Indian Institute of Remote Sensing   *iirs*

CONTACT

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

CONTENTS

Saga of Twenty-Five Years of Training & Capacity Building using Indian Satellite Data Products

Ever since the launch of first operational Indian remote sensing satellite, IRS-1A on 17th March 1988, India's Earth Observation (EO) capability has grown manifolds in response to application requirements of the country. The resurgence in demand and availability of satellite based remotely sensed data through various follow-on ISRO missions with improved imaging capability *viz.*, IRS-1C & 1D, Oceansat series, Resourcesat-1 & 2, Cartosat-series and RISAT-1 & 2; there has been a greater need to develop capacity in user organizations to assimilate new technologies and derive information which was never before possible. After the successful launch of India's first planetary mission, Chandrayaan-1 in 2008 and planned missions to Mars and Chandrayaan-2 and the greater emphasis laid on atmospheric studies with missions like Megha-Tropiques; there is a paradigm shift in remote sensing applications in India and renewed interest for scientific pursuits. Recently, the thrust has been laid on not only how we acquire data, process and analyze but also most importantly how we disseminate through web-based geospatial technology. Thus, the growth and complexities in EO technologies have also necessitated the capacity building for quality manpower development at different levels. The Indian Institute of Remote Sensing (IIRS), formerly known as Indian Photo-Interpretation Institute is one of the oldest institute in the country as well as in the world and has developed strong expertise in the fundamental image interpretation to advanced geospatial modeling techniques and the knowledge extraction using EO data to address national imperatives and government priorities. In the recent times, it has diversified its programmes with focus on research driven training and educational programmes well integrated with ISRO's research programmes. It is well equipped to meet the future challenges and new paradigms of climate change and disaster management. From the modest beginning in 1966 to accelerated growth during 1988 to 2013, the saga of 25 years of capacity building in remote sensing is illustrated through several projects providing critical inputs for planning and development.

Director's Message

The capacity building in IIRS is realized through training, education and research involving professionals from stakeholder departments, students community and researchers. It is a multitier approach wherein senior level professionals like decision makers to fresh science post-graduate and engineering graduate students are provided with training, education, and research experience for both institutionalization and further advancements of geospatial technologies and their applications. The challenges in capacity building are many and it can be addressed by focusing on alignment of the capacity building programmes in tune with various developmental programmes of Govt. of India; researchers should take up issues or problems faced by user departments as research questions and address conclusively and comprehensively through multi-tier research delivery mechanism.

- Dr. Y.V.N. Krishna Murthy

Monitoring and Assessment of Ecosystem Processes in North-Western Himalaya (NWH)

Ecosystems of NWH are fragile and sensitive with respect to natural resources status, environmental conditions and biodiversity. This region remained geo-dynamically active and produced three longest faults on earth's surface. Active geo-dynamic processes,

Dean (Academics) expounds inter-disciplinary research programme of IIRS initiated during 12th Five - Year Plan.

human interferences and climatic impacts made this region highly prone to various kinds of disasters viz., earthquakes, landslides, flash flood; anthropogenic activities such as deforestation, forest fire and faulty agricultural practices etc. contributed high degree of soil erosion, depletion of soil nutrients and reduced crop and forest productivity of NWH. This region is also most prone to ecological degradation as a result of perturbations in the bio-geochemical cycle mainly, carbon and nitrogen. Climate change and anthropogenic activities also impacted the water resources in the form of snow and glacier status. Therefore, towards sustainable environmental development, making disaster resilient society and improved livelihood in the NWH region, IIRS has taken up an inter-disciplinary research project in collaboration with research institutes/ organization in NWH as major focused research in 12th Five Year Plan of the institute with following sub-themes :

(i) **Geodynamics and Seismicity Investigations:** (a) *Deformation measurement and strain modeling using DGPS, DInSAR and ScanSAR.* Acquisition of TEC (Total Electron Count) data and assessment of data for earthquake precursors study using inospheric anomalies with reference to significant earthquakes in Himalaya and surrounding region and (b) *Active fault mapping using high resolution EO data and geophysical investigation* in selected sectors around Main Central Thrust (MCT) and Himalayan Frontal Thrust (HFT).

(ii) **Biodiversity Vulnerability Assessment due to Climate Change:** (a) *Ecosystem structure and functioning* to study impact of global change on species composition in Himalayas*, (b) Quantification of Ecosystem processes* for Nitrogen dynamics in mountain ecosystem structure and functioning and (c) *Impact of Global climate Change* on tree line ecotone of Himalayan region.

(iii) **Sustainable Mountain Agriculture:** (a) *Climate change impact on productivity of food and plantation crops* to develop a framework of agro-ecological zone for assessing climate change effects on mountain agriculture and understanding of agro-ecosystem processes and *productivity changes under present* and future climate, (b) *Assessing soil erosion and nutrient loss and its impact on soil quality and crop productivity* to study surface runoff, soil erosion and nutrient loss at watershed scale and its impact on soil quality and crop productivity under climate change regime.

(iv) **Water Resources Status and Availability :** *(a) Climate and Land Use Land Cover (LULC) change scenario modeling and hydrological modeling* to quantify its effect on water availability and *(b) To improve mapping accuracy of snow cover area and snow parameters,* debris covered glacier ice and crevasses in NWH glaciers using RS/GIS under normal and changed climate and LULC scenarios.

(v) **Modeling Temporal & Spatial Growth of NWH Cities:** *Multi-Criteria Evaluation (MCE) and Artificial Neural Network (ANN) in modeling complex urban systems* and effectiveness of remote sensing and GIS as spatial data providers and spatial data handlers.

(vi) **Rainfall Retrieval Using Remotely Sensed Data and Study of Extreme Rainfall Events:** *(a) Systematic documentation of the fine-scale spatio-temporal variability of rainfall* and an analysis of extreme events over the topographically rich NWH region, *(b) Long-term analysis of the rainfall data set and investigation of trends, (c) Modification in the merged rainfall product* for example TRMM 3B42, 3B43 and IMSRA using ground truth for NWH region and *(d) Rainfall retrieval algorithm from microwave remotely sensed data.*

Collaborating Organizations: Wadia Institute of Himalayan Geology, Dehradun; G.B. Pant Institute of Himalayan Environment & Development, Almora; Y.S. Parmar Institute of Forestry & Horticulture, Solan; C.S.K. Himachal Pradesh Agricultural University, Palampur; J & K Agricultural University; Snow & Avalanche Research Establishment, Chandigarh; National Institute of Hydrology, Roorkee and Indian Institute of Science, Bangalore.

- **Dr. S.K. Saha**

RESEARCH COMMUNICATIONS

Snow and Glacier Studies with RISAT-1 SAR Data: Initial Results

Snow and glacier-melt based perennial Himalayan Rivers support millions of people in India by providing water for irrigation, drinking, hydropower and other uses. Therefore, year around spatio-temporal mapping of snow and glacier remains a big challenge in high relief and inaccessible Himalayan region. Globally, optical remote sensing has been used operationally to map the cryospheric components but retrieval of snowpack and glacier physical parameters and mapping during cloud cover remains a big gap area. In this regard, SAR offers a better tool to retrieve snow cover and snow physical parameters, glacier features and surface and top soil water resources. The potential users of such products are reservoir authorities (e.g. BBMB, THDC), hydropower companies, snowmelt runoff and snow avalanche modelers. Recently, India has launched C-band SAR satellite, RISAT-1 with hybrid, dual and fully polarimetric modes. The present work shows the initial results from the analysis of RISAT-1 SAR data in MRS (HH/HV) and Hybrid (RH/RV) modes for snow and glacier studies in Himalayas. Figure 1 shows the backscatter image and estimated wet Snow Cover Area (SCA) from MRS HH mode of RISAT-1 data for Gangotri and Beas-Chenab areas of NWH. The backscatter threshold method was used for finding the 1st level wet SCA. The basic principle for mapping wet snow is derived from the fact that wet SCA has major backscatter contribution from top surface and
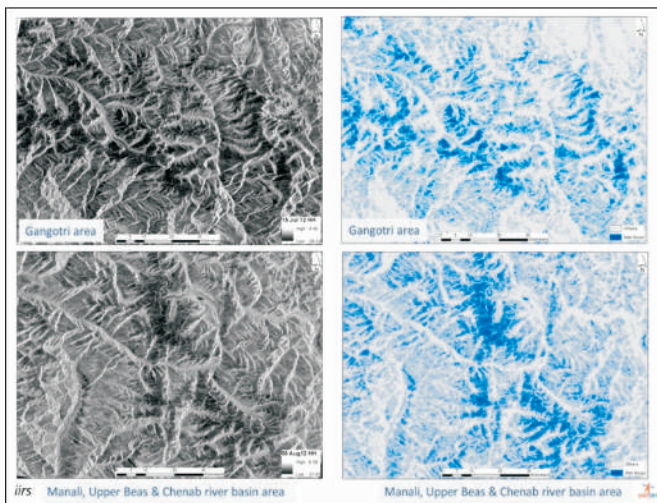

Fig. 2. Hybrid polarimetry (RH/RV) based decomposition results for Gangotri Glacier, 9thJan 2013.

some from volume, and due to the presence of water around ice crystals in snow, the relative backscatter from wet SCA is much less than as that of dry snow or other land use/land cover classes. The derived wet SCA is further being refined to remove the non-snow pixels, water bodies and area under layover and shadow.

Another study has been carried out to highlight the potential of hybrid polarimetry mode of RISAT-1 data. The data in RH/RV mode, dated 9thJanuary 2013 of Gangotri glacier has been processed to derive various hybrid polarimetric decomposition parameters. The initial results of m-delta and m-chi decompositions around main Gangotri glacier area are shown in figure 2. The image is of winter time i.e., 9thJanuary 2013 during which optical data only shows snow (Figure 2c) over glacier area and no glacier features are visible. The major feature identified from these decomposed SAR image are snout position, glacier with debris cover in ablation area, smooth glacier ice and part of accumulation area. The same SAR data can also be used during cloudy season (Figure 2b) of summer-monsoon and end of ablation time i.e., close to end of monsoon, which will help in demarcating accumulation and ablation area. This information can be very useful for winter as well as summer glacier mass balance studies.

Fig. 1. Wet snow cover area from RISAT-1 MRS data for 15thJuly 2012 & 8thAugust 2012.

- Praveen K. Thakur & S.P. Aggarwal

Modeling of Land Subsidence Phenomenon in Jharia Coalfields by Spaceborne DInSAR, Ground-Based GPS and Leveling Techniques

The study aims at detection and characterization of land subsidence phenomena in Jharia coalfield, Jharkhand, India by spaceborne differential interferometric SAR (DInSAR), GPS observation and precision leveling techniques. Using multi-frequency C- and L-band DInSAR, slow and rapidly subsided areas in the coalfield were delineated. During 2007-2008, 22.8 km^2 and 12.2 km^2 subsidence areas were delineated, respectively from C- and L-band DInSAR. Out of which only 4.4 km^2 was observed in both C- and L-band DInSAR. In C-band DInSAR, the maximum LOS subsidence rate was observed at 15-30 cm/year whereas in L-band DInSAR, it was 30-55 cm/year. The study infers that land subsidence detection and subsidence rate measurements are sensitive to radar wavelengths. Collateral GPS observation and precision leveling were conducted in 3 test sites to validate DInSAR based measurements and to determine the net displacement vectors. Subsequently, it was observed that in addition to a dominantly vertical displacement component, there was a substantial horizontal displacement component in the land subsidence.

- **R.S. Chatterjee**
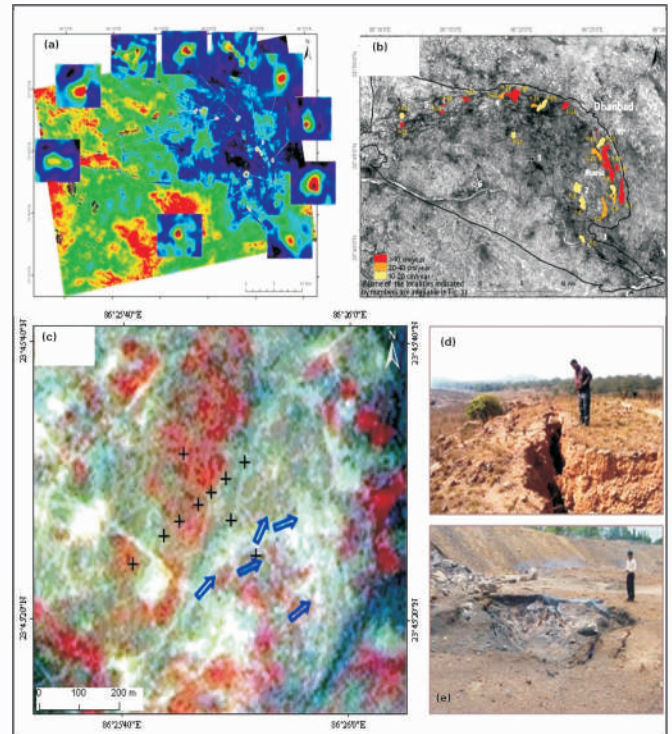
(a) L-band differential interferogram showing subsidence fringes, (b) Compiled L-band DInSAR-based subsidence map of 2007-2008, (c) Displacement vectors in Dobari test site as derived from ground-based measurements, (d & e) Field photographs showing mining-induced and coal fire induced subsidence

Characterization of Forest and Forest Plantation using RISAT-1 SAR Data

The project aims at utilization of RISAT-1 data for value addition to the information on forest type and density derived from optical data. RISAT-1 data is also being evaluated for assessing the biomass of younger stages of forest plantation species viz., eucalyptus and poplar. The initial results of RISAT-1 data utilization are presented in this article. RISAT-1 C band data in Fine Resolution Mode (FRS-1) was acquired for the monsoon season (2ndJuly 2012) for the part of Dun valley, Uttarakhand. Hybrid polarimetry technique based on m-chi decomposition was applied on hybrid dual polarized data (RH/RV) to differentiate components of volume scattering, even-bounce scattering and odd-bounce scattering (a & b images). As illustrated, various land cover/ land use types such as forests, settlements, agriculture and river channels are clearly visible. The northern aspects of Shiwalik range visible in a shade of green color are forests dominated by *Shorea robusta* (sal). The changes in the intensity of volume scattering
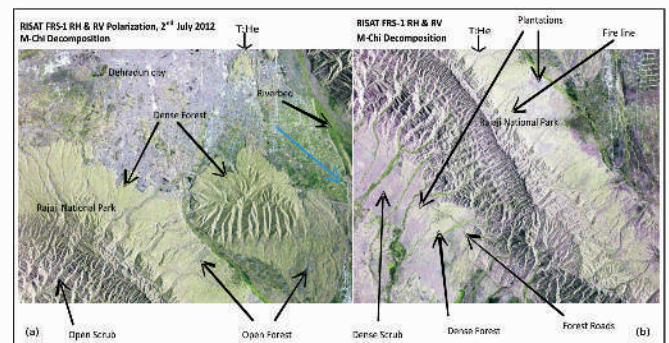
indicate the variations in forest density. The southern aspect dominated by odd-bounce scattering is having very sparse vegetation cover. The higher spatial resolution of FRS-1 data (3m) also allows differentiation of fire line, forest edges, road network within forest area, clearing at park boundary, etc. The fine scale topographical details e.g., ridges, slopes, stream channels and valleys are useful for assessing the site details.

- **Hitendra Padalia & Sadhana Yadav**

Analysis of Temporal Radar Backscatter of Paddy using RISAT-1 SAR Data

The RISAT-1 SAR data is one of the high-resolution microwave remote sensing data source for agriculture monitoring in tropical and sub-tropical regions. It overcomes the limitations of optical sensors and is responsive to moisture, roughness and the geometric structure of the vegetation.

The main objectives of this study was (i) to understand the interaction between microwave backscatter and rice canopy, (ii) to understand the effect of physical plant parameters on the backscatter signatures as a function of polarization and how these signatures vary in a complete growth cycle of rice and (iii) to assess the potential of dual-polarized C-band RISAT-1 data to estimate the Leaf Area Index (LAI) of two varieties (non-basmati and basmati) of paddy. Four Medium Resolution ScanSAR (MRS) dual-polarization (HH/HV) mode RISAT-1 data were acquired over parts of Karnal district, India in kharif season of year 2012 and ground data consisting of crop height, LAI, canopy moisture, etc. were collected during the same period of the satellite pass. Furthermore, with the use of multi-temporal RISAT-1 data and the examination of temporal backscatter signatures, two types of paddy (non-basmati and
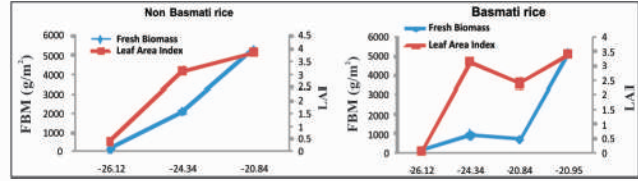
Temporal backscatter behavior of Non-basmati (July, August and September months; harvested in October month) and Basmati (July, August, September and October months) rice backscatter in HV polarization with fresh biomass and Leaf Area Index (LAI) at different growth stages

basmati) with different life-spans ranging from 90-100 days to 125-135 days and other targets have been discriminated. The backscatter of rice in different polarizations over entire growth period was analyzed and LAI was estimated using a semi-empirical model based on simplified Michigan Microwave Canopy Scattering (MIMICS) by fitting it at the same time of RISAT-1 data acquisition. Finally, estimated LAI from the proposed model was compared with the ground measurements. The model showed appreciable results for LAI estimation of basmati using HV backscatter and provided the promising approach for LAI prediction using SAR data.

- Mamta Kumari, S.K. Saha, N.R. Patel
& Vineet Kumar

वर्षा जल संचयन तकनीकः सुदूर संवेदन एवं भौगोलिक सूचना प्रणाली का उपयोग

वर्षा जल एक अत्यन्त महत्वपूर्ण अवयव है जो न केवल शुद्ध है अपितु धरती पर प्रचुर मात्रा में उपलब्ध है। भारत में कुल वर्षा 4000 अरब घन मीटर प्रतिवर्ष होती है। यदि इसका 20 प्रतिशत भी उपयोग में लाया जा सके तो भारत में जल की समस्या का निवारण अपने आप हो जायेगा। किन्तु वर्षा कहीं कम (अल्प वृष्टि) तो कहीं अधिक (अति वृष्टि) होतीहै। जैसे कि राजस्थान के कुछ रेगिस्तानी भाग में सामान्यतः 120 मिली मीटर वर्षा प्रतिवर्ष होती है वहीं मेघालय के चेरापूँजी एवं मोसिमराम में लगभग 12,000 मिलीमीटर वर्षा प्रतिवर्ष होती है। जैसे–जैसे जनसंख्या वृद्धि होती जा रही है, भू–जल का उपयोग निरन्तर बढ़ता चला जा रहा है। परिणामस्वरूप, भू–जल स्तर गिर रहा है एवं हैण्ड पम्प और कुएं सूखते जा रहे हैं। अब प्रश्न उठता है कि कैसे भू–जल स्तर को बढ़ाया जाये एवं कैसे शुद्ध पानी, पीने एवं सिंचाई के लिए एकत्रित किया जाएं। क्या ऐसा हो सकता है कि जहाँ वर्षा की बूँद गिरे वहीं इसका संचय न हो। जी हाँ, यही वर्षा जल संचयन है।

शहरी क्षेत्र में वर्षा जल संचयन सामान्यतः छत के ऊपर वर्षा एकत्रित कर किया जा सकता है। वर्षा जल छत पर सीधे गिरता है जो इकट्ठा होकर एक पाइप के सहारे जमीन में डाल दिया जाता है। जब वर्षा जल पाइप के सहारे जमीन तक आता है तब इसको फिल्टर कर किसी बड़ी टंकी में एकत्रित कर लिया जाता है अन्यथा भू–जल स्तर वृद्धि के लिये भंडारण के बिना ही सीधे जमीन में जाने दिया जाता है। सुदूर संवेदन से शहरी क्षेत्रों में कुल छतों का क्षेत्रफल आसानी से मापा जा सकता है। यह उच्च स्थानिक विभेदन क्षमता वाले उपग्रहों जैसे कार्टोसेट–1 एवं 2 के आंकड़ों से प्राप्त

किया जा सकता है। ऐसे ही एक आंकलन में यह पाया गया कि यदि 10 फुट × 10 फुट की छत से वर्षा का जल पूरे वर्ष एकत्रित किया जाए एवं कुलवर्षा 2000 मिमी हो तो एक वर्ष में लगभग 15000 लीटर जल एकत्रित किया जा सकता

चित्र 1 : तालाब एवं रूद्ध बांध

है। ग्रामीण क्षेत्र में चूंकि जल की आवश्यकता खेती करने के लिये अधिक होती है, अतः भू–सतह पर ही जल एकत्रित करने को प्राथमिकता दी जाती है। ग्रामीण क्षेत्र में वर्षा जल संचयन के लिए तालाब एवं रूद्ध–बाँध का निर्माण किया जाता है। सबसे बड़ी समस्या यह है कि तालाब एवं रूद्ध–बाँध कहाँ पर बनाये जायें। सुदूर संवेदन एवं भौगोलिक सूचना प्रणाली ने इस काम को बहुत सुगम बना दिया है। इसमें विभिन्न मानचित्रों जैसे कि मृदा, ढलान, भू–उपयोग मानचित्र एवं अपवाह मानचित्र को सुदूर संवेदन एवं भौगोलिक सूचना प्रणाली के द्वारा बना लिया जाता है। तदोपरांत, भौगोलिक सूचना प्रणाली के द्वारा एक नये मानचित्र का निर्माण कर लिया जाता है जो तालाब अथवा रूद्ध बांध बनाने की सटीक जगह दर्शाता है। चित्र 1 में सुदूर संवेदन एवं भौगोलिक सूचना प्रणाली तकनीक द्वारा प्राप्त तालाब एवं रूद्ध बाँधों की उपयुक्त जगहों को दर्शाया गया है।
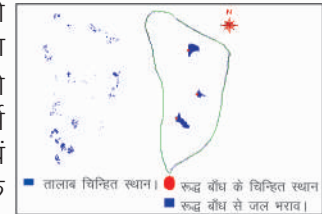
— शिव प्रसाद अग्रवाल

COURSE REPORTS

M.Sc. in Geo-information Science and Earth Observation with Specialization in Geoinformatics

10th M.Sc. course (2011-13) in Geo-Information Science and Earth Observation with specialization in Geoinformatics offered within the framework of IIRS-ITC Joint Education Programme was completed on 22nd March 2013. Thirteen students have joined the course while eleven students graduated on this day. The course aimed at developing a critical understanding of appropriate techniques and tools for the acquisition, processing, transformation, analysis, modeling, storage and presentation of spatial data, including developing research skills in various fields of Geoinformatics. The course work was covered in 23 modules (each module of 3-weeks duration) that included individual M.Sc. research project during the last 8 modules. As a part of coursework, the students visited ITC of the University of Twente, The Netherlands for three months to attend advanced modules on topics related to the M.Sc. research problem chosen by them. The M.Sc. research was carried out under the joint supervision of IIRS and ITC faculty on various topics viz., close range photogrammetry, geostatistics, uncertainty modeling,

SAR interferometry and polarimetry, advanced image processing, modifiable temporal unit problem and mobile mapping. The research work was evaluated by the Thesis Assessment Board (TAB) consisting of members from IIRS and ITC and an external expert with Prof. M.G. Vosselman (Chairman of the Department of Earth Observation Science, ITC) as the Chair.

The M.Sc. degrees were distributed by Prof. M.G. Vosselman and the merit certificate to the topper of the batch was given by Dr. Y.V.N. Krishna Murthy, Director, IIRS.

- S.K. Srivastav

M.Sc. in Geo-information Science and Earth Observation with Specialization in NHDRM

9th M.Sc. course in Earth Observation and Geo-Information Science or in short, Geoinformatics with Specialization in Natural Hazards and Disaster Risk Management (NHDRM) has commenced on 26th September 2011 and concluded on 22nd March 2013. It was organized as a part of Joint Education Programme between IIRS and Faculty of Geo-information Science and Earth Observation (formerly known as ITC), Twente University (TU), The Netherlands.

The M.Sc. course is modular in structure with 14 course work modules and 9 project modules (each module of 3 weeks duration) spread over 18 months. The course jointly started with M.Sc. students and 15 PG Diploma students in 2011 with PG Diploma students graduated in July 2012. The initial three modules are the core modules on Principles of Remote

Sensing, Principles of GIS and Principles of Databases and were delivered by Photogrammetry and Remote Sensing Department (PRSD) and Geoinformatics Department (GID). After the completion of core modules, students joined applications departments for 2 common modules on: (i) Disaster Management: Concepts and Overview and (ii) High Resolution Image Analysis for Natural Hazards Assessment, which was organized as a short course with the participation of ITC/UoT faculty, Mr. Robert Voskuil and Mr. Mikhael Damen. This special course was also attended by other participants from different user organizations.

After first 5 modules, students were offered two specialization modules on: (i) Applications of Geo-informatics to Natural Hazards and (ii) Natural Hazards and Risk Modeling with three specializations:

Environmental, Hydro-meteorological, and Geological Hazards. The Module 8 on Advanced Remote Sensing for Natural Hazards Study and Module 9 on Advanced 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), multivariate statistics and Geostatistics. The module 10 on Computer Programming for Natural Hazards study was offered for M.Sc students; however, PG Diploma students also attended the same as an optional subject. The Module 11 on Research Skill Development helped the students to develop their initial proposal for M.Sc. Thesis.

From 2011-13 batch onwards, M.Sc. students of both the specializations visit ITC/UoT, The Netherlands at the same time and attend similar modules (Module 12-15). Thus, introducing better coherence among both the specializations of M.Sc. Programme. After the completion of Module 15, the course work came to an end and Project modules 16 to 23 started from 3rd September 2012 to 22nd March 2013.

As the project work is very important component of the course programme, the students presented and defended their proposal before the faculty members of ITC/UoT. Thereafter, they carried out project work which involved collection and ordering of relevant satellite and ancillary data, data interpretation, analysis, field verification, data collection and report writing.

The mid-term evaluation was held in November 2012 and final evaluation was held on 18th March 2013 in the presence of Prof. M. G. Vosselman, ITC/UoT and others from The Netherlands joined through video conferencing. The Thesis Assessment Board (TAB) consisted professors of ITC, guides from ITC and IIRS, external examiners and both the Course Directors from IIRS and ITC as observers. The course has concluded on 22nd March 2013, wherein successful candidates were presented M.Sc. Diploma/Certificate by Prof. M. G. Vosselman, ITC/UoT faculty and Dr. Y.V.N. Krishna Murthy, Director, IIRS.

- P.K. Champati ray

Special Course on Geospatial Technologies for Cadastral Mapping

A three weeks special course in two batches sponsored by Survey Settlement Land Records (SSLR) Department, Government of Karnataka was organized. Forty Assistant Directors and Land Records officers in two batches, (15 participants in first batch and 25 participants in second batch) attended the course. The first course was conducted from 18th February to 8th March 2013 and second course was organized from 25th March to 12thApril 2013. The aim of the course was to train SSLR officers about geospatial technologies in the field of cadastral mapping. The course objectives were drafted while keeping in mind the centrally sponsored scheme e.g., National Land Records Modernization Programme (NLRMP). During the course, the emphasis was given on regional and global reference systems, global navigation satellite system with augmentation and navigation systems, GAGAN and IRNSS, aerial and satellite stereo data processing for geometrically corrected

ortho-image generation and the role of DEM in ortho-image generation. There were special lectures on Digital Cadastre generation, updation and application as well as survey/re-survey of cadastral maps using modern technology and digitization of cadastral maps.

- Anil Kumar

Special Course on Geoinformatics for Disaster Response

A special course on `Geoinformatics for Disaster Response' was organized during 8th-18thApril, 2013. This course was especially designed for National Disaster Response Force (NDRF) for providing exposure as well as hands- on experience on use of RS/GIS and GPS technology in disaster response and judiciously incorporating geoinformatics technology in SOPs. It was attended by 25 personnel from NDRF consisting of 2 Second-in-Command, 5 Deputy Commandants, 3 Assistant Commandant, 9 Inspectors and 6 Sub-inspectors. This course was organized for the first batch of 281 personnel of NDRF to be trained under similar programmes in near future.

The idea for organizing such training programme came during technical deliberations at the EAS-India workshop, 'Building Regional Framework for Earthquake Risk Management', 8th- 9thNovember 2012 involving Mr. P. M. Nair, DG, NDRF and Dr. S.K. Saha, Group Director (ER&SSG) and Dean (A). NDRF very promptly followed the idea and sent request through Mr. J.K.S. Rawat, DIG to train 281 personnel. Accordingly, the follow up with IIRS has resulted into extending capacity building for the field level officers for accessing the data from different GIS portals and preparing the action plans for disaster management. The IIRS faculty worked out the contents of the course which included topics such as spatial information requirement during different stages of disaster management with special reference to flood, cyclone, earthquake, landslides, forest fire, EO data availability from ISRO and through International Charter, NRSC-DSC (ISRO) operational support during disaster event, DIP and GIS analysis, GPS survey, overview of Bhuvan, open source/public domain data and services. Two lectures were delivered by guest faculty namely, Dr. G. Srinivas Rao, Head, DSC, NRSC and Mr. G.S. Saini, Director, National Civil Defence College, Nagpur. The main emphasis of the course was hands-on experience and practical exercises required for disaster response. A special simulation case study was designed for demonstrating the geospatial technological solutions using hand-held devices like mobile phones (see inset). The course has successfully concluded on 18th April 2013 during the presence of Mr. G.S. Saini, Director, National Civil Defence College, Nagpur as Chief Guest, Dr. Y.V.N. Krishna Murthy, Director, IIRS and Dr. S.K. Saha, Dean (Academics) highlighted the role of Geoinformatics in disaster response and representative of the course participants, Mr. Nishit Upadhyay, Second-in- Command, 2nd NDRF provided very positive feedback on behalf of the participants that the course was extremely beneficial and suggested to increase the duration of the course and organize advance modules on similar lines.

- P.K. Champati ray

Simulation Case Study For Disaster Response: Geospatial Solutions Over Mobile Phones

During the course, a case study on real time disaster reporting system using low cost mobile devices with GPS and GPRS connectivity was conducted. To relate the technology with real time disaster scenario, a virtual disaster control room was established at IIRS. The control room was having the geospatial data sets related to study area like infrastructure layers, land use, high resolution satellite data, access to various online geospatial data resources from popular mapping websites like ISRO Bhuvan, Google Maps, Open street Map, Bing Map, etc. One mobile based software application for Android platform was developed and deployed in the mobile devices of course participants. The data collection form was designed for the course participants as per their personal experience in the ground during any disaster event. For demonstration purpose, two cases were generated i.e., landslide and accidents.

Teams were sent to field with their mobiles loaded with required application and they were asked to report the disaster event through given data collection form in their mobile device and submit the report through GPRS. The data received from the team at ground included the GPS coordinates, required attributes and field photograph of the location/event. The data was received at central server system established at IIRS in virtual control room. The field photo and attribute data was automatically geo-tagged and overlaid on GIS layers available at virtual control room. The team sitting at control room analyzed the data with respect to the geographical location of the disaster event, calculation of shortest route for any rescue operation, availability of critical support facilities at nearby location, etc. Finally, a GIS based plan was prepared and communicated to the team at ground for action. A two way messaging system was established and tested for preparation of any GIS based plan for rescue operation.

- Harish Chandra Karnatak

Summer School on Data Assimilation

As a part of ISRO-UK Space Agency collaboration programme, the Indian Institute of Remote Sensing, ISRO, Dehradun conducted a one week summer school on Data Assimilation during 17th-21st December 2012. Data Assimilation is a major subject for ingesting various sources of data; complexity of scale and in time, and needs to be understood for advanced predictive modeling. This shall be useful for the remote sensing application scientists of ISRO working on complex models for predicting future scenario.

Data assimilation methods are used to prepare the grid data as the best possible estimate of the true initial state of a system by merging various measurements irregularly distributed in space and time (e.g., satellite data, ground measurements etc.) with a prior knowledge of the state given by a numerical model. It improves the quality of the forecast and the model, and increases the physical understanding of the considered systems. Data assimilation now plays a very important role in studies of atmospheric and oceanic problems. The course was started with the introduction of data assimilation and further insight was given on various methods of data assimilation like: variational methods (3DVar and 4DVar), Kalman Filters, Particle Filters, etc. Its implementation for various case studies was also discussed. The technical limitations of different data assimilation techniques were also discussed in detail. Hands-on exercises included the exposure to the Python (freely available programming language) and application of the 3DVar, 4Dvar, Kalman and Particle filters. Twenty one participants from various organizations like VSSC, PRL, SPL, SAC, NRSC, ISAC, NARL, NCMRWF, INCOIS, NIO, etc., including IIRS participated in the programme. Dr. Jan Van Leeuwen of University of Reading, UK was the chief instructor for the training programme and his team members, Dr. Tristan Quife, Dr. Javier Amezcua, Dr. David Livings of Data Assimilation Research Centre, University of Reading, UK delivered the lectures. The course was funded by UK Space Agency and delivered by National Centre of Earth Observation (NCEO) staff, UK for the ISRO scientists. The participants found the programme as very useful for their research activities.

- D. Mitra

Orientation Course on Applications of Remote Sensing and GIS in Forestry

A one-week orientation course on 'Applications of remote sensing and GIS in forestry' was organized by the Forestry and Ecology Department for twenty-nine field level Range Forest Officers from Forest Training and Ranger's College, Sundarnagar, Himachal Pradesh between 10th-14thDecember 2012. The officers were exposed to theory and practical aspects viz., quantitative information extraction from aerial photographs, spectral properties of vegetation, visual and digital methods for forest type, density and change mapping, growing stock assessment along with a demo on Bhuvan portal. One-day field visit was also organized to demonstrate ground truth collection and use of field instruments such as Ranger's compass, Hypsometer and GPS. The trainees were given the soft copies of the course material and awarded with certificates.

- S.P.S. Kushwaha & Hitendra Padalia

ITEC, MEA-Sponsored Short Courses

Indian Technical and Economic Cooperation popularly known as ITEC was launched by a decision of the Indian Cabinet on 15th September 1964 as a bilateral programme of assistance of the Government of India. Under it and its corollary Special Commonwealth Assistance of Africa Plan (SCAAP) countries in Asia, East Europe (including former USSR), Central Asia, Africa, Latin America, the Caribbean as well as Pacific and Small Island countries are invited to share the Indian developmental experience acquired over six decades of existence as a free nation (www.itec.mea.gov.in). The training programmes have contributed to capacity building and human resource development in many parts of the world.

Under the aegis of ITEC and SCAAP of Ministry of External Affairs, Govt. of India, IIRS organizes two training programmes each year (i) Short course on Geoinformatics conducted during September to November each year and (2) Short Course on Remote Sensing with special emphasis on Digital Image Processing during January to February. The two training courses are designed for middle level professionals engaged in remote sensing, GIS, GPS and related technologies, applications and projects in their own area of specialization.

9th Short course in Geoinformatics was conducted during 24[th]September 2012 to 16[th]November 2012. Twenty-two foreign nationals from 13 countries were nominated by ITEC/SCAAP for this course. There were 5 participants from Afghanistan, 2 participants each from Botswana, Mauritius, Nepal and Sri Lanka and 1 each from Bhutan, Costa Rica, Ethiopia, Fiji, Indonesia, Jamaica, Myanmar, Moldova and Uzbekistan. In the eight-weeks course, Module 1 (first three weeks) was dedicated to principles of Remote Sensing, EO platforms & sensors, Photogrammetry, visual image interpretation and Digital Image Analysis. The next module 2 (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 theory lecture classes and the lectures were followed up by practical demonstrations. The

course participants were taken to Mussoorie for short field excursion and an educational and sightseeing trip to Delhi and Agra was also organized. The last two weeks dealt with small case study / project and lectures on advanced topics which included topics like Geoinformatics for Natural Resource & Facility Management delivered by the Dr. Y.V.N. Krishna Murthy, Director, IIRS.

13[th]Short Course on Remote Sensing with special emphasis on Digital Image Processing was conducted during 7[th]January 2013 to 1[st]March 2013. This year there were 17 candidates from 10 countries with three participants from Yemen, two participants each from Indonesia, Myanmar, Namibia, Nigeria,Vietnam; one each from Cuba, Czech Republic, Kazakhstan and Niger. This course of 8 weeks duration offered a blend of latest technology and conventional techniques and it covered the basic and advanced concepts of Remote Sensing, Photogrammetry, Image Interpretation, Fundamentals of GIS & GPS, Digital Photogrammetry, Thermal and Microwave Remote Sensing, SAR Interferometry and basic & advanced topics on Digital Image Processing like Image pre-processing and geo-referencing, image enhancement, image transformations, image classification and accuracy assessment, digital change detection, image fusion, hyperspectral remote sensing, image segmentation, etc. These topics were covered in theory lecture classes and all the lectures were followed by practical demonstrations and field visits. Course participants felt that the programme objectives have been achieved and the course is reasonably useful in their present nature of job.

- Meenakshi Kumar

Distance Learning Programme on Geoweb Services: Technology and Applications

The World Wide Web (www) and high-speed network access have given a new dimension to geospatial domain where large datasets can be processed, more complex models can be established, complex analysis for decision-making can be performed and better methods of display and visualization for virtual reality can be achieved. The Geospatial-web or Geoweb applications are known as intelligent GIS on web which can be developed using web 2.0 technologies by including more public participation in geospatial system. In addition to typical web mapping system, the Geoweb applications emphasizes on dynamic, participation-oriented, user-centric, distributed, loosely-coupled services. ISRO is actively developing and promoting such technological solutions in internet domain through various Geoweb services like Bhuvan, BIS, IBIN, India-WRIS, etc. To enhance the outreach of such ISRO Geoweb services and to promote these technological developments among user communities, 10th satellite-based distance learning programme on 'Geoweb services Technology and Applications' was conducted from 11th

February to 15th March 2013. A total of 1033 participants from 42 universities (including one foreign university) have participated in the programme. The contents of the course are designed by the users of state-of-art technologies like Geoweb 2.0, AJAX, Open system architectures, etc. with emphasis on practical demonstrations. The special session on ISRO Bhuvan Geoportal was organized with hands-on practical exercises for the utilization of Bhuvan data and information services and APIs for software development. The participants have shown keen interest on critical issues related to Geoweb technologies like functioning of internet, data security, service performance, public participation in GIS, real-time data reception and integration using portable devices like mobile. An examination was conducted at the end of the course and students were evaluated based on examination result and assignments. The certificates were awarded to the successful students.

- Harish Chandra Karnatak

Special Course on Geospatial Technologies for Railway Line Projects

A special short course of one-week for the engineers of Department of Rail Vikas Nigam Limited (RVNL) from 15th - 19th April 2013 was organized at IIRS. Seven senior level officers from the Indian Railways involved in the railway line projects joined the course. The course curriculum was designed keeping in mind the requirements of the user department and topics like overview of remote sensing technology and mapping, sources of DEM creation and their accuracy, GPS/GNSS survey methods and data processing, image processing, overview of Geographic Information Systems and database creations, concept of Web-GIS and visualization were included. Considering the railway route alignment requirement of the participants that requires planning and implementation with field level challenges, two lectures were delivered on geotechnical considerations for railway alignment and railway bridge catchment hydrology. A lecture

demonstrating ISRO's experience in the similar area and a field work demonstrating DGPS survey and its processing were also organized. A formal feedback was taken at the end of the course where participants appreciated the course and expressed its usefulness in their future projects.

- Ashutosh Bhardwaj & Shefali Agrawal

WORKSHOPS/SYMPOSIA/MEETS

First IIRS User Interaction Meet (IUIM-2013)

IRS annually conducts more than 40 different training and education programmes including M.Sc., M.Tech., PG Diploma, special courses including NNRMS (academia), ITEC (International) sponsored certificate and customized short-courses. IIRS, within the framework of Joint Programme has also collaborations with internationally acclaimed institutions like ITC, The Netherlands and Andhra University, etc. So far, more than 8600 students have completed various courses at IIRS across various natural resources disciplines. The Institute also has a unique distance-based learning EDUSAT programme, initiated in 2007 with a participation of 12 universities. The EDUSAT programme has expanded to more than 70 institutions/ universities across the country. The e-learning programme is also being developed by the Institute. Students at IIRS are trained and groomed by around 70 multi-disciplinary full-time faculties.

In its endeavour to remain in the forefront of training and capacity building in the field of geo-spatial technology and to have constant dialogue with stake holders, IIRS User Interaction Meet (IUIM-2013) was organized during 11th-12thMarch 2013 at Dehradun. The objectives of the meet were as follows: apprise on advances in space applications, remote sensing and GIS technological advancements vis-à-vis role of IIRS in research and capacity building; understand and explore new opportunities with user organizations in both government, non-government and private sectors dealing with infrastructure planning, rural & urban development, environmental conservation, natural resource, and disaster management, etc.; interface with remote sensing and GIS industry on newer avenues; explore the placement opportunities for IIRS students, and interact with representatives from universities on distance learning programmes of IIRS under EDUSAT for further improvements in course content and delivery mechanism. Participants from Central/ State Govt. departments, autonomous organizations, NGOs, industries attended the meet.

Academia from Central/ State/ Private Universities and coordinators of EDUSAT Programme associated with Distance Learning Programme of IIRS also attended the meet and shared their experiences and expectations. IIRS alumni were encouraged to attend the meet with the expectation that their experience shall further strengthen the training, education and research programmes of IIRS. A total of 152 participants attended and deliberated during two-day programme. The event began with the lighting of lamp by the Chief Guest, Dr. V.K.Dadhwal, Director, NRSC; Dr. A.K. Wahal, DG, FSI; Dr. Prithivish Nag, VC, M.G. Kashi Vidyapeeth, Varanasi and other dignitaries. Dr. Y.V.N. Krishna Murthy, Director, IIRS gave the introductory remarks followed by the addresses by Dr. A.K. Wahal and Dr. Prithvish Nag. Dr. S.P.S Kushwaha, GD, PPEG, IIRS proposed the vote of thanks. An exhibition was organized during the IUIM- 2013 for the benefit of academia, user and industry highlighting the training opportunities, research initiatives of IIRS faculty, research outputs of students, on-going national projects, products, services and infrastructure available at IIRS for various remote sensing and GIS related research, education and training activities. The event provided a platform to share the achievements and experiences of faculty and students of IIRS and informed the current and potential user community about the existing capabilities in areas of customized training, education and research. Industry has been providing placement

opportunities to many of IIRS students. The focus of meet was also to understand the present and future requirements of the industry, skill gaps and strategy to meet the demand-supply gap in human resource development. It was also envisaged to organize campus interviews by industry. IUIM was an important forum to get feedback on overall training programme of IIRS, its quality and expectations, which will be an important input for designing future courses and taking up research in newer areas relevant to the user community. IUIM has provided unique opportunity to interactions on entire gamut of capacity building needs of RS applications and diaspora of IIRS. In addition, a formal feedback was also taken from the participants.

- S.P.S. Kushwaha

TROPMET-2012: National Symposium on Frontiers of Meteorology with Special Reference to the Himalaya

Indian Meteorological Society, Dehradun Chapter (IMS-DC) organized TROPMET-2012, the National Symposium on `Frontiers of Meteorology with special reference to the Himalaya' during 20th-22nd November 2012 at IIRS with the support of Survey of India (SOI), Uttarakhand Space Application Centre (USAC) and India Meteorological Department (IMD), Dehradun. Around 250 delegates participated in the symposium. A special session was also conducted to provide platform for industry/ entrepreneurs and vendors to exhibit their products (H/W and S/W) and services. The event has provided a common platform for exchanging new concepts amongst eminent subject experts/ researchers and facilitated national institutions to initiate R&D programs in emerging areas of science and technology. The programme was inaugurated by Shri Surinder Singh Negi, Hon'ble Minister of Science & Technology, Uttarakhand. Shri R.C.Pathak, Secretary, Science & Technology, Govt. of Uttarakhand also graced the occasion as Guest of Honour. During the programme, Dr. Shailesh Nayak, Secretary, Ministry of Earth Sciences delivered the Presidential Address; Dr. Y.V.N. Krishna Murthy, Chairman, IMS-DC gave Welcome address; Dr. Swarna Subba Rao, Surveyor General of India, SOI gave Opening Remarks and Dr. M.M.Kimothi, Director, USAC concluded the inaugural session with Vote of Thanks. TROPMET-2012 was a three day long event having eighteen technical sessions covering ten themes of meteorology (Mountain Meteorology, In-situ Observation and Networking, Numerical Weather Prediction, Orographic Rain & Mountain Climate, Agro-meteorology, Monsoon Studies, Remote Sensing, Climate Science, Air Quality and Natural Disasters). A total of 119 technical papers were presented during the symposium. Invited plenary talks from experts drawn from India and abroad including the Gilbert Walker Award Winners, Dr. D.R. Sikka, Ex-Director, IITM and Dr. T.N. Krishnamurti, Professor, Florida State University, USA were conducted during the programme. These presentations were streamed live online and also made available at the IMS website. Recommendations were brought out highlighting various requirements such as instrumentation, observations, research and capacity building etc. with emphasis on Himalayan region. The detailed recommendations are made available at IMS website. The resolutions and recommendations of the TROPMET-2012 will play a vital role and gave vision and directions to meet various challenges in the Himalayan Region.

- P.L.N. Raju

Chairman, ISRO Reviewed the IIRS Activities

Dr. K. Radhakrishnan, Chairman of Space Commission, Secretary, Department of Space, Govt. of India and Chairman of ISRO reviewed the various activities of IIRS, Dehradun during his visit to the Institute on 25th March 2013. Scientists of the Institute presented the research activities mainly focussed on RISAT-1 and hyperspectral data applications. He interacted with young scientists and encouraged them for carrying out research on upcoming sensors. He also inaugurated e-learning module on Remote Sensing techniques and applications developed by the Institute to facilitate distance education. Construction and Maintenance Department of the Institute presented the proposed Master Plan of the Institute. The Chairman, ISRO addressed the scientists, staff and students and enlightened the audience with

the space research programme of the country. During his address, he also emphasized on employees' welfare.

- S.K. Saha

Release of Indian Bioresource Information Network (IBIN) Portal

Indian Bio-resource Information Network (IBIN) main portal (www.ibin.gov.in) was released by Prof. M.S.Swaminathan during 11th Conference of Parties to Convention of Biological Diversity (COP11-CBD) at Hyderabad on 11th October 2012. The IBIN programme is initiated by the Department of Biotechnology (DBT) in collaboration with Indian Institute of Remote Sensing (IIRS), Dehradun and University of Agricultural Sciences (UAS), Bangalore. It aims at developing a single window gateway to access distributed bio-resource database available in the country to offer spatial and non-spatial (species) services on diverse domains of bioresources and biodiversity.

There are two core data nodes of the IBIN portal viz., the spatial data (*Jeeva Manchitra*) maintained at IIRS, Dehradun and the species data (*JeevaSampada*) maintained at UAS, Bangalore; while the partners of IBIN, called as Bioresource Information Centres (BRICs), serve India's bioresources data on plant, animal, microbial resources, etc. along with their spatial distribution from their respective institutes/ centres located in different parts of the country. Apart from the identified BRICs, there is a provision to capture the information provided by the end users as Crowdsourcing/ Voluntary Geographic Information (VGI). IBIN data are served under the given three

categories: Core data that has already been created by the existing major IBIN nodes; Distributed data that is contributed by BRICs and the Captured data contributed by the end users in the public domain. It recognizes two kinds of knowledge base: Curated data, information that is processed and filtered periodically by a national curating team of IBIN and is then uploaded on the portal and raw data and the information which is captured from the public sources but yet to be curated. The information provided under IBIN will be useful to professionals for bio-prospecting, marketing, protecting bio-piracy and conservation of bioresources.

- Sameer Saran & S.P.S. Kushwaha

Humboldt Day Celebration at IIRS

Friedrich Wilhelm Heinrich Alexander von Humboldt (1769-1859) was a German geographer; naturalist and explorer, whose quantitative work on botanical geography laid the foundation of biogeography. In recognition of his contribution to science, Alexander von Humboldt Foundation, Bonn, Germany aims to promote international scientific and cultural dialogue and academic exchange. Humboldt alumni are 25,000 Humboldtians around the world, comprising 48 Nobel Laureates. Since 1953, the Foundation has granted 1727 research fellowships to scholars from India. Twenty-five Humboldtians from northern India met at IIRS to celebrate the 'Humboldt Day' on 8th December 2012. The meeting was organized by Dr. S.P.S. Kushwaha, Group Director, PPEG, IIRS and a Humboldt Fellow. Dr. Y.V.N. Krishna Murthy, Director, IIRS welcomed the Humboldt Fellows and delivered the inaugural talk on ISRO's programmes, promoting

societal development. Subsequently, the Humboldtians presented their research work on topics *viz.*, climatic change evidences from cave structure from Himalaya, LiDAR applications in forestry, quantum physics, Geo-tectonic activities in Himalaya, etc. All the Humboldtians appreciated the cooperation extended by IIRS for organizing the event.

- S.P.S. Kushwaha

Earth Day Celebration - 2013

The Indian Meteorological Society-Dehradun Chapter (IMS-DC) and the Indian Society of Remote Sensing-Dehradun Chapter (ISRS-DC) jointly organized series of events as part of this year's earth day celebrations at IIRS Campus. The year 2013, marks the 43rd anniversary of Earth Day celebration and the theme for the current year is 'The Face of climate change'. A series of six events were organized as part of Earth Day celebrations-2013 i.e.,'Green Run' on 21st April 2013; 'Craft from Waste material' competition for school students; screening of documentary 'Revealed Himalayan Meltdown' on 22nd April 2013; debate competition for the IIRS faculty and staff, students of IIRS/ CSSTE-AP, IMS-DC and ISRS-DC members on the topic 'Energy resources: conventional vs. non-conventional', followed by a popular lecture and an open quiz for all on 25th April 2013. A total of 43 participants including 6 women participated in the Green Run of approximately 9 km stretch. In the men's category, Shri P.L.N Raju, Shri Rafeal G.Velorio Q. and Shri Mohamed Musthafa and in women's category, Ms. Kirthiga Murugesan, Ms. Mansi Puri and Ms.

Kimeera Tummala were awarded the first, second and third prizes, respectively. A total of 20 participants from 10 schools participated in 'Craft from Waste Material' competition for school students and three member team of judges awarded the first, second and third prize to Rashtriya Indian Military College, The Doon School and Kendriya Vidyalaya, ONGC, respectively. In Debate Competition, Ms. Vandita Srivastava, Shri Guru Pardhan and Shri Rajbhagat were awarded the first, second and third prize, respectively. During the final program on 25th April

2013, Dr. Y.V.N. Krishna Murthy, Chairman, IMS-DC welcomed all the guests and introduced the Chief Guest, Dr. M.O. Garg, Director, Indian Institute of Petroleum, Dehradun to the audience. Shri P.L.N. Raju, Joint Secretary, IMS-DC presented a brief report on Earth Day celebrations. It was followed by the popular Lecture on 'Energy Security' by Dr. M.O. Garg, where he enlightened the audience on various aspects of energy security, energy situation in India,

alternative energy sources etc. and urged the audience to save the energy as much as possible, as a drop of oil saved later becomes a large pool of resources. An open quiz was conducted by Shri Prasun Kumar Gupta, Scientist, IIRS after the popular lecture. The open quiz was followed by the prize distribution jointly given by the Chief Guest and Director, IIRS.

- Kshama Gupta & P.L.N. Raju

CAMPUS NEWS

Distinguished Visitors

Dr. K. Radhakrishnan, Chairman of Space Commission; Secretary, Department of Space, Govt. of India, Chairman of ISRO and Chairman, CSSTEAP-GB visited IIRS campus on 25th March 2013. He graced the graduation ceremony of 17th Post Graduate Course in Remote Sensing and Geographic Information System held under the aegis of CSSTEAP and distributed the certificates and awards to the course participants.

Shri Vijay Bahuguna, Chief Minister, Uttarakhand state inaugurated the seminar on 'Geo-Enabling Uttarakhand: Opportunities and the Way Forward' held at IIRS campus on 30th November 2012. The seminar was jointly organized by Indian Institute of Remote Sensing (IIRS), Federation of Indian Chambers of Commerce and Industry (FICCI) and Uttarakhand Space Application Centre (USAC).

Awards

Dr. Y.V.N. Krishna Murthy, Director, IIRS was honoured with 'ASI Award for Space Sciences and Applications' for the year 2010 on 28th May 2013 at Bangalore from the Astronautical Society of India.

Dr. Suresh Kumar, Scientist 'SF', Agriculture and Soils Department (ASD), IIRS received best oral paper presentation award on research paper titled 'Improving spatial prediction of soil nutrients by integrating terrain attributes derived from Digital Terrain Model (DTM) and geostatistics' authored by Suresh Kumar and Ravinder Pal Singh at ISRS

National symposium on 'Space Technology for Food & Environment Security' held during 5th -7th December 2012 at New Delhi.

Mr. Vineet Kumar, M. Tech. Student (2011-2013), ASD, IIRS received best oral paper presentation award on research paper titled 'Geospatial technology for natural resource management' during the workshop under the theme 'Geospatial Technology for Agriculture' held during 21st - 22nd May 2013 at G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand.

CONTACT

Appointments

Shri Suresh Kannaujiya joined IIRS during January 2013 as Scientist/ Engineer-SC in Geosciences and Geohazards Department. He has done M.Tech. (Applied Geophysics) from IIT Roorkee.

Shri Arpit Chouksey joined IIRS on 21st January 2013 as Scientist/ Engineer-SC in Water Resources Department (WRD). He has done M.Tech. (Water Resources Engineering) from IIT, Guwahati.

Shri Ashok Kumar Khanduri joined ISRO during February 2010 as Administrative Officer at ISTRAC Bangalore and was posted at Lucknow since 18th February 2010. He joined IIRS during November 2012.

Shri Shiva Reddy K. joined IIRS during January 2013 as Scientist/ Engineer- SC in Geoinformatics Department (GID). He has done from M.Tech. (Geomatics) from IIT, Roorkee.

Shri Janardan Vishwakarm joined IIRS during February 2013 as Technical Assistant in Geoinformatics Department. He has done Diploma in Electronics Engineering from Board of Technical Education, Lucknow.

CONTACT extends a warm welcome to the new faculty and staff to IIRS family

Superannuations

We wish them a happy & healthy life after superannuation.

Smt. Shashi Kudrat
Sr. Project Assistant
31.10.2012

Dr. M.C. Porwal
Scientist/ Engineer-SG
30.11.2012

Dr. M. Kudrat
Scientist/ Engineer-SG
28.02.2013

Sh. K.R. Joshi
Sr. Project Assistant
28.02.2013

Sh. Om Prakash
Sr. Technician-B
31.03.2013

Sh. M.P.S. Chauhan
Scientist/ Engineer-SD
31.05.2013

Recreation Club Activities

गणतंत्र दिवस समारोह

26 जनवरी, 2013 को गणतंत्र दिवस समारोह के अवसर पर निदेशक डॉ. वाय.वी.एन. कृष्ण मूर्ति ने ध्वजा रोहण किया। सभा को संबोधित करते हुए उन्होंने सभी को दिवस की बधाईयाँ दी और आई.आई.आर.एस. व इसरो की गतिविधियों से अवगत कराया। ध्वजा रोहण तथा निदेशक महोदय के भाषण के पश्चात् 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 गई और सभी विजेताओं को निदेशक महोदय द्वारा पुरस्कृत किया गया।

– गणतंत्र दिवस आयोजन समिति

Cultural Evening

During the visit of Dr. K. Radhakrishnan, Chairman of Space Commission; Secretary, Department of Space, Government of India; Chairman of ISRO and Chairman, CSSTEAP-GB to the IIRS campus, the Recreation Club of IIRS along with Ladies Club and IIRS students organized a cultural programme on 23rd March 2013. Dr. Radhakrishnan graced the occasion and interacted with IIRS employees, their families and students.

- Recreation Club

Kathak Performance

Recreation Club, IIRS in association with SPIC MACAY organized Kathak performance by Ms. Monisa Nayak, an accomplished Kathak performer of the Jaipur Gharana on 5th October 2012. Ms. Monisa is an empanelled artiste of the ICCR, Govt. of India and has performed widely in major festivals within and outside the country e.g., Malhaar Festival of ICCR, Taj Mahotsav, Agra; Kalakshetra Kathak Festival, Chennai; Doordarshan's National Program of Dance, etc. She has been awarded the Bismillah Khan Yuva Puraskar, Sanatana Nritya Puraskar and Sangeet Kala Ratna, as well as the Sanskriti Kalakriti Fellowship for research in Kathak choreography. Presently, Monisaji is teaching at Gandharva Mahavidyalaya, New Delhi. Her prodigious talent, versatility and dedication to the art form were very much appreciated by IIRS family. The evening was attended by employees, students of IIRS, CSSTEAP and their family members.

- Recreation Club

Sports Events

The sports events were held in IIRS campus during January 2013. The IIRS employees and students participated in various sports events viz. badminton, table tennis, volley ball, etc. with great enthusiasm. Prizes were distributed by the Director, IIRS to the winners on the Republic Day. Shri Rajesh Kohli and Shri Shankar Acharya K. were awarded the 'Sports Person of the Events' under employees' and students' categories, respectively.

- Recreation Club

Dear Readers,

CONTACT bears a new look designed by a student, Shri A V Surya Sen. The newsletter shall be published bi-annually during June and December months. Please send your feedback to us at *newsletter@iirs.gov.in.*

TRAINING CALENDAR 2013

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										
1.	D-AS	Sustainable Agriculture	M.Sc in Agriculture/B.Sc. Agriculture (4 years)/B.E./ B. TECH in Agriculture Engg./Geoinformatics/Master in Geogrpahy/M.Sc. Environmental Science	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
2.	D-FE	Forest Resources & Ecosystem Analysis	M.Sc. Forestry/Ecology/Botany/Wildlife Sciences/Zoology/ Environmental Sciences/Master in Geography/B.E. (Geoinformatics)/B.Sc. Forestry (4 Years)/Forest Officers (B.Sc.+2years experience)	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
3.	D-GG	Geosciences	M.Sc./M.Sc.(Tech.)/M.Tech. in Geology/Applied Geology/ Geophysics/Earth Sciences/Geoexploration/Petroleum Engineering or equivalent/Geoengineering/Mining Engineering/Geoinformatics, Environmental Sciences, Geography (Specialization in Geomorphology) or B.Tech./ B.E. in Civil Engineering, Geosciences, Petroleum Engineering, Mining Engineering, Mineral Processing/Geoinformatics.	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
4.	D-MS	Marine and Atmospheric Sciences	M.Sc. in Marine Science/Earth Science/Geography/ Natural Science/Physics/Atmospheric Science/ Environmental Sciences/B.E.(Geoinformatics).	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
5.	D-UR	Human Settlement Analysis	Master in Planning / B.E. (Civil) /Geoinformatics/ B. Architecture / B. Planning / Master in Geography	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
6.	D-WR	Water Resources	B.E. / B.Tech. / M.E. / M.Tech. Civil Engineering / Agricultural Engineering / Geoinformatics/ M.Sc. in Geology / Environmental Sciences	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
7.	D-PR	Photogrammetry and Remote Sensing	BE/B.Tech./M.Sc./M.Tech. Physics, Maths, App. Maths, Statistics, Geophysics, Meteorology, Oceanography, Geology, Physical Science, Earth science, Natural/Environmental Sc., Geoinformatics/Master in Geography or MCA (with B.Sc. degree). The candidates should have mathematics as one subject upto 10 + 2 level. Govt. employee with Bachelors degree in science and 2 years experience.	6	19.08.2013	20.06.2014	Nil	60,000	6,000	31.05.2013
M.TECH. COURSE										
8.	+M-RG	M.Tech. in RS & GIS	M.Sc. in Natural/Physical Sciences/Geography/M.Sc. Geoinformatics/Geomatics/Earth Sciences/Geoexploration/ Petroleum Engineering or equivalent / Geoengineering/ Mining Engineering/Environmental Sciences/Natural Hazards/Disaster management B.E. or B.Tech. (Civil Engg. & Agricultural Engg.) Elec. and Electronics/Computer Sciences/Computer Engg./B. Tech. Geoinformatics Engineering, or B.Tech (IT)/B.E. in Geosciences/Geomatics, Petroleum Engineering, Mining Engineering, Mineral Processing / B.Arch./ M.Planning / B Planning/ / Master in Computer Applications (with B.Sc. degree) / B.Sc. (Forestry / Agriculture, both with 4 years duration course).	30	19.08.2013	14.08.2015	Nil	1,44,000 + 20,000 (Andhra Univ. Regn.Fee)	14,400 + 250 (Andhra Univ. Regn. Fee)	24.05.2013

Note :
- Master degree should be with Bachelor in Sciences.
- Preference will be given to Mathematics in 10+ 2 standard.
- Candidates should have secured a minimum of 55 % marks in the qualifying examination.
- M.Tech. is accredited by Andhra University, Visakhapatnam and from 2nd module onwards the students admitted to this course will have to select one of the following disciplines:
- Sustainable Agriculture, (ii) Forest Resources & Ecosystem Analysis, (iii) Geosciences, (iv) Marine and Atmospheric Sciences,(v) Human Settlement Analysis (vi) Water Resources,(vii) Satellite Image Processing &Photogrammetry and (viii) Geoinformatics
- The admission for M.Tech. course is based on entrance test and interview. GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its students.

GEOINFORMATICS : TECHNOLOGY AND APPLICATION										
9.	D-GI IIRS-ITC Joint Education Program	Post Graduate Diploma in Geoinformation Science & Earth Observation with specialisation in Geoinformatics	M.Sc. / M.Tech. Degree in Physics, Mathematics, Applied Mathematics, Statistics, Geophysics, Metereology, Oceanography, Geology, Agriculture, Urban and Regional Planning, Remote Sensing OR any Natural/Environmental Sciences,Master in Geography / B.E. / B. Tech. (Civil Engineering / Electronics and Communication, Computer Science/Computer Engineering / IT/Agricultural Engineering/ Geoinformatics/MCA (with B.Sc. degree).	10	23.09.2013	19.07.2014	Euro 300	65,000	3000	21.06.2013
10.	M-GI IIRS-ITC Joint Education Program	M. Sc. in Geoinformation Science & Earth Observation with specialisation in Geoinformatics	M.Sc. / M.Tech. Degree in Physics, Mathematics, Applied Mathematics, Statistics, Geophysics, Metereology, Oceanography, Geology, Agriculture, Geography, Urban and Regional Planning/ Remote Sensing OR any Natural/ Environmental Sciences OR BE/B. Tech. (Civil Engineering/ Electronics and Communication/Computer Science/Computer Engineering / IT/Agricultural Engineering /B. Tech. in Geoinformatics / B.Sc. (4 years) Agriculture /Forestry or equivalent OR MCA with Science Graduation or M.Sc. in IT.	10	23.09.2013	20.03.2015	Euro 2500 payable to ITC + (₹ 2,00,000 Approx. own expenditure for visit to ITC)	1,20,000 payable to IIRS +Euro 2500 payable to ITC + (₹ 2,00,000 Approx. own expenditure for visit to ITC)	7000	24.05.2013

Note :
- The candidate should have secured a minimum of 60 % marks in the qualifying examination
- GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its students.
- The M.Sc. degree is awarded under Joint Education Programme of IIRS-ITC by Facultyof Geoinformation Science and Earth Observation of the University of Twente, The Netherlands.

| 11. | D-NHDRM IIRS-ITC Joint Education Program | PG Diploma in Geoinformation Science & Earth Observation with specialisation in Natural Hazards & Disaster Risk Management | M.Sc. in Natural Sciences / Earth Sciences / Physical Sciences or B.Arch/B.Planning/M. Planning or B.E. /B.Tech. in Civil Engineering/ Agricultural Eng./Environmental Eng/ Geosciences/ Geoexploration/Earthquake Engineering/ Geoinformatics/IT/CS/ECE or B.Sc. (Forestry/Agriculture both with 4 years duration course) or Master in Disaster Management /Geography or Forest Officers (Graduates in Science with 2 years experience) / MCA (with B.Sc.). | 10 | 23.09.2013 | 19.07.2014 | Euro 300 | 65,000 | 3000 | 21.06.2013 |

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 $	
12.	M-NHDRM IIRS-ITC Joint Education Program	M. Sc. in Geoinformation Science & Earth Observation with specialisation in Natural Hazards & Disaster Risk Management	M.Sc. in Natural Sciences/Earth Sciences/Physical Sciences/ Agriculture or M.Sc. in Geography / P.G.in Urban and Regional Planning / B.Arch/ B.Planning/ M. Planning or B.E./B.Tech./M.E./M.Tech. in Civil Engineering/Agricultural Engineering/Environmental Eng/Geosciences/Geoexploration/ Earthquake Engg / IT/CS/ECE or B.Sc. (Forestry/Agriculture, both with 4 years duration course) or M.Sc. Geography/ M.A. Geography (with B.Sc.) / M.A. (Disaster Management with B,Sc.) / MCA (with B.Sc.).	10	23.09.2013	20.03.2015	Euro 2500 payable to ITC + {₹ 2,00,000 Approx. own expenditure for visit to ITC}	1,20,000 payable to IIRS + Euro 2500 payable to ITC + {₹ 2,00,000 Approx. own expenditure for visit to ITC}	7000	24.05.2013

Note :
- The candidate should have secured a minimum of 60 % marks in the qualifying examination
- GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its student.
- The M.Sc. degree is awarded under Joint Education Programme of IIRS-ITC by Facultyof Geoinformation Science and Earth Observation of the University of Twente, The Netherlands.

Sl. No	Course Code	Course Name	Entrance Requirements	No. of Seats	Starting Date	Passing Out Date	Govt. Spons. ₹	Open ₹	Foreign US $	Apply by Date
			REMOTE SENSING APPLICATIONS : THEME SPECIFIC ORIENTATION COURSE							
13.	O-DM	Remote Sensing -An Overview for Decision Makers	Decision makers in organizations (with 10 years experience in service).	10	18.06.2013	21.06.2013	7,000 @	7,000 @	700 @	18.05.2013
			INTERNATIONAL PROGRAMMES							
14.	S-RS	Short Course on Remote Sensing with special emphasis on Digita Image Processing (ITEC Sponsored)	Post Graduate degree in natural sciences, graduate in any engineering discipline, or graduate in natural sciences with sufficient knowledge of mathematics/statistics at high school level. Middle level resourcesl managers and professionals from Govt., NGOs, Universities with 2 years work experience relevant to natural science/management/ data-map handling. Age: Upto 45 Years or so.	20	07.01.2013	01.03.2013	20,000	20,000	2,000	28.11.2012
15.	S-GI	Short Course on Geoinformatics (ITEC Sponsored)	Post Graduate degree in natural sciences, graduate in any engineering discipline, or graduate in natural sciences with sufficient knowledge of mathematics/statistics at high school level. Middle level resources managers and professionals from Govt., NGOs, Universities with 2years work experience relevant to natural science/management/data-map handling. Age: Upto 45 years.	20	23.09.2013	15.11.2013	20,000	20,000	2,000	23.08.2013
			Dates of course at Sl. No. 15 are subject to change							
			CERTIFICATE COURSE							
16	C-RS	Short Course on Remote Sensing and Image Interpretation	Engineering Graduate / Post Graduates in Science and Geography.	5	07.01.2013	01.03.2013	Nil	12,000	1200	28.11.2012
			NNRMS - ISRO SPONSORED CERTIFICATE COURSES : FOR UNIVERSITY FACULTY ONLY							
17.	N-GI	GIS Technology and Advances	Post Graduate Degree in Science/Engineering Graduate. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
18	N-WR	RS & GIS Applications to Water Resources	B.E. / B. Tech., M.E. /M. Tech. (Civil & Agricultural Engineering) with 2 years teaching /research experience.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
19	N-FE	RS & GIS applications to Forestry/Botany/Ecology / Wildlife / Environmental Sciences	Post Graduate Degree Botany/Ecology/Forestry/ Environment/ Zoology / Wildlife Science/ Life Science. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
20	N-UR	RS & GIS Applications to Urban & Regional Planning	M. Planning/ B.E.(Civil)/B. Arch. / B Planning / Master in Geography. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
21	N-CM	Cartography and Mapping	Post Graduate Degree in Science/Geography. The candidates should have 2 yrs. teaching experience at PG level	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
22	N-GG	RS & GIS Applications to Geosciences	Post Graduate Degree in Geology/ Applied Geology/ Geophysics/Geography. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
23	N-GA	RS & GIS Applications to Agriculture and Soils	Post Graduate Degree in Science/Agriculture/Geography/ Environmental Sciences. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013
24.	N-MA	RS & GIS Applications to Meteorology & Atmospheric Sciences	Post Graduate Degree in Science / Marine Sciences / Meteorology / Atmospheric /Environmental Sciences. The candidates should have 2 yrs. teaching experience at PG level.	8	06.05.2013	28.06.2013	Nil	12000	1200	15.02.2013

Note: Please note the following important information:
- If the date of commencement falls on 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 also. In case of NNRMS sponsored course, the candidates admitted are paid TA/DA by IIRS as per 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 staff.** Private Universities & self sponsored candidates have to pay **full course fee** prior to joining the course.
- Security deposit : Self Financed candidates, have to deposit/ remit security deposit one month prior to the commencement of the course, failing which seats would be offered to the waitlisted candidates, as mentioned further: **(i) @₹4000/- in respect of Certificate Courses (ii) @ ₹6000/- in respect of PG Diploma Courses and (iii) @ ₹10000/- in respect of M.Sc./M.Tech. courses.**
- Boarding and lodging charges at IIRS Hostel comes to ₹ 2500 p.m. (approx.). **Local candidates will be considered for hostel accommodation, only if available.** **@Includes boarding and lodging charges for thecourse mentioned at S.No.13.**
- **Number of seats are subject to change in all courses.**

For further details, contact: Director / Group Director (Programme Planning & Evaluation Group),Indian Institute of Remote Sensing, ISRO, Dept. of Space, Govt. of India, 4, Kalidas Road, Dehra DunPin- 248 001, UTTARAKHAND (INDIA).
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E-mail:admissions@iirs.gov.in. Kindly visit www.iirs.gov.in for other details and application form.