Editorial

Golden Jubilee Celebrations have started with couple of successful initiatives that helped to enhance the visibility of this Journal. Journal of IGU has become a cited journal with effect from January, 2013. This has materialized due to concerted efforts made by Dr. V.P. Dimri, Dr. P. Koteswara Rao, Dr. P. Sanjeeva Rao and Sri P. Siva Subramanian. I am personally grateful to them, as I have been dreaming about this achievement for the last 15 years. Editorial team is aware that this is only the beginning and we have to go miles to make it an internationally reputed journal. Such a growth can be achieved only by committed support to the journal by one and all. We have received a shot in our arm with the open support extended by Prof. Mrinal K Sen, Director, NGRI. He has asked NGRI scientists to contribute one article each in one year to enhance the impact factor of the Journal. While extending support Prof. Sen stressed the need to enhance quality of the journal, to avoid down grading of the journal. This is an apt caution. We are extremely thankful to him for this unequivocal support. We assure him that we would put in all efforts to meet the aspirations of our scientific community. We humbly request our scientific community to come forward and support this journal. Kindly note that IGU or IGU journal are not owned by couple of individuals. They belong to nearly 750 members/ fellows. Due to some setbacks, we could not reach out to all the members of the IGU family. No one is responsible for this set back. Some unforeseen developments and lack of facilities led to this .We solicit your support, in bridging this gap. We have brought out a new Directory of IGU members/ fellows. After carrying out needed changes, if any, in consultation with individual Fellows/Members it will be kept on our website in about 2 months. Please bear with us, till then. Hopefully, this should enhance better connectivity between IGU office and the IGU family members. I am happy to inform some senior scientists, who have received IGU awards, respecting the decision taken by the IGU General Body have come forward to contribute articles to the journal. I request them to contribute articles, at their earliest convenience.

A Tribute

The Journal of IGU was started 16 years back. It has come to this level due to untiring efforts made by Late Sri N. Venkateswarlu and Dr. P. Koteswara Rao. Late Sri Venkateswarlu was meticulous and ensured publication of the journal on time. As Editor for the first 10 years I have seen its growth, amidst number of road blocks. I could overcome them due to the support extended by Late Sri Venkateswarlu. I and Dr. Koteswara Rao remembered him, when we received impact factor-citation certificate from NISCAIR, New Delhi. The rating is reasonably fair (0.133), when compared to many other journals. Late Sri Venkateswarlu would have felt extremely happy and satisfied in hearing this news. IGU fraternity dedicates this positive development, in his memory.

IGU is thankful to many for this achievement ---Sponsors, Patrons, Presidents, Executive Committee members (1996 till date), Authors and Reviewers, past and present Editorial Board Members, Editorial Office, NGRI and Artworks Publishers. The Editorial team looks forward to continued support from all of them.

Golden Jubilee workshops

Due to excellent support extended by NIO and NCOAR, Goa we could successfully organize a two day workshop at NIO, Goa. A write up on this workshop included in this issue. We are hopeful rest of the four workshops also would be successfully organized at NESAC, Shillong, WIHG, Dehradun, SRMT University, Nanded and IIT, Kharagpur. Our main objective in organizing these workshops is to basically propagate the importance of various studies carried out by earth system scientists. It is relevant to point out here that scientists belonging to four branches of earth system are striving hard to serve the

Mankind in enhancing their living standards without adversely affecting the Nature, Environment and cohabitants…Flora and Fauna. Still, we are groping in dark in developing models that logically bring out solutions to problems. This is due to absence of a meaningful dialogue between scientists, scientists and administrators/ politicians. We are optimistic that the five workshops would bring together scientists of different branches of earth system sciences and help them address various environmental and societal problems, using holistic approach.

Seismicity of Himalayan Belt—Present Scenario

A physicist has stated `Nature does not know what you are looking at, and she behaves the way she is going to behave whether you bother to take down the data or not'. This perfectly holds good in the case of Nature`s role in generating earthquakes of different magnitudes, in different segments of the Himalayan belt. With the availability of new recording gadgets and processing methodologies, studies have been carried out by individuals and groups of individuals, leading to publication of number of excellent articles on the existing scenario. The models depicting block and region wise structural fabric suggest varied pattern in different segments of Himalayan belt. There are number of regionally extending faults parallel and perpendicular to the strike. In addition there are local faults that are intersecting the regionally extending faults. Each tectonic block/ domain has local stress pattern in addition to the regional. Indications of stress transfer from one segment of a fault to other segments and from one fault to the other suggest a complicated dynamics of internal processes. In nut shell the seismotectonics of entire Himalayan belt is very complex and intriguing. The region witnessed both strike-slip and thrust/ subduction related seismic activities of different magnitudes from varying focal depths. There exist two schools of thought, in addition to some individual opinions. One school believes a 9 magnitude earthquake is going to occur at any time. The other believes that it is difficult to subscribe to such a short term prediction (in time and space) from the available data. They also believe if the prediction is accepted in totality and one issues statements to that effect; we would be creating a chaotic situation affecting millions of people. Some kind of physical REALITY actually exists. But none knows what the REALITY is. Only reconciliation between subjective probability and objective probability can expose us to "elements of reality".

It is a well known fact that our country is vulnerable to both inter and intra plate seismicity. Every seismologist knows that short term prediction of high magnitude earthquake is still beyond our comprehension. As such, it is extremely essential for us to strengthen our knowledge base through our own capabilities and face the vicissitudes of our efforts boldly. Himalayan belt is under considerable strain and the built up energy has to come out one day or the other. The last big earthquake of 8.7 magnitude, occurred more than 60 years back, killed many and destroyed a large chunk of foothills region. A 9 magnitude earthquake can be manifold destructive, than the previous big earthquake. Every seismologist is aware of this. However, due to complex tectonic fabric it is impossible to predict which segment of 5000 km long mountain chain will snap first and how this would result in subsequent activity and when?. At the same time no one can rule out occurrence of a big earthquake at any time starting from immediate future to next 30 or 50 years. As stated above there are two schools of thought regarding present status of seismicity in the Himalaya. A proper interaction between these two schools of thought can help one and all in facing any probable catastrophe.

Excellent scientific research has been carried out by American seismologists, in understanding the earthquake mechanism and nucleation. They, however, desist from giving statements pertaining to short term forecasting/ prediction of a seismic event. We salute them for their steadfastness, in pursuing their research and their humility in accepting their limitations in short term prediction of a big earthquake. They are basically concentrating on strengthening vulnerable zones, by producing area specific structural

models (with minute details) and educating common man regarding steps to be taken to minimize losses, due to a big earthquake. They are monitoring in real time any changes in and around many faults and constantly upgrading the quality of various models, necessary to face any Catastrophe. Inspite of their commitment to help the common man they are under constant stress, as they are yet to come out with a short term prediction (in time and space) of next big earthquake in California. The signatures of the stress are palpably visible on the faces of committed seismologists.

We need to generate apt data. In generating such a data we have to take the help of positive thinking foreign scientists and governments. Once such a data is generated we can better strengthen our disaster pre-paredness programs, albeit keeping in view the magnitude of the problem, magnitude of such pre-paredness operations, viability of carrying out such operations with presently available resources and facilities. Wisdom is best obtained by learning to think clearly for oneself. By thinking in an objective way, majority of the Indian seismologists have come to a conclusion that short term prediction is still beyond our reach as many factors contribute to release of inbuilt stress. The interaction between lithosphere and ionosphere, the extra terrestrial gravitational pull, rare planetary congregations, solar eclipse influence, piezoelectricity in internal rock strata, ionosphere plasma bubbles and density variations, electric coupling between the ionosphere and surface changes in the earthquake fault zone, surface and sub surface strata's dynamic response to continued internal interactions, when impart their influence in an unknown way, one would witness some signatures as pre and co-seismic events. These signals cannot be interpreted in isolation and come to a conclusion. A Japanese scientist by analyzing data from GPS network, has detected an increase in the Total Electron Content (TEC) in the ionosphere above the focal region of the earthquake beginning about 40 minutes before the earthquake. Some scientists have reported increase in Outgoing Long wave Radiation (OLR) emitted from the earth atmosphere system to outer space, before an earthquake. Some have noticed radon emission before an earthquake. Some others have reported ground water fluctuations and changes in the Vp/Vs ratio. All these reports were based on post event studies. We appreciate the importance of these studies. But, we do not call these scientific results as part of short term prediction. Since February, 2012 number of TEC enhancement anomalies from Sumatra-Java, Haiti, South America, Tibet and Pacific Ocean have been noticed. No seismic activity has been reported from any of these regions. As pointed out by an eminent international seismologist all these signals only suggest that our Mother Earth is showing signs of increased restlessness. We do agree that scientific, management, mitigation, relief & rehabilitation teams need to be more vigilant. We make it clear that reported forecasting of an earthquake in Italy, based on radon emission, was very exceptional and rare. Such predictions are routinely made, through correlation of various factors. As of now no concrete short term prediction has been made successfully (of big magnitude earthquakes), except the one in China that was based on animal behavior. In the last one year one Indian Astro-Seismologist predicted about 5 earthquakes, based on planetary positions. None proved correct. We are pained to hear the unsavory treatment meted to the hapless Italian seismologists, who could not predict an earthquake, due to various limitations and non uniqueness of some pre-seismic signals; including radon emission. Indian seismologists are carrying out apt research that helps in building area specific building codes by generating vast information base pertaining to issues like regional geology and seismotectonics, liquefaction potential and susceptibility, site amplification and predominant frequency response, shallow velocity structure and site specific hazard. Every one of them supports continuation of fundamental research that is aimed at in solving the puzzle associated with earthquake mechanism and nucleation. As and when the seismologist/s (of any country) succeed in unraveling this mystery, in an unequivocal manner (short term prediction of a high magnitude earthquake in time and space) all of us would salute him/them for his/their success, as such a success would immensely help the man kind in facing the most unpredictable Natural Hazard---the Earthquake.

Indian seismologists, taking note of the seismic hazard potential of the Indian region, have already initiated number of measures, in the right direction, including strengthening surveillance net work in logistically difficult terrain, acquiring and processing Real Time GPS data, preparing Shake Maps, educating to the extent possible both the planning and administrative channels. However, we do agree that lot more has to be done, to build appropriate data bank. The major thrust has now shifted from earthquake forecasting to earthquake hazard assessment and mitigation. Microzonation studies have been taken up, in right earnest, by almost all the research institutes including NGRI, IMD, GSI, CBRI, SERC, ISR and some universities, independently and as joint programmes. DST, MOES, CSIR, NDMA are extending support to these initiatives. However, preparing such codes/ models in many vulnerable segments of Indo-Gangetic Plains and Brahmaputra Basin requires considerable inputs in the form of infra structure and man power. One has to admit that we are acutely short of both the equipment and the trained manpower. To complete the task on hand the seismologists need positive support from one and all. I am optimistic that we would receive the needed support from within and outside.

Scientific temper:

Often we hear we need to develop scientific temper to solve many societal problems. What is scientific temper? Even many scientists do not know meaning of this oft quoted phrase. We believe that a real scientist is one who carries out his well planned studies, with dedication and focus, without expecting in return anything of materialistic importance. In this process he surrenders himself to his work and derives pleasure in seeing the success of his/ her study/ experiment. Scientific temper describes an attitude which involves the application of logic and the avoidance of bias and preconceived notions. Discussion, argument and analysis are vital parts of scientific temper. It is thus necessarily open — admitting every point of view, however heterodox it might be, or where it comes from. Elements of fairness, equality and democracy are built into it. To develop scientific temper, is one of the fundamental duties of the Indian citizens, according to the Constitution of India (Courtesy: Google search). Unfortunately, majority of our scientists consider scientific research as a routine office work. So, to start with our scientists should develop scientific temper. Once such a change takes place it is easier to enhance quality of our scientific pursuits.

New Science Policy:

Government of India has announced recently, a new science policy. As per this number of new research institutes will be built, covering different branches of basic sciences (including earth and atmospheric sciences). While welcoming such an initiative, we advocate strengthening of existing research institutes and universities, as additions alone will not solve the basic problems. Let us not statistically project development with money spent. However, the question of funding fundamental research remains a matter of concern with the country not yet out of the bind of sparing only one percent of GDP. The new science policy proposes considerable increase in research funding. Assuming such a development would take place in the near future, we need to give top priority in encouraging young students (middle and high school) in developing interest in basic sciences. As pointed out by Prof. Mrinal K Sen., Director, NGRI we need to motivate young researchers to take initiative in solving problems, through direct interaction with peers, rather than allowing them to carry out routine research exercises without understanding the basics. In nutshell he advocates inheritance of scientific temper. We strongly support the initiative (put into practice by NGRI) of training young research scholars in upgrading their knowledge through direct interaction with seniors and internationally reputed scientists. It is evident that Prof. Sen is aiming to mould the young researchers to be communicative, acquire creative problem-solving knowledge, resourceful, curious and professional. Once these are attained they can shine anywhere and do not look

forward to instructions from seniors for all jobs. Basic idea for such training/ interaction is to unleash the creativity amongst the young researchers and bring them out of their tight and secluded compartments. As stated by Swami Vivekananda - We want that education by which character is formed, strength of mind is increased, intellect is expanded and by which one can stand on one`s own feet.

Students and young researchers are in general either too vociferous or too submissive. Both these qualities are detrimental to their growth. Students from developed countries have a different outlook. They are encouraged to freely interact with peers. Such a meaningful approach can be practiced by young scientists of 25 to 35 years, if they have been involved in such interactions from their formative age—10 to 15 years. We notice some intelligent young scientists, who have never received appropriate guidance and advice during their formative years, avoiding direct interaction with seniors. A meaningful dialogue and effective interaction is essential to strengthen the capabilities of young scientists. Once they cross this phase of their lives it would be very difficult for the young to develop a fearless approach, even if they are blessed with good intelligence. So, the new science policy should advocate fearless learning process, starting from young age, to make our country world leader in scientific research.

Today economy is growing at 6-7 % a year and the Government is eager to invest in scientific research and development. Still, India's aim of becoming one of the global leaders in science is a tall order. Chief among the challenges are training teachers, providing infra structure for a ballooning population of students, and attracting a higher fraction of those students to basic sciences including earth system sciences. The recent failure of the vast majority of candidates in the Central Teacher Eligibility Test is convincing proof that the system of teacher education is in urgent need of repair. The gamut of issues surrounding teacher education needs a fresh look. As pointed out by a learned senior scientist "in the old days we had no money but had people. Today, we have the money but not the people". Since numbers give hope that upcoming generation may produce more scientists, the Indian government has set a goal of increasing undergraduate attendance from one in nine to one in three in the next ten years. The unfortunate happenings in some of the universities, demanding free entry to carry out Ph.D. studies, setting aside merit are rather painful to witness. We need to discipline the entire education system to achieve international standards in education and research. As stated by eminent scholars training people, following scientific temperament principles, is perhaps the most daunting hurdle faced by us. Absence of scientific culture and lack of scientific temperament are adversely affecting the growth of large scientific projects and the meeting of higher education goals. It is essential to note that scientists and university teaching staff should be encouraged to carry out their duties freely, without fear, to make new science policy successful. It is necessary for the government to understand that any changes suggested should have full backing of both research and teaching communities. To start with any change in the teaching and research procedures will be opposed by both the teaching and research professionals. This reality should be kept in mind, before making any drastic and abrupt changes. The change should be gradual. University faculty is used to work in a different type of environment. As stated by Paul Johnson (2010-Forbes India) "Best of the schools are characterized not so much by what they teach but by the extent they provide opportunities and encouragement for students to teach themselves. The best also help to instill certain intellectual virtues in young minds, including respect for democracy, the rule of law; the need to back up opinions with clear arguments, empirical evidence and hard work; the varying importance of resolute conviction and friendly compromise, when appropriate; open-mindedness at all times; and the perpetual need for courage in the pursuit of truth". Unfortunately, we are short of such schools, leading to production of mediocre graduates and post graduates. Scientists and the management in the national institutes have got used to not having to deal with teaching inquiring minds. As of now, unfortunately, both the teachers and scientists are working in suboptimal conditions.

Among the ideas for coping with the student population swelling faster than infrastructure are the use of the internet to reach more students and the recruitment of expats for permanent or short term stints. However, these gadgets should not kill originality and convert students/ young researchers in to robots. As such the new science policy should mix the earlier generations` inquisitiveness and new generations` tech savvy expertise. Better exchange of ideas between teachers and research scientists, mutual respect and understanding of each other's problems need to be given top priority in preparing new strategies, to usher in a new era of knowledge enhancement.

Contents- A brief introduction

This issue has seven research articles and one opinion. R.N. Singh, an eminent Theoretical Geophysist, in his article on "Advection diffusion equation models in near-surface geophysical and environmental sciences" has stressed the importance of mathematical models to better understand the near-surface geophysical anomalies and environmental dynamics. Such an approach paves way for better interaction between theoretical and field earth scientists and provides apt answers to many problems. Bhaskara Rao in the article entitled "Gravity Anomalies of two-dimensional bodies" has derived two simple and interesting rules by extending the line integral method to find the equations for the gravitational attraction components due to a planar surface in the directions perpendicular and parallel to the surface. The stability of inversion with dike, trapezoidal and also with polygon models is studied by carrying out inversion of synthetic and field gravity anomalies. In the third paper entitled "Studies on textural characteristics of sediments from Gosthani River Estuary- Bheemunipatnam, AP., East Coast of India", Ganesh et. al have presented a detailed textural and clay mineralogical study of Gosthani Estuary. The textural parameters indicate that the sediments are of medium grain size, moderately sorted, positively skewed and deposited under moderate to low energy conditions with dominant rolling and suspension mechanisms. In the fourth paper De et. al described in detail the impact of Urban Flooding in recent decades in four mega Cities (Delhi, Mumbai, Kolkata and Chennai). In the fifth paper entitled "Filtering of gravity and magnetic anomalies using the finite element approach (fea)", Ndougsa-Mbarga et. al have carried out qualitative analysis of regional and residual gravity maps and magnetic maps. The qualitative analysis of gravity maps revealed a non homogeneous basement. Observed gravity lows are found to be associated with sedimentary infill. The relative gravity highs are found to be associated with structural highs or the presence of either metamorphic or volcanic rocks. The qualitative magnetic study derived from the application of the finite element has helped in sub dividing Ebolowa-Djoum into five sub zones with different magnetic responses. In the sixth paper Bhattacharyya and Mazumdar carried out Basin Modeling / Analysis based upon geological details and geo physical maps. The study covering a part of the western offshore has brought out detailed structural configuration of some important western offshore segments of India. In the seventh paper, Ramteke in the article entitled "Geophysical investigations for solving seepage problems" has brought in to focus the successful utilization of geophysical methods to identify seepage zones so that remedial measures could be taken up properly to ensure the suitability of a structure. Reddy, as an opinion, stressed the need for a relook into the Shale gas and Oil usage as an energy resource, due to significant pollution problems in the extraction of Shale Gas.

In the sub section- News & Views at a Glance, some useful details on POLLUTION have been included. I am aware the details given do not cover appropriately, this important topic. It is included as a part of the series….Life, Environment and Pollution. Pollution is affecting both the man and the environment. Unless, educated youth come forward and initiate steps to change the mindset of the commonman, industry and the government we cannot come out of this muddle.

P.R. Reddy