Editorial

Editorial team of JIGU wishes all the readers and well wishers of the journal…Happy and Prosperous Dasara and Deepavali. 51st annual convention of IGU is scheduled during 19-21, November, 2014. On behalf of Editorial team I wish successful organisation of the convention. I urge students and the young researchers to avail the opportunity of attending the convention to enhance their knowledge base by interacting with senior scientists. Since the main theme is very important for the young to help our society, I encourage the young to come out with novel methods of research for sustainable development of all the stakeholders of our society. If such interactions take place the young could be of significant help in meeting needs of the society and saving the environment. Geo-technical expertise could be acquired by earth scientists, as they have basic knowledge of geology and tectonics of a region. In addressing natural disasters, we need to have holistic approach, by synthesising all the relevant data sets of different branches of earth system.

In support of my statement I give below a recent example. The disaster that wiped out a village in Sahyadris near Pune could have been averted, if geotechnical practices had been aptly applied, under the supervision of experts. Weather experts also need to be alert, in monsoon times. It appears that NASA has alerted on 29th July, with a map showing Malin area in Pune as landslide prone area but IMD failed to notice it. The village Malin near Bhimasankaram, one of the Dwadasa Jyothirlinga kshetras, the Sahyadris is covered by thick Deccan lava sequence. The high level laterite has capped mesas. These lava layers get separated by erosion. In this area where land slide took place, the tableland is highly fractured, and prone for breakaways. Such a breakaway resulted, on the fateful day, in dislodgement of the huge laterite blocks. In this highly sloppy hilly region, where dredging and levelling was carried out earlier without properly assessing the ground reality, the laterite blocks that were dislodged and precariously embedded in the loose soil crashed down after high intensity rains leading to the man-made disaster. The Ministry of Environment, Forests and Climate Change is setting up a three-member committee to look into the issues surrounding the landslide. Ambegaon district near Pune had in fact, been marked out as an ecologically sensitive area in the Kasturirangan Committee report, which had subsequently been accepted by the Ministry of Environment in November last year. However, according to activists, developmental activities including quarrying did not stop in the area, consequently resulting in the landslide that claimed at least 136 lives. The Kasturirangan Committee report had said that about 37 per cent of the Western Ghats as having high biological richness. It recommended that a non-tolerance policy be approached with respect to environmentally damaging activities such as mining and quarrying. However, these activities have allegedly continued in the area, which includes Malin, resulting in formation of loose rocks and soil. It is essential that " Ground Truthing " is carried out in zones that are identified as sensitive by satellite imageries. For such a survey it is essential to make use of earth science, geo technical and environment experts, as a close-knit team to objectively assess the ground reality.

State of Affairs:

It is always good to derive happiness by completing a task on hand. The task of finalising a set procedure to ensure steady growth of the journal has been partly accomplished by selecting procedures, priority wise, by the Editor and Executive Editors. However, implementation of these procedures needs a concerted effort by all the concerned. Like an overused gramophone record I continue to request one and all to support. The record has become old and any time may become useless. As repeatedly pointed out by me in all my editorials the journal can grow only when scientists, teachers and research scholars contribute quality manuscripts .Since last 20 years IGU has honoured at least 80 to 100 senior and junior scientists. I personally requested all the award winners to contribute articles to the journal. A resolution was made during 49th annual convention, making it mandatory for the award recipients to contribute articles to IGU journal. The response is dismal with only six responding to it. In spite of such a scenario I am confident the journal will grow and receive needed support. I say so as I am aware and believe in Swami Vivekananda message…..." Have faith in yourself, and stand up on that faith; that is what we need ".

Need for a pragmatic approach in reporting scientific results:

Using travel times of shallow and deep earthquake body waves myself and my colleague Dr.V.G.Krishna, independently in collaboration with Dr.K.L.Kaila delineated presence of two velocity discontinuities (structural and compositional changes) at depths of about 400 and 600 km, respectively, in India and different parts of the earth. The results were published in late 1960s and early 1970s. Subsequent Tomography and Receiver Function studies by seismologists have brought in to focus finer details of these discontinuities. From research point of view all these studies have significance, but nothing directly connected with societal needs.

On 14th June, 2014 a reputed English News paper brought out an article with the title "World`s largest water reservoir found". The article starts with the sentence "In what could quench the thirst of billions of people in the future, researchers have discovered our planet`s largest water reservoir 640 km beneath our feet. The north-western University, USA scientists have stated that they have found deep pockets of magma located beneath North America, a likely signature of the presence of water at depths of 640km". This is a commendable scientific finding. However, the concerned geophysicists never claimed that this water trapped inside the molecular structure of the minerals in the mantle rocks would quench the thirst of billions.

The actual statement by the concerned geophysicists is given below:

Scientists said massive amounts of water appear to exist deep beneath the planet's surface, trapped in a rocky layer of the mantle at depths between 250 miles and 410 miles (410 km to 660 km).*The water is not liquid - or any other familiar form like ice or vapour. It is locked inside the molecular structure of minerals called ringwoodite and wadsleyite in mantle rock that possesses the remarkable ability to absorb water like a sponge***.**

"It may equal or perhaps be larger than the amount of water in the oceans," Northwestern University geophysicist Steve Jacobsen said in a telephone interview. "It alters our thoughts about the composition of the Earth." "It's no longer liquid water that we're talking about at these great depths. The weight of hundreds of kilometers of rock and very high temperatures above 1,000 degrees Celsius (1,832 Fahrenheit) break down water into its components. ***And it's not accessible. It's not a resource in any way,"*** *Jacobsen added.* The statement, clearly states that the water from that depth is not a resource in anyway.

For the last 5 to 6 decades systematic efforts have been made to drill deep holes, both on land and in Oceans, to have direct access to deeper formations. Number of theories proposed using surface scanning methods proved wrong looking at formations present even at a depth of about 10 km and earth scientists (all over the world) have been exposed to reality and limitations of our imaging techniques. These efforts made a considerable change in our way of working and building models**.** It is clearly proved beyond doubt, during drilling of deep holes in to the crust that drilling even holes up to 20 km is fraught with many problems. If so, how one can expect water in molecular form probably present at 400 to 650 km can quench thirst of billions of people. Such media presentations do only harm the scientists and their initiatives. It is necessary that a type of screening is introduced before publication of such articles, as the contents would unnecessarily create hope to common man, suffering for want of drinking water. To an extent we need to blame ourselves, as it is evident that some of our scientists derive pleasure through media interactions. To avoid problems to scientific community and the common man we need to avoid hyper projection of our studies that have an impact on our society.

Our role in strengthening country`s Economy:

Country`s economy, apart from IT, depends mostly on proper use of our natural resources, production of quality commodities to enhance exports and growing agriculture based food products. Due to EL-NINO effect and other weather related adversaries our agriculture sector is facing problems. If the newly formed government is to meet all the demands of

125 crore population, we have to be successful in all the above mentioned sectors. Since it is established that sustainable development of our economy is closely linked with our agriculture, earth-system scientists need to contribute significantly to overcome the problems being faced by our farming community, by providing needed inputs to experts in the agriculture and irrigation. It is essential for enterprising earth scientist to get exposed to some applied subjects of meteorology and agronomy that are indirectly linked with earth sciences, to make his specialisation useful to the society. It is good to learn that CSIR has selected 25 Technology Villages (TECHVIL), identified from 25 backward districts of India under CSIR-800 program. The aim of the CSIR-800 programs is to improve the living standard of the 800 million Indian citizens from rural areas through science and technology. Under this programme a cluster of villages has been selected from Nalgonda district, Telangana by CSIR-NGRI for introduction of water conserving new irrigation practices to cultivate Rice (Please refer to the article by Rekapalli et al in this issue).

In our endeavour to augment our water resources, it is essential to introduce innovative technologies. One such technology—Soil Bio-technology (SBT), has been found to revive a contaminated Herohalli tank of Bengaluru city. It is heartening to learn that using the concept of sewage mining, the SBT system taps into the sewage line and draws 1.5 MLD into a small wet well. From there the water is strained using 20 mm and possibly 10 mm strainers to remove solids, plastic, grit and large sediments. This is then collected and removed separately. The remaining waste water is then allowed to percolate gradually through a specially prepared bed of soil, gravel and stones, which harbour millions of bacteria. These bacteria eat away at the carbon in the sewage and also change the composition of nitrates and absorb phosphates to clean up the water.

Since such scientific initiatives are given due weightage by research institutes, it is essential to extend the scope of such technological initiatives to help the farmers, through an integrated approach. To make clear my point I have selected couple of topics. Please go through the details and ponder over various possibilities to help our country`s wellbeing.

Monsoon Aberrations:

Monsoon arrives to India every year with a standard deviation of one week. The early prediction by IMD weather experts that 2014 SW monsoon would be below normal has been proven to a considerable extent, with scanty rains during June and first half of July. By mid-July, which is critical period for sowing operations, all India rainfall was deficit by 43 per cent indicating severe drought like situation leading to many socio-economic consequences. Even though there was a temporary revival in the second half of July, failure of monsoon (especially in the southern and western India) in August confirmed that El Nino has set in. The possible development of El Nino for longer duration and its influence on monsoon behaviour have created fear among the planners and the society at large. Irrespective of various positive statements by all those associated with our food production, the set back to agriculture is clearly evident.

Thanks to global warming, scientific studies suggest more frequent extreme events like cyclonic storms, torrential rains, floods and droughts in many parts of India. Extreme climatic events in the Indian Ocean region are caused by significant differences in sea surface temperatures (SSTs) between western and eastern Indian Ocean. These differences, influence weather patterns over the Indian subcontinent. Since SSTs can get reversed, as the winds and ocean currents do have a significant role, short term fluctuations in all these elements (regional and local) are to be constantly monitored and apt prediction models developed to give proper advice to farming community. Nevertheless, predicting how an El Nino will shape up and , more importantly for India, forecasting what might thereby happen to the monsoon are still challenges, as there could be several factors influencing the interplay between an El Nino and the monsoon. In the event of fractured monsoon activity, area specific advices and location-specific contingency plans would be very useful to the farmers and Agro-meteorologists can play a significant role in providing needed inputs, in lessening the misery. The `National Agro-met Advisory Bulletin' by the India Meteorological Department in collaboration with the All India Coordinated Research Project

on Agro-meteorology, Central Research Institute for Dry land Agriculture would provide district level contingency plan and crop-specific advisories to be followed to mitigate the prevailing conditions and improved agricultural production. Let us look forward to the results of the `Monsoon Mission' towards improved location specific weather predictions over the country.

Agro-meteorology

Agro-meteorology is the scientific study of influence of weather on crops, animals, fisheries and other species related to farming. The scope and purpose of Agro-meteorology is to "apply every relevant meteorological skill in helping the farmer to make the most efficient use of the physical environment for improving agricultural production". Several farming activities from seedbed preparation to harvest, storage, marketing and transport are influenced by weather. Study of hydrological cycle in relation to crop husbandry had thus drawn the attention of researchers since early times. India was the first country to initiate research in agricultural meteorology through the pioneering efforts of late Prof. L. A. Ramdas in 1926. Since then, Indian Council of Agricultural Research, Department of Science and Technology, Ministry of Earth Sciences evolved the weather based agro-met advisory services to the farmers, at the district level. These advisories are accessible through various means of communication systems available. Yet, currently, farmers do not have access to reliable locally relevant meteorological and agricultural information by which to plan and manage their farming operations. Information presently available is based on inputs from weather stations that are located at taluka or mandal head quarters. In the monsoon-driven weather systems, local agro-meteorological conditions, especially rainfall, vary within even a kilometer; and such distantly located weather stations are not able to provide data that can generate locale-specific knowledge and advisories. For example, need-based irrigation scheduling and pesticide applications not only benefit the crops but also improve the sparse water resources and reduce environmental contamination. In earlier days, before technology drove our lives, the elders of the village planned their agriculture activities based on how they sensed the forthcoming weather and what they observed in the surrounding flora and fauna. Most of this indigenous knowledge is now lost.

Extreme weather events like hailstorms, gale winds, droughts, floods, and heat and cold waves affect both crops and livestock. The major concern is the frequency of occurrence of these events and their timely predictions. Farming community especially small and marginal category does not have fast resilient ability to tide over ill effects of vagaries of weather. One element of weather risk management strategies is to enhance the financial services available to cope with weather risks. An option being tried in several countries is the use of weather index insurance or weather derivatives. The need of the hour is to develop better weather based insurance schemes and weather data which are to be considered for compensation in the event of occurrence of weather extremes. Sparse network of weather observing stations is proving a hindrance for agro-met applications at large and emphasis has to be given to increase the network of weather stations. Ultimate goal should be to monitor weather conditions in each village.

Finally, earth system science, in particular agro-meteorology has substantial contributions to make towards understanding crop growth, irrigation requirements, pest/disease outbreaks, selection of fertilizer, microclimate modification etc., on one side, and harvesting, storage, transport and marketing etc., on the other. Possibilities are immense in furthering research and development of climate forecasting models and expert systems with user-requirement targeted approach would be a viable solution. Integration of traditional knowledge, support from basic and applied research, adoption of new approaches to analysis, utilization of modern tools like remote sensing, simulation modelling, GIS technology and communication systems, are expected to result in framing of more realistic targets. Weather-based agro advisories would stimulate value added services for day-to-day agricultural operations, and move towards sustainable agricultural produce.

I request IGU to consider organising a one day workshop involving agro-meteorologists, agronomists, earth scientists and experts in weather forecasting, with the support of ICAR, DST, IMD, CSIR and MOES. This would enhance the visibility of IGU and send a clear signal that IGU is genuinely concerned about the welfare of our society.

This is important when we take in to consideration expert's views on deterioration of hither to known set monsoon pattern. Weather experts/ scientists point out that India should brace for more calamities like landslide that devastated Malin village near Pune, blocking of Kosi river in Nepal and catastrophic rain and flood in Uttarakhand last year. Climate scientists say days of evenly spread rainfall are past and globally, there is a growing instance of torrential downpours separated by dry patches.The weather office says at least in central India, there is empirical evidence to show that extreme rainfall events are rising. "Heavy rain events (more than 10 cm/day) over central India are increasing at about 1 per cent/year while weak and moderate events are decreasing at about the same rate over the past 50 years," minister for science and technology and earth sciences Dr. Jitendra Singh told Parliament. Dr. RK Pachauri, chairman of intergovernmental panel on climate change (IPCC), has consistently raised concerns about the rising incidence of extreme rainfall, although there may not be a direct link between any single event and climate change."No single extreme event can be attributed to human induced climate change, because it could have occurred as a result of various causes. However, the IPCC has assessed that extreme precipitation events are on the increase over many parts of the globe. In future, extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will very likely (probability of over 90 per cent) become more intense and more frequent by the end of this century."

In this Issue:

We have included in this issue six research papers and two research notes, in addition to News and Views. In the first paper Prabhakar E Rao etal presented results of magnetotelluric study in the Surajkund hot spring area. With a view to understand the subsurface electrical structure of the hot spring area and to examine its relation to the origin of hot springs, a magnetotelluric (MT) survey was conducted in and around the Surajkund hot spring area. The 2D modeling results of the MT profile brought out an anomalous, 10Km. thick horizontal crustal conductor (5-10 Ohm.m) underneath the Surajkund hot spring area in the depth range of 5-15 km. The anomalous high conductive feature in this tectonically active NSL zone is inferred to be magmatic material originated from upper mantle depths and emplaced in the upper crust. The study assumes importance in view of our efforts to have thermal energy to augment our energy basket. In the second paper Rekapalli et al detailed about groundwater management in drought prone Mandollagudem TECHVIL cluster of Nalgonda dist, Telangana state. They suggest that the adoption of System of Rice Intensification method along with Alternate Wetting and Drying method and Direct Seeding methods would help to reduce the consumption of water up to 30 percent with more grain productivity compared to continuous uncontrolled flooded field methods .If practiced the suggested cultivation practices would arrest to a reasonable extent fast depletion of groundwater. In the third paper Satyavani et al detailed about Gas Hydrates occurrences in Andaman offshore. Multi-Channel Seismic (MCS) data in Andaman offshore shows a prominent bottom simulating reflector (BSR) at a depth of ~575 meters below the seafloor (mbsf), indicating the presence of gas hydrates/free gas in the region. Based on AVO modeling and attenuation (Q^{-1}), an attempt has been made to qualify if the BSR is related to gas-hydrates underlain by free gas. The increase in seismic amplitudes at BSR, almost double to that of the seafloor, indicates the presence of free gas below the BSR and the study of Q made at two locations (with and without BSR) indicates the presence of gas hydrates above the BSR. In the fourth paper Subba Rao and Chandra Sekhar detected oil contamination, using integrated geophysical studies. They have demonstrated that Ground Penetrating Radar (GPR) and 2D Electrical Resistivity Imaging (ERI) methods provide a rapid and economical solution non-destructively, to detect hydrocarbon leakages and contamination from underground seepage sources. In the fifth paper Surajit Gorain presented Multi-litho Attribute based Inversion for Reservoir Classification in Kalol Reservoir, Cambay Basin, India.He has demonstrated that "Multi-litho Attribute based Inversion" provides a way to generate 3D attribute volume of log property(GR, RT, DT and other conventional well logs) from seismic and well log data.He further pointed out that Reservoir/Non reservoir can easily be separated out using this approach.It is shown that this approach is operative even if the reservoir is very thin beyond seismic resolution and can provide a probability distribution map of reservoir. In the sixth paper Varade et al analyzed the

pumping test data of ten (10) large diameter dugwells, falling under micro-watershed WGKKC-2 of Kalmeshwar Tehsil, Nagpur district, Maharashtra. The drawdown and recovery data, generated through pumping tests were analyzed by the empirical formulae given by Kumarswamy (1973). They have found out from their study that the transmissivity (T), Specific yield (Sy) and Specific capacity (C) values determined using empirical formulae of Kumarswamy (1973) fall within the reported value ranges of basaltic aquifer, estimated by various other researchers. Therefore, it is concluded that the Kumarswamy method can be significantly used in the determination of aquifer properties in shallow, unconfined and anisotropic aquifers of hard rock Deccan trap basaltic terrain. Through a short communication "Applications of thermal conduction equation models in Indian geology" R.N.Singh has stressed the importance of Heat Conduction models. He has reiterated that heat conduction equation models have found extensive applications in constructing knowledge about thermal structure and evolution of continental lithosphere. He has succinctly brought into focus that this knowledge is vital for understanding the rheology and deformation of lithosphere. In the second short communication (Research Note) "Active Seismograph for Early Detection of Earthquake" D.N.Avasthi has pointed out that Active seismographs measure the response of subsurface geologic and tectonic features to changes in the rock properties of their constituents under stress generated due to progressive increase in destabilising geologic forces. And as such they are better suited, compared to passive seismographs, to issue necessary warning with sufficient time in hand to meet the disaster that the impending earthquake may bring about. Short term earthquake prediction is fraught with number of subjective judgements. Since decades efforts are made by earth scientists to unravel the mysteries associated with short term earthquake prediction. We are yet to conclusively come out with answers to many facets of earthquake generation. Success can be confirmed only when the result is replicated, in time and space. However, since scientific endeavours that can help the society need to be given due importance the research note of Avasthi is included in this issue, as the suggestion made by Avasthi needs to be given due importance, by providing needed field support. Since segments of Uttarakhand are being monitored for abnormal sub surface structural changes (presumed to be probable locales for future high magnitude earthquakes) it would be better to deploy Active Seismographs in select zones and monitor their performance. It is pertinent to state that other surveillance techniques need to be given due weightage, during these experiments, to generate different data sets to bring out integrated models that might probably show subtle signals associated with deformation/ stress/ strain etc. If these efforts yield reasonably acceptable results in time and space the responsible authorities can give needed Philip to this initiative. As suggested by the author seismologists of MOES and research organisations have to provide needed support in deploying and monitoring the active seismographs.

In the subsection "News and Views at a Glance", some recent developments/studies in Space and Planetary sciences have been detailed.

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