

FIRST CIRCULAR

FEBRUARY 2018

36TH INTERNATIONAL GEOLOGICAL CONGRESS

THE INDIAN SUBCONTINENT INVITES YOU TO THE 36TH IGC

GEOSCIENCES: THE BASIC SCIENCE FOR A SUSTAINABLE FUTURE

2 - 8 MARCH 2020

INDIA EXPO CENTRE

DELHI, INDIA

GEOSCIENCES

THE BASIC SCIENCE

FOR A SUSTAINABLE FUTURE

36th International Geological Congress

Major Partners

सत्यमेव जयते
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Earth Sciences

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Contents

Letter of Invite from the President, Co-President and Secretary General, 36th IGC	1
Letter of Invite from the President, International Union of Geological Sciences	2
The Venue	3
The Host City	3
36th International Geological Congress Partners	4
Sponsorship and Funding Support	5
Core Organizing Committee	6
Important Deadlines	7
Proposed Overall Structure of 36th International Geological Congress	7
Registration	8
Draft Scientific Program	9
Submission of Abstracts	31
Workshops/Short Courses	31
Geohost Support Program	31
Congress Field Trips	32
One Day Field Trips	38
Exhibition	38
Visa Requirements for the Congress Participation	38
Accommodation	38
The Indian Subcontinent Beckons	39

General distribution of this and the subsequent circulars for the 36th IGC will be via email. Please feel free to forward it to others who may be interested. If necessary, hard copies will be provided in limited numbers on request by email to the Secretary General, 36th IGC: **igc.delhi2020@nic.in.**

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The Second Circular is scheduled for electronic circulation in September 2018.

Letter of Invite from the President, Co-President and Secretary General, 36th IGC

It gives us immense pleasure to invite you to the 36th International Geological Congress that is being organized in India during 2-8 March, 2020. The event is being jointly hosted by India, Bangladesh, Nepal, Pakistan and Sri Lanka. The Congress will be held in the India Expo Centre & Mart (IEML), a state-of-the-art Convention Centre in the Delhi National Capital Region (NCR).

Alarmed by the dwindling Earth resources, we have chosen 'Geosciences – the Basic Science for a Sustainable Future' as the theme for the 36th IGC. Accordingly, the draft Scientific Program has been drawn embracing a wide spectrum of topics to reflect that Geosciences are integral to a sustainable future. Although exhaustive, the Science Program is kept flexible in order to accommodate new ideas and thoughts that may emerge during interactions of the Science Program Committee with the international geoscientific community. Apart from benefitting from the scientific sessions, the delegates will have the opportunities of attending a wide range of workshops/short courses on various geoscientific topics of scientific and societal relevance.

The Science Program is supplemented by over 45 field trips that will showcase the unique geological set up of the Indian Subcontinent. The field trips are well mixed with short trips to give a glimpse of the rich culture and geoheritage of the subcontinent.

The Congress will also provide an ideal platform for all the international geoscience groups to integrate their meetings into 36th IGC and make most of the opportunities created therein. The Congress will include the meetings of IUGS Commissions, Task Groups and Joint Programs of 2020, and the 6th Young Earth Scientists (YES) Congress.

We await with all enthusiasm your inputs and, above all, your participation in this mega quadrennial scientific event. Please visit our website: www.36igc.org for all key information related to the event.



Prof. V. P. Dimri
President, 36th IGC



N. Kutumba Rao
Co-President, 36th IGC



Dr. P. R. Golani
Secretary General, 36th IGC

Letter of Invite from the President, International Union of Geological Sciences

Dear Geoscientist Colleagues,

The quadrennial sessions of International Geological Congress (IGC) constitute the major scientific events that are held under the sponsorship of the International Union of Geological Sciences (IUGS). The 36th session of the Congress is being hosted by India along with co-host nations comprising Bangladesh, Nepal, Pakistan and Sri Lanka.

As President of the IUGS, I extend a warm invitation for the entire geoscientific community to attend the 36th International Geological Congress at New Delhi, India in March, 2020.

It has been endeavor of the IUGS to advance geosciences and identify and address global geological problems in the successive International Geological Congresses. I believe that the title theme of the 36th International Geological Congress 'Geosciences: The Basic Science for Sustainable Future' is relevant in resourcing future generations and advancing geological sciences in its wider spectrum. In addition to basic geosciences, the 36th IGC offers around 40 themes that fall in the broad category of Geosciences – Evolution, History, Heritage and Ethics, Geosciences of the Near Surface, Economy, Sustainable Future, New Issues and Methods and Planetary Sciences. The Indian subcontinent offers some of the magnificent geological features that are unique in the global context. Over 40 field excursions are planned to study these spectacular geological formations that also offer a glimpse of rich cultural heritage of the subcontinent.

Like in past, workshops, short courses and business meetings will be integral part of the Congress deliberations. The IUGS delegation has recently interacted with the Local Organizing Committee of the 36th IGC and visited the sprawling premises of the venue at Delhi that provides ample scope for a well – expanded place for exhibits as never before.

I foresee a wonderful Congress and look forward to seeing you at the 36th IGC in New Delhi. I am sure that the geoscientists and related technology persons planning to attend the Congress will realize the worth of participation in the 36th IGC.



Prof. Qiuming Cheng
President

The Venue

The 36th International Geological Congress will be organized at the India Expo Centre & Mart (http://indiaexpomart.com), popularly called IEML. Conceptualized to meet the diverse and ever increasing demands of the fast growing exhibition industry, the IEML is strategically located on the Greater Noida Expressway, Delhi-NCR, India. It is India's first integrated international exhibition cum convention centre, featuring a mix of state-of-the-art infrastructure and facilities, which along with the marts, encompasses more than 2,32,000 sq m area. Innovatively designed to offer scale and flexibility in layout and planning, it houses 29 meeting rooms, 14 halls, three restaurants and a huge space of over 25,000 sq m, for the Geoexpo. It can accommodate over 10,000 delegates and run more than 60 parallel sessions with a seating capacity of 200 each. It is conveniently located, with easy access to the places of interest in and around Delhi. The options for accommodation, in all categories, around the IEML is plenty.



India Expo Centre & Mart (IEML)

The Host City

Delhi, the host city of the 36th IGC, is a sprawling cosmopolitan metropolis. With a history that goes back by many centuries, Delhi exemplifies the amalgamation of a glorious ancient culture and a rapidly modernising society. The seat of many powerful empires in the past, its long history can be traced in its exotic monuments, ancient forts and tombs. Simultaneously, like any modern city, it has a world class mass transit system, superspeciality medical facilities, bustling markets, vibrant entertainment hubs and fabulous eating places etc.

Delhi is excellently connected with the neighbouring regions and other major cities of India through all modes of transport such as airways, railways and roadways. One can also opt for the safest, convenient and quickest mode of transport - the Metro Rail - to travel across the city and to its nearby regions. With English being widely spoken in Delhi, visitors will have a hassle-free communication experience in the City. More information on Delhi is available at www.delhitourism.gov.in.


Chandratal, Lahul & Spiti, Himalayas

36th International Geological Congress Partners

Responsible Entity

The Legal Entity responsible for organizing the 36th IGC is the Society named the "36th International Geological Congress". It is the supreme authority empowered to take all measures necessary for successfully holding the Congress. Powers to manage the "Society" and its funds vest with the "Governing Body" constituted by the Government of India.

Partners

The Ministry of Mines (MoM), the Ministry of Earth Sciences (MoES), and the Indian National Science Academy (INSA) are the major partners for organizing the 36th International Geological Congress. MoM and MoES of the Government of India are the major funding agencies. INSA along with the Science Academies of Bangladesh, Nepal, Pakistan and Sri Lanka is supporting the conference for its scientific intent.

The Ministry of Mines *(https://mines.gov.in)*

The Government of India regulates the mineral resources of the country through the Ministry of Mines. The Ministry is responsible for the survey and exploration of all minerals, other than natural gas, petroleum and atomic minerals; for the mining and metallurgy of non-ferrous metals like aluminium, copper, zinc, lead and gold, and for the legislative administration of mines and minerals under its jurisdiction.

The Geological Survey of India (GSI), an Office under the Ministry of Mines, is the nodal organization for organizing the 36th IGC.

The Ministry of Earth Sciences *(www.moes.gov.in)*

The Ministry of Earth Sciences conducts and supports scientific research and technical activities related to forecasting of weather, monsoon, climate change and geo-hazards. It also carries out exploration of polar regions, and develops technology for the exploration and exploitation of ocean resources. Its policies and programs are implemented through the Earth System Science Organisation (ESSO) which has a number of premiere institutions working under it.

The Indian National Science Academy *(http://www.insaindia.res.in)*

The Indian National Science Academy (INSA) is the premiere scientific body for promoting science in India and harnessing scientific knowledge for the cause of humanity and national welfare. Its prime objective is to coordinate amongst various scientific bodies and present the scientific work done in the country at international fora. It is also responsible for scientific publications and promoting liaison between Science and Humanities. INSA is the adhering body, representing India in the IUGS.

Sponsorship and Funding Support

The 36th IGC provides an ideal opportunity to all organizations in the geoscience sphere for their involvement in the Earth Science extravaganza. They can highlight their achievements, specific and/or mutual interests and science and industry related capabilities.

An extensive outreach program is being formulated by the Sponsorship Committee to address Government and Private participation in the 36th IGC. The Congress will provide a host of opportunities to various stakeholders - Explorers, Miners, Researchers and Technologists - across the globe to showcase their contributions and innovations in applications of Geological science.

The following activities have been identified as some of the sponsorship opportunities:

- Pre-Congress funding – promotional activities of 36th IGC in various national and international events; dry runs for the proposed field trips
- Field trips - Pre and Post Congress
- Congress venue and associated infrastructure
- Congress events and functions such as the welcome function, Congress dinner, the opening and closing ceremonies, lunch, refreshment, bags and other materials like souvenirs etc for delegates
- Scientific sessions, Plenary Speakers, Keynote Speakers and various presentations
- Publication of Congress materials such as the Congress program, field trip guides and the Volume of Abstracts
- Legacy Program – bring out publications (Episodes, Geotourism hotspots of India/Subcontinent etc); and materials (souvenirs etc), and showcase scientific materials
- Geohost program that will enable geoscientists and geoscience students, particularly those from developing countries to attend the Congress
- Geoheritage program - which is of great significance to the tourism industry and for sustainable development in South Asia, such as:
  - A coffee table book on the geoheritage sites of South Asian countries
  - Booklets/Pamphlets for select geotrails and geosites in South Asia
- Training and skills development – Short Courses/Workshops.

The organisers will endeavour to provide a sponsorship package that would best suit the sponsor's corporate strategy and objectives. Proposals for other sponsorship modules too are welcome. Interested organizations, institutions or individuals may contact the Secretary General or the Chair, Sponsorship Committee for booking/finalizing their sponsorship package by email at igc.delhi2020@nic.in.

Core Organizing Committee

Prof. V. P. Dimri	President
N. Kutumba Rao	Co-President
Director General, Geological Survey of India (Ex-Officio)	
Dr. P. R. Golani	Secretary General
Prof. Talat Ahmad and Dr. P. R. Golani	Chairs, Science Program
Prof. Somnath Dasgupta and Dr. N. R. Ramesh	Chairs, Field Trip Program
Dr. Gopal Dhawan	Chair, Sponsorship Program
Prof. R. Shankar	Chair, Geohost Program
Dr. Fareeduddin	Chair, Legacy Program
Prof. L. Ramanathan	Chair, Volunteer Program
A. K. Gupta,	Chair, Finance
Dy. Director General, Geological Survey of India (Ex-Officio)	
S.N. Bhagat	Treasurer
Dr. Snigdha Ghatak	Secretariat
Debasish Rout	Secretariat
Dr. Himangshu Sekhar Mandal	Secretariat
Dr. Tanvi Arora	YES Representative



The Indus Valley, Nyoma Village, Ladakh

Important Deadlines

Event	Date
Abstract Submission opens	December 2018
Early Registration opens	February 2019 (Available till November 2019)
Abstract Submission closes	August 2019
Notification to the successful authors for their abstract submissions	September 2019
Close of Registration and Payment for presenters of papers (oral and poster). Without payment, deletion from the Congress Program	October 2019
Early Registration closes. Higher Standard Registration opens	November 2019
Standard Registration closes. Higher Registration fee will apply to all registrations received after this date. No online registration will be accepted after this date. A higher onsite Registration fee will apply to all registrations received onsite.	January 2020

Proposed overall structure of 36th International Geological Congress

Pre-Congress Field Trips	24 February – 1 March 2020
Young Earth Scientists Field Trip and Reception	29 February 2020
Registration opens, Exhibition setup, some Business meetings	1 March 2020
Welcome Reception	1 March 2020
Opening Ceremony and First Session	2 March 2020
Scientific Program	2 – 8 March 2020
Business Meetings (Evenings)	2 – 8 March 2020
Congress Dinner	7 March 2020
Closing Ceremony and Concluding Session	8 March 2020
Post Congress Field Trips	9 – 15 March 2020



Goriganga valley, Bougdiar, Uttarakhand

Registration

Congress registration fees will be announced in February, 2019. Early registration will be available till November 2019, after which the registration fees will progressively increase.

Registration fees will cover lunch, morning and afternoon refreshments, a ticket (one person) to the welcome reception and Congress materials including a Congress program and abstracts (on CD-ROM). It is being planned to provide the Program and Abstracts on a suitable downloadable app, which will allow delegates to compile their own personalised program. Wifi access will be available in the Convention Centre.

Delegates may pay the registration fees either in Indian currency or the equivalent amount in any other currency. Secure on-line credit card/ debit card payment facilities will be available.



The Pangong Tso, Ladakh

Draft Science Program

The Science Program of the 36th IGC is built on the theme 'Geosciences: The Basic Science for a Sustainable Future'.

The Science Program Committee (SPC) has identified 42 themes with 200 likely symposia in the draft science program that is open to suggestions from the IUGS bodies, geoscientific organizations and from individual scientists of repute. The SPC has been conscious to the fact that geological sciences are rapidly diversifying with several new emerging themes that need to be addressed. It is believed that the near-surface geosciences involving monsoon and Earth observations system including climate variables and mineral resources constitute important thrust areas that are also relevant to the intensely populated Indian subcontinent. Advancements in geoscientific studies related to management, sustainability and augmentation of Earth resources and issues of societal importance such as geo-hazards will be important considerations in proposing short courses/workshops.

The SPC has identified potential theme coordinators and would welcome other renowned and upcoming scientists to contribute and coordinate various symposia and conduct short courses/ workshops.

All symposia in the scientific sessions will include oral and poster presentations with English as the official language. Barring invited keynote and plenary speakers, other geoscientists can make only one oral presentation in the Symposia program unless the SPC decides otherwise under special circumstances. They may, however, co-author multiple oral and poster presentations. Poster

presentations are proposed to be accepted in digitized format to facilitate LED-based displays. Videography and photography during presentations are not permitted. Translation facility from English to other languages and vice versa will not be available at the Congress.

The sprawling India Expo Centre & Mart - the venue for 36th IGC - provides ample space and scope for scientific, technological and industrial exhibits.

The SPC hopes that deliberations during the 36th IGC will bring to fore the current status and new developments in geoscientific knowledge through plenary talks, symposia presentations, business meetings and out-of-the-lecture-room discussions among scientists, technocrats, policy makers and other stakeholders.

Plenary "Hot Topic" Sessions

Two Plenary Sessions per day are planned for the Congress. These will be held pre and post-lunch from 3 to 7 March 2020. Some of the proposed topics are:

1. The Himalayas
2. Global Geodynamics through Time
3. Ores
4. Concealed Deposits
5. Climate & Tectonics
6. Supercontinent
7. The Making of India
8. Planetary Sciences
9. Paleobiology
10. Continental Deep Drilling



The Panchchuli peaks, Munsiari, Uttarakhand

Proposed Themes and Theme Coordinators

1. Geoscience for Society

Coordinators: R. Shankar *(rshankargeo@gmail.com)*, T.A.Vishwanath *(tavis54@gmail.com)*

Humans, in their quest for natural resources and amenities and comforts, have upset the balance between the different subsystems of Planet Earth, resulting in environmental degradation, pollution, disappearance of species etc. Earth Science deals with processes and resources (for example, clean air, water, energy, soil, and earth resources), which are needed for our very survival. Earth science education and awareness would also ensure that geologically important sites across the world are preserved and conserved as Geoheritage sites and Geoparks for future generations and for promoting Geotourism. Practising ethics in all these endeavours is of paramount importance.

Sub-themes could include Geoscience Education, Geoheritage; Geoparks, Geoethics, Geotourism and Medical and Forensic Geosciences.



An artist's impression of metallurgical extraction at Zawar, Udaipur, Rajasthan

Courtesy: P.T. Craddock

2. Hadean to Archean Earth

Coordinators: M.E.A. Mondal *(erfan.mondal@gmail.com)*, C. Manikyamba *(cmaningri@gmail.com)*

The first 500 million years of the Earth's history that includes the Hadean time (4600 - 4000 Ma) is shrouded in uncertainty as few records of this age are preserved and studied. Scientists practically have limited knowledge about this "dark age" of the Earth whereas the crustal record of the Archaean Eon (4000-2500 Ma) are relatively well documented across the globe. This period of Earth's history is linked with habitability of life on the planet. It was also a period when oceans and atmosphere started evolving to more oxidizing composition. Iron, gold and



Pillow Lava, Maradihalli, Karnatka

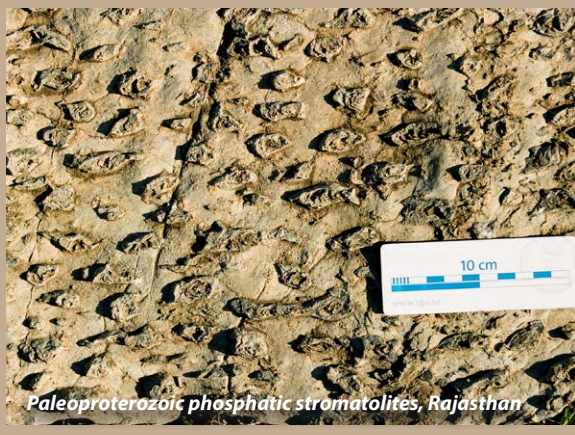
a number of other ore deposits were also formed in greater abundance than found in rest of the Earth's history. Understanding the geodynamic paradigm of the Earth of this duration remains a thrust area in geoscientific studies.

The subthemes may be formation of early Crust, Hydrosphere, Evolution of Atmosphere and Early Life.

3. Proterozoic Earth and Boring Billion

Coordinators: Partha Pratim Chakraborty *(parthageology@gmail.com)*,
V. Ravikant *(ravikant.vadlamani@gmail.com)*

The Proterozoic crustal record of the Earth differs from its Archaean counterpart in having much increased proportion of sedimentary rocks over magma-derived components and thickening of the continental crust. There has been profuse growth of microbial and algal mats and the anoxic environment became progressively oxygenated and supportive to early life. The thickened crust responded to fragmentation and amalgamation of supercontinents in various geodynamic settings. It was also a period of development of intracratonic basins, dyke swarms and evolution of mobile belts. The Proterozoic period has been favorable for formation of mineral deposits of economic significance.



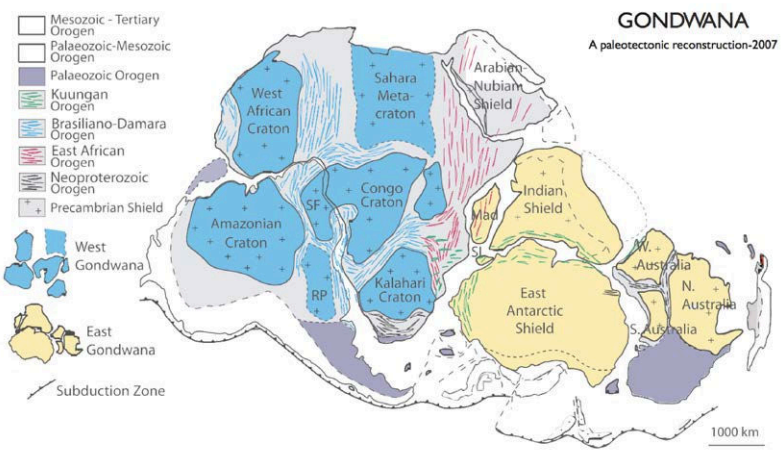
Paleoproterozoic phosphatic stromatolites, Rajasthan

The subthemes could be the evolution of crust and basin formation, the boring billion, evolution of atmosphere and life.

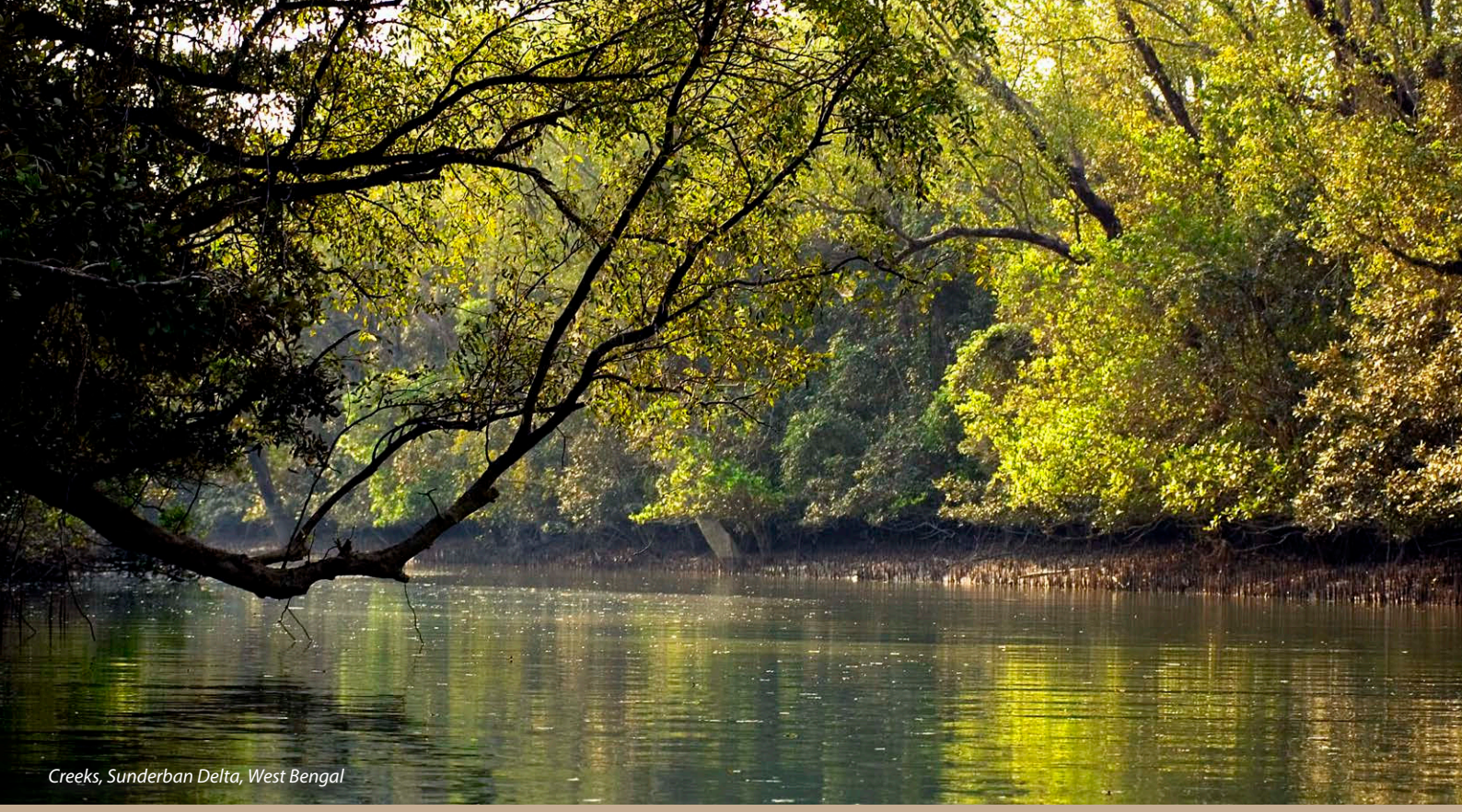
4. Supercontinent Cycles and Geodynamics

Coordinators: M.Santosh *(msantosh.gr@gmail.com)*, M.K. Pandit *(manoj.pandit@gmail.com)*

Earth's history, punctuated by the episodic nature of amalgamation and dispersal of supercontinents, provides challenges of transcontinental correlation especially during the Precambrian. Atypical configurations of continents and possible presence of microcontinents are being increasingly recognized as the requisite input for precise geodynamic inferences. This theme will address the issues considering evolution of crust through time, using multiple lines of evidence to reduce uncertainties in interpretation.



The subthemes could be related to the processes associated with the plate margins, ancient lineaments of transcontinental affinity, paleomagnetic signals and reconstruction of supercontinents through time by using magmatic, sedimentary and metamorphic records.



Creeks, Sunderban Delta, West Bengal

5. Ancient and Modern Continental Margins

Coordinators: Subir Sarkar *(ssarkar@geology.jdvu.ac.in)*, B.N. Nath *(nagendernath@yahoo.com)*

The continental margins cover a small area of about 7-9% of the world ocean, but the coastal and continental slopes within the margin area are responsible for more than 90% of organic carbon burial, making them major repositories of carbon and nutrients. The continental margins are host of unique morphological features, estuaries and thick sedimentary sequences such as deltas, submarine fans. Ancient continental margins on the other hand are locales of geological processes that have implications in evolution of crust and formation of mineral resources.

The symposia would include coastal morphodynamics and tectonic features on continental margins; and ancient and modern sedimentary processes in estuarine, mudflats and deltas, sediment-biota relations and geochemistry in coastal environments.

6. Critical Events, Mass Extinctions and Evolution of Biosphere

Coordinators: Vandana Prasad *(prasad.van@gmail.com)*, Rajeev Patnaik *(rajeevpatnaik@gmail.com)*

The theme will cover fundamental aspects of biotic evolution during Phanerozoic. The theme is intended to address topics on modern synergistic approaches of integration of fossil data with molecular phylogenetic aspects to uncover the evolutionary pattern of biota and biodiversity in deep geological times. It will include major paleobiogeography hypotheses, issues of mass extinction, evolution and divergence history of angiosperms, role of geodynamic events in the vertebrate paleontology and evolution of primates.

In addition to the above topics, the subthemes will also include boundary problems, environmental issues of Phanerozoic, recent developments on KT mass extinction and role of Deccan volcanism.

7. Geological Time Scale and Dynamic Record

Coordinators: G.V.R. Prasad *(guntupalli.vrprasad@gmail.com)*, Kishor Kumar *(kishorsri@gmail.com)*

The theme will address stratigraphic nomenclatures, especially divisions of geologic time, unit names, boundary and age updated over the years with development of new dating methods, and ratified by International Commission on Stratigraphy (ICS). Since division of geologic time is dynamic, the theme will deal with modifications as needed to include accepted changes of unit names and boundary age estimates.

The symposia under this theme will also include stratigraphic records in the light of allogenic and authigenic responses to sediment flux, climate, tectonics and sea level forcing. Events, cycles, hiatus and condensation in stratigraphic records will be discussed along with recent understandings on Permo-Triassic (P-T) and Cretaceous-Tertiary (K-T) boundaries.

8. The Polar World - Past, Present and Future

Coordinators: N.C. Pant *(pantnc@gmail.com)*, Thamban Meloth *(tmeloth@gmail.com)*

Polar domains are current focus of attention recognizing that changes in these isolated areas influence climate and society directly. Cryosphere is the single most visible feature of the Polar Regions. Significant changes occurred in the Polar domains during the Cenozoic, which involved both the Cryosphere as well as the non-Cryosphere components including the on surface and in ocean. The availability of sub-ice morphology through geophysical investigations during the last decade provides fresh data to model the behaviours of Polar Regions through an understanding of its past.

Symposia in this theme will include ice-sheet behaviour through Cenozoic time, sub-ice morphology and geology, relate continent proximal marine sediment record to the adjacent land, understand and predict changes in the polar oceans and its impact on biota and link the past, present and future climate.



Tertiary sedimentary sequence exposed near Ny-Alesund, Svalbard, Arctic

9. Glacial Mass Balance: Approaches and Problems

Coordinators: Shakil A. Romshoo *(shakilrom@yahoo.com)*, D.B. Dobhal *(dpdobhal@wihg.res.in)*

Glaciers constituting the dominant component of Cryosphere, lock not only ~70% of the global fresh water but also have major influence on sea-level fluctuations. Estimation of glacial mass balance of large as well as small glaciers continues to have high degree of errors because of associated physical challenges and uncertainties of the depth measurements.

Various symposia in this theme will highlight methods of glacier-mass balance studies, discuss methods of direct and indirect depth estimation of glaciers and address the errors associated with the measurements. Symposia will also be invited to link glacier mass balance with the dynamic evolution of climate in polar and non-polar domains.

10. Orogeny through Time

Coordinators: M. Jayananda *(mjayan.36igc@gmail.com)*,
Deepanker Asthana *(deepanker.asthana@gmail.com)*

Evolution of orogenic belts is generally considered to be a result of large horizontal shortening of the crust and the associated deformation, metamorphism and magmatism. Collisional orogens are characterized by intense contraction deformation and reworking of older continental crust that may not contribute much towards crustal growth. Accretionary orogens, on the other hand, lead to significant crustal growth through addition of juvenile material. Recent advances in high-precision geochronology and isotope geology, quantitative petrology, deep seismic profiling, experimental and theoretical modelling of the rheology and deformation of lithosphere, etc. have led to a much deeper understanding of orogenic processes through geologic time.

This theme aims to cover multiple sessions related to research in the holistic understanding of the accretionary and collisional orogenic process through the Earth's history, high-precision geochronology, rheological models, quantitative petrology and geochemistry.



Quartz vein-filled extentional fractures in dolomite, Zawar Mines, Rajasthan



The Chandra Valley, opp. Bara Shigri Glacier, Himalayas

11. The Himalayas –Anatomy of an Evolving Mountain Chain

Coordinators: Talat Ahmad *(tahmad@jmi.ac.in)*, Saibal Gupta *(saibl@gg.iitkgp.ernet.in)*, N.B.W. Harris *(n.b.w.harris@open.ac.uk)*, Qasim Jan *(mqjan@yahoo.com)*, Ranjan Kumar Dahal *(rkdahal@gmail.com)*

The India-Eurasia convergence resulted in intense crustal shortening leading to rise of the Himalaya during Cenozoic period. The enormously thick Himalayan metamorphic belts are thrust southwards along the Main Central Thrust (MCT) over the Proterozoic (~1.9 Ga) Inner Lesser Himalayan Sedimentary Belt which, in turn, is unconformably overlain by ~1.0-0.525 Ga Outer Lesser Himalayan Belt. The latter is thrusted over the sub-Himalayan Tertiary Siwalik sequences. The Himalayan amphibolite-granulite facies metamorphic core has undergone ultra-high pressure metamorphism at ~53 Ma. Separated by the South Tibetan Detachment System, it is covered by late Precambrian to Eocene Tethyan Himalayan Sequence. This Himalayan core is key in understanding structural and metamorphic evolution of this orogen.

The subthemes will cover various aspects of evolution of the modern and young Himalayan Orogen in its totality magmatism, sedimentation, structure, metamorphism, denudation and exhumation, leucogranite generation, channel flow models, and finally its subsurface and sub-horizontal geometry using geophysical aspects.

12. Quaternary Environments: Sedimentation and Landform Evolution

Coordinators: Pradeep Srivastava *(pradeep@wihg.res.in)*, Pankaj Srivastava *(pankajps@gmail.com)*

The vibrant environments of the Earth's surface echo inter-relationship among biological and non-biological systems. Sedimentary suites provide the best archives of how these linkages have evolved vis-à-vis Earth's endogenic (tectonics) and exogenic (climate) perturbations through the past. The Quaternary associates closely to human timescales and therefore understanding sedimentation and landscape evolution in this time slice is of societal relevance and has critical bearing towards future trajectories for life on Earth.

This theme may invite contributions involving Quaternary studies on sedimentation, landscape evolution and climate-tectonic linkages, sedimentology and history of extreme hydrological events,

marine and coastal archives, glacial-paraglacial-sink relationships, developments in chronological and sedimentological techniques.

13. Imaging the Earth's Interior

Coordinators: V.M. Tiwari *(virendram.tiwari@gmail.com)*, Ajay Manglik *(amngri@gmail.com)*

Understanding anatomy of the Earth requires geophysical tools of deep probing potential for assimilating resolvable images of the Earth's interior. There are several advancements in geophysical modeling to address the various aspects of geo-tomography using signals of seismic, gravity and conductivity associated with passive and active sources of diverse tectonic setting. Seismic tomography and Long Period Magnetotelluric (LPMT) survey is effective in imaging Earth's interior at various scales up to core-mantle boundary. This theme addresses the innovative researches on imaging of different structures beneath cratons and mobile belts, oceanic lithosphere, core-mantle-crust interactions for understanding transition zone geometry, phase transformation having bearing on the dynamic system of physical and chemical scenario of the Earth's interior composition.

The subtheme could also be related to craton boundaries, continental growth, core-mantle-crust interactions, near surface characterization and recognition of deep conducting bodies.

14. Emerging Trends in Exploration for Deep and Concealed Resources

Coordinators: D.S. Jeere *(dsjeere@gmail.com)*, Dinesh Gupta *(dineshguptagsi@yahoo.co.in)*

Barring Africa and Latin Americas, most of the near surface deposits have been discovered and the general depth of new mineral finds is increasing. The average depth of new mineral find varies from 150 m to 215 m in countries like Australia, Canada, Europe and USA. In India, near surface mineral deposits have been discovered to a large extent in the well-exposed, mineral potential terrains. The mineral exploration in concealed terrains remains unattempted in most parts of the world. This theme is meaningful for all nations and more so, for Australia, Canada, China, India and several other nations that have concealed mineral-rich formations.

Regolith geology, cover characterization, predictive geological mapping of potentially covered terrains or basement mapping, crustal architecture, tracing craton margins and intra-cratonic structures, fault splay systems, tracing distal footprints of mineral deposits, and application of advances in geophysical exploration techniques are some of the thrust areas that shall fall in this theme.

15. Volcanology: Geological, Archeological and Contemporary

Coordinators: R.A.Duraiswami *(raymond.duraiswami@gmail.com)*, M.S. Bodas *(makarand.bodas@gmail.com)*

Volcanism is one of the most important agents that couples the interior of the Earth (and other planetary objects) with its surface and the atmosphere through heat and mass transfer. Thus, the products of volcanism provide a window into processes in the interior of the Earth (e.g. nature of convection in the mantle, evolution of the lithosphere, or storage and recycling of volatiles), the



Columnar joints in rhyolites, St. Mary's Islands, Karnatka



atmosphere (budget of key volatiles such as CO_2 and sulfur, occurrence of aerosols) and the ocean (driver for hydrothermal plumes that affect the evolution and formation of life forms as well as ore mineral resources). Ultimately, these processes are major players in phenomena such as global climate change, mass extinction, and reappearance of new life-forms. Soil produced from products of volcanism are often critical for agriculture, and on shorter timescales, catastrophic volcanic eruptions have affected civilizations and the course of history in a significant manner. At the same time, volcanoes, as sources of geothermal energy, are attractive sites in the energy debate. As a consequence, monitoring volcanoes, understanding the plumbing systems that feed them, and improving our ability to predict such eruptions is a key area of geological research. India, with over half a million square kilometer of land exposing the Deccan Volcanic Province along with its feeder systems provides an excellent setting for deliberating the entire spectrum of these manifestations of volcanism.

Under this theme, we invite contributions that address various aspects of study of volcanic rocks and processes, from older sequences to active as well as contemporary volcanic fields. Contributions highlighting methods of study of volcanic rocks on Earth and other planets, their importance in human civilization and new technologies for monitoring dormant and active volcanoes are also welcome.

16. Magmatism and Petrogenetic Processes

Coordinators: N.V. Chalapathi Rao *(nvcrao@bhu.ac.in)*, Parampreet Kaur *(param.geol@gmail.com)*

Our understanding of magmatic and related petrogenetic processes is in the midst of a process of paradigm shift. Concepts related to all of the underlying aspects of generation, migration and emplacement of magmas are undergoing major revisions. For example, concepts of magma mushes are replacing the views of large magma chambers, and such partially molten regions are thought to be constructed from pulsed motion of magmas rather than a single magma emplacement event. Recognizing the different processes and understanding the spatial and temporal relationships between these, along with the chemical and dynamic consequences in different tectonic settings is an area of vibrant research currently. The same basic physicochemical processes manifest themselves very differently in various tectonic settings such as divergent plate boundaries (rifting), convergent plate boundaries (subduction or collision), and intraplate settings (hot spots or continental magmatism). Key geological events such as the growth of the continental and oceanic crust or the formation of major ore deposits are the consequences of such processes. Indeed, the origin of life itself has been recently suggested to be connected to fluids generated from such processes.

The symposia in this theme could be related to studies of large igneous provinces, magma 'oceans' and early Earth processes, evolution of granitic rocks and continental crustal material in the broadest



The Kailash Temple, Ellora Caves, Aurangabad, Maharashtra

sense, as well as more exotic but important classes of materials (e.g. kimberlites, alkaline magmatism). We particularly welcome sessions that integrate contributions from field observations, theoretical modelling, experimental petrology, geochronology, geodynamic modelling and geophysical data sets to develop a holistic view of igneous petrogenesis.

17. Advances in Geochemistry

Coordinators: Y.J. Bhaskar Rao *(yjbhaskarrao@gmail.com)*, B. Sreenivas *(bulusu.sreenivas@gmail.com)*

The theme will cover exciting methodological advances in all areas of geochemistry including radiogenic and stable isotope (traditional and non-traditional stable isotopes), trace element analyses and organic geochemistry with applications to major planetary, terrestrial, biogeochemical and environmental processes. A wide range of themes ranging from "Stars to Life" shall be encouraged. Application of advancements in geochemistry in exploration remains a thrust area in prognosticating mineral targets.

Advances in geochemistry is recognised as a major theme that will contribute to subthemes such as chemistry of early Solar system, geochemistry of Early Earth, crust-mantle interactions, minerals and geostandards, nano- to microscale processes in geochemistry, chemistry of oceans, current practices in geochemical mapping, environmental geochemistry including contaminants and pollutants and developments in the analyses of stable-, including heavy metal, and radiogenic- isotopes.

18. Advances in Mineralogy, including Ore Mineralogy and Gemology, Geometallurgy

Coordinators: K.L. Pruseth *(klpruseth@gmail.com)*, Jayshree Panjikar *(jayshreepanjikar@gmail.com)*

Minerals of the various compositional groups have been the focus of studies in Geoscience from the earliest days. Still new data about their structure, composition, etc. are emerging as more and more studies are conducted on complex materials by using sophisticated instrumentations. The

symposia will involve many of such aspects and touch frontier areas like experimental and theoretical understanding of mineralogy of Earth's deep mantle. Advances in the fields of detrital mineralogy, ore minerals and their fluid inclusions, gemology, etc. will also be addressed.

The subthemes will include various aspects of mineralogy, gemology, and Geometallurgy. Looking at the necessity of treating low grade lean ores it is proposed to include the subtheme on process technology.



Retorts from an ancient metallurgical site, Zawar, Udaipur, Rajasthan

19. Metallogeny in Relation to Geodynamics and Crustal Evolution – Archean to Recent

Coordinators: Mihir Deb *(mihirdeb@gmail.com)*, M.L. Dora *(dorageol@gmail.com)*

Genesis of metal-bearing mineral deposits, can be viewed as a special type of petrogenesis, controlled by fluid flow and tectonics that varied in time and space due to making, breaking and remaking of the lithosphere during much of Earth's history. Geodynamic set up largely control magmatism, sedimentation and metamorphism and eventually metallogeny in the crust-mantle system.

The symposia may be related to the distribution and formation of different mineral deposit types right from Archean to Recent in various tectonic settings such as continental hot spots, constructive plate boundaries, passive and active continental margins, subduction zones, continental collision zones, greenstone belts as well as intra-cratonic basins in the tectonically stable regions.

20. Sustainable Development and Mining – An Integrated Approach

Coordinators: Y.G.Kale *(ygkale@ibm.gov.in)*, Pankaj Satija *(pk.satija@gmail.com)*

The concept of Sustainable Development has an ambiguous relationship with the extractive industry because of its intrinsic nature, which has led to severe negative consequences worldwide. The issues related to this relationship will be addressed in this theme, based on the "three pillars of sustainability"



Rampura- Agucha Zinc-Lead Mine, Rajasthan

– economic development, social viability and environmental protection, keeping in mind the guiding principles of reduce, replace and recycle. Emphasis will be on the developing countries since the problems related to mining have assumed uncontrollable dimensions in many a place threatening the existence of the local communities in the mining regions.

The subthemes can be related to better practices in mining, land reclamation, social responsibility programs, afforestation etc.

21. Earth Observation System – Climate Variables, Proxies and Modelling

Coordinators: K.J. Ramesh *(kj.ramesh@imd.gov.in)*, A.P. Dimri *(apdimri@mail.jnu.ac.in)*

Measurements of various climate variables is fundamental to understanding Earth processes. Such measurements made over longer periods provide seasonal, annual and even decadal climate variability. However, an understanding of centennial or millennial variability going back to the time when instrumental means were unavailable requires the use of proxies. These data put together can provide knowledge on climate forcing factors at various timescales. Spatio-temporal analysis of such data provide valuable inputs to climate models for predicting future climate. This session aims at bringing together observations made on climate variables, spatially and temporally as well as modelling of climate data for understanding future Earth, on a single platform.

We look to contributions from the perspective of atmospheric, land based and marine records as well as any other observations that can provide inputs to understanding of the Earth system.

22. Monsoon Evolution: Past, Present and Future

Coordinators: Rahul Mohan *(rahulmohan@ncaor.gov.in)*, Arun Deo Singh *(arundeosingh@yahoo.com)*

Earth's monsoon systems are likely to change adversely in response to the current and future changes in our climate, affecting billions of lives. Our current knowledge of drivers of monsoon systems is

limited with conflicting evidence from geological archives. The priority research focus on monsoon, therefore, will be brought together in this theme that will cover research topics on drivers of global monsoon, such as tectonics, climate and vegetation. In particular, this theme will invite sessions on past, present and future of monsoon evolution, bringing studies from both data and model, of the global monsoon systems (South Asian, East Asian, Australian, American and African) on various timescales.

The subthemes could be origin and evolution of monsoon over the Cenozoic, climate forcing factors of monsoon, exhumation control, tele-connections among monsoon systems and monsoon modelling.

23. Hi-Tech and Critical Mineral Commodities

Coordinators: D.K. Sinha *(dksinha.amd@gov.in)*, P.R. Golani *(prggsi@gmail.com)*

The demand for some high-tech and critical metals are soaring in recent years with increasing applications in electronic consumer products and other advanced technologies. The list includes the Rare Earth Elements (REE) particularly, La, Ce, Sm, Nd, Dy and Gd. The rare metals such as Li, Ta-Nb and Zr along with energy critical elements like selenium, germanium, gallium, indium and selenium are finding increasing use in electronic industry and development of low-carbon energy alternatives.

This subthemes in this thrust area will be related to geological availability of hi-tech and critical minerals, understanding their source characteristics and mineralogy with an objective to assess uninterrupted supply of these critical commodities.



Heavy mineral (ilmenite-rich) sand, Kovalam Beach, Kerala

24. Oceans in a Changing World

Coordinators: Rajeev Saraswat *(rs.niog@gmail.com)*, Sunil Kumar Singh *(sunil@nio.org)*

The symposia on oceans gains importance with large climate variability and its biogeochemical effect. The oceans are being heavily impacted by climate change, by altering the surface water stratification, reducing the vertical nutrient supply thereby hindering the phytoplankton growth. Atmospheric CO_2

concentrations have already crossed 400ppm that play a crucial role in global warming. The other half of the CO_2 problem "Ocean acidification" has been affecting marine organisms especially the ones with calcareous shells. Oceans are therefore, considered repositories of geoscientific information that may throw light on climatic variability.

The subthemes will include ocean atmosphere interactions and their reflections in the biology, chemistry and eventually the climate change.



'Pancake' ice formation, Southern Ocean Antarctic region

25. Human Evolution, Geoarcheology, Sustenance Strategies

Coordinators: Rajiv Nigam *(rajivnigam1954@gmail.com)*, Rakesh Tiwari *(rakesh.tewari53@gmail.com)*

The emergence of the Bronze Age Civilizations occurred when sea level stabilized around mid- Holocene. In this symposia we would like to look at the numerous sites of this phase of Human societies which are lying far away in the hinterland and were supposed to be close to the coasts. These archaeological evidences are in agreement with geological findings of the Mid-Holocene. It would be interesting to understand the sea level which has fallen around the Christian Era as evidenced by several archaeological findings noticed in the inter tidal zone. The archaeological findings during the last 1500 yrs. have immensely contributed towards the understanding of shoreline changes.

We would like to understand the component of human evolution as evidenced by their remains, as also it will be an augmentation of knowledge on the possible sustenance strategies.

26. Metamorphic Processes and Petrogenesis

Coordinators: Somnath Dasgupta *(somnathdasg@gmail.com)*,
Santanu K. Bhowmik *(santanu@gg.iitkgp.ernet.in)*

Metamorphic processes operative in different geodynamic settings can be understood from textural, mineralogical, compositional and computational studies on metamorphic rocks. Advances made in instrumentation related to imaging, chemical and isotopic in situ analysis in micro domains enable us to decipher cryptic clues which were overlooked earlier, and build more robust models of these processes. This has resulted in better understanding of the P-T-t estimates of metamorphic process that have implications in assessing geodynamics of different tectonic settings. This theme will invite symposia in wide ranging related topics of current interest in metamorphic petrology that include petrochronology, time scales and rates of metamorphic processes, diffusion chronometry, role of volatiles, fluids and melts, geochemical cycling and petrogenesis of metamorphic rocks in subduction zone settings, cooling and exhumation of UHT and UHP metamorphic rocks respectively, correlation of metamorphic processes with Plate Boundary deformation and geodynamics (and geodynamic modelling), transient thermal structure of the crust in case of UHT metamorphism, trace elements behaviour during metamorphism, field and laboratory observations with microanalytical and computational methods to understand processes that control development of mineral assemblages, textures and composition of metamorphic rocks.

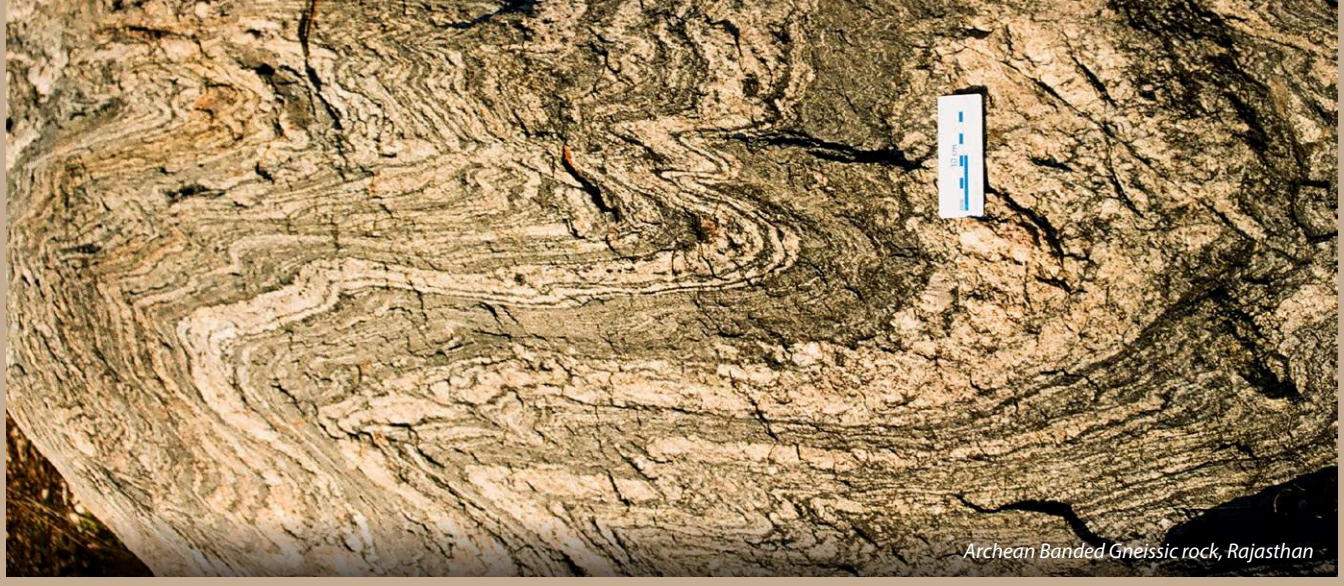


Khondalite, central Dronning Maud Land, eastern Antarctica

27. Rock Deformation and Rheology

Coordinators: M.A.Mamtani *(mamtani@gg.iitkgp.ernet.in)*,
Anupam Chattopadhyay *(anupamchatto@gmail.com)*

In addition to the classical way of looking at the geometry of tectonic structures, modern structural geology research aims at a deeper, quantitative understanding of the deformation processes operating at crustal scale to microscopic or sub-microscopic scale. Symposia on this theme would cover all aspects of structural geology including new insights into the deformation processes at all scales, numerical and



Archean Banded Gneissic rock, Rajasthan

experimental simulations of rock deformation, paleo-stress and strain analyses, active faults and active tectonic processes, evolution of fault systems, rheological behaviour of rocks, interdisciplinary research approaches, and fault-generated earthquake, tsunami and landslide hazards.

28. Ore Forming Processes and Systems

Coordinators: Sisir K. Mondal *(sisir.mondal@gmail.com)*, Biswajit Mishra *(bmgg@iitkgp.ac.in)*

Understanding the geological processes that lead to distribution and concentration of elements and their later modifications producing the mineral or ore deposits of today is crucial to discovery of new ore deposits in the future. The essential processes involve magmatism, hydrothermal and sedimentary processes with a strong imprint of tectonism and of weathering and erosion. The symposia topics may include the major mineralised provinces of the world; ore forming processes; alteration halos; primary and secondary dispersions; ore deposits in different tectonic settings; basin-hosted ores; magmatic, pegmatitic and granitoid-hosted ores; volcanic-hosted massive sulphide deposits; radioactive ore mineral deposits, iron oxide-copper-gold deposits; unconformity-related deposits; paleo-placer deposits; sedimentary-diagenetic and lateritic ores; and any other system of ore formation.

29. Energy Resources

Coordinators: Manas Roychowdhury *(manasmayukh@gmail.com)*,
P.S.Parihar *(pariharps1954@gmail.com)*

Despite low-carbon emission protocol, coal exploration and mining may continue until technologically viable clean energy options are available to meet the global energy demand. This theme incorporates all the issues and options related to the non-conventional hydrocarbon / non-hydrocarbon natural energy resources like coal, lignite, coal bed methane (CBM) and shale gas including nuclear energy options. In addition, the theme includes renewable energy resources like wind, solar, geothermal and wave energy.

30. Hydrocarbon Systems and Gas Hydrates

Coordinators: Kalachand Sain *(kalachandsain@yahoo.com)*, P. Chandrasekharan *(pcran@oilindia.in)*

Due to the decreasing production world over from the matured fields and dwindling new hydrocarbon finds, new exploration and exploitation technologies are required in order to meet the ever-increasing global energy demand. This theme includes all aspects of petroleum geosciences and the relevant

technological advancements for enhancing oil recovery from the known fields and finding new petroleum resources. Moreover natural gas hydrates are presently considered as vast resources of energy, and recent research has indicated that gas hydrates may be abundant in nature. However, the geological and environmental implications of use of gas hydrates are not yet clearly known.

This theme focuses on understanding hydrocarbon systems and gas hydrates in terms of their occurrence, distribution, management, resource evaluation and production.

31. Geohazards

Coordinators: O.P. Mishra *(opmishra2010.saarc@gmail.com)*, Saibal Ghosh *(saibal.springdale@gmail.com)*

Geohazards, such as earthquakes, floods, landslides, avalanches, volcanic eruptions and tsunamis are caused by short and long-term geological processes and pose serious threats to the human societies and the natural environment of our planet. The main challenge is to put all scientific and multi-disciplinary tools together for comprehensive understanding, assessing and monitoring such events, providing timely advice on their occurrence, and suggesting relevant risk reduction measures. Developing an early warning system is another challenge. Through these scientific endeavours, the geoscientists can contribute substantially in effective risk management to ensure sustainability and long term protection of human societies.

Some of the relevant symposia topics would be Flood Hazard and Risk Assessment and Modelling, Earthquake Hazard and Risk Assessment, Tsunamis, Landslide and Avalanche, Vulnerability Assessment, Challenges and Solutions, Risk Reduction Measures, Control Mechanisms, Risk Management Framework, Risk Management Practices to achieve the Sustainable Development Goals (SDGs) of the Sendai Framework (2015-2030) of Disaster Risk Reduction, Risk Transfers and Insurance.



Landslide in Uttarakhand

32. Environmental Geosciences

Coordinators: J.K. Tripathi *(jktrip@yahoo.com)*, C.V. Dharma Rao *(venchasa@gmail.com)*

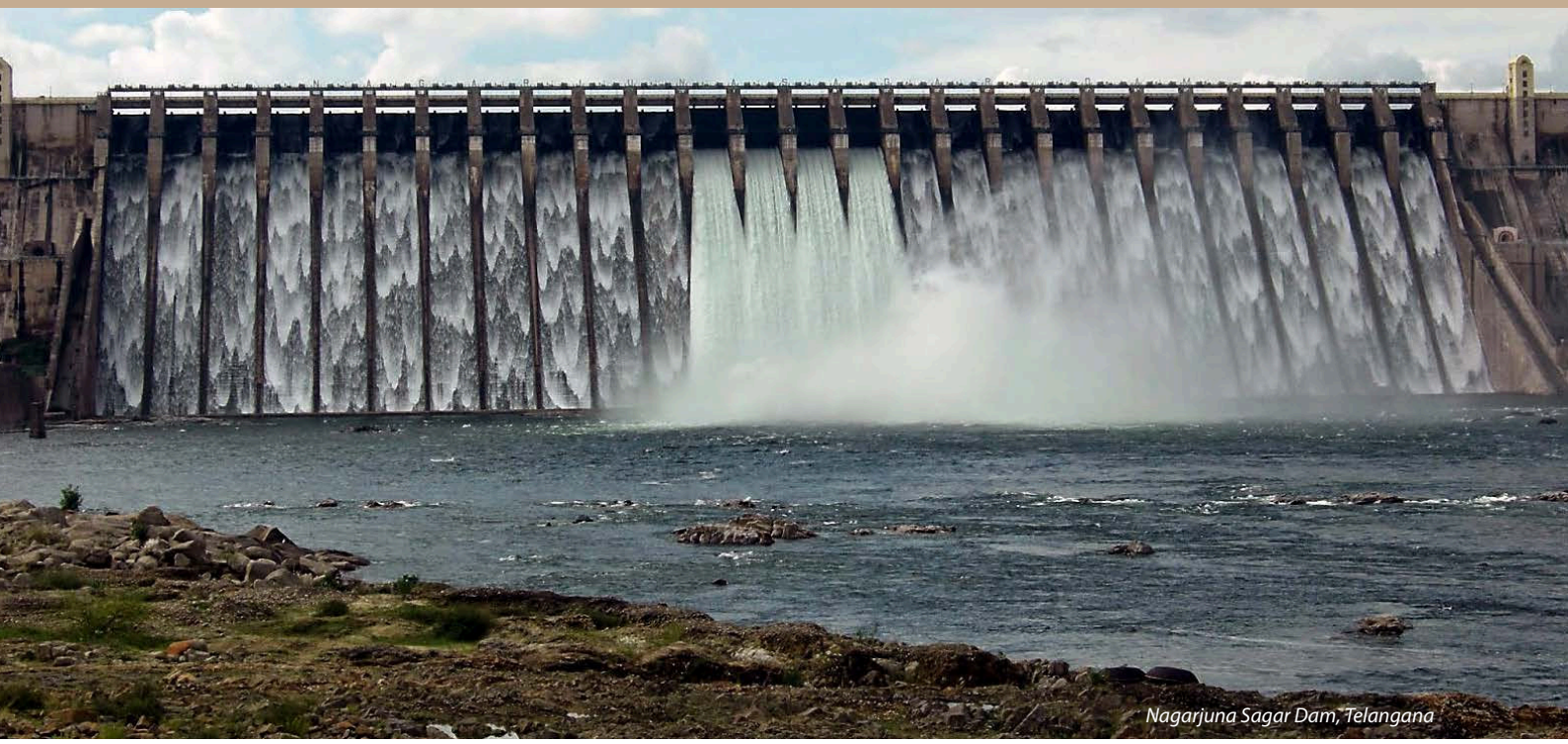
The environment of the biosphere is outcome of the complex interplay of geological processes that are considerably affected by the anthropogenic activities especially in the Quaternary sequences, hydrosphere, biosphere and atmosphere. The environmental impacts of major natural processes as well as the human induced activities need to be assessed and understood properly for safe and sustainable world. Mining and mineral processing of ores, high carbon footprint practices and poor waste management practices are some of the key factors that lead to environmental degradation.

The subtheme topics could be on monitoring of changes of essential parameters of environment including geogenic and anthropogenic impact, heavy metal pollutants, geomicrobiology, waste disposal, carbon sequestration and global dust cycle, smog and mitigation measures of environmental issues.

33. Geotechnical Engineering and Rock Mechanics

Coordinators: T.N. Singh *(tnsiitb@gmail.com)*, K.S. Rao *(raoks@civil.iitd.ernet.in)*

Geotechnical engineering and rock mechanics have become integral part of infrastructural development projects on transport and communication, energy sector, irrigation and drinking water supply, hazardous waste disposal etc. The symposia topics related to this theme include river valley development, urban planning and development, coastal development, hydro and nuclear power generation, hazardous waste disposal, transport and communication projects, slope stability and analysis including submarine slope failures, underground storage facilities, and any other developmental activities requiring geotechnical skill.



Nagarjuna Sagar Dam, Telangana

34. Geomagnetism: Origin of Geomagnetism; Seismology from Space

Coordinators: C.D. Reddy *(cdreddy@iigs.iigm.res.in)*, Mita Rajaram *(mitarajaram@yahoo.com)*

The origin of the Earth's magnetic field is a long-standing issue, yet the mechanism by which the field is generated and its manifestation in different time scales remains an enigma. While the available paleomagnetic and archeomagnetism data can provide clues to the temporal and spatial behaviour of the geomagnetic field from past to present, analysis of ground and satellite based observations followed by their mathematical modelling can shed light on the origin of the geomagnetic field.

The symposia sessions could be related to the origin of the geomagnetic field, paleo- and archeo-magnetism to unravel the past and present geomagnetic activity, contribution of geomagnetism to seismology, monitoring of the geomagnetic field, analysis of ground and satellite-based observations, mathematical modelling, study of lithosphere-atmosphere-ionosphere-magnetosphere interactions etc.

35. Advances in Mineral Resource Evaluation and Mine Planning

Coordinators: H.S. Pandalai *(pandalai@iitb.ac.in)*, P.V. Rao *(drpvrao@gmail.com)*

Successful transformation of a mineral deposit into an operating mine essentially depends on its reliable evaluation that involves careful characterization of the relevant properties of the host rocks and the associated mineralization. The symposia topics related to this theme would include drilling, deposit evaluation, resource modeling, estimation, classification and reporting, mineral processing, geotechnical engineering and mine planning. In the symposia, the domain experts may highlight the emerging techniques and technologies to accomplish improved ore body characterization, mineral resource evaluation and mine planning.

36. Exploration and Mining of Marine Mineral Resources

Coordinators: S. Rajan *(rajan.ncaor@gmail.com)*, Kolluru Sree Krishna *(nio.krishna@gmail.com)*

Of late there has been a resurgence of commercial and scientific interest in the prospecting and exploration for polymetallic nodules and sulphides and cobalt-rich crusts in the Exclusive Economic Zone (EEZ) seabed and beyond. The focus of this theme is on the geoscientific studies related to origin and occurrence of marine resources in diverse settings and their prospecting and exploration under the regulatory mechanisms prescribed by the International Seabed Authority. The theme encourages contributions on the scientific and technological challenges in marine mineral exploration, environmental aspects related to mining, the ecosystem dynamics at the locales of these resources and international laws that are being evolved by United Nations Convention on the Law of the Sea (UNCLOS) for regulation of exploration and mining.



Samudra Ratnakar – Ocean Going Research Vessel of GSI

37. Critical Zone and Sustainable Development

Coordinators: Vimal Singh *(vimalgeo@gmail.com)*, Sekhar Muddu *(sekhar.muddu@gmail.com)*

The planet Earth is unique and so are the processes occurring over it. These surface processes shape the environment that makes life possible on this planet. The surface processes involve weathering, erosion, transportation and deposition of sediments in various environment and generate various landforms. It has direct implications not only on understanding of Earth's functioning but also on environmental and public safety concerns, sustainability of natural resources and engineering.

The contributions addressing various aspects of Earth surface processes such as fluid flow, sediment transport, mass movements, biogenic and chemogenic processes along with long-term and large-scale processes and impact of climate change on the Earth surface processes are welcome.

38. Hydrogeology for Sustainable Development

Coordinators: L. Elango *(elango34@hotmail.com)*, Dipankar Saha *(dsaha002@yahoo.com)*

Water has been important resource for societal needs. Over 70% of water requirement for agricultural activities depend on groundwater. Hence, the subject of hydrogeology dealing with the study of groundwater has direct relevance to the society. In addition, hydrogeology plays an important role in mining, engineering constructions, environmental impact, sustainability. Recent developments in groundwater models are relevant for management and better understanding of hydrogeological systems, which are essential for sustainability of the resources.

The subthemes will include aquifer parameter assessments, groundwater recharging, geophysical methods for exploration of groundwater, water harvesting and groundwater pollution.

39. Geoscience Information- Integration

Coordinators: Alok Porwal *(alok.porwal@gmail.com)*, Vinod Kumar *(vinodkumar_k@nrsc.gov.in)*, M.N. Mishra *(mnmishra4@yahoo.co.in)*

For a holistic understanding of the complex Earth system, acquisition, integration, spatial analysis, visualization, and modelling of multi-disciplinary geospatial datasets is essential. The unprecedented growth in the resolution and the variety of geospatial datasets in earth sciences, have provided excellent opportunity to comprehend the Earth's physical processes. The convergence of GPS, GIS, and Remote Sensing technologies and integration of multi-disciplinary geospatial datasets have opened new areas of research to understand geodynamic processes, mineral prospectivity mapping, mineral deposit models in relation to global tectonics and evaluation and mitigation of natural hazards and environmental modelling.

The symposia on this theme will be related to the application of geoinformatics in geological and subsurface mapping, mineral exploration and resource evaluation, predictive modelling and mineral prospectivity mapping, geo-hazards, geomorphometry and related fields through data integration and 3-D / 4-D modelling.

40. Planetary Sciences

Coordinators: Mahesh Anand *(mahesh.anand@open.ac.uk)*, Jayanta K. Pati *(jkpati@gmail.com)*

Extraterrestrial materials, remote sensing, satellite data, sample return missions offer a unique window to understand the planetary bodies. In addition, Earth-based collection of meteorites, micrometeorites, investigations on meteorite impacts and extinctions continuously augment our understanding of the solar system and its processes, including the evolution of life on our planet. The symposium offers an all-encompassing platform for presenting latest research on comets, asteroids, meteorites, micrometeorites, meteorite impacts and extinctions in the geological time scale, impact modeling, tektites and microtektites, planetary processes and astrobiology. In addition, the recent space missions by leading space agencies have provided new data sets for Moon, Mars and Venus. The theme will offer a platform to assess understanding of our celestial neighbours.



The Lonar Lake- an impact structure, Buldhana, Maharashtra

The subthemes could be Meteorites and Micrometeorites, Moon, Mars, Venus-new possibilities, Astrobiology, Planetary Analogues on Earth and new instruments ideas and techniques for Planetary Exploration.

41. Quantification of Non-Linear Geological Processes

Coordinators: R.K. Tiwari *(rktiwari54@gmail.com)*, Abhey Bansal *(abhey.bansal@gmail.com)*

Recent advances in modeling and characterization show that the Earth's non-linear processes are better understood by using stochastic and geo-statistical methods. Thus, this session invites papers from all branches of non-linear geophysics/geology, which deal with quantification of physical/ geological processes to understand the non-linear dynamics of the earth system.

Sub themes may broadly include Application of fractals in geosciences, and Quantification of geophysical time-series to understand the complex geological processes, etc.

42. Geological Sequestration of CO_2 and Enhanced Oil Recovery

Coordinators: Nimisha Vedanti *(nimisha@ngri.res.in)*, Vikram Vishal *(v.vishal@iitb.ac.in)*

Carbon dioxide emission is believed to be one of the main causes of global warming. Geologic sequestration of carbon dioxide (CO_2) is a way to reduce greenhouse gas emissions in the atmosphere. This is an active area of research, which requires integration of geology, geophysics and rock mechanics inputs for successful implementation. This session invites papers on research on various aspects of the process.

Sub themes may broadly include Injection of CO_2 for Geo-sequestration and Enhanced Oil Recovery.

Your participation in building the Science Program

We have made the Science Program exhaustive. However, it is still open to changes. The Organizing Committee invites your suggestions to make the Program more comprehensive and relevant. You are welcome to send your suggestions or comments to the respective Theme Coordinators.

Submission of Abstracts

Abstracts are accepted only through the Congress website www.36igc.org. The weblink for submission of abstracts will be activated in December 2018 and deactivated in August 2019.

A delegate will be permitted to make only one oral presentation (except plenary and invited keynote speakers), but may co-author multiple oral/poster presentations. Full details of the terms and conditions for abstract submission will be available on the Congress website in December 2018.

There will be a nominal abstract submission fee. For delegates whose abstracts are accepted, this fee will be adjusted against the registration fee.

Workshops/Short Courses

The 36th IGC envisages a host of expert workshops/short courses to be offered at an additional cost. Information on these will be made available on the Congress website, after their finalization. We invite your proposals/suggestions for developing or organizing a workshop/short course through the Congress website.

There will also be a range of training workshops designed for delegates from low-income/developing nations.

Geohost Support Program

The 36th IGC is planning an elaborate Geohost Support Program which will comprise 1000 supports in the form of travel supports, registration fee supports and local hospitality supports for geoscientists. This is to ensure larger participation of serious geoscientists.

The Program will also comprise a special Youth Geohost Program for 121 selected young students pursuing Masters/Ph.D program in geoscience to participate as Full Delegates.

The Program will host 500 geoscience students from the Indian subcontinent as volunteers who will assist and interact with senior IGC delegates for the entire duration of the Congress.

The criteria for selection of these participants and other specifications are being worked out, and will be published in the Second Circular.

There will be a range of training workshops designed for the delegates under this Program. The workshop themes will have relevance to low-income/developing nations.

Congress Field Trips

The Indian subcontinent has a common geological ancestry with other parts of the globe for being constituent of several older supercontinents. In the aftermath of breakup of Gondwanaland, the Indian landmass moved northward for over 5000 km to collide and stitch together with the Asian landmass that resulted in shaping some of its present landforms, typified by the Himalayan mountain chain. The geological processes inherently unique to the Archean Indian crustal nuclei, its Proterozoic and Late Phanerozoic umbilical relations with other continents coupled with its unparalleled great northward 'flight' led to endowment of several unique geological features in the Indian subcontinent. Some of these superlatives include:

The Himalayan orogen epitomizing the greatest crustal shortening on Planet Earth and displaying geodynamic structures related to continent-continent collision, accretion and subduction.

Closure of Neo-Tethys as a result of cold subduction in the trijunction of Indian, Burmese and Asian plates in northeastern India.

Granulite Terrain in Southern India and Sri Lanka that represents extension of the Pan-African Orogen.

An extensive Proterozoic ultrahigh temperature granulite grade metamorphic tract that forms part of the Eastern Ghats Mobile Belt in eastern India, as a part of the Indo-Antarctic orogen during the formation of Rodinia.

The Central Indian Tectonic Zone supposedly responsible for the stitching together of the Greater Indian Landmass during the formation of Rodinia.

The Neoproterozoic felsic volcanic-dominated Malani Igneous Suite exposed in an area of about 50,000 sq km, and interpreted to be a result of breakup of Rodinia and almost an equal expanse concealed under the Eocambrian sediments in the northwestern India.

The Late Cretaceous Large Igneous Province of Deccan Flood Basalts that cover an expanse of 500,000 sq km in western India.

Two rare nestling sites of dinosaurs in central and northwestern India.

The great Indo-Gangetic Plain (2200 km long, 220 km wide) forming the foreland to the Himalayas represents one of the largest alluvium tracts in the world.

The Proterozoic basins in NW India host world class base metal deposits (about 400 million tonnes) that include the single largest sphalerite-rich sulphide body in the world.

The Bengal Fan is the largest submarine fan in the world that has a length of about 3000 km and a width of about 1000 km.

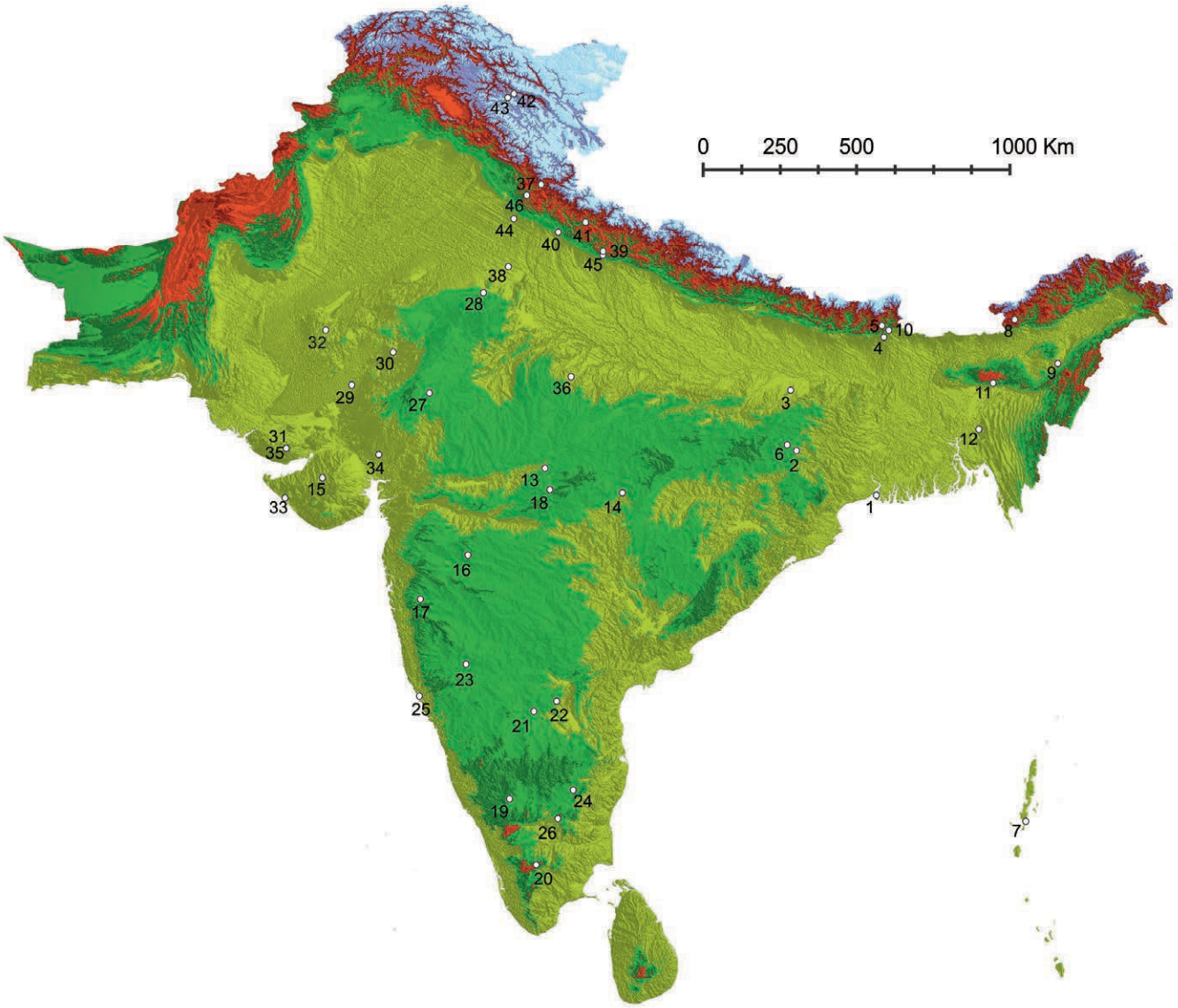
The chain of Andaman Islands in the southeastern part of the subcontinent displays an intimate association of ophiolite sequence with deep sea sediments.

46 pre- and post-Congress field excursions have been planned for the participants of the 36th IGC to have a taste of the spectacular geological features of the Indian subcontinent. A List of the field trips and their location in the map of the subcontinent is presented. Most of the field trips also provide a glimpse of the rich cultural heritage the subcontinent is known for.

There will also be an interesting bouquet of one-day trips during the Congress. Details of these trips will be available in the Second Circular.

Delegates may choose the Field Trips of their interest on the Congress website: www.36igc.org while registering for the Congress.

Physiographic map of India, Bangladesh, Nepal, Pakistan and Sri Lanka showing locations of the proposed Field Trips



Note:

The white circles represent the approximate mid-points of the Field Trip routes

The numbers adjacent to the white circles represent the Field Trip numbers (see Table below)

Proposed Field Trips

Sl No	Code	Title	Duration (Days)	Pre or Post Congress
1	ER-001	Sundarban Delta System	3	Pre
2	ER-002	Proterozoic gold mineralising system in North Singhbhum Mobile Belt	4	Post
3	ER-004	Rajgir-Bodh Gaya- Barabar Geotourism: A unique geological and historical heritage of Bihar	3	Pre
4	ER-005	The Teesta chronicle: Tectonics-climate and human-landscape dynamics	5	Post
5	ER-008	Landslide failure mechanisms, hazard and risk scenarios in Darjeeling Himalayas	5	Post
6	ER-009	Glacial to post-glacial fluviomarine sedimentation system: Evidences from West Bokaro Coal Field	4	Post
7	ER-010	Andaman Islands: An anatomy of the Accretionary prism in an active Burma-Andaman –Java subduction zone	6	Pre
8	NER-001	Geodynamic evolution of Northeastern Himalayas: Traverse along Tezpur-Bomdila-Tawang section Assam and Arunachal Pradesh	4	Post
9	NER-002	Nagaland Ophiolite Complex: Type locality for Intra-oceanic Subduction within the NeoTethys	8	Post
10	NER-003	A glimpse of the enigmatic Himalayan Inverted Metamorphic Sequence: A classic section across the Darjeeling-Sikkim Himalayas	7	Post
11	NER-004	Tectonic evolution of NE Indian Craton, Meghalaya Plateau: Journey from Pre-Grenvillian -- Grenvillian Orogeny to Pan-African Orogeny and Gondwana break-up	5	Post
12	NER-005	Unfolding of Quaternary History and Associated Geoarchaeological Remains of Tripura, Northeastern India	5	Post
13	CR 001	A magnificent trail to Gondwana geology, nature and heritage: Satpura Basin of Central India	5	Pre
14	CR 002	Proterozoic mountain building processes and growth of Greater Indian landmass: A view from the southern margin of the Central Indian Tectonic Zone	5	Pre
15	CR 003	Monogenic alkaline lava flow fields in Deccan Traps-Kachchh & Saurashtra	7	Pre

16	CR 004	Sculptures In Deccan Basalts: Impact Crater To Rock-Cut Caves	6	Post
17	CR 005	Deccan Volcanic Province: Characters and Landscapes	7	Post
18	CR 006	Crustal Evolution and VMS Metallogeny in the Proterozoic Betul Belt, Central India	4	Post
19	SR 003	The Deep crust of Archean Dharwar Craton	6	Post
20	SR 005	Neoproterozoic –Early Cambrian Crustal Evolution In South India: Implications of East Gondwana Assembly	6	Post
21	SR 006	Diamond fields of South India – Wajrakarur Kimberlite Field, Eastern Dharwar Craton	5	Pre
22	SR 007	A journey from Paleo to Neoproterozoic; sedimentation, magmatism and mineralisation in the Cuddapah basin, India	5	Post
23	SR 016	Gravity gliding of Mesoproterozoic Sedimentary Cover of Kaladgi Basin	3	Pre
24	SR 017	Neoproterozoic alkaline carbonatite complexes, Southern India	6	Post
25	SR 018	Quaternary evolution of western continental margin of Karnataka - Goa coasts with emphasis on resource and environment	5	Pre
26	SR 019	Resource Survey For Dimension Stone Granite Deposits in Granulitic Terrain Of Tamil Nadu, India	4	Post
27	WR 001	Palaeoproterozoic Lead-Zinc- Copper-SulphideMetallogenesis In Aravali-Delhi Orogenic Belt, South Central Rajasthan	4	Pre
28	WR 002	Copper mineralisation of Khetri, Rajasthan	3	Post
29	WR 003	Tracing the Rodinia break-up: evidences from North Western India	5	Pre
30	WR 004	Thar Desert And Its Evolution	7	Pre
31	WR 005	Stratigraphic architecture of Rift to Passive Margin evolution in Kachchh Basin	7	Pre
32	WR 006	Stratigraphy And Palaeoenvironments Of The Jurassic Rocks Of The Jaisalmer Basin	7	Post
33	WR 008	Quaternary Miliolitic Limestone of Saurashtra	6	Post
34	WR 009	A Walk on Mars: Jarosite Localities of Kachchh, India	5	Post
35	WR 010	Stratigraphic Architecture of Rift to Passive Margin Evolution and faunal diversity pattern in Kutch Basin	4	Pre

36	NR 001	Dhala structure, India- a Paleoproterozoic complex impact crater	3	Pre
37	NR 003	Archives of Late Quaternary climate fluctuations in Satluj Valley, Himachal Pradesh	5	Pre
38	NR 004	Holocene Climate change and its impact on the dispersal of Indus Valley/ Saraswati Civilization	2	Post
39	NR 005	Pre-Himalayan metamorphism and magmatism in Kumaun Lesser Himalaya	7	Post
40	NR 006	Tectonics of the Higher Himalayan Crystallines along Alaknanda-Dhauli Ganga Valleys, Uttarakhand Himalaya	8	Post
41	NR 008	Evolution of the Lesser Himalaya-A Columbia-Rodinia-Gondwana Connect	7	Post
42	NR 009	Trans Himalayan Ladakh Batholith: A key to Magma Chamber Processes and Dynamics	5	Post
43	NR 010	Ladakh- an archive for Quaternary landscape, climate and neotectonics	8	Post
44	NR 011	Siwalik vertebrates and Siwalik Fossil Park, Saketi (Himachal Pradesh)	2	Pre
45	NR 013	Paleoseismology along the foothill zone of the Central Himalaya, Uttarakhand, India	5	Post
46	NR 016	Outer to Central Himachal Himalaya Transect – Sedimentary and Tectonic story unfolded	5	Post

The list of field trips indicated is not exhaustive; more field trips from India and neighbouring countries will be added in due course

One-Day Field Trips

There will be a number of exciting one-day trips during the Congress covering various aspects like culture, heritage etc. These are being finalised and will be published on the Congress website. For participating in these trips, a delegate can register through the website.

Exhibition

Geoexpo, the 36th IGC exhibition, will be held alongside the Congress at the IEML. Both pre-fabricated and customized booths of various sizes will be available. Detailed information will be provided in the Second Circular.

Visa Requirements for the Congress Participation

All foreign nationals entering India are required to possess a valid international travel document in the form of a national passport with a valid visa obtained from an Indian Mission or Post abroad. Passports from Bhutan and Nepal entering India are exempted from the requirement of a Visa, and those from Maldives are exempted for 90 days only, subject to certain terms & conditions. All information on visa requirements is available on the website of the Ministry of External Affairs, Government of India (www.mea.gov.in).

The Government of India has introduced e-Visa facility for several nations across the world. The details are available at *https://indianvisaonline.gov.in/visa/index.html*.

Official letters of invitation will be provided to delegates by the 36th IGC for obtaining a Visa, after confirmation of receipt of registration fee. Delegates have to arrange for visas on their own.

Accommodation

The Delhi National Capital Region has a number of hotels close to the Congress venue. They have been categorized as 5-star deluxe, 5-star, 4-star, 3-star, 2-star and budget hotels. Delegates may book their accommodation through either the Congress website or the hotel websites. We are planning to provide hop-on hop-off bus services between the hotels and the venue during the Congress.

The Indian Subcontinent beckons!

India is a tourist's paradise. It is a land of knowledge and culture, growth and development, mysticism and modernity. It is known for its great diversity, heritage and tradition which pervade every aspect of life and society. The world's largest democracy, India is a pluralistic, multilingual, and multiethnic society. Globally, India has emerged as a nerve centre for political, economic and commercial activities. The rapid urbanisation and growth of infrastructure has brought India to the forefront of 'preferred destinations' for tourism and conference activities.

Hill stations: India has some of the best hill stations of the world. These are Darjeeling, Mussoorie, Shimla, Manali, Kashmir, Shillong, Gangtok, Ooty, Panchmari, Munar to name few. March offers a splendid time to visit these places.

Sea beaches: The magnificent sea beaches at Mumbai, Puri, Pondicherry, Kovalam, Goa and Visakhapatnam are perennial crowd pullers. Tourists from across the globe throng to these places to experience the sublime sunrises and sunsets and the local cuisine.

Desert: The Thar desert, also called the Great Indian Desert, with its piles of golden sands, attracts millions every year. The place resonates with its colourful carnivals, rustic music and a great menu of local food.

Forests: From diverse flora and fauna to exotic wildlife, India boasts of a charming landscape for any nature and wildlife lover. The country has a host of National Parks and wildlife sanctuaries, namely, the Ranthambore, Bandavgarh, Periyar, Kaziranga, Jim Corbett, Sunderbans, Kanha, Jaldapara, Manas, and Gir.

Architectural beauty: India epitomizes the multicultural and multidynastic influence on its architecture. Sculptural marvels like the Taj Mahal, Khajuraho and Konark, temples like Meenakshi



Red Fort, Delhi

and Kanyakumari, caves liked Ajanta and Ellora, forts like Agra and Red Fort (Lal Qila) stand testimony to the rich and varied architectural styles adopted in India.

Religious places: India is known for its religious and spiritual places. These include the Puri Jagannath Temple, the Sringeri Math, Vaishno Devi, Rameshwaram, Pawapuri, Dilwara, Jama Masjid, Khaja Baba Mosque and plenty more.

Culinary Delights: There will be a wide range of food to pamper all palettes. India has a tradition of street food that has flourished through the centuries. At the same time, International cuisine is very popular and it's easy to find a large number of restaurants and food outlets serving Italian, Japanese, Continental, Mexican, American, Middle-Eastern, Thai and Chinese food of high quality.

Some of the unique foods that Delhi is famous for are the Mughlai kababs and roast dishes; varieties of chaat - an Indian fast food; a host of delectable breads – nans, kachoris, parathas; and a wide range of desserts like rasgullas, gulab jamuns, jalebis, kulfis, gajaks etc.

Metropolitan cities: India has embarked on a journey of building a 100 smart cities. Delhi, Mumbai, Kolkata, Chennai, Bengaluru, Chandigarh and Jaipur are some of the most important and popular ones among the long list of Indian tourist cities.

Currency: The Rupee (sign:₹; code: INR) is the currency of India. The Rupee is subdivided into 100 paise.

For more information, please visit tourism.gov.in, the official website of the Ministry of Tourism, Government of India.

Bangladesh, Nepal, Pakistan and Sri Lanka are all beautiful countries in their own special way. Each has its own distinct culture, heritage, history, geography and lifestyle. For more information on the tourist places of these countries, please visit:

Ministry of Civil Aviation and Tourism, Government of Bangladesh at *http://www.mocat.gov.bd*

Ministry of Culture, Tourism and Civil Aviation, Government of Nepal at *http://www.tourismdepartment.gov.np*

Pakistan Tourism Development Corporation at *https://www.travel-culture.com/ptdc*

Ministry of Tourism Development and Christian Religious Affairs, Government of Sri Lanka at *http://www.tourismmin.gov.lk*



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