GEOLOGICAL SURVEY OF INDIA

TRAINING INSTITUTE, HYDERABAD

Photo Geology and Remote Sensing Division

4th COURSE ON APPLICATION OF REMOTE SENSING AND GIS FOR MINERAL EXPLORATION (GSI-ISRO COLLABRATIVE PRAGRAMME UNDER NNRMS) (19th January to 31st March 2005)

With a view to increase Human resource personnel in the field of application of remote sensing and GIS for mineral exploration, a MOU was signed by GSI and ISRO on 4-07-2001 for conducting series of specialized training courses on "Application of Remote Sensing and GIS for Mineral Exploration" of 10 weeks duration, at least once a year for 5 years. The target group identified for this purpose is mainly faculty and research scholars from universities and officers from the state and central organizations.

In the first, the second and third course a total of 16, 17 and 16 participants had successfully completed this course during 2002, 2003 and 2004 respectively. The Fourth course in the series was conducted between 19.1.2005 and 31.3.2005.

Besides, the core faculty from Geological Survey of India training Institute, a number of eminent and experienced geoscientist from GSI and other organizations participated as guest faculty for specific topics including case studies on application of remote sensing and GIS for mineral targeting.(Annexure-I)

In the inaugural session, after a brief self-introduction by the participants, shri U.S.N. Reddy, Director, gave a brief account of the course curriculum. Shri M.P. Muralidharam, Director, Technical Coordination, GSITI and Chairman of the session stressed the importance of the Photo geology and remote sensing techniques as a significant tool earth resource studies, in general and mineral search in particular. He also stressed the role of mineral exploration programs that substantially contributed to nation's mineral industry development.

Dr. R.R.Navalgund, Director, NRSA and the Chief guest, in his inaugural address, emphasized the utility of remote sensing data in mineral exploration and advised the participants to take full advantage of this specially designed program and the facilities available in PGRS and INDIGEO laboratories of GSITI. He also gave a lead lecture on "Space program for earth science studies".

Dr. R.N.Misra, Deputy Director General (Retd), GSI and the Guest of honour gave a detailed account of usefulness of remote sensing data in resource management studies. He also gave a lead lecture on "Overview of Geological and tectonic frame of India with reference to mineralisation".

For the benefit of the participant's special lecture on the usefulness of the remote sensing data for mineral exploration by Sri S.Narasihma. Director, GSITI was arranged.

The training was dealt in the following four modules.

1. Photo geology and remote Sensing. 17 working days
2. Digital image processing and digital photogrammetry. 12 working days
3. Geographic Information System. 15 working days
4. Block interpretation, field checks, report writing etc. 15 working days.

The modules on Digital Image processing and Digital photogrammetry and geographic Information System (GIS) were conducted at Project INDIGEO, GSITI and the remaining two modules were conducted at Photo geology and remote Sensing Division of GSITI.

Under the Photo Geology and remote sensing, lectures on principle of aerial photography, photogrammetry, physics of remote sensing and multi spectral remote sensing in visible, infrared, thermal and microwave regions were covered. A lecture on usefulness of hyperspectral remote sensing of future satellite programmes in geological interpretations was also included in this course. Lectures followed by practical exercises were covered on the techniques of interpretation of remote sensed data in identifying and delineating geomorphology, lithology and structures in igneous, sedimentary and metamorphic terrains. Case studies on usefulness of remote sensed data in mineral exploration for minerals like base metal, diamond, gold, surficial deposits, atomic minerals, coal, oil, ground water etc. was dealt by experts in that field for the benefit of the participants. The experts dealt lectures on integration of geological, geophysical and remote sensed data to NRSA for the advantage of the trainees to understand data storage formats, data processing procedures and usage of remote sensed data for understanding the geologic signatures.

Under the Digital Image processing and digital photogrammetry module lectures and demonstrations on different image processing technique involving image loading and rectification, data enhancement techniques, multispectral classification, map mosaicking and map composition were covered in detail. Project work in selected blocks was carried out using different enhancement procedures for better appreciation of digital data vis-à-vis hard copies. The principles and procedures for the generation of ortho images, Digital Elevation Model (DEM), 3D modelling and morphometric studies were dealt with using ERDAS Ortho base and Stereo analyst software.

After attaining a fair degree of confidence in visual photo interpretation and digital image processing techniques, the trainees were given "Block interpretation" (project work) of the area around Kalva-Gani, Kurnool district, parts of toposheet:57I/1,2, 57 E/14, in Ramagiri Schist Belt, Anantpur district(parts of 57 F/7&11) and Wajrakarur area, Anantpur district (parts of 57 E/8 and 57 f/5). The Trainees, grouped into four batches, one batchfor Ramagiri block, two batches for Kalva-Gani block and one batch for Wajrakarur block, prepared geology map through aerial photographs. All the four batches prepared an interpreted geological map from the geocoded sheets for the four block area. Field traverse were carried out in the above areas with a view to understand the signatures of each litho unit vis-a-vis ground geology, to assess the confidence level of

interpretaions and to finalize the geological mapo. The participants carried out field checks along two geological traverse viz. Kurnool-Tammarajupalli-Nandyal and Kurnool-Veldurthi-ramallakota sections. These sections expose the lower Cuddapah sediments.

The well known Gani-Kalva fault picked up from the remote sensed data, was studied indetail in the field traverse and the effect of faulting demonstrated in detailed for the trainees. Mineralisation in different host rocks like iron ore, steatite, base metal and diamonds from conglomerates were studied. Field checks in the Ramagiri Schist belt area were carried out with a view to verify the interpretations made from the remote sensed data across the schist belt and to collect the ground truth for the different lithounits marked by the tonal contrasts. Limitations of remote sensed data in bringing out different lithounits not having tonal contrast between them was shown to the trainees in the traverses, the field in the Wajrakarur area was taken with a view to stress importance of the structural discontinuities/fractures and their intersections which are the possible areas suitable for emplacements of kimberlite and lamproite rocks. Three kimberlite location of weathered and unweathered nature were shown during the traverses emphasing the scientific approach and caution to be exercised during their search. The trainees were taken to the kimberlite museum at Wjrakarur to observe various type of kimberlites discovered from the area and their lithological variations. Number of indicator minerals associated with the kimberlites was shown and theior importance in the rock search was made known to the trainees. Trainees were taken to Mangampeta barite mines, world largest bedded barite deposit for the understanding regional geological setup, stratigraphy and structural controls, nature and grade of the deposit.

The participants submitted a report along with a map, after incorporating the ground geological data in the interpreted map. Presentations by the trainees on various topics on the block areas was completed under group discussions.

Under the Geographic Information System (GIS) theory and demonstrations on map and spatial data concepts and analysis (through arc info software) were dealt with in detail. The topics covered in the GIS module included data base concepts and DBMS model, introduction to Arc GIS, spatial data capturing techniques, spatial data editing and topology, coordinate systems and map projections and GIS analysis tools. A lecture on spatial modelling and GIS analysis was also included from the expert in that field. Application of GIS in mineral exploration through case studies was included in identifying probable zones for kimberlites emplacements.

The results of the evaluation test of the participants were excellent and performance on presentations and discussions on various topics indicated their full participation with enthusiasm and zeal in various modules of the training programme.

In the end of the course, some of the trainees presented their research work in the field their specializations.

The chief guest Sri. E.V.R.Partasaradhi, Dy.Director General, (Retd), GSI, in his valedictory address gave a brief account on the recent trend in remote sensing that are of immense use in mapping and mineral exploration. The advised the participants to use those trends as essential tools in their endeavors of their research projects. Dr. K.S.Misra, Dy. Director General, GSITI, and he extends stated that as the GSITI is considered as center of excellence in geoasciences and he

extended technical support from the GSITI faculty for the trainees in their research projects as and when they need it.

Feedback:

The planning and execution of all the modules in the course was rated as excellent. The participants expressed their satisfaction in handling the theory and hands-on in a systematic approach. The case studies on the application of remote sensed data in targeting potential zones of mineralization's in different geological set ups by the experts in the field of specializations were rated as very good to excellent. All the participants rate the theory and practical exercise in the remotely sensed data excellent. The digital image processing and digital photogrammetry modules were dealt in detail and rated as very good.

All the trainees have given word of appreciation for the faculty members for their approacvh in teaching, untiring involvement at every stage, cooperation and encouragement extended during the course.

LIST OF FACULTY MEMBERS

Course Coordinator: Shri U.S.N. Reddy, Director, PGRS, GSITI, Hyderabad (USNR)

Core Faculty:

Shri N.Rajendran, Director, Project INDIGEO, GSITI, Hyderabad (NR)

Dr. N.R. Ramesh, Geologist (Sr.), PGRS, GSITI, Hyderabad (NRR)

Shri I.V.Reddy, Geologist (Sr), PGRS, GSITI, Hyderabad (IVR)

Shri K.K. Chatterjee, Geologist (Sr), Project INDIGEO, GSITI, Hyderabad (KKC)

Dr. M.Surendranath, Geologist (Sr), Project INDIGEO, GSITI, Hyderabad (MSN)

Dr. L.P. Singh, Geologist (Jr), Project INDIGEO, GSITI, Hyderabad (LPS)

Shri S. Rama Murthy, geologist (Sr), INDIGEO, Hyderabad (SRM)

Guest Faculty from GSITI:

Dr. K.S. Misra, Dy. Director General, Hyderabad (KSM)

Shri M.P. Muralidharan, Director, TC, Hyderabad (MPM)

Dr. J. Shimhachalam, Director, Hyderabad center (JS)

Shri. S. Narasihma, Director, Chitrdadurga center (SN)

Shri K. Chandrasekar, Geologist (Sr), Hyderabad center (KC)

Guest faculty from GSI:

Shri P.F. Augustine, Director, Technical coordination, SR, Hyderabad	(PFA)
Dr. P.K. Muralidharan, Direcvtor, Geodata, SR, Chennai	(PKM)
Shri P.K.Sinha, Geologist (Sr), GSI, Hyderabad	(PKS)
Shri S.S.Naik, geologist (Sr), OP: A.P., Hyderabad	(SSN)
Shri D.K.Chowdhary, Geologist (Sr), PGRS, Hyderabad	(DKC)
Dr. R.N.Misra, Dy. Director General (Retd), GSI	(RNM)
Shri V.Hanumantha Rao, Director, OP: A&M, NER, GSI	(VHR)
Shri M.N. Misra, Geologist (Sr), GSI, CR, Bhopal	(MNM)

Guest faculty from Non-GSI:

Dr. R.R. Navalgund, Director, NRSA, Hyderabad	(RRN)
Dr. A. Perumal, Scientist G, NRSA, Hyderabad	(AP)
Dr. Y.V.S. Murthy, Scientist G, NRSA, Hyderabad	(YVSM)
Dr. K. Vinodh Kumar, Scientiast E, NRSA, Hyderabad	(KVK)
Dr. P.V.N. Rao, Scientist E, NRSA, Hyderabad	(PVNR)
Shri M. Jayakumar, Scientist, CGWB, Hyderabad	(MJK)
Shri Tapas Ranjan Martha, Scientist, NRSA, Hyderabad	(TRM)
Dr. A.K. Chaturvedi, Scientist G, AMD, Hyderabad	(AKC)