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Awards & Honors:

National Geoscience Award, GoI 2012
Associate Indian Academy of Science Bangalore 2002
Seg Outstanding Educator Award, Society Of Exploration Geophysicists, USA, 2020
Leadership For Academician Programs MHRD, & IIT Kanpur 2020
Visiting Advanced Joint Research Faculty Scheme, DST-SERB 2020

PhD Student's Achievement

Roshan K Singh: Awarded the prestigious DAAD Fellowship under Sandwich Ph.D. Programme with Prof Ute Weckmann, GFZ, Potsdam, Germany.

Kajaljyoti Borah: Recipient of Best Ph.D. Thesis of the Association of Exploration Geophysicists

Ved P Maurya: Selected as the top-ranked candidate of the IAGA Working Group I.2.

Academic Qualifications

B. Sc. (Physics Hons.) 1990, Banaras Hindu University
M. Sc. Tech 1993, Banaras Hindu University
M. Tech (Mining Geophysics) 1995, Indian School of Mines, Dhanbad
Ph.D. (Applied Geophysics) 2000, Indian School of Mines, Dhanbad
(Title: Nonlinear Inversion of Electrical and Magnetotelluric Data using Very Fast Simulated Annealing)

Major Assignments at National Level

Expert Member, DST
Member, Apex Exploration and Research Advisory Committee (AERAC) of Atomic Minerals Directorate for Exploration and Research (AMD)

Position Held at Institute Level

Dean (Research and Development) 2018-Till Date
Head Department of Applied Geophysics 2012-2015
Head Centre for Innovation Incubation and Entrepreneurship 2016-2018

Significant foreign assignments

S. No.	Period of Visit		Institute/Country Visited	Purpose of Visit
	From	To		
1	November 1, 2012	December 31, 2012	Colorado School of Mines, USA	Visiting Professor Research

Research Interest

Optimization of Geophysical data sets using swarm intelligence, mineral exploration and solid earth geophysics

Significant contributions

The significant contributions have been made in the interpretation of resistivity, Induced Polarization (IP), Self Potential (SP), Electromagnetic (EM), Magnetic and Gravity methods. His contributions in magnetotellurics (MT) characterizing the deeper crustal structure are examples of outstanding academic work. The work may be summarized in three different depth regions: near surface (mineral and ground water exploration), intermediate (geothermal) and deep crustal studies.

Mineral and Ground Water Exploration

- Inversion of geophysical data sets using Grey Wolf Optimization (GWO) – concept applied for the first time in exploration geophysics and inspired by mimicking the social leadership hierarchy and hunting behaviour of Grey Wolves.
- Inversion by Particle Swarm Optimization (PSO) and Ant Colony Optimization – concept applied for the first time in exploration geophysics. It simulates the social behavior observed in a flock (swarm) of birds and ants searching for food as a target.
- Interpretation of resistivity and IP data using Very Fast Simulated Annealing (VFSA).
- Interpretation of SP data using the concept of charged occurrence probability (COP) and dipole occurrence probability (DOP). Also developed the extended Euler and Enhanced Local Wave number techniques for the interpretation of SP anomalies.
- Interpretation of airborne magnetic data by inverting the analytic signal.
- Mise-a-la-masse survey for an auriferous sulfide deposit.
- Regional and residual separation using Finite Element Technique and interpretation of magnetic anomaly using enhanced local wave number.
- Remote reference MT soundings carried out across the Dalma Volcanics (DV) in North Singhbhum Mobile Belt (NSMB) draws inference on the metallogeny of the area. Inductively coupled plasma atomic emission spectroscopy (ICP- AES) analysis of the samples collected from 8-10m pit different stratigraphic units of Dalma volcano-sedimentary belt indicates the presence of gold, silver, uranium and copper. Thus, the conducting zones carry the impression of metallogeny associated with volcanogenic massive sulfide (VMS) or volcano hosted gold deposit (Au-VMS) in the study area.
- The 3D joint inversion of MT + AMT data over North Singhbhum Mobile Belt (NSMB) is a metallogenic province was performed with impedance, tipper and combination of impedance and tipper. Resistivity cross-sections from the 3D joint MT + AMT inversion of the combination of impedance and tipper are in broad agreement with previous 2-D results but with modified dimension and location. It delineated both near surface and deep conductor and establishes the link between these conductors. Near surface conducting heterogeneities mostly represents carbon phyllites, graphitic schists and tuffs - indicators of gold deposits. These mostly lie at the northern fringes of DV are surrounded by shallow resistive subsurface rocks. Relatively deep conducting volcanics are mostly dominant below DV. The presence of alternating conductive and resistive rocks below DV also validates the bimodal character of Dalma Volcanics. The sensitivity analysis suggest that the modeling results are mostly sensitive up to the depths of ~ 15 km. Conductivity anomalies of deposit scale both at shallow and deep levels, possibly enriched with sulfide-mineralization representing the metallogeny are associated with the evolution of Proterozoic Volcanics. The obtained depths of DV and SGM are 4–5 km and ~1.5 km, which is in agreement with the gravity data.
- Integrated geophysical surveys (resistivity, magnetics, SP, gravity and radiometric) over

a part of northern fringe of Dalma Volcanics Singbhum was carried out. The low resistivity, relatively high gamma counts and TG peaks corresponding to negative SP anomaly, high magnetic, high gravity may be attributed to sulfide mineralization whose trend coincides with the pyrite mineralization as seen in the 8-10m deep pits in the study area. The rock of Upper DVs seems to be the host for the mineralization. Five potential mineralized zones (S-I to S-V) have been identified on the basis of commonality between the results. Zones S-I and S-II localized in the northern and southern part can be considered for detailed drilling on priority. The results of PSO and Euler depth solution match well and they are in agreement with the ERT results. These results are in broad agreement with the drill hole data of Parasi (bounded by Latitude 22°57'30"-23°00'00'' N and Longitude 85°40'30"-85°45'00'' E; MECL, 2010). The shape of these shallow causative sources for SP and gravity anomalies seems to be of a spherical nature where as for magnetic anomalies it is of thin dyke or horizontal cylinder. However, within the profile also the shape of the causative source varies, which can be attributed to the affect of interference from the neighboring sources or different concentration of sulfide. Infact, the Parasi drilling data shows, that the percentage of sulfide varies from 0.5% to 1.5%. These recent findings, in the northern fringe of DVs, are important gold prospect within the NSMB requires exploration policy to be revived to achieve considerable target in terms of the finding of the new gold deposits. Infact, Atomic Mineral Directorate for Exploration and Research, Govt. of India has planned detailed drilling programme in the study area.

- Uncertainty and Sensitivity Assessment of the Attribute based Inversion of Kalol, Field Cambay Basin, India for initial oil in-place calculation.

Geothermal Exploration

- The AMT/MT work in Bakreswar, has shown that the potential source of geothermal reservoir is about 13 km west of the hot spring at a depth of 3 km extending up to 27 km.

Deep Crustal Studies

- Designed new field set up for Remote Reference (RR) MT data acquisition enhancing resolution of electrical conductivity models. It also gave birth to the new concept of Time Lapse MT or 4D MT.
- The results of electrical Moho show that EIC has a resistive Moho and the only other such a feature is Slave craton, Canada.
- Delineation of electrical anisotropy of the upper mantle underneath Singhbhum craton.
- Development of a hybrid robust technique to improve signal-to-noise ratio over the entire MT frequency band including the "dead band" (0.5-5 Hz).
- Electrical signature beneath the EIC shows that the LAB is at 95 km. The region is interesting as the electrical properties of the crust and mantle and the Moho depth are similar to those of the Slave Craton, Canada (~4.0 Gyr) but the depth of the LAB beneath the EIC is half that of the Slave craton. As cratonic signatures, depicted by ultrapotassic rocks fromGondwana coal fields close to EIC, are preserved at least till early Cretaceous (117 Ma) it is likely that Himalayan orogeny could have played a major role in delamination of the lithospheric roots of the EIC in addition to attendant seismicity.
- Petrophysics in mineral exploration. The application of petrophysics helps in understanding whether the mineralization is controlled by texture/grain or bulk

properties. The integration of petrophysics with geology and inverted geophysical sections has inverted geophysical has a substantial impact in terms of predicting the mineralization prospect and, at the same time, substantially reduces the drilling cost providing a new orientation and advancement to the exploration strategy for deeper deposits.

- Further, on the basis of geophysical surveys the concealed ore deposits for M/S IMFA, Odisha, M/S Balasore Ispat Alloys Ltd Odisha and M/s Zawawi Minerals LLC, Bldg No. 163, Plot No. 498, Way No. 48, North Al Azaibha, Near Zafeer Mall, Muscat, Sultanate of Oman could be established.

Employment History

Period (Year)	Position Held	Institute
23rd February 2000- 3rd October 2002	Technical Officer	Indian School of Mines, Dhanbad
4th October 2002- 31st December 2005	Assistant Professor	Indian School of Mines, Dhanbad
1st January 2006-31st December 2009	Associate Professor	Indian School of Mines, Dhanbad
1st January 2010-Till Date	Professor	Indian School of Mines, Dhanbad

Book Published

Geoelectric Methods: Theory and Applications by Bimalendu B Bhattacharya and Shalivahan, For more information see http://www.mheducation.co.in/geoelectric-methods-theory-and-application ISBN: 9789339221379

Details of PhD Guided

- Dinesh Kumar Majhi, 2012, Propagation of Seismic Waves in Heterogeneous and Anisotropic Layered Medium (Joint Guidance with Prof S Gupta)
- Kajaljyoti Borah, 2013, Seismic Tomography of Dharwar Craton
- Ved Prakash Maurya, 2015, Magnetotelluric Studies Over Dalma Volcanics, Eastern India: Inferences On Metallogeny
- Surajit Gorain, 2015, Reservoir Characterization By Attribute Based Inversion And Spectral Decomposition With RGB Color Blending In Kalol Reservoir, Cambay Basin, India
- Praphulla Kumar Adhikari, 2016, Geophysical Studies Over Volcanogenic Sulfide Settings In The Northern Fringe Of Dalma Volcanics, Eastern India
- Ritima Das, 2016, Shear Wave Velocity And Anisotropy Of Crust Beneath South India
- Pramod Kumar Yadav, 2018, Geophysical Investigations For Mineral Prospecting Over Dalma Volcanics, Large Igneous Province, Eastern India
- Deepjyoti Goswami, 2018, Geothermal And Geomechanical Regime Of The Koyna Seismogenic Zone, Deccan Traps, India
- Shailendra Singh, 2018, Audiomagnetotelluric Study Across Dhanjori Metavolcanics, Eastern India
- Akash Chandra, 2018, Grey Wolf Optimization: A new strategy to invert geophysical data sets

- Gokul Saha, 2019, Seismic Tomography of Western Himalaya and Western Tibet
- Soumya Jana, 2020, Stochastic Modeling Of Gas Hydrate Reservoirs
- Roshan K Singh, 2020, 3D Inversion Of Magnetotelluric Data Over Dalma Volcano-Sedimentary, Dhanjori Volcanics And Bakreswar Geothermal Province, Eastern India Shield

Ongoing Research Projects

- Ministry of Earth Sciences: Crustal Structure and Electrical LAB Beneath Rajmahal Trap and Dalma Volcanics from Magnetotelluric Investigations (Project Investigator)
- DST- FIST: To Augment the Post graduate Teaching and Research Facilities in the Department of Applied Geophysics (Co Project Investigator)
- Geological Survey of India: Audio-Magnetotelluric Investigations Over Low Dominance Aeromagnetic map in parts of Sikar, Rajasthan
- BRNS: Geophysical Prospecting along northern fringes of Dalma Volcanics around Kantaldih-Pharenga area.

Some of the Completed Projects

- Magnetotelluric Investigations in the Geothermal province of Bakreshwar West Bangal India
- Rainwater harvesting study in Dhanbad Township areas in the drought prone Jharkhand state Sub surface cavity detection by inversion of geophysical data using global optimization technique
- Gas Hydrates: Seismic Signatures through Anisotropic Velocity Analysis and Amplitude Variations with Offsets
- Ultra high period magnetotelluric for deep mantle investigation and integration of the theoretical under pinning of geo-electromagnetic
- Use of Optimal Basis Functions for Modeling and Inversion of Full Waveform Seismic Data