

Report on the ‘Workshop on Multi-sensor Aerogeophysical Surveys over Obvious Geological Potential Areas of India (OGP Block-8)’ Covering Parts of Karnataka, Andhra Pradesh and Telangana, 23rd February, 2024

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Received: 2 March 2024 / Accepted: 3 March 2024

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A one-day workshop on the above theme was organised in dual-mode by the Remote Sensing and Aerial Surveys (GSI-RSAS) wing of the Geological Survey of India (GSI), Karnataka Circle at the Marriot Fairfield, Rajajinagar, Bengaluru. The workshop began traditionally with the lighting of the lamp by the dignitaries including Deb Kumar Bhattacharya, Dy. DG and HoD, RSAS, and Dr. S. Ravi, Dy. DG, SU-Karnataka and Goa, GSI besides Biplob Chatterjee, CEO and Director (Consulting), Dr. Joygopal Ghosh, DDG, GSI (Retd.) & Principal Advisor (Exploration) of Geovale Services and G. Ramesh Acharya, Director, M/s McPhar International Pvt. Ltd. The Chief Guest for the event Janardhan Prasad, Director General, GSI, Kolkata joined the function in the virtual mode (Fig. 1).

Deb Kumar Bhattacharya, in his address in the Inaugural Session, welcomed the delegates consisting of experts from different departments and diverse fields and requested feedback on the National Airborne Geophysical Mapping Program (NAGMP) with magnetic gradiometry and radiometric surveys taken up since 2017 by the GSI for identifying the OGP.

He outlined the objectives as: (1) To create country-wide, uniform baseline magnetic and radiometric data within a short span of time for the stakeholders engaged in mineral exploration activities. (2) To identify potential target zones and geological features to facilitate enhancement of mineral exploration. NAGMP covers around 1.2 million sq. km, divided into twenty-one (21) blocks with a uniform survey specification, namely, traverse line spacing of 300 m, control line spacing of 300 m at an altitude of 80 m above ground level (AGL) and the aircraft speed of 65-85 m/s.

Block 8, covers the whole of Karnataka besides some parts of Andhra Pradesh (c. 24%) and Telangana (c. 1%). He briefly outlined the challenges and delays in obtaining clearances from regulatory bodies for the low flying (c. 80 m) airborne surveys that began in GSI

during the 1970s. Current surveys began in 2017 with M/s. McPhar and Geovale, as the service providers which is part of the National Geoscience Data Repository (NGDR) programme. The mineral potential regions, recognised after such detailed studies recognised as ‘Obvious Geological Potential (OGP) areas are released to the public domain (NGDR portal) for facilitating the auctioning process.

Dr. Ravi, in his address complimented Debkumar Bhattacharya and his RSAS team along with the service providers M/s McPhar International Pvt. Ltd., for completing the data acquisition in Block 8 following the timeline tightly (covering an area of 87,520 km² (3,20,785 line km) by November 2023 and come up with interpretations in this Workshop. This contrasts with the inordinate delays in the NMET projects. He recalled how three decades back helium surveys in collaboration with NGRI, Hyderabad was taken up in the Wajrakarur kimberlite fields to locate new diamond pipes. He envied as how the younger generation of geologists are fortunate to create such wealth of data and provide them in the open source. Such data provides an unmatched arsenal in any geoscientist’s hand to seek mineral resources that are sourced from both the mantle and crustal domains. Integration of such vital geophysical, geological and geochemical data base may lead to discovery of minerals and metals from world class deposits in ten years, i.e. c. 2032.

G. Ramesh Acharya, Director, M/s. McPhar Int. Pvt., Ltd., welcomed all for the evaluation of the results after the successful completion of the surveys in the OGP-8 block. He outlined the challenges to avoid delays in commencing the next project of OGP block-15 to be taken up in Gujarat with M/s. Ex Caliber, the largest airborne survey companies in the world for over 100 years.

The inaugural session ended with the address by Shri Janardan Prasad, DG, GSI in the virtual mode from his office chamber embellished by the photographs of all the illustrious DGs of GSI of



Fig. 1. Dr. Ravi, Debkumar Bhattacharya, Dr. Joy Gopal Ghosh and Dr. Ramesh Acharya (left and middle) and Shri Janardhan Prasad, Chief guest during the inauguration.

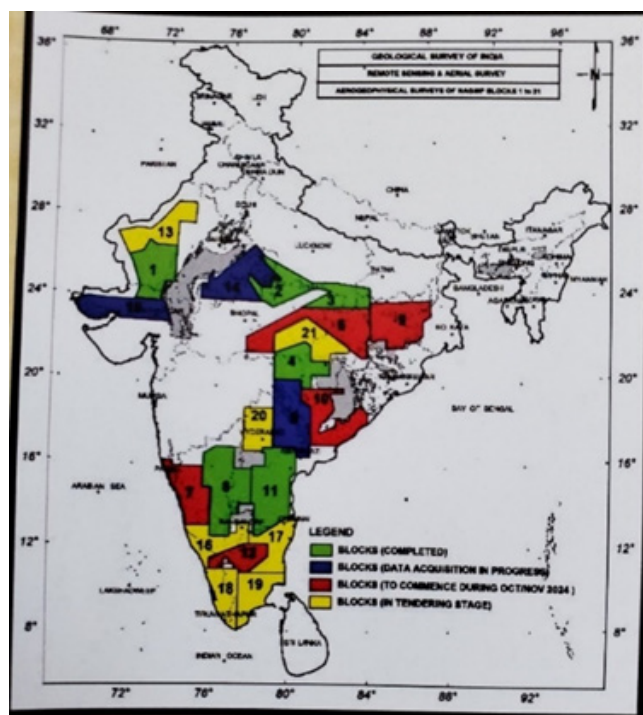


Fig.2. Location of the twenty-one (21) OGP exploration blocks.

yester years (see Fig. 1). He complimented the team of RSAS, GSI, Bengaluru for the successful completion of the field operations and the interpretations. He however cautioned them as to be not influenced in their interpretation with 'legacy data'. This was followed by a tea break.

Session II began with a lecture on 'Geology, Mineralisation and Opportunity – OGP-8' by D.S. Jere, Director, RSAS, GSI, Bengaluru. He outlined briefly the known geology and mineralisation of the Block-8. It consists of N-S to NNW-SSE trending Archean greenstone belts of the Dharwar craton that are spatially separated by both older basement gneiss (e.g., Sargur) and Late Archean granite intrusive. The western part of the Proterozoic Cuddapah basin forms the eastern boundary of the block whereas in the northwestern part, the block is represented by the Proterozoic Kaladgi and Bhima basin and the SE peripheral part of the upper Cretaceous Deccan volcanic province (DVP). Linear, N-S trending, late Archean Closepet granite along the middle part of the block marks a major lithounit between the Eastern and Western Dharwar craton. With greenstone belts of different ages (e.g., Sargur, Chitradurga and others) trending NW-SE to N-S, suture zones, older basement rocks, collision-related granites and carbonatite-alkaline intrusive, Block 8 represents an ideal setup for hosting a variety of mineral deposits. The block is known for orogenic gold. Primitive, mantle-derived rocks hosting Ni-PGE, stratiform Cu-Co, alkaline rock - carbonatite hosted REE and rare metal-bearing pegmatites besides the well-known deposits of banded iron formations and manganese. Thick lithospheric keel in the eastern part of the Dharwar craton had been known to host diamond bearing kimberlites. Mr. Jere was optimistic in that the high quality radiometric and aeromagnetic data over the block is likely to provide clues for both rare metal, rare earth and uranium (regolith-bearing areas) besides new areas for gold, diamond and others.

Dr. Rajesh Kumar, Superintending Geophysicist, RSAS, GSI in his lecture on 'Multi-sensor Aerogeophysical Survey over OGP Block-8: An Overview', traced historically the seven decades of air borne geophysical surveys in India that began in 1950 for oil exploration by ONGC culminating in the 'Operation Hard Rock' by the GSI in 1967 besides other collaborations between BRGM, NGRI and

GSI. GSI's own acquisition of an aircraft in 1986 in the RSAS wing covered some 11-12% of the country. The NAGMP programme funded by the National Mineral Exploration Trust (NMET) plans to cover around 1.2 million sq. km that are divided into 21 blocks with a uniform survey specification as mentioned previously by the HoD, RSAS.

This was followed by the Session II from 11.30 am to 15.30 pm with an hour's lunch break which included the 'Presentation and Interactive Session on "Aerogeophysical Survey- Data Acquisition, Processing, Interpretation and Results' by M/s McPhar Int. Pvt. Ltd. and Geovale Services by their team comprising Biplob Chatterjee, CEO and Director (Consulting), Geovale Services, Dr. Joygopal Ghosh, Retd. DDG & Principal Advisor (Exploration), Geovale Services and G. Ramesh Acharya, Director, M/s McPhar Int. Pvt. Ltd. Ramesh Acharya, in his lecture, provided a succinct account of the details on the survey that dealt with data acquisition and processing (both spectrometric with some fifteen corrections and magnetic data processing with ten corrections) that leads to the derived maps to aid interpretation, quantitative modelling, geophysical interpretation approaches, integrated interpretation and finally defining and characterising the mineral potential zones. Discussions on identified mineral potential zones in different geological domains ensued followed by the assessing the mineral potential zones and ranking. Recommendations for future exploration plan form the final part of this comprehensive mineral exploration exercise.

Dr. Joy Gopal Ghosh, provided some inferences based on the interpretations of the aeromagnetic data and air borne gamma-ray spectrometric data based on K-U-Th distributions. Based on magnetic data signatures, it was inferred that the boundary between the Western and Eastern Dharwar craton is rather diffused and not striking as made out from previous studies. He further pointed out that in using radiometric data in regolith-covered areas, one needs to be more careful as adsorbed U and potassic clays could influence simple interpretations.

The survey brought out clearly the Bababudan meta basalts, banded magnetite quartzites and the Sargur pelites. The presence of overwhelming presence of magnetic anomalies coinciding with shears that occur in the SW part of Block 8 (Fig. 3)

There were also interventions and brief interactions and discussions during and after these lectures which dealt with the mineral potential blocks, both in the pre-lunch and post-lunch sessions by very senior, retired officers of the GSI, namely, Dr. H.S.M. Prakash, Dr. K.V. Krishnamurthy, R. Rajendran and others on areas that have been mapped and studied by them previously, such as the Gadag schist belt, Hutti gold mine areas. The inferred anorthositic body and postulated ultramafic body at depths for possible Pt, Cr and related mineralisations in the NW parts of the areas covered in Block 8 evoked considerable debate and the importance for very close scrutiny of the ground truth on such postulations including scout drilling.

Dr. Joygopal Ghosh in his presentation emphasized that the geophysical data and the inference has been obtained following rigorously the international minerals industrial standards. They should be interpreted in conjunction with the available ground data on geology, structure and known mineralisation with the concept of 'mineral system approach' in predicting blind deposits in conducive terrains with no surface expressions. He cited the example of the giant Resolution copper deposit with c. 1.6 billion tonnes of ore with 1.47% Cu and 0.037% Mo at depths c. 1.3 km near Superior, Arizona in USA, hosted in Cenozoic sediments in North America. He further emphasized the importance of lithology and minerals that carry the K (clay vs. silicates) while inferring radiometric anomalies and Fe-bearing rocks (oxides vs. silicates). Fe in the oxide minerals provide the magnetic signatures that are obtained in airborne surveys for predicting potential mineral deposits.

The possible presence of gold (< 2 micron-sized) adsorbed on to clays when panning for placer gold fails to give evidences in conducive

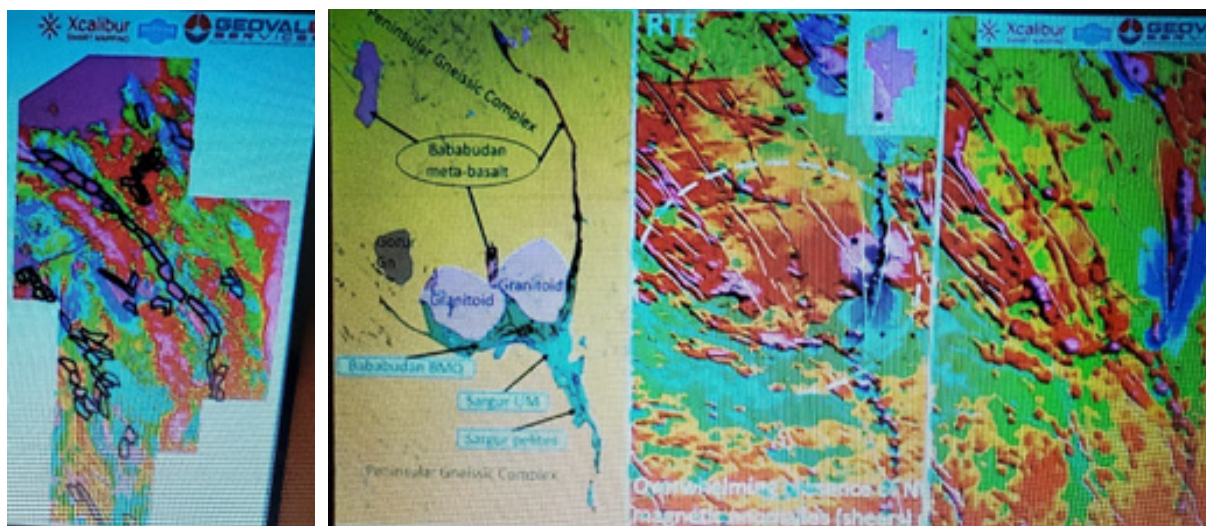


Fig.3. Block 8 (left) and the parts detailing parts of the well-known schist belts that have prominent NW-SE trending magnetic anomalies along lineaments of the areas indicated in the two strips to the right.

terrains. The survey had identified a belt with Ramgiri in the NW towards Kolar Gold Fields in the SSE with a distinct gap in the middle for seeking gold. Some 800 reports have been scrutinised for seeking possible ground clues. As regards the potential for new Au prospects, it was pointed out that one needs to follow the same magnetic lineament that has known Au mineralisation or deposits along with the path finder elements provided by the National Geochemical Mapping (NGCM). Additional favourable criteria include presence of source rocks, evidence for fluid movements (alteration features), suitable throttling path and force along with structural traps.

As regards the Wajrakarur kimberlite field, covering some 750 sq. km area, some four clusters have been recognised. The indicator minerals (pyrope, picro-chromite, picro-ilmenite, chrome diopside and diamond) extend over an area of 2000 km² with many orphaned indicator mineral anomalies which need to be sourced.

The suggested mineral potential zones, ranked as strong, moderate and low must be taken up for ground truthing and delineation of fertile areas that need to be followed up by using conventional prospecting tools to identify targets for detailed evaluation. The ranking would change based on results obtained after evaluations.

There were also discussions on the REE and rare metal potentials in the Block 8. Areas such as Shapur circular anomaly with a central

magnetic high) to the southeast of the Kaladgi basin in the northwestern part of the block, the Koppal (syenite and phoschorite-related with possible continuity plunging to the SSE), zoned pegmatites of Manglur and also in parts of the eastern margin of the Closepet granite.

Dr. Fareddudin, formerly of GSI complimented the efforts and opined that the 'legacy data', such as EDC, WDC and others, as mentioned by Shri Janardhan Prasad, DG, GSI should not bias data interpretation. Dr. P. Krishnamurthy, formerly of AMD, recalled as how Australia and Canada carried out such aero-geophysical surveys in the early 1970s to find new giant uranium deposits to counter the oil crisis that followed the Arab-Israeli war. Their surveys resulted in the discovery of the concealed (c. 500-1km depths) giant Proterozoic uranium deposits in the Athabasca basin and the Pine Creek Geosyncline. Similar, high-quality data generated within a span of four months by the RSAS, GSI, Bengaluru needs to be complimented. It is hoped the data as presented and interpreted further would lead to deposits of enduring value to the country.

Acknowledgement: The author would like to thank Dr, Ravi, Dy. DG, SU-K&G, GSI, Dr. Ravi Kumar, and Shri Ramachandrapa, RSAS, GSI, Bengaluru for providing some valuable inputs to the report

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