing for strategic application by Dr. Abhai Mishra, from DEAL and Map projections of OSM and DSM map series by Mr. R.K. Srivastava from SOI.



Additionally, a lecture on RS data for natural resource application and Earth observation data for strategic application was also delivered by Director, IIRS. At the end of each module, they carried out short-duration case studies and presented the results. A formal feedback was taken at the end of the course. In general, all the participants rated the course as very good to excellent in terms of objective of course, course program design and implementation.

- Shefali Agrawal

Special Course on RS and GIS Applications in Water Resources for CWC Officers

A special course on "RS and GIS Applications in Water Resources" was organised during August 19-23, 2014 exclusively for senior level Officers of Central Water Commission (CWC). The content for this one week course was designed on the request of CWC by Water Resources Department (WRD) of IIRS Dehradun. 25 course participants joined the course from different parts of the country; 16 from CWC New

Delhi Office, 01 from Gandhinagar, 01 from Shillong, 01 from Shimla, 01 from Bangalore, 01 from Jaipur, 01 from Gangtok, 02 from Hyderabad and 01 from Agra. The course curricula contained fundamentals of remote sensing applications in quantification of hydrological cycle elements, hydrological modelling, DEM generation and its analysis, rainfall runoff modelling, catchment geo-database creation using Geo-HMS and flood

hydrograph estimation using HEC-HMS and river data creation & hydrodynamic modelling with HEC-RAS/Mike 11. Through a special session on "ISRO's Data Portals and its applications in Water Resources" the trainees were exposed to Bhuvan and India WRIS, which was well appreciated. Each lecture was followed by hands-on practical exercise on same topic in the afternoon. One day field work was also arranged in and around Mussoorie for GPS demonstration and image interpretation. The lectures and practical material were provided in both soft and hard copy book volumes as well. All the officers showed very keen interest and enthusiasm to learn new tools and techniques especially related to their work on DEM analysis and hydrological modeling. Overall feedback given by officers was Excellent to Very Good and they emphasized that more time to be given to practical and demonstrations. Refresher and follow-up course is also suggested by officers. Valedictory function of this



special course was held on 23rd August 2014 and certificates were distributed by Director, IIRS. It is expected that the training programme will help CWC officers to streamline the use of geospatial technology in the field of hydrological and hydrodynamic modelling of various rivers basins and watersheds in the country.

- Vaibhav Garg and S.P. Aggarwal

Geospatial Technologies in Veterinary Epidemiology and Disease Informatics

A special course on "Geospatial Technologies in Veterinary Epidemiology and Disease Informatics" was organised during 08-12 September, 2014. Fourteen participants joined the course wherein 12 participants were sponsored from National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI), Bengaluru and 02 participants from Indian Veterinary Research Institute (IVRI), Izzat Nagar, Bareilly, Uttar Pradesh. In the course, total 17 lectures and 06 practical classes were conducted dealing mainly with topics on fundamentals of remote sensing, Digital Image Processing, GIS and spatial analysis, BHUVAN ISRO portal use in livestock management. Specialized lectures on the topics covered were: RS and GIS applications in veterinary epidemiological research and applications, Geo-statistical Interpolation of meteorological/parasitological data, Terrain and spectral indices and its potential in epidemiological studies, Land surface



temperature retrieval from fine and coarse resolution satellite data, microwave remote sensing in wetland mapping, remote sensing of meteorological parameters and their role in epidemiological studies, Geospatial Technologies in Veterinary Epidemiology and Disease Informatics and GIS analysis for animal disease risk mapping.

- Suresh Kumar

Refresher Course on Working Plan Preparation Using Remote Sensing and GIS

A one-week refresher training course, sponsored by Ministry of Environment, Forests and Climate Change, New Delhi, for senior Indian Forest Service Officers on Working Plan Preparation using

Remote Sensing and GIS Technology was organized during 22-26 September, 2014 at IIRS. Twenty-eight officer trainees participated in the course. A suitable course syllabus- including lectures, hands-

on practical and field visit was formulated. Six lectures were delivered by IIRS and NRSC faculty and another six by guest faculty from Forest Survey of India, Forest Research Institute, Wildlife Institute of India, and Uttarakhand Forest Department. The practical on use of remote sensing and GIS were conducted by IIRS faculty. The course participants showed keen interest in remote sensing, GIS, and GPS technology applications in working plan preparation. The course was directed and coordinated by Dr. S.P.S. Kushwaha, Head and Dr. Arijit Roy, Faculty, FED, IIRS, respectively. The course Participants were taken to Mussoorie Forest Division for first-hand impression of the impacts of various working plan prescriptions in land reclamation and forest conservation in the areas affected by mining activities. Lectures on working plan preparation and wildlife perspective, generation of stand and stock maps and tables, and ISRO geo-web services for forestry applications were also delivered. A panel discussion led by Dr. Y.V.N. Krishna Murthy, Director, IIRS on the utility of the course to the participants and scope of further improvement was



also held. The participants expressed that such courses should be organized by IIRS as frequently as possible for benefit of forest officers involved in working plan preparation.

- Arijit Roy and S.P.S. Kushwaha

Short Course on Geoinformatics (ITEC Sponsored)

IIRS organized a short Course on Geoinformatics during 22nd September 2014 to 14th November 2014 under the aegis of Indian Technical and Economic Cooperation (ITEC) and Special Commonwealth Assistance of Africa Plan (SCAAP) of Ministry of External Affairs, Govt. of India. The course was attended by 18 candidates from 17 countries. There were 2 participants each from Ethiopia, Niger, Sri Lanka, Zimbabwe and 1 each from Bhutan, Cuba, Estonia, Lithuania, Mauritius, Nigeria, South Sudan, Syria, Tanzania, Uganda. In addition to the above participants, 6 participants from India and sponsored by IIRS attended the course. During the eight-week course, Module 1 of first three weeks was devoted to Principles of Remote Sensing, EO platforms and sensors, Basics of Photogrammetry, Visual image interpretation and Digital Image Analysis. The next module 2 of three weeks focused on Principles and potentials of GIS and Spatial Database organization, query and analysis Data Visualization, Global Positioning System (GPS) and current trends in Geoinformatics technology. These topics were covered in lecture classes and followed by practical and demonstrations. The course participants were taken to an educational and sightseeing trip to Delhi and Agra. The



last two weeks dealt with advanced lectures and small case study/project on the following topics: Comparison of 3D Vector and Raster based analysis for computing fastest route, LULC change analysis: a case study of Mazowe DAM reservoir in Zimbabwe, Service area Analysis for public secondary schools, Web-based route visualization in Dehradun City, Urban LULC change detection in part of Dehradun city and LULC change detection in Doon Valley. After each module and at the end of the course, formal feedback was taken

from the course participants. Majority of course participants felt that the programme objective have been achieved and they were highly satisfied by the course. The valedictory function was organized on 14

November 2014. Dr. Dharmendra Verma, Director, Forest Education, Govt. of India was the chief guest during the valedictory programme.

- Minakshi Kumar

Special Course on Satellite Observations and Products for Agrometeorological Applications

In continuation of TROPMET-2012 recommendation on capacity building of meteorologists through periodic organization of short-course on geospatial technologies related to meteorology theme, IIRS has announced tailor-made short-course on 'Satellite Observations and Products for Agrometeorological Applications' during 01-05 December, 2014 under the aegis of Indian Meteorological Society - Dehradun Chapter (IMS-DC). The major objectives of the course was to impart training on generating satellite based agrometeorological information as well as products and their use in agro-advisory and weather related hazard services. The course had over-whelming response with more than 180 applications received from different organizations e.g. IITs, NITs, IMD, NCMRWF, ICAR and other agricultural and allied universities. Among these applications, 30 candidates were short-listed and finally 21 candidates from diverse background such as agrometeorology, agronomy, meteorology, atmospheric science, geography and environmental science joined the course. The course had major focus on basics of satellite remote sensing and GIS, geostationary meteorological satellite applications, retrieval of agromet parameters, land surface processes and weather modeling, drought monitoring and regional crop forecasting, role of satellite in pest-disease warning and mapping potential fishing zones, EO data portals and climate services. There were total of 15 lectures and 8 practical demonstrations conducted during the course. Guest lecturers from SAC and NCIPM (ICAR)



were also arranged. Course participants were provided with a hard-copy of lecture notes and a CD containing presentation slides and few INSAT data processing software tools. A discussion with Director, IIRS was arranged on 4th December 2014 to encourage participants for making the fullest use of satellite observations and products available from ISRO portals (Bhuvan & MOSDAC) for crop planning, agro-advisory services and developmental activities which benefits common man and society. A formal feed-back was taken on last day of the course wherein participants have appreciated the course and found it much useful in Gramin Krishi Mausam Seva Programme. However, participants have suggested having longer duration of such course.

- N. R. Patel and Charu Singh

Special Course on Geospatial Technologies for Urban and Regional Planning

A special course on 'Geospatial Technologies for Urban and Regional Planning' was organized at IIRS, Dehradun during 15-26 December 2014. Thirty-one participants from government, private and

NGO sectors attended the training programme. Among the course participants, fifteen professionals are working in town and country planning organizations or urban local bodies

namely, Barotiwala Nalagarh Development Authority (BBNDA), Himachal Pradesh, City and Industrial Development Corporation (CIDCO), Maharashtra, Directorate of Town & Country Planning, Naya Raipur, Chattisgarh, Municipal Corporation, Raipur, Chattisgarh, M.P. Council of Science & Technology (MPCOST), Bhopal, National Capital Region (NCR) Planning Cell, Ghaziabad, State Urban Development Agency (SUDA), West Bengal, Town & Country Planning Department, Haryana, National Botanical Research Institute, Lucknow; seven professionals are working in academic institutions such as University of Burdwan, University of Delhi, Central University of Punjab, Jawaharlal Nehru University, Delhi, National Institute of Technology, Patna, and School of Planning and Architecture, Delhi; two professionals are working in private or NGO sector such as Loius Berger, Mumbai and World Resource Institute, Bengaluru and seven are research scholars. The training programme contained sixteen lectures on geospatial technologies, sixteen case studies-cum demonstrations that were based on geospatial applications and nine practical sessions. The participants were given exposure on overview of Remote Sensing, Geographical Information System and Earth Observation data, Remote Sensing Data



Processing, Global Positioning System, Urban Land Use Mapping, Building footprints & Space use Mapping, Open Source Tools, National Urban Information System, Urban utility Mapping, Urban Sprawl Mapping and Growth Modelling, 3D Modeling, Urban Green Spaces, Close Range Photogrammetry, etc. Guest lectures were also delivered on Bhuvan-NUIS by Dr. K.Venugopal Rao and cadastral mapping by Dr. S.S. Rao from National Remote Sensing Centre, Hyderabad during the training programme.

- Pramod Kumar

Orientation Course for Range Forest Officers on Application of Remote Sensing and GIS in Forestry

A one-week orientation course on Applications of Remote sensing and Geographic Information System (GIS) in Forestry was organized at IIRS for 35 field Range Forest Officers (Uttarakhand-22, Assam-10, J&K-2, Mizoram-1) during 22nd to 26th December 2014 from Forest Training Institute and Rangers' College (FTI&RC), Sundernagar, Himachal Pradesh. The officers were exposed to theory and practical aspects of topics viz., quantitative information extraction from aerial photographs, spectral properties of vegetation, visual and digital methods of forest type, density and change mapping, growing stock assessment. Exposure to IIRS distance learning programme and demonstration on Bhuvan portal was also organised. One-day field visit was conducted for ground truth collection. Field instruments such as Terrestrial Laser Scanner, Spectroradiometer, Laser Range Finder and Global Positioning System were also demonstrated. An



examination was conducted and formal feedback was taken at the end of the course. Shri Parminder Singh, Deputy Director, FTI & RC expressed overall satisfaction on course structure and organization. This was second consecutive course conducted by FED for this category of the forest officers to enhance their professional skill on use of remote sensing and GIS in forestry.

- S.P.S. Kushwaha and Hitendra Padalia

WORKSHOPS/ SYMPOSIA/ MEETS

State-level Workshop on Master Plan Formulation Using Bhuvan-NUIS

A state-level workshop for the capacity building of stakeholders for 'Master Plan Formulation using Bhuvan-NUIS' was held at IIRS, Dehradun on 5th September 2014. The National Urban Information System (NUIS) Scheme has been launched by the Ministry of Urban Development, Govt. of India in March, 2006 to develop GIS database at two scales i.e., 1:10,000 and 1:2,000. The database has been prepared so far for 152 towns in the country and hosted on Bhuvan-NUIS. Shri D.S. Garbyal, Secretary, Housing and Urban Development, Govt. of Uttarakhand graced the occasion as Chief Guest and addressed the participants. He stated the fact that Uttarakhand state has seen the level of urbanization rising to 30% which matches with the national level urbanization trend of 31.18% in 2011. However, the challenge lies in availability of land for urbanization in a Himalayan state like Uttarakhand. Dr. Y.V.N. Krishna Murthy, Director, IIRS in his key note address emphasized the role of geospatial technology for good governance and societal benefits. Shri S. Surendra, Head, Urban and Regional Information System, Town and Country Planning Organization (TCPO), New Delhi and Shri S.K Pant, Chief Town Planner, Govt. of Uttarakhand were also present during the workshop. Sixty participants representing State Town Planning Department, Urban and Housing Development Department and Urban Local Bodies, Uttarakhand and Delhi states attended the workshop. During the technical session on 'NUIS-Bhuvan: Master Plan Formulation', the participants



were given demonstration on 'Bhuvan Geospatial Data and Services'. Later, the demonstration was also given on the urban-specific case studies available on Bhuvan namely, municipal-GIS, tourism and urban sprawl for various cities in India captured through temporal remote sensing datasets. Demonstrations were also given on the strength of remote sensing and GIS in plan formulation, steps and authorization plans during layers preparation and master plan formulation exercise, open source GIS software Q-GIS plugin and interface with Bhuvan Web Portal. Later, a detailed hands-on exercise on Q-GIS functionalities and NUIS-Bhuvan data creation/approval exercise was carried out by the participants. The participants also had interactive discussions on the tools and technology demonstrated and its utility for master plan preparation.

- Pramod Kumar

CAMPUS NEWS

Harnessing Solar Energy for In-house Electricity Requirements: Initiatives of IIRS/ISRO

Solar energy, a clean renewable resource with zero emission has got tremendous potential which can be harnessed using variety of devices. With recent developments, solar energy systems are easily made available for industrial and domestic use with the added advantage of minimum maintenance. The National Solar Mission is a major initiative of the Government of India to promote ecologically sustainable growth while addressing India's energy security challenge. The immediate aim is to setup an environment for solar technology penetration in the country both at a centralized and decentralized level. Initiatives have been taken for harnessing solar energy by ISRO. ISRO is

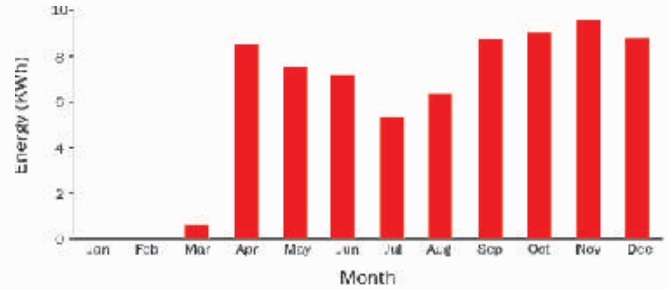
planning to set up 3MWp Grid Interactive Solar Power plant in coming 2 years.

The required power supply at 11KV for the IIRS campus is being drawn from the nearby UPCL substation. The power received is stepped down to 415V by 2nos. of outdoor type, oil filled 500kVA power transformers located at sub-station building. The maximum demand at present is 450KW with a contracted maximum demand of 920 KW. Preliminary survey was conducted by CMD/IIRS, and subsequently, it was found feasible to establish a roof top solar power plant due to lack of sufficient land in the IIRS campus. Main building in



IIRS campus having 920 sq.m of flat roof is best suited to establish 80KWp solar power plant since this roof top is shadow free as well as suitable for optimum sun angle.

There are broadly 3 types of solar photo voltaic power plants available viz., i) Stand-alone with battery backup, ii) Grid interactive without battery backup, and Hybrid system i.e., combination of above two models. Out of these 3 options, 80KWp Grid interactive solar power plant was established in IIRS Campus for the following reasons: i) IIRS campus is already having HT supply connection and also 100% DG power backup, hence, battery bank backup is not viable, ii) Initial as well as replacement cost of battery bank is very high which is an avoidable expenditure, and iii) 80KWp solar power plant would supplement the institute's total energy requirements by 10% which will result in



low electricity bills. The 60KWp Grid Interactive Solar Power plant was commissioned in the month of March 2014 and 20KWp was added in the month of September 2014. This 80KWp plant was integrated with Main LT Panel located in the substation so that the total energy generated during day time can be utilised. The total completion cost of this project is 70Lakhs and till date the generation was around 81,000 units. The payback period is 5 years considering it as backup source. In addition to this, it saved 50000 kg of Carbon dioxide till-date. Considering the advantages of solar power, 40KWp will be installed during 2015.

- P.V. Rama Raju and Ganesh Kumar Kota

Training programme on Fire Safety in Office Buildings

A one-day training program on Fire Safety in office buildings was conducted at IIRS campus on 9th October 2014 to create the awareness on Fire safety among employees and casual support staff. The first session has focused on understanding the concepts of Fire, Firefighting, Smoke detection, Evacuation and first aid to be done in case of fire. This session gave an overview of precautions to be taken in the office buildings to avoid the fire hazards. In the postlunch session, a real fire drill and evacuation from the building in case of fire was organized.



- IIRS Safety Committee

Remote Sensing Day

IIRS in collaboration with Dehradun Chapters of Indian Society of Remote Sensing and Indian Meteorological Society celebrated Remote Sensing Day on 12th August 2014 at IIRS and different schools/universities in Dehradun viz., Doon University, Graphic Era University, Govt. Girls Inter College, University of Petroleum & Energy Studies, Rajiv Gandhi Navodaya Vidyalaya and DRDO School. Lectures were delivered by IIRS faculty members at different Schools/ Universities in Dehradun on Remote Sensing Day on the topic "Space Technology and its Usefulness to Common man" including video display on Mars/Moon Mission films. In addition, 21 students from

Grace Academy, Dehradun visited IIRS. In the afternoon, Dr. C.B.S. Dutt, Deputy Director, ECSA, NRSC delivered a popular lecture on 'Space Technology and a Few Challenges'.



Remote Sensing Day Celebration at IIRS campus

- Hitendra Padalia

World Space Week

The World Space Week (WSW) celebration is held every year during 4-10 October, in more than 65 countries across the world, to commemorate two milestones in space exploration: 1) 4th October marking the launch of first manmade satellite Sputnik-1 in 1957 and 2) 10th October marking the day on which the first International Space Treaty for peaceful uses of Outer Space came into force in 1967. The celebrations are intended to foster interest in Space Science, Technology and Exploration for the benefit of mankind. The theme of WSW-2014 was 'Satellite Navigation'.

A poster exhibition on recent development in Space Science (IRNSS, GAGAN, Mars Orbiters Mission etc.) was organized at IIRS followed by a popular lecture on 'Space Navigation' by Mr. P. Sankaravelayutham, Dy. General Manager, MMD/MME, Vikram Sarabhai Space Centre (VSSC), ISRO, Thiruvananthapuram. School children from 24 schools participated in different events. Painting competition on the theme 'Space



Exploration' and the quiz competition was organized for the school children. A documentary movie on Indian Mars Mission was also screened during the programme. An essay competition on topic "Space observation and its applications" was organized for the students of Post-graduate courses from IIRS.

- Hitendra Padalia

Observance of Vigilance Awareness Week

IIRS observed the Vigilance Awareness Week-2014 during 27th October to 1st November 2014 with active participation of all employees and trainees of IIRS. During this week, the banners and posters were displayed at prime locations in IIRS campus in Hindi and English languages. Pledge was taken at IIRS on 27th October 2014 by all employees and trainees of IIRS. A debate competition was also organized on topic 'Combating Corruption - Technology as an enabler'. The debate has enlightened the audience about the role of CCTV, Aadhaar Card and Internet Banking etc. in bringing transparency and removing corruption. Prizes were given to first three winners. Also, a guest lecture was organized on 31st October 2014 at IIRS by Dr. R.R.



Singh, Head of the Corporate Vigilance, ONGC, Dehradun on Vigilance & Awareness.

- A.K. Khanduri

Communal Harmony Fortnight

Communal Harmony Fortnight was celebrated during 27th August to 05th September 2014 at IIRS campus to promote National Integration and Communal Harmony among people of all religions, languages and regions with the active participation of all staff of IIRS, CSSTEAP and students of various courses. Various programs such as pledge, Sadbhavana and communal harmony quote displayed on screen, movie show, slogan writing, and



poem reading on sadbhavana and communal harmony were conducted. A guest lecture on 'Scientific Vision of Indian Youth towards National Integration' was delivered by Dr. (Mrs.) Suchismita

S. Pande, Joint Commissioner, Uttarakhand Govt. on 05th September 2014.

- Suresh Kumar

Rajasthani Folk Music and Dance by Manganair Group

Recreation club IIRS in association with SPIC MACAY Dehradun Chapter organised "Rajasthani Folk Music and Dance" by Manganair Group on 26th August 2014. The troop was led by the legendary Bade Ghazi Khan, the legendary singer of the famous "Nimbuda Nimbuda" song. Jasso Khan, the famous Kartaal Player performed with the group as well. The prodigious talent, versatility and dedication to the art form was very much appreciated by IIRS family. The evening was attended by employees, students of IIRS, CSSTEAP and their family members.



- Vaibhav Garg

Odissi Dance Performace by Padma Shri Madhavi Mudgal

Padma Shri Madhavi Mudgal performed in IIRS campus on 15th December 2014. Madhvi Mudgal is an Indian Classical dancer, who has made her mark world-wide with her Odissi dance style. She is widely acclaimed internationally for her deep insight into the art of choreography and her commitment to train and encourage new dancers to finer nuances of Odissi. She has been awarded the prestigious, President of India's award of Padma Shri in 1990 for her contribution to Indian classical dance. She has been conferred with numerous other awards for her contribution, some of them being Orissa State Sangeet Natak Akademi Award in 1996, Grande Medaille de la Ville by Govt. of France in 1997, Central Sangeet Natak Akademi Award in 2000, Delhi State Parishad Samman in 2002 and the title of Nritya Choodamani in 2004. The programme was organized under the aegis of SPIC MACAY, the society for the



promotion of Indian classical Music and Culture amongst youths, which is a non-profit, voluntary organization dedicated to promoting an awareness of Indian culture in schools and colleges throughout India.

- Poonam S. Tiwari

भारतीय सुदूर संवेदन संस्थान प्रयोक्ता संवाद सभा-2015

भारतीय सुदूर संवेदन संस्थान, प्राकृतिक संसाधन प्रबंधन तथा अंतरिक्ष उपयोग जैसे विषयों पर शोध तथा क्षमता निर्माण एवं सहयोग जैसी विभिन्न राष्ट्रीय मिशन परियोजनाओं में काफी अहम योगदान देता रहा है। गत वर्षों की भांति, भारतीय सुदूर संवेदन संस्थान में इस वर्ष भी दिनांक 26 से 27 फरवरी 2015 तक प्रयोक्ता संवाद सभा का आयोजन किया गया। यह सभा इस संस्थान से सम्बद्ध सभी प्रयोक्ताओं को भारतीय सुदूर संवेदन संस्थान समाज/समुदाय से विभिन्न विषयों पर परस्परिक संवाद का अनुपम अवसर

उपलब्ध कराती है। उक्त सभा ऐसा महत्वपूर्ण मंच है जहां प्रयोक्ताओं को इस संस्थान के समस्त प्रशिक्षण कार्यक्रमों, उनकी गुणवत्ता तथा अर्हताओं/अपेक्षाओं से सम्बद्ध समग्र जानकारी प्राप्त होती है, जो भावी प्रशिक्षण कार्यक्रमों की रूपरेखा तैयार करने तथा प्रयोक्ता समाज से सम्बद्ध नए क्षेत्रों में शोध करने में काफी महत्वपूर्ण/मददगार सिद्ध होती है। भारतीय सुदूर संवेदन संस्थान ने पहली तथा द्वितीय प्रयोक्ता संवाद सभा का आयोजन क्रमशः वर्ष 2013 व 2014 में किया गया था, जिसमें केंद्र/राज्य सरकारों के विभागों,

स्वायत्त संगठनों, गैर सरकारी संगठनों तथा उद्योगों के प्रतिनिधियों एवं संस्थान के भूतपूर्व छात्रों ने भाग लेकर इस आयोजन को सफल बनाया। दूरस्थ अधिगम कार्यक्रम से जुड़े केन्द्रीय/राज्य/निजी विश्वविद्यालयों के शैक्षिक समुदाय तथा एडुसैट कार्यक्रम के समन्वयक उक्त संवाद सभा में भाग लेकर अपने अनुभव एवं अपेक्षाओं से सबको अवगत कराते हैं। प्रयोक्ता संवाद सभा में एक हिंदी सत्र भी रखा जाता है, जिसमें पहले से निर्धारित विषयों पर संस्थान

के वैज्ञानिक तथा आपदा प्रशमन एवं प्रबंधन केंद्र, देहरादून, राष्ट्रीय जल विज्ञान संस्थान, रुड़की, वाडिया हिमालय भू-विज्ञान संस्थान, देहरादून, राष्ट्रीय आपदा मोचन बल, वानिकी एवं पारिस्थितिकी समूह, राष्ट्रीय सुदूर संवेदन केंद्र, हैदराबाद आदि विभागों/ संस्थाओं के लब्ध-प्रतिष्ठ वैज्ञानिक अपने लेखों का प्रस्तुतीकरण हिंदी में करते हैं।

– राजीव कुमार त्रिपाठी

हिंदी दिवस एवं हिंदी पखवाड़ा समारोह

भारत सरकार की राजभाषा नीति के अंतर्गत सरकारी कामकाज में राजभाषा हिंदी के प्रति जागरूकता तथा उसके उत्तरोत्तर प्रयोग में गति लाने के उद्देश्य से केंद्र सरकार के प्रत्येक कार्यालय में प्रति वर्ष हिंदी दिवस/पखवाड़ा का आयोजन किया जाता है। तदनुसार, भारतीय सुदूर संवेदन संस्थान, देहरादून में इस वर्ष भी हिंदी पखवाड़ा समारोह का आयोजन किया गया। यह समारोह निदेशक, भारतीय सुदूर संवेदन संस्थान के अध्यक्षता में दिनांक 15-30 सितंबर 2014 तक मनाया गया। समारोह का उद्घाटन दिनांक 15 सितंबर 2014 को डा० वाई.वी.एन. कृष्ण मूर्ति, निदेशक, भारतीय सुदूर संवेदन संस्थान एवं अध्यक्ष, राजभाषा कार्यान्वयन समिति के कर कमलों द्वारा दीप प्रज्वलन के साथ हुआ। आमंत्रित विशिष्ट अतिथि डा० राम विनय सिंह, आचार्य, डी०ए०वी० स्नातकोत्तर महाविद्यालय, देहरादून ने हिंदी भाषा के इतिहास, प्रकृति, साहित्यिक स्वरूप, अन्य भाषाओं के साथ इसके सह-अस्तित्व तथा एक राजभाषा के रूप में इसकी उपयोगिता के साथ-साथ इसके समस्त पहलुओं पर प्रकाश डाला। उद्घाटन समारोह के अंत में निदेशक महोदय ने अपने अभिभाषण में कार्मिकों को राजभाषा हिंदी के प्रति उनके संवैधानिक दायित्वों की पूर्ति तथा हिन्दी के प्रगामी प्रयोग के लिए निर्धारित लक्ष्यों को प्राप्त करने का आह्वान किया। डा० शिव प्रसाद अग्रवाल, सह-अध्यक्ष, राजभाषा कार्यान्वयन समिति ने सभागार में उपस्थित लोगों को कार्यक्रम व प्रतियोगिताओं की विस्तृत जानकारी देते हुए कार्यक्रम का संचालन किया।

कार्मिकों, कनिष्ठ अध्येताओं, विद्यार्थियों आदि में हिंदी के प्रति रुझान एवं आग्रही भाव को बढ़ाने के उद्देश्य से इस समारोह के अंतर्गत आयोजित कार्यक्रमों एवं प्रतियोगिताओं का विवरण निम्नवत है।

(क) आशुभाषण प्रतियोगिता: इस प्रतियोगिता का आयोजन दिनांक 16 सितंबर 2014 को 15:30 बजे किया गया। इस प्रतियोगिता के अंतर्गत सहभागियों को कार्यक्रम स्थल पर ही एक विषय दिया गया, जिसे तैयार करने हेतु तीन मिनट तथा उक्त विषय पर बोलने हेतु पाँच मिनट का समय दिया गया। इस प्रतियोगिता के माध्यम से कार्मिकों के बीच से काफी संख्या में कुशल वक्ता सामने आए जिनके वाक कौशल की लोगों ने भूरि-भूरि प्रशंसा की।

(ख) श्रुतलेखन प्रतियोगिता: हिंदी को सुग्राह्य बनाने के उद्देश्य से आयोजित इस प्रतियोगिता का आयोजन दिनांक 17 सितंबर 2014 को 15:30 बजे किया गया। इस प्रतियोगिता के अंतर्गत प्रतियोगियों से स्वामी विवेकानंद के भाषण के अंश पर हिंदी में श्रुतलेखन करवाया गया।

इसके अतिरिक्त श्रुतलेखन के अंतर्गत प्रतियोगियों को हिंदी के कुछ शब्द भी लिखने को कहा गया।

(ग) यूनिकोड पर हिंदी टंकण प्रतियोगिता: कार्मिकों को कंप्यूटर पर हिंदी में काम करने के लिए प्रोत्साहित करने एवं इस संबंध में उनकी दक्षता का आकलन करने के उद्देश्य से इस प्रतियोगिता का आयोजन दिनांक 19 सितंबर 2014 को 15:30 बजे किया गया। कार्यक्रम/प्रतियोगिता में कार्मिकों की कंप्यूटर पर हिंदी में कार्य करने की क्षमता विशेषकर अन्य भाषा-भाषी कार्मिकों के क्षमता सराहनीय रही।

(घ) हिंदी अनुवाद प्रतियोगिता: सरकारी कामकाज में राजभाषा हिंदी के सरल एवं सहज स्वरूप को अपनाने तथा आवश्यकतानुसार अंग्रेजी में प्राप्त पत्रों का हिंदी में जवाब देने हेतु प्रोत्साहित करने के उद्देश्य से इस प्रतियोगिता का आयोजन दिनांक 22 सितंबर 2014 को 15:30 बजे किया गया। इस प्रतियोगिता के अंतर्गत प्रतियोगियों को दैनिक कामकाज में प्रयोग किए जाने वाले कुछ शब्दों एवं वाक्यांशों का हिंदी में अनुवाद करने के लिए दिया गया।

(ङ) हिंदी टिप्पण एवं आलेखन प्रतियोगिता: दैनिक कामकाज में हिंदी के प्रयोग को बढ़ावा देने एवं भाषा को और सुग्राह्य बनाने के उद्देश्य से दिनांक 24 सितंबर 2014 को 15:30 बजे इस प्रतियोगिता का आयोजन किया गया। इस प्रतियोगिता में कार्मिकों को एक नोट/टिप्पण तथा एक पत्र का मसौदा तैयार करने के लिए दिया गया।

(च) चित्र देखकर भावाभिव्यक्ति/कहानी लेखन: इस प्रतियोगिता का आयोजन दिनांक 26 सितंबर 2014 को 15:30 बजे किया गया जिसके अंतर्गत प्रतियोगियों को प्रॉजेक्टर पर एक चित्र दिखाकर उस पर कहानी लिखने को कहा गया। प्रतियोगिता के माध्यम से कार्मिकों की रचनाशीलता एवं लेखन काला/प्रतिभा सामने आई जो काफी प्रशंसनीय रही।

इस बार नकद पुरस्कार के साथ-साथ विजेताओं को पुस्तकें (विश्व के मशहूर वैज्ञानिक, प्रेमचंद की श्रेष्ठ कहानियाँ तथा पंचतंत्र की कहानियाँ) भी प्रदान की गईं। इस वर्ष संस्थान के कार्मिकों के बच्चों के लिए शैक्षणिक वर्ष 2013-14 में दसवीं कक्षा में हिंदी विषय में अत्यधिक अंक प्राप्त करने वाले छात्रों हेतु नकद पुरस्कार की भी व्यवस्था की गई थी।

– राजीव कुमार त्रिपाठी

भारतीय सुदूर संवेदन संस्थान का स्वच्छता अभियान

प्रधानमंत्री के स्वच्छ भारत अभियान के अंतर्गत भारतीय सुदूर संवेदन संस्थान के 200 वैज्ञानिकों, इंजीनियरों, कार्मिकों तथा देशी-विदेशी विद्यार्थियों द्वारा 02 अक्टूबर 2014 को स्वच्छता अभियान चलाया गया। इस अभियान के अंतर्गत सहभागियों ने सुबह 09:45 बजे स्वच्छता के प्रति सजग, सक्रिय एवं समर्पित रहने की शपथ लेने के बाद संस्थान परिसर से लगे हुए क्षेत्र में सड़कों, नालियों तथा कूड़ा-कचरा के ढेरों की सफाई की। उक्त अभियान के दौरान एक ट्रैक्टर-ट्राली कचरा इकट्ठा करके नगर निगम के कचरा संग्रहण स्थान को भेजा गया। स्वच्छता व स्वास्थ्य-रक्षा अभियान के अतिरिक्त स्थानीय निवासियों को परामर्श दिया गया जिसके अंतर्गत स्वच्छता, स्वास्थ्य-रक्षा तथा स्वच्छ व स्वस्थ जीवन शैली के लाभ बताते हुए उन्हें इस दिशा में जागरूक बनाने का प्रयास किया गया, जिसके परिणाम-स्वरूप स्थानीय निवासियों ने यह वचन दिया कि अब वे कूड़ा खुले में फेंकने के बजाए नगर निगम के सफाई कर्मियों को देंगे तथा अपना आस-पड़ोस



साफ रखेंगे। निदेशक, भारतीय सुदूर संवेदन संस्थान ने स्थानीय निवासियों को आश्वासन दिया कि संस्थान परिसर से लगे हुए क्षेत्रों को स्वच्छ एवं हरा-भरा रखने हेतु संस्थान द्वारा यथासंभव सहायता की जाएगी।

- राजीव कुमार त्रिपाठी

स्वतंत्रता दिवस समारोह

15 अगस्त 2014 को स्वतंत्रता दिवस के अवसर पर निदेशक डॉ. वाई.वी.एन. कृष्ण मूर्ति ने ध्वजारोहण किया। सभा को संबोधित करते हुए उन्होंने सभी को स्वतंत्रता दिवस की बधाईयाँ दी और आई.आई.आर.एस. व इसरो की गतिविधियों से अवगत कराया। ध्वजारोहण तथा निदेशक महोदय के भाषण के पश्चात समस्त उपस्थित कर्मचारियों, उनके परिजनों तथा छात्र-छात्राओं को मिष्ठान वितरण किया गया। इस समारोह को आगे बढ़ाते हुए मनोरंजन क्लब द्वारा विभिन्न आयु वर्ग के लोगों के लिए खेल-कूद प्रतियोगिताएं आयोजित की गयीं और सभी विजेताओं को निदेशक महोदय

द्वारा पुरस्कृत किया गया। समारोह के दौरान समस्त आई.आई.आर.एस. परिवार को एक फिल्म दिखाई गई। आई.आई.आर.एस. कर्मचारी, उनके परिवार के सदस्यों और सभी छात्र-छात्राओं ने पूर्ण उत्साह के साथ समारोह में भाग लिया।

- एस.के. श्रीवास्तव



DISTINGUISHED VISITORS



Prof. B.L. Deekshatulu, Chairman of College of Engineering, JNTU, Hyderabad, former Director, NRSA and former Director, CSSTEAP, Dehradun visited IIRS on 30th August 2014



Dr. George Joseph, ISRO Honorary Professor, SAC, Ahmedabad, former Director, SAC, Ahmedabad and former Director, CSSTEAP, Dehradun visited IIRS during 07-08 October 2014



Dr. K. Kasturirangan, Chairman, Karnataka Jnana Aayoga, former Chairman, ISRO, former Member of Parliament (Rajya Sabha), and former Member (Science), Planning Commission, Govt. of India visited IIRS on 27th November 2014

The dignitaries were apprised about ongoing and completed research projects and other activities of IIRS.

SUPERANNUATION



Mrs. Aleyamma David
Sr. Project Assistant
31.07.2014



Sri Prabhunath
Sr. Project Attendant
30.09.2014



Sri Surat Singh
Admn. Officer
31.12.2014



Mrs. Shalini Bora
Project Personal Secretary
31.12.2014

CONTACT wishes them and their family members a happy, healthy and peaceful life ahead.

Dear Readers

This issue of CONTACT newsletter contains articles under the broad theme 'Recent Advances in Geospatial Technologies' based on experiments conducted by Scientists, Students and Researchers of IIRS. Kindly write to us at newsletter@iirs.gov.in.

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TRAINING CALENDAR 2015

Last updated on 28.10.2014

Sl. No	Course Code	Course Name	Entrance Requirements	No. of Seats	Starting Date	Passing Out Date	Course Fee for Individual Candidate			Apply by Date
							Govt. Spons. ₹	Open ₹	Foreign US \$	
POST-GRADUATE DIPLOMA COURSES IN REMOTE SENSING AND GIS WITH SPECIALIZATION IN										
1.	D-AS	Sustainable Agriculture	M.Sc. in Agri./Vet. Sci./Env. Sci./Agril. Engg./Master deg in Geog. (with Sci. at H.Sc. level)/B.Sc. Agri. (4 years)/B.E. / B.Tech. in Agril. Engg. /Agric. Inform./Agril. Officers with 2 years exp.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
2.	D-FE	Forest Resources & Ecosystem Analysis	M.Sc. Forestry / Ecology / Botany / Wildlife Sci. / Biosci. / Zool./Env. Sci. / Life Sci. / Master in Geog. (with Sci. at H.Sc. level)/B.Sc. Forestry (4 years) / Forest Officers with 2 years exp.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
3.	D-GG	Geosciences	M.Sc./M.Sc.(Tech.) / M.Tech. in Geol. / Appl. Geol. / Geophy. / Earth Sci. / Geoexplor. / Petrol. Engg. or equivalent / Geo-Engg. / Mining Engg. / Env. Sci. / Master in Geog. ((with Sci. at H.Sc.level) / B.Tech. / B.E. in Civil Engg., Geosci., Petrol. Engg., Mining Engg., Mineral Process.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
4.	D-MS	Marine & Atmospheric Sciences	M.Sc. in Marine Sci. /Earth Sci. / Physics / Oceanog. / Atm. Sci. / Env. Sci. / Master in Geog.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
5.	D-UR	Urban & Regional Studies	Master in Plng. / Arch. / Civil / Agri. / Comp. Engg./IT/ Geo-inform./ Env.Sc./Geog./B. Plan./B.Arch/ B.E./B.Tech. in Civil/Agri./Comp. Engg. /IT/ Town Planners with 2 years exp.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
6.	D-WR	Water Resources	B.E. / B.Tech. / M.E. / M.Tech. (Civil Engg.) / Agril. Engg. / M.Sc. in Geol. / Env. Sci./Geog.. Candidates should have Math as one subject up to 10+2 level.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
7.	D-PR	Photogrammetry & Remote Sensing	B.E. / B.Tech. in Civil / Electronics / Electrical/ECE/Comp. Sci. / Comp. Engg. / IT/ Geomatics / Geoinform./Remote Sensing or equivalent or M.Sc. / M.Tech. in Physics / Appl. Physics / Math. / Stat. / Appl. Math. /Geog. / Geoinform. / Geomatics / Remote Sensing ore quivalent with B.Sc. in Sci. Candidates should have Math as one subject up to 10+2 level.	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
8.	D-NHDRM	Natural Hazards & Disaster Risk Management	M.Sc. in Math. / Chem. / Bot. / Zool./ Geol. / Earth Sci. / Env. Sci. / Marine Sci. / Atm. Sci. / Agri. / Master in Geog. (with B.Sc. at Grad. level) OR B. Arch / B. Plann. / M. Plann. / Master in Geog. (with Science at H.Sc.level) / OR B.E. / B.Tech. in Civil Engg. / Agril. Engg. / Env. Engg./ Geosci./Geoexplor. / Geo-Engg. / Earthquake Engg. / IT / CS / ECE OR B.Sc. (4-year Forestry / Agri., course) OR Master in Disaster Mgmt. /Forest / Agri. Officers (with B.Sc. deg.) / MCA (with B.Sc. in Sci.).	6	17.08.2015	17.06.2016	Nil	60,000	6,000	29.05.2015
M.TECH. COURSE IN RS & GIS										
9.	M-RG	M.Tech. in RS&GIS with specialization in: (i) Sustainable Agriculture, (ii) Forest Resources & Ecosystem Analysis, (iii) Geosciences, (iv) Marine & Atmospheric Sciences, (v) Urban & Regional Studies, (vi) Water Resources, (vii) Satellite Image Analysis & Photogrammetry & (viii) Geoinformatics	For specializations from Sl. No. 1 to 7 corresponding qualifications as mentioned for Post-Graduate Diploma courses under Sl. Nos. 1 to 7 are applicable. M.Sc. (Geog.) is eligible. Entrance Requirement for Geoinformatics Specialization: M.Sc./M.Tech. in Physics/ Appl. Physics/ Electron./ Math./ Appl. Math./ Stat./ IT/ Comp. Sci./ Geo-Engg./ Urban and Reg. Plann. OR M.Sc. in Remote Sensing/ Geoinform. or its equivalent. OR Master in Geog. (having B.Sc. in Science subjects) OR B.E./ B.Tech./ B.Sc.(Engg.)/ Graduate (with four year deg. course) in Civil Engg./ Electron. & Comm./ Comp. Sci./ Comp. Engg./IT/Agril. Engg./ Remote Sensing/ Geoinform./ Geosci. Engg./Petrol. Engg./ Mining Engg./ Agri. Inform./ Forest Inform. or its equivalent OR B.Arch./ B.Plann./ M.Arch./ M.Plann., OR MCA (having B.Sc. in Science subjects), M.Sc. Geog. OR equivalent.	30	17.08.2015	14.08.2017	Nil	1,44,000+ 20,000 (Andhra Univ. Regn. Fee)	20,000 (Andhra Univ. Regn. Fee)	29.05.2015
<p>Note:</p> <ul style="list-style-type: none"> Candidates should have secured a minimum of 55% marks in the qualifying examination. M.Tech. is accredited by Andhra University, Visakhapatnam. From 2nd module onwards the students will have to select one of these disciplines: (i) Sustainable Agriculture, (ii) Forest Resources & Ecosystem Analysis, (iii) Geosciences & Geohazards, (iv) Marine and Atmospheric Sciences, (v) Urban & Regional Planning, (vi) Water Resources (vii) Satellite Image Analysis & Photogrammetry, and (viii) Geoinformatics. The admission for M.Tech./M.Sc. courses is based on entrance test (held annually at Dehradun, Nagpur, Banaglore, Jodhpur, and Kolkata), interview and academic record. Govt.-sponsored candidates are exempted from written test. They have to appear only for interview. Admission to P.G. Diploma course is based on merit considering the academic record and subject relevance. Govt.-sponsored candidates are given preference. Selection to long-term courses i.e. P.G. Diploma, M.Sc, M.Tech. will involve counseling from 2015 onwards. Discipline, once opted, can't be changed during the course. The age limit for admission to above courses (Sl. No. 1-8) is 50 years. 										
IRS-ITC JOINT EDUCATION PROGRAMME										
10.	D-GI	Post-Graduate Diploma in Geoinformation Science & Earth Observation with specialization in Geoinformatics	M.Sc./M.Tech. in Physics/ Appl. Physics/Electron./Math./Appl. Math./Stat./IT/Comp. Sci./Geology/Geophysics/Geo-Engg./ Agriculture/Forestry/Urban and Reg. Plann. or any Natural/ Env. Sci., OR Master in Geog. (having B.Sc.in Science subjects) OR B.E./ B.Tech./ B.Sc.(Engg.)/ Graduate (with four year deg., course) in Civil Engg./Electron.& Comm./Comp. Sci./Comp. Engg./IT/Agril. Engg./Geosci. Engg./Petrol. Engg./ Mining Engg./ Agri. Inform./ Agriculture/ Forest Inform./ Forestry or equivalent, OR B.Arch. / B.Plann./M.Arch./ M.Plann., OR MCA (having B.Sc. in Science subjects), OR equivalent.	10	21.09.2015	15.07.2016	EURO 450	65,000 + EURO 450	EURO 3000 + EURO 450	29.05.2015

Sl. No	Course Code	Course Name	Entrance Requirements	No. of Seats	Starting Date	Passing Out Date	Course Fee for Individual Candidate			Apply by Date
							Govt. Spons. ₹	Open ₹	Foreign US \$	
11.	M-GI	M.Sc. in Geoinformation Science & Earth Observation with specialization in Geoinformatics	Entrance requirements as mentioned under Sl. No. 10.	10	21.09.2015	17.03.2017	Nil Fee to IIRS	1,20,000 payable to IIRS	EURO 5000 payable to IIRS	29.05.2015
							ITC Fee Euro 4050 (tuition fee) PLUS Euro 4230 approx. (living allowance & other cost for 4.5 month stay in The Netherlands) payable to ITC.			
							Others To and fro air travel to visit ITC (to be borne by student).			
Note: (i) For M.Sc. course, candidate should have secured a minimum of 60% marks in the qualifying examination. (ii) The M.Sc. degree is awarded by the University of Twente, The Netherlands under Joint IIRS-ITC Education Program. (iii) The Post-Graduate Diploma in Geoinformatics (D-GI) is awarded jointly by IIRS and ITC/University of Twente. (iv) The admission for M.Sc. Course is based on entrance test (held annually at Dehradun, Nagpur, Bengaluru, Jodhpur, and Kolkata), interview and academic record; the government-sponsored candidates are exempted from appearing in the entrance test. The admission for PG Diploma Course is based on merit considering the academic record and experience. The government-sponsored candidates are given preference.										
REMOTE SENSING APPLICATIONS: THEME-SPECIFIC ORIENTATION COURSE										
12.	O-DM	Remote Sensing -An Overview for Decision Makers	Decision makers in organizations (with 10 years experience in service).	10	15.06.2015	18.06.2015	10,000 (includes boarding+ lodging charges)	10,000 (includes boarding+ lodging charges)	--	15.05.2015
INTERNATIONAL PROGRAMMES (Only for Foreign Nationals from ITEC/SCAAP Partner Countries)										
13.	S-RS	Short Course on Remote Sensing with special emphasis on Digital Image Processing (ITEC-Sponsored)	P.G. Deg. / Graduate in Physics, Chem., Math., Bot., Forestry, Zool, Wildlife Sci., Env. Sci., Life Sci., Agri. Sci. subjects, Geog. (with B.Sc. at Grad. level) or any other Sci. / any discipline of Engg. with sufficient knowledge of Math. / Stat. at high school level / middle level resource managers and professionals from Govt., NGOs, Universities with 2-year work experience. Age limit: up to 45 years.	20	05.01.2015	27.02.2015	20,000	20,000 (12,000-Fee+8,000 - Regn.)	\$ 2000	27.11.2014
14.	S-GI	Short Course on Geoinformatics (ITEC-Sponsored)	P.G. Deg. / Graduate in Physics, Chem., Math., Bot., Forestry, Zoology, Wildlife Sci., Env. Sci., Agri. Sci. subjects, Geog. (with B.Sc. at Grad. level) or in any other Sci. / Engg. discipline with sufficient knowledge of Math. / Stat. at high school level / middle level resource managers and professionals from Govt., NGOs, Universities with 2-year work exp. Age limit: up to 45 years.	20	21.09.2015	13.11.2015	20,000	20,000 (12,000-Fee+8,000 - Regn.)	\$ 2000	21.08.2015
CERTIFICATE COURSE										
15.	C-RS	Short Course on Remote Sensing and Image Interpretation	Engg. Graduate. / P.G. in Sci. and Geog. (with B.Sc. in Sci.)	5	05.01.2015	27.02.2015	Nil	20,000 (12,000-Fee+8,000 - Regn.)	-	27.11.2014
NNRMS-ISRO SPONSORED CERTIFICATE COURSES: FOR UNIVERSITY FACULTY ONLY (With Two Years Teaching Experience at P.G. Level)										
16.	N-GI	GIS Technology and Advances	P.G. Deg. in Sci. / Engg.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
17.	N-WR	RS & GIS in Water Resources	P.G. Deg. in Civil / Agril. Engg.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
18.	N-FE	RS & GIS in Forestry/ Ecology / Wildlife / Env. Sciences	P.G. Deg. in Bot. / Ecol. / For. / Env. Sci. / Zool. / Wildlife Sci. / Life Sci. / Biosci.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
19.	N-UR	RS & GIS in Urban & Regional Studies	P.G. Deg. in Plann. / Civil Engg. / Arch. / Geog.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
20.	N-CM	RS & GIS in Cartography and Mapping	P.G. Deg. in Sci./Geog.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
21.	N-GG	RS & GIS in Geosciences	P.G. Deg. in Geol./Appl. Geol./ Geophy./ Geog.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
22.	N-GA	RS & GIS in Soils & Land Use Planning	P.G. Deg. in Agri./Geog./ Env. Sci./Agric. Engg./Vet. Sci.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015
23.	N-CO	RS & GIS in Coastal & Ocean Sciences	P.G. Deg. in Marine Sci./Geol./Oceanog./Appl. Geol./Env. Sci.	8	05.05.2015	26.06.2015	Nil	12000	1200	31.03.2015

Important information:

- If the date of course commencement falls on a holiday, course will start from next working day.
- Sponsoring organizations are required to meet all expenses viz., traveling allowance, daily allowance, contingent expenses, medical expenses etc., for their candidates except course fee. However, courses at Sl. Nos. 13, 14 & 15 are paid courses for all including Govt. organizations. In case of NNRMS-sponsored course, the candidates admitted are paid TA/DA by IIRS as per ISRO/DOS rules applicable for this course.
- The Govt. organizations (Central/State Government bodies/Autonomous Institutions and State and Central Govt.-funded Universities) can sponsor only permanent employee. Private universities & self-sponsored candidates have to pay full course fee in advance.
- Security deposit: Self-financed candidates have to deposit security deposit one month prior to the commencement of the course @ Rs. 4000/- in respect of Certificate Courses @ Rs. 6000/- in respect of P.G. Diploma Courses, and @ Rs. 10000/- in respect of M.Sc./M.Tech. courses failing which seats would be offered to the wait-listed candidates.
- Boarding and lodging charge at IIRS Hostel are Rs. 2500 p.m. (approx.). Local candidates will be considered for hostel accommodation only if available.
- Number of seats are subject to change in all courses.

For further details, contact: Director, IIRS/Group Director, Program Planning & Evaluation Group, Indian Institute of Remote Sensing, ISRO, 4 Kalidas Road, Dehradun-248001, U.K., India. Tel: +91-135-2744583, 2524105, 2524106, 2524107, Fax: +91-135-2741987, 2748041; E-mail: admissions@iirs.gov.in; please visit our website- www.iirs.gov.in for details about IIRS and application form download.