2nd INDO-GERMAN WEEK OF THE YOUNG RESEARCHER

25th November – 1st December 2023

New Delhi / Dehradun

सत्यमेव जयते

Deutsche Forschungsgemeinschaft

German Research Foundation

Kedernath Temple- 2013 Extreme events along the Mandakini River. A >9 m long sub-angular migmatitic gneiss brought by the flood during the breaching of Chora Bari or Gandh Sarvoar Lake.

DFG SERB Indo-German Week of the Young Researcher 2023

Dear colleagues from India and Germany,

We are very delighted to welcome you to our Second edition of The Week of the Young Researcher in Dehradun! An initiative between the German Research Foundation and the Science and Engineering Research Board.

Now, in November in 2023 we can bring together two groups of excellent researchers in the field of Geosciences ("Geodynamics and Climate Science of the Himalaya Region") from Germany and India.

The main goal of this meetings is to foster collaboration among early-mid career researchers who will be setting the agenda of scientific cooperation between India and Germany in the near future.

We hope that over the coming 5 days there will be lots of interaction, fruitful discussions and exchanges about future collaboration.

With this we wish you a great week and many successful collaborations to come.

Organizing Committee of the IGWYR

डॉ. अखिलेश गुप्ता
सचिव
Dr. AKHILESH GUPTA
SECRETARY

विज्ञान और इंजीनियरी अनुसंधान बोर्ड
(विज्ञान और प्रौद्योगिकी विभाग, भारत सरकार का एक सांविधिक निकाय)
SCIENCE & ENGINEERING RESEARCH BOARD
(A Statutory body of Department of Science and Technology, Govt. of India)

8th November, 2023

MESSAGE

The Science and Engineering Research Board (SERB) is a statutory body under the Department of Science and Technology, Government of India. It was established with the aim of promoting and funding scientific research and innovation in various fields of science and engineering in India. SERB plays a crucial role in supporting and catalyzing research initiatives in the country. One of SERB's key objectives is to foster international collaborations and partnerships to enhance the scientific and technological landscape in India. Through this effort, SERB has initiated research collaboration with DFG, German Research Foundation in the frontier areas of research.

SERB in partnership with DFG has already organized a scientific bilateral SERB-DFG "Week of the Young Researchers" (WYR) conclave in the year 2022 in the area of Chemical Sciences, where young researchers were invited to share their research interests, and seek partnerships that could be supported through future bilateral R & D calls.

I am delighted to learn that this year again, an event in the area of Geo-Sciences is being organized. The SERB-DFG WYR is a platform for budding researchers, established scientists and esteemed mentors to engage in meaningful dialogues, exchange pioneering ideas, and foster connections that transcend geographical boundaries. It is my sincere belief that such interactions will not only lead to cutting-edge discoveries but will also contribute to a deeper understanding of our environment and its intricate systems.

I wish to extend my warm wishes and appreciation to Indian and German delegates making the "Week of the Young Researchers" (WYR) conclave grand success. I wish you all a week of enriching experiences, fruitful collaborations, the promise of scientific exploration, and the conclave of a resounding success.

SERB's efforts to initiate and promote such collaborations with organizations like the DFG demonstrate its commitment to fostering research and innovation. These collaborations not only advance scientific knowledge but also contribute to the development of research ecosystem in both the countries.

(AKHILESH GUPTA)

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Prof. Talat Ahmad
FNA, FASc, FNASc, JC Bose National Fellow

Chairman, G.B.
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Message

It is with great pleasure and anticipation that I welcome you to the 2nd edition of SERB-DFG Week of the Young Researcher, November 27th to December 1st, 2023, at WIHG, Dehradun, a collaborative initiative between the Science and Engineering Research Board (SERB) and the Deutsche Forschungsgemeinschaft (DFG). This event stands as a testament to the shared commitment of both organizations toward fostering scientific exchange and advancing knowledge in the dynamic realm of geodynamics and climate science, with a particular focus on the Himalayan region.

The Himalayas, often called the roof of the world, hold a unique position in the global geoscientific community. These majestic mountains not only shape the physical and ecological landscapes of the subcontinent but also bear profound implications for regional climate patterns and, consequently, have far-reaching consequences on a global scale. Understanding the intricate interplay between geodynamics and climate science in this region is pivotal, and this conclave provides an invaluable platform for the brightest young minds in research to come together, exchange ideas, and forge collaborations that will drive this field forward.

This week, we will delve into various topics, ranging from tectonic processes shaping the Himalayas to the cascading effects on climate, hydrology, and ecology. We are privileged to host a distinguished panel of speakers and experts whose expertise spans a broad spectrum of disciplines, offering unique insights and perspectives that promise to enrich our collective understanding. I extend my deepest gratitude to SERB and DFG for their unwavering support in organizing this conclave. Their commitment to nurturing young talent and fostering international scientific cooperation is commendable.

In closing, the SERB-DFG Week of the Young Researcher will be a resounding success, leaving an indelible mark on the landscape of geoscientific research. I look forward to witnessing the insightful presentations, spirited debates, and the seeds of collaborative projects that will undoubtedly emerge from this gathering.

Warm regards,

Talat Ahmad

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Prof Bodo Bookhagen
Group Leader
Geological Remote Sensing

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Foreword

Earth Science research in India has a long tradition, which stretches back several thousand years. In the past two millennials, the 6th century Varahamihira's Encyclopedia Virhat Sanhita (or Brhat Samhita) in Sanskrit-language stand out and contained many aspects of modern geologic observations and first conceptual models. Since then, several important theories were developed in the geosciences, for example why earthquakes repeatedly occur on the same fault as the result of stress accumulation and periodic stress release. In recent decades, research linking the interaction between tectonics and climate but also tectonics and biodiversity underline the importance of the geosciences as a highly interdisciplinary research discipline.

Significant conceptual advances and models in modern geosciences are derived from studies that used the active Himalaya and its foreland areas as natural laboratories. Examples of these include, but are not limited to:

- Exhumation of deep-seated rocks and the formation of a 'channel flow';
- the formation of metamorphic core complexes during orogenesis;
- the gravitational collapse of large-scale orogens due to its own weights and tectonic deformation;
- the initiation of the Asian monsoon system with global consequences;
- the coupling of protracted erosion and exhumation and the understanding that erosional unloading change the stress field and ultimately can lead to changes in exhumation processes;
- the rapid re-arrangement of river catchments on geologic time scales;
- sediment transport processes and lag times in the foreland areas.

Several of these important concepts were aided by technical advances. For example, the first optical satellite images for the Himalaya and adjacent Tibetan Plateau provided guidance for large-scale fault mapping and the understanding of 'escape' or 'indenter' tectonics. The geophysical traverses across the Himalaya helped to elucidate the depth structure of continental-scale active faults.

Such concepts are not only important in academic environments, but find application in several societally-relevant topics. Most of the new approaches are often tested and explored in Himalayan settings.

The significance of geoscientific education and research has become more important during the past decades, especially during times of global change.

We anticipate, that this workshop will provide a gateway and pathways to establish more of these interactions and provide venues to develop concepts and explore ideas.

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) is the central self-governing research funding organisation in Germany. The DFG serves the sciences and humanities and promotes research of the highest quality in all its forms and disciplines at universities and non-university research institutions. The focus is on funding projects developed by the academic community itself in the area of knowledge-driven research.

The DFG funds research projects, creates competitive opportunities and conducts procedures for the review, evaluation, selection and decision of research proposals. It helps shape the overall conditions and standards of academic research. The DFG maintains dialogue with society, politics and business and supports the transfer of knowledge. It advises state institutions and institutions working in the public interest on issues relating to academic research and research policy.

Moreover, the DFG takes particular care to promote international cooperation, early career researchers, gender equality and diversity in science and the humanities.

The DFG has a current annual budget of €3.6 billion, provided primarily by the German federal government (69 percent) and the states (30 percent).

The DFG is an association under private law. Its member organisations include universities, non-university research institutions, such as the Max Planck Society, Fraunhofer, the Helmholtz Association and the Leibniz Association, academies of sciences and humanities, and scientific associations. The Head Office supports the work of the statutory and additional bodies.

The DFG's primary task is to promote excellent knowledge-driven research, especially at universities. Funding science across the entire spectrum of academic disciplines and scientific institutions, the DFG also has a special responsibility to shape the development of the German science system in general. In this context, the DFG's three main areas of responsibility are as follows:

- The DFG selects and funds incoming research proposals, enabling a fair, science-led competition.
- The DFG adopts strategic funding initiatives to support specific research fields or to react upon acute research needs or upon suggestions for expanding collaborative ventures in certain cases.
- The DFG helps shape appropriate conditions and standards of academic research.

Within the DFG, researchers make funding decisions and other decisions on a self-organised basis – as members elected by the academic community to the DFG's statutory bodies.

SERB-DFG Week of Young Researcher 25th Nov – 1st Dec, 2023

The Science and Engineering Research Board (SERB) is a statutory body established through an Act of Parliament. Supporting basic research in emerging areas of Science & Engineering are the primary and distinctive mandate of the Board.

SERB aims to build up best management systems which would match the best global practices in the area of promotion and funding of basic research.

Goals:

Stimulating the search for new knowledge and encouraging invention, discovery, innovation and development by supporting bottom-up research.

Support conceptually new directions, even when risky, but having the potential for non-incremental and transformative success. Strengthen deep-expertise in specific domains and link them through inter-disciplinary and multi-institutional 'top-down' programmes that address challenging national problems.

Develop funding programmes which connect with needs of our society and identify key scientific questions, both basic-science and application that have concrete societal value. Launch and strengthen programmes to bring in researchers from under represented regions, weaker and marginalized segments of the society. Realising the importance of gender parity, ensure that appropriate programmes pro-actively have mechanism to encourage enhanced and equitable representation of woman scientists. Initiate and strengthen schemes that link teachers in colleges and resource-poor universities with opportunities in active research, thereby aiding in expanding the footprint of quality science. Through global bilateral and multilateral partnerships support collaborative top quality research in cutting-edge areas to ensure the speedy growth of quality science in India. Scout, mentor, incentivize and reward exceptional performers, teams and institutions. Show unstinted commitment towards science by constantly improving our methods and speed for research support, while ensuring the highest adherence to financial processes.

Recognising that all research support has at its base the development of quality, well-trained researchers; initiate and strengthen programmes of identifying research potential, mentoring, training and hands-on workshops, on a broad-based national scale.

Make SERB the vehicle of choice for all R&D funding agencies for their core programmes by developing inclusive processes and proactively synergizing with them for the requisite integration and consolidation of the research effort in Science and Engineering in the country.

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PROGRAMME

Saturday, 25 November 2023		
Arrival of guests in Delhi		
	CHECK-IN, Jaypee Siddharth, New Delhi	
7:00 – 9:00 PM	Reception being hosted at the German Embassy in New Delhi	Bus Leaves Hotel at ca. 6:00 PM
~9:30PM	**Return to Hotel** **15 min light sightseeing tour with the bus**	
Day 1 (Sunday, 26 November 2023)		
7:30- 8:30 AM	**Breakfast**	
9:00 AM	**Trip from New Delhi to Dehradun** **Stop-over at a Geological site in the vicinity of HFT/MFT at Mohand anticline**	Bus Leaves Hotel at ca. 9:00 AM
6:00 PM	**Arrival in Dehradun** **Check-In Hotel Hyatt Centric, Dehradun**	
7:00 PM	**Dinner at the Hotel**	
Day 2 (Monday 27 November 2023)		
7:30-8:15 AM	**Breakfast**	
8:30 AM	**Travel from Hotel to WIHG, Dehradun**	Travel by Bus
Inaugural Session		
9:30-10:30 AM	• Greetings by Conveners • Lighting of the Lamp • Introduction by participants	
10:30-11:00 AM	**Climate Research Agenda for India-vision 2030 and beyond**	Program Introductory talk by Akhilesh Gupta Secretary, SERB
11:00-11:30AM	**Rockfall: Prediction and its Remedial Measures in High Hill**	Introductory Talk T N Singh Director, IIT-Patna
Technical Session-1		
11:30-12:05 PM	**Observing sediment-flux changes in space and time in the Himalaya**	**Bodo Bookhagen**
12:05-12:30 PM	A Desert in making: Exploring the Himalayan connection of the Thar Desert	Anirban Chatterjee
12:30-12:55 PM	Understanding Past and Projecting Future Tree Growth Patterns Amidst Climatic Shifts: Insights from Dendrochronology	Sugam Aryal, Achim Bräuning
12:55- 1:55 PM	**Lunch**	

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1:55-2:20 PM	Provenance and palaeogeographic changes within the Mesozoic Kutch Basin, western India	Angana Chaudhuri
2:20-2:45 PM	Sediment provenance of Cretaceous–Paleogene strata from the frontal Himalaya of northwest India: Implications for India-Asia collision	Cody Lee Colleps
2:45- 3:15 PM	**Coffee/tea and snacks break**	
Technical Session-2		
3:15- 3:50 PM	**Tectonics, climate, erosion, and the relief of mountain belts**	**Peter van der Beek**
3:50- 4:15 PM	Hydrogen isotopes of archaeal lipids as novel tracers of paleohydrology	Felix Elling
4:15- 4:40 PM	**Coffee/tea and snacks break**	
4:40-5:05 PM	Extreme Eocene warmth drove proto-monsoons and desert greening in NE Tibet	Niels Meijer
5:05-5:30 PM	Detrital Garnet Petrology	Jan Schönig
5:30-6:00 PM	**Coffee/tea and snacks break**	
Technical Session-3		
6:00-6:35 PM	**Geo-hazards in the Himalaya and Plausible Mitigation**	**Kalachand Sain**
6:35-7:00 PM	Monitoring of Himalayan Glacier and Associated Hazards using Space and Ground Observations	Rakesh Bhambri
7:00-7:25 PM	Fluvial response to mass movements in the Himalayas: quantifying rapid river incision due to the 2021 Chamoli disaster	Yunus Ali
7:25-7:50 PM	Recent Changes in Snow-Water Resources in High Mountain Asia	Taylor Smith
7:50 PM	**Dinner at WIHG**	
9:15 PM	**Travel back from WIHG to Hotel**	Travel by Bus
Day 3 (Tuesday, 28 November 2023)		
7:30-8:15 AM	**Breakfast**	
8:30-9:30 AM	Travel from hotel to WIHG	Travel by Bus
Technical Session-4		
9:30-10:05 AM	**Two Decades of Earthquake Geological Studies in the Himalaya: the compelling necessity for Seismic Hazard Assessment**	**R. Jayangondaperumal**
10:05-10:30 AM	Fluid and tectonic pressure interplay: A new window to understand Himalayan earthquakes	Arun Kumar Ojha
10:30-10:55 AM	Seismic tomography of different seismically active tectonic regions of Indian subcontinent	P. Mahesh
10:55-11:20 AM	Potential Talk for Funding Information (DAAD/IGSTC)	tba

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11:20-11:50 AM	**Coffee/tea and snacks break**	
Technical Session-5		
11:50-12:25 PM	**Recent advance in understanding of the tectonics of the Western Himalayan the frontal fold and thrust belt and how we can progress in the future?**	**Rasmus Thiede**
12:25-12:50 PM	Investigating uplift driven diversification of the Kashmir Himalayas using multiproxy data	Showkat Hamid Mir
12:50- 1:15 PM	Ground water scenario of Northwest India derived from remote sensing and deep learning tools	Alka Singh
1:15-2:15 PM	**Lunch**	
2:15- 2:40 PM	Expression of Active Tectonics in the Maturity of the Evolved Landscape: A Case from the Western Sub-Himalaya	Mjahid Zebari
2:40- 4:30 PM	**Discussion at the posters**	
4:30-5:00 PM	**Coffee/tea and snacks break**	
5:00 PM	**End of scientific session** **Travel back to Hotel**	Travel by Bus
7:00 PM	**Dinner - Outside as per their choice**	
Day 4 (Wednesday, 29 November 2023) **Field Visit**		
7:00 AM	**Early breakfast**	
7:30 AM	Leave Hotel for field excursion **Dehradun** to **Tehri Dam** with multiple stopovers	Travel by Bus/ Light Commercial Vehicle
7:00 PM	**Back at the hotel** **Dinner at Hotel Hyatt Centric**	
Day 5 (Thursday, 30 November 2023)		
7:30-8:15 AM	**Breakfast**	
8:30-9:30 AM	Travel from hotel to WIHG	Travel by Bus
Technical Session-6		
9:45-10:20 AM	**Contrasting crustal evolutionary trends for the Precambrian and Post Cambrian periods in Northern Indian Shield & the western Himalaya**	**Talat Ahmad**
10:20-10:45 AM	Pyroclasts and Hydrothermal Signatures from the Central Indian Ocean Basin	Ankeeta Amonkar and Sridhar D. Iyer
10:45-11:10 AM	Tracking the research trends in Geodynmaic evolution of the Himalayan Metamorphic Core: The past, the present and the future	Sayantan Chakraborty
11:10-11:40 AM	**Coffee/tea and snacks break**	
11:40-12:05 PM	Crustal evolution in the western central Indian shield through Precambrian TTG- Granitoids and the magmatic rocks of the western Himalaya, Ladakh region	Hiredya Chauhan, Talat Ahmad
12:05-12:30 PM	Mineralogical and petrological investigation of limestone and shale of Permian-Triassic section at Guryul Ravine, Kashmir, India: Emphasising on the paleoenvironmental conditions prevailed during their deposition	Shamim A. Dar and Nozmul Karim

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12:30-12:55 PM	The role of equilibration volume in the formation of complex microstructures: A case study on the origin of corundum-sapphirine-cordierite double corona around aluminosilicates in high grade metamorphic	Anindita Dey
12:55-1:20 PM	Constraints of partial melting and melt transfer mechanisms on crustal rheology of the Himalayan orogeny	Purbajyoti Phukon
1:20-2:20 PM	**Lunch**	
2:20-4:00 PM	**Discussion at the posters**	
4:00- 4:30 PM	**Coffee/tea and snacks break**	
4:30- 6:00 PM	**Visit to Late-Pleistocene Caves in and around Dehradun**	
5:30 PM	**Travel back to Hotel**	Travel by Bus/ Light Commercial Vehicle
7:00 PM	**Dinner**	
Day 6 (Friday, 1 December 2023)		
7:30-8:15 AM	**Breakfast**	
8:30-9:30 AM	Travel from hotel to WIHG	Travel by Bus
Technical Session-7		
9:30-9:50 AM	**SERB support Facilities / Fellowships by SERB**	Arvind Chaudhary
9:50-10:10 AM	**DFG: Funding programs**	Guido Lüniger
10:10-10:40 AM	**Coffee/tea and snacks break**	
10:40-12:00 PM	**Summarizing all themes**	
12:00 PM	**Lunch**	
1:00 PM	**Departure to Delhi (Airport)**	Travel by Bus/ Light Commercial Vehicle

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List of Attendees (Alphabetically)

Talat **Ahmad**	Wadia Institute of Himalayan Geology, Dehradun Chairman, Governing Body
Ankeeta **Amonkar**	Dnyanprassarak Mandal's College and Research Centre, Goa Department of Geology Assistant Professor
Sugam **Aryal**	Friedrich-Alexander-Universität Erlangen-Nürnberg, Department of Geography, Scientific Staff
Rakesh **Bhambri**	Wadia Institute of Himalayan Geology, Dehradun Glacial dynamics and related hazards division Scientist C
Bodo **Bookhagen**	University of Potsdam Institute of Geosciences Full Professor
Sayantan **Chakraborty**	Indian Institute of Technology, Guwahati Department of Civil Engineering (Earth System Science and Engineering Division) Assistant Professor
Anirban **Chatterjee**	Presidency University, Kolkata Department of Geology Assistant Professor
Angana **Chaudhuri**	Georg-August-University Göttingen, Geoscience Center, Department of Sedimentology and Environmental Geology Postdoctoral Research Fellow
Hiredya **Chauhan**	Wadia Institute of Himalayan Geology, Dehradun Scientist C
Cody L. **Colleps**	University of Potsdam Institute of Geosciences Postdoctoral Researcher
Shamim Ahmad **Dar**	Banaras Hindu University Department of Geology Assistant Professor
Anindita **Dey**	University of Delhi Department of Geology Assistant Professor

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Felix **Elling**	Kiel University Leibniz Laboratory for Radiometric Dating and Isotope Research Group leader
Akhilesh **Gupta**	Department of Science & Technology, Government of India Secretary, Science & Engineering Research Board & Senior Adviser
Niels **Meijer**	Senckenberg Biodiversity and Climate Research Centre, Frankfurt a. M. Postdoctoral Researcher
Showkat Hamid **Mir**	Julius-Maximilians-Universität, Würzburg Institute of Geography and Geology Humboldt Postdoctoral Fellow
Arun Kumar **Ojha**	CSIR-National Geophysical Research Institute, Hyderebad R & D Group, Geochemistry
Mahesh **Perugu**	CSIR-National Institute of Oceanography, Dona Paula Geological Oceanography Division Scientist
R. **Jayangondaperumal**	Wadia Institute of Himalayan Geology, Dehradun Structure and Tectonic Group Scientist F and Hon-Prof. AcSiR
Pubajyoti **Phukon**	Assam University, Silchar Department of Earth Science Assistant Professor
Yunus Ali **Pulpadan**	Indian Institute of Science Education and Research, Mohali Department of Earth and Environmental Sciences Assistant Professor
Kalachand **Sain**	Wadia Institute of Himalayan Geology, Dehradun Director
Jan **Schönig**	Georg-August University, Geoscience Center, Department of Sedimentology and Environmental Geology Research Associate – Post Doc
Alka **Singh**	University of Amrita Vishwa Vidhyapeetham Department of Wireless Network and Application Assistant Professor
T. N. **Singh**	Indian Institute of Technology, Patna Director

Taylor **Smith**	University of Potsdam Institute of Geosciences Postdoctoral Researcher
Rasmus **Thiede**	Kiel University Institute of Geosciences, Petrology and Geodynamics Heisenberg position
Pieter **van der Beek**	University of Potsdam Institute of Geosciences Professor of General Geology
Mjahid **Zebari**	Ludwig-Maximilians-Universität München Department of Earth and Environmental Sciences Postdoctoral Researcher

Dr. Vaibhav **Agarwal**	DFG Office India
Dr. Arvind **Chaudhary**	SERB, Government of India
Dr. Franziska **Langer**	DFG International Affairs, DFG Office India
Dr. Guido **Lüniger**	DFG Scientific Affairs
Dr. Prahlad **Ram**	SERB, Government of India
Dr. Praveen K. **Somsundaram**	DST/SERB, Government of India


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SPECIAL LECTURES

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SPECIAL LECTURE by Akhilesh Gupta

Secretary, Science & Engineering Research Board &
Senior Adviser, Department of Science & Technology
Government of India
New Delhi
E-mail: akhilesh.g@nic.in

Dr Akhilesh Gupta has a doctorate degree from IIT Delhi in Atmospheric Sciences (1999) and post graduate degree from Lucknow University in Physics (1984). He joined the India Meteorological Department in 1985 and later the National Centre for Medium Range Weather Forecasting in 1994, both are currently under Ministry of Earth Sciences. Dr Gupta has been the Adviser to Union S&T Minister and Secretary to University Grants Commission (UGC). Currently, Dr Gupta is the Secretary, Science & Engineering Research Board (SERB) and Senior Adviser in DST heading Policy Coordination and Programme Management Division and overall in-charge of 5 national missions viz., National Mission on Interdisciplinary Cyber Physical System, National Mission on Quantum Technology and Applications, National Super-computing Mission, National Mission on Strategic Knowledge for Climate Change and National Mission for Sustaining the Himalayan Ecosystem. Dr Gupta has published over 200 research papers in various National and International journals and proceedings of conferences. He is editor of 5 books, author of over 350 articles and nearly 1000 reports. Some of the key research areas of interest to Dr Gupta include, Tropical cyclone prediction, monsoon meteorology, location specific weather prediction, weather and climate modelling, STI policy areas like Open science, equity & inclusion, STI financing, system interconnectedness, etc. Dr Gupta has been one of the authors of India's National Action Plan on Climate Change (NAPCC) and head of the Secretariat which drafted India's new Science, Technology and Innovation Policy, which is under finalization. Dr Gupta is a Fellow of Indian National Academy of Engineering (FNAE), Fellow of Indian Meteorological Society (FIMS) and a Fellow of Association of Agrometeorologists (FAAM).

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India's Climate Research Agenda for 2030 and Beyond

Akhilesh Gupta

ABSTRACT

India, like all other countries of the world, faces the challenge of dealing with the threat of climate change, while also trying to sustain rapid economic growth. Climate research across the world is focusing on developing resilience to address the impact of climate change, which in turn requires innovative approaches and interventions. Sustainable and regenerative development of ecosystems and communities warrant climate-compatible planning, implementation, and monitoring. The National Action Plan on Climate Change (NAPCC) released in June 2008 emphasised positioning dedicated research initiatives for developing long-term climate adaptation strategies to promote sustainable development and climate-resilient socioeconomic growth. As one of the founding members of the Intergovernmental Panel on Climate Change (IPCC), India has contributed to global climate research since 1990 when the IPCC released its First Assessment Report (FAR). Following this several initiatives were undertaken by the government, including Monsoon Trough Boundary Layer Exp. (MONTBLEX) in 1990, India's Methane campaign in 1991, the Indian Climate Research Programme (ICRP) in 1997, the LAnd Surface Processes EXperiment (LASPEX) in 1997, Indian Ocean Experiment (INDOEX) in 1999, Bay of Bengal Monsoon Experiment (BOBMEX) in 1999, Arabian Sea Monsoon Experiment (ARMEX) in 2001, Experiment on Monsoon variability under TOGA-I in 2002, and the National Action Plan on Climate Change (NAPCC) in 2008. And in the following year in 2009, the NAPCC gave birth to eight National Missions on Climate Change anchored at seven central ministries and departments viz., Ministry of New and Renewable Energy (MNRE), Ministry of Power, Ministry of Urban Affairs, Ministry of Water Resources, Ministry of Agriculture & Cooperation, Ministry of Environment, Forests & Climate Change and Department of Science & Technology (DST). DST is responsible for implementing two of these missions viz., the National Mission for Sustaining the Himalayan Ecosystem and the National Mission on Strategic Knowledge for Climate Change. With these efforts, it has, amongst other things, supported more than 200 projects, 15 centres of excellence, 30 major research and development programs, 14 network programs, six task forces, and 25 centres with over 1500 scientists and students working on these mission projects. In similar way, several research initiatives have been undertaken by the Ministry of Earth Science from the Centre for Climate Change Research (CCCR), Indian Institute of Tropical Meteorology Pune. These include the development of the Earth System Model, IITM-ESM in partnership with the National Oceanic

and Atmospheric Administration (NOAA), USA. CCCR also generates regional climate scenarios for monsoon in the Indian region through its participation in the World World Climate Research Programme (WCRP) initiative: COordinated Regional climate Downscaling Experiment (CORDEX), by dynamical downscaling of regional climate over large South Asian domain, using high resolution (50 km) Regional Climate Models (RCMs). These efforts have been crucial in understanding the weather and climate of the region and mitigating its effects.

The recently released sixth Assessment Report (AR6) of IPCC highlights the need for setting a new vision and agenda for climate research, to meet the challenges of the future impact of now 7 “irreversible” climate change globally. Climate change is expected to increase extreme events like heat waves, cyclones, heavy rainfall, floods and droughts. These are likely to affect India directly or indirectly by accentuating increasingly severe, interconnected and often irreversible impacts of climate change on ecosystems, biodiversity, and human systems. Thus, underscoring the urgency for climate research that would help India mitigate extreme events and increase climate resilience. Hence, there is need to develop a long-term vision for climate research in the country to identify key priority areas of climate research.

The Department of Science & Technology (DST) through its deep consultations with experts in the country have identified six broad priority areas for climate research in the country for 2030. These include; climate modelling, extreme events, glaciology, urban climate, aerosols, and Himalayan ecosystem studies. A detailed climate research agenda and vision report for 2030, titled “India’s Climate Research Agenda: 2030 and Beyond” has been developed by a national drafting committee. Each chapter in this report is based on the identified themes in Climate Science and Adaptation - Monsoon, Climate Modelling, Aerosol-Climate Interactions, Hydrology & Cryosphere, Extreme Events, Oceanic Sciences, Urban Climate, Carbon Cycle and Sector-specific Climate Services. The agenda contains a comprehensive evaluation of climate research carried out by the Indian scientific community, gaps in climate research, and futuristic avenues to bridge these gaps. The chapters were written, thoroughly expert-reviewed, and finalized during last one year. The presentation will cover some key research agenda contained in this report.

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SPECIAL LECTURE by Kalachand Sain

J.C. Bose National Fellow
Director, Wadia Institute of Himalayan Geology, Dehradun
E-mail: kalachandsain7@gmail.com; director@wihg.res.in

Kalachand Sain obtained M.Sc. (Tech) in App. Geophysics from IIT-ISM, Dhanbad and Ph.D. in Active Seismology from CSIR-NGRI (Osmania University), Hyderabad. He visited Cambridge University (UK) and Rice University (USA) as a post-doctoral Fellow, and USGS (USA) as a Visiting Scientist. He is the Director at Dehradun-based Wadia Institute of Himalayan Geology - An Autonomous Institute of DST, GoI. Earlier, he was the Chief Scientist & Head of Seismic Group at CSIR-NGRI. He is also an honorary Outstanding Professor at the AcSIR, Ghaziabad.

His expertise includes AI/ML, seismic tomography, attribute characterization, advanced processing and rock physics. His research covers wide-ranges of sciences: gas-hydrates, geothermal and conventional hydrocarbon energy resources; sub-volcanic imaging; basin evolutions; geo-dynamics and seismo-tectonics; glacial dynamics; climate change; geo-hazards due to earthquakes, landslides, avalanches, flash floods, etc. All these have resulted into 197 SCI articles; 100 Non-SCI articles/documents; 26 book chapters; 5 Authored Books; 7 Edited Volumes; Section Editor for the 'Encyclopaedia of Solid Earth Geophysics' by Springer; Supervision of 13 Ph.Ds., mentoring of 70 Master-dissertations, etc.

He is a Fellow of all three Indian Science Academies: INSA (New Delhi), IAS (Bangalore), NASI (Allahabad), as well as Fellow of AP Akademi of Sciences (Hyderabad) and Telangana Academy of Sciences (Hyderabad); Recipient of J.C. Bose National Fellowship of SERB-DST, National Merit Scholarship by Min. of Education, Raman Fellowship of CSIR, and BOYSCAST Fellowship of DST.

Honored with Distinguished Alumnus Award of IIT-ISM, AP Scientist Award, National Geoscience Award by MoES, National Mineral Award by MoM, YS Award of CSIR, Krishnan Medal and Decennial Award of IGU. He is the Vice President of IGU; Secretary General of FIGA; Chairman and Member of several National Committees constituted by SERB-DST, CSIR, MoES, DST, MoE, MoEFCC, Science Academies, RACs/GBs of many National Institutes and Universities.

Main Scientific Achievements:

- Demonstrated subsurface hydrological imbalance to the causes of land sliding at Joshimath (2023)
- Identified seismic precursors from 2021 ice-rock avalanche leading to develop early warning system
- Established AI Centre of Excellence (2022) at WIHG, Dehradun for application to geosciences data
- Provided scientific accounts of flash floods/snow avalanches (2022-23) in UK, HP, J&K Himalaya
- Explained recent seismicity in the Delhi-NCR from the Magneto telluric study (2023)
- Developed AI-based new tools (2022) for auto-delineation of subsurface 3D features from surface data
- Developed 2D tomography (2023) of wide-angle seismic data, first in India, for subsurface imaging
- Projected the hydrocarbon and renewable/green energy status of India (2022) for her energy security
- Mapped geothermal resources in UK Himalaya (2020), and pursuing to convert into electrical energy
- Established Gas Hydrate Research Center (2008) with world-class facilities at CSIR-NGRI-Hyderabad
- Characterized and evaluated gas-hydrates in KG, Mahanadi and Andaman basins validated by drilling
- Estimated critical parameters - pre-requisite for development of gas-hydrates production technology
- Delineated high-resolution crustal structures over Indian provinces (onshore, offshore and Himalaya)
- Led scientific cruises for (i) heat flow, (ii) gas-hydrates & (iii) imaging subduction plate geometries
- Leading a Project on "Characterization and Assessment of surface and subsurface Processes in Himalaya for Seismogenesis, Geodynamics, Geo-hazards, climate-tectonics, and Natural resources

SERB INDIA · WIHG 1968 · DFG Deutsche Forschungsgemeinschaft German Research Foundation

Geo-hazards in the Himalaya and Plausible Mitigation

Kalachand Sain

ABSTRACT:

The Himalaya is the World's youngest and rugged mountain chain, formed by the Indo-Eurasian collision tectonics, which was initiated in the early Eocene age. The sediment-water transmit from glaciers, snow fields and river-system, and many other resources have made the Himalaya a centre for habitation for agro-economic growth and socio-cultural development. However, the Himalaya is stressed by different kinds of natural processes, environmental degradation, anthropogenic activities, and more intensely by present-day climate-induced extreme events. All these phenomena change the geomorphology and landscape, which, in turn, control the damage pattern during an earthquake or landslide or avalanches or flash flood or debris flow or glacial lake outburst flood (GLOF) etc. To live with these adversities, we need to build disaster-resilience and climate-adaptability for sustainability and secured living in the Himalaya and adjoining regions. The impact of disasters can be reduced by designing appropriate buildings and development of Integrated Early Warning Systems (IEWS) by deploying related web-based sensors in the field; real-time transmission of data to the lab; processing/analysis of data using advanced algorithms; and dissemination of information through an alert system well before the tragedy takes place. With dense network of high-resolution sensors, availability of fast computing machines, innovative approaches, and integration of multiple data by AI/ML, it is possible to achieve the goal of development of respective IEWS as mitigation measures. The investment on monitoring and development of IEWS would be much less than the cost we pay towards the rehabilitation and restructuring, and loss to properties and lives. We would discuss some aspects of Geo-hazards related to Avalanches, GLOF, Landslides, Earthquakes, and their plausible mitigation through IEWS in the Himalaya with special reference to the Uttarakhand Himalaya.

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SPECIAL LECTURE by T. N. Singh

Prof. T. N. Singh is a globally renowned earth scientist who has land mark contribution in various research fields like Rock Mechanics, Slope stability, Underground Space Technology, Mining, Blasting & Soft Computing, Climate Change, and Natural Disasters (Landslide, RockFall) etc. Prof. Singh is an alumni of BHU. He completed his MSc in Geology & Ph.D. in Rock Mechanics from IIT-BHU, Varanasi.

He is presently in the position of Director IIT Patna since 2021. Before that he was Vice-Chancellor of Mahatma Gandhi Kashi Vidhyapith, Varanasi and VBS University, Jaunpur, UP. He has teaching experience of more than 30 years at IIT-BHU and IIT Bombay

Awards & Honors: He received a number of prestigious awards out of which some of the significant awards are mentioned here:

Life Time Achievement Award by NEEM International Foundation **2019**
Excellence of Teaching Award, IIT Bombay**, 2017**
The John C. Gammon Prize, Institute of Engineers**, 2017**
GSI Sesquicentennial Commemorative Award; **2011**
Professor Gopal Ranjan Rock Mechanics Award (IIT Roorkee); **2013**
Society of Geoscientists and Allied Technologists (SGAT) Award of Excellence; **2011**
First P.N. Bose Mineral Award; **2009**
National Mineral Award, Ministry of Mines, GoI; **2006**
Sukumar Rikhit Rock Mechanics Award, MMGI, Kolkata; **1999**
Etc.

Publications: He published 410 research papers in National & International referred journals (16132 google scholar citations). Besides, he published 35 book chapters, 21 Popular Scientific Articles and edited total 8 books. He is member of editorial boards of number of high impact SCI journals. He supervised 45 Ph.D. scholars and more than 100 M.Tech/MSc Dissertations.

Projects: He accomplished 27 sponsored research projects and 175 consultancy projects.
He also accomplished several collaborative research projects with scientist of different countries e.g. Australia, Norway, Iran, USA, and France etc.

He is an expert member of several National Committees like (i) Ministry of Railway (2009-010, Katra – Kashmir Railway Tunnel; (ii) Tunneling Project, KRCL, Jammu and Kashmir Rail lines (2011-2013); (iii) World Heritage Team, ASI, Aurangabad, Maharashtra (2011- 2013); (iv) Expert Member: Ministry of Communication and Information Technology (2009- 2015) for Development of Early Warning System for Natural Disasters; (v) Expert Member: GI Application, Ministry of Commerce, Govt. of India and many more

Some of the Major Scientific Contribution of National Importance are

- National Network project for Kedarnath- Rishikesh NH-54
- Stability investigation and Rock-Fall Assessment along Mumbai-Pune Expressway
- Rockfall Assessment and Barrier Design at Mata-Vaishno Devi Hill Pathway, Katra, J&K
- Landslide Monitoring and Hazard Zonation in and around Pithoragarh, Dist. U.K.
- Determination of strength properties of rock for design of tunnel support for Bansagar Irrigation Tunnel
- Geotechnical Investigation for Road Construction at Markundi Hill slope near Chopan, Sonbhadra Distt, UP.
- Geotechnical Investigation for the design of Uttaranchal Hydroelectric Power Project, SJVNL. Etc.

Rockfall: Prediction and its Remedial Measures in High Hill

T N Singh

ABSTRACT:

Rockfall is a common occurrence in hilly terrains, particularly in the Himalayan region, where enormous block-size stones fall downward, causing major problems for humans and the surrounding environment. Moreover, a systematic risk assessment due to Rockfall along the path of prominent pilgrimages and tourist destinations such as Shri Kedarnath, Badrinath, Saptashrungi Gad Temple, in and around Ajanta Caves, on the way to Mussoorie and Nainital etc. is equally important for the visitor's safety. Rockfall are mostly triggered by their discontinuities parameters and increased pore pressure although the shape and size of blocks, rocks lithology, topography, slope geometry and anthropogenic activity can all have an impact on the intensity and risk of Rockfall. Therefore, the evaluation of Rockfall is essential for the development and urban planning of any region in order to minimise the risks and hazards and to ascertain the probability of failure. Rockfall modelling using 'Rocscience Rocfall software' is an effective descriptive technique based on lumped mass method to augment failure path of Rockfall, initiation point of blocks, maximum height and distance of falling blocks, total kinetic energy and translational velocity of varied blocks. The results of this study discusses the outcomes of Rockfall modelling for pilgrims along the circumambulatory pathway, Saptashrungi Gad Temple, Vani, Nashik Maharashtra, India, and Rockfall hazard assessment at Ajanta Cave, Aurangabad, Maharashtra, India and their successful design of required support system i.e. position and capacity of protection Barriers.

PLENARY TALKS

SERB-DFG Week of Young Researcher 25th Nov – 1st Dec, 2023

Prof Talat Ahmad, FNA

FNA; FASc; FNASc, J.C. Bose National Fellow
Chairman, Governing Body,
Wadia Institute of Himalayan Geology, Dehradun
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Prof Ahmad completed his graduation and Post-Graduation in Geology from AMU, Aligarh. He did his M. Phil and Ph.D from JNU, New Delhi in Igneous Petrology and Geochemistry. He did Post-Doctoral work at the University of Liecester, UK, and University of Cambridge, UK and a third PDF at University of Nagoya, Japan. He worked at the Wadia Institute of Himalayan Geology, 1984-2003, then he served Department of Geology, University of Delhi as Professor of Geology 2003 onwards. He went on deputation as Vice Chancellor to the University of Kashmir, Srinagar from 2011-2014, then to JMI, New Delhi as its Vice Chancellor from May 2014 to July 2018, then again as Vice Chancellor, University of Kashmir, Srinagar, J&K, from August 2018 till May 22. Presently he is Chairman, Governing Body, Wadia Institute of Himalayan Geology, Dehradun. He has received many awards and recognitions, some of these are as follows:

1. National Mineral Award, 1994 from the Government of India.
2. Fellow of the Indian National Science Academy, New Delhi
3. Fellow of the Indian Academy of Sciences, Bangalore
4. Fellow of the National Academy of Sciences, India, Allahabad
5. J. C. Bose National Fellowship, DST, New Delhi
6. And many more

Highlights of major academic contributions

Prof Ahmad has published **128** research papers in reputed national and international journals, some manuscripts are in pipeline. He has supervised **24** Ph. D theses work, and presently supervising **one** student for their Ph. D work at the **Department of Earth Sciences, Oxford University, U.K.**

Prof Ahmad has worked on the geochemical and isotopic characteristics of the Precambrian mafic magmatic rocks form the northern India shield (Aravalli and Central India regions) and those from the Lesser Himalaya, which helped in understanding the Precambrian lithospheric extension and opening of Aravalli and Lesser Himalayan rift basins. Similar studies on the Cretaceous magmatic rock of the Indus and Shyok Suture Zones, Ladakh helped in understanding of the closure of the Neo-Tethyan Ocean by northward subduction of the Neo-Tethyan ocean floor under the Eurasian. Recent Sm-Nd and U-Pb zircon age data from the Amgaon-Tirodi basement rocks indicate first extraction of the crust from mantle started during Archean (~3100 Ma) and the first remobilized granitic melt were generated during early Proterozoic (~2400Ma) in the Central Indian Shield. He has worked extensively in the Trans-Himalayan Ladakh region of Ladakh.

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Contrasting crustal evolutionary trends for the Precambrian and Post Cambrian periods in Northern Indian Shield & the western Himalaya

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Abstract:

Contrasting crustal evolution trends for the Precambrian and Post Cambrian periods in Northern Indian Shield & the Himalayas

The Precambrian magmatic rocks from northern Indian shield and those from the Lesser Himalaya represent plume and rift tectonic setting. The Aravalli rocks are represented by high temperature komatiitic/picritic rocks (T Liq 1500-1600C). They were formed by higher degrees of partial melting of asthenospheric sources indicating plume head and the adjoining basaltic magmatism of Gwalior, Betul and Lesser Himalayan region represent rift tectonics. These rift basalt represent lower temperature (T Liq 1200C) and lower degrees of partial melting of lithospheric sources. Most of the rift zone developed in failed rift (aulacogens) except the Aravalli rift basin which developed into shallow marine conditions.

Rift tectonics prevailed in Ordovician where first appearance of alkaline basic magmatism is recorded from Bafliaz volcanics and Permian Panjal traps from Kashmier Himalaya.

On the other hand the Ladakh-Karakorum magmatic arc terrain is represented by the Indus Suture Zone in the south and the Shyok suture zone in the north. The eastern part Indus suture zone comprises of the Nidar ophiolitic complex and the Zildat ophiolitic mélange. In the western part the Dras magmatic arc and the Shergol ophiolitic mélange are exposed. The mélange zones preserve N-type MORB and Ocean Island Basalt (OIB) indicating their derivation from N-MORB sources and the OIB were derived from deeper mantle sources represented by asthenosphere upwelling. The Nidar and Dras island arcs represent intra oceanic arc systems derived because of within ocean subduction in the Neo-Tehthyan ocean. Maturity of the arc from south (Nidar-Dras) towards north represented by the Ladakh batholith is observed. This is indicated by compositional variation from more mafic to more felsic components. The magmatic rock of the Shyok suture zone represents Andean type arc magmatism, with severe enrichment of the incompatible trace elements including the rare earth elements (REE). The Karakoram batholith also show enrichment of incompatible trace elements unlike the Ladakh batholith. Thus, the Ladakh-Karakoram region represent sequences of Intra oceanic Mariana tyke arc and Andean type continental arc respectively.

Thus, our broad observation is that the Precambrian terrains represent plume-rift tectonic setting which prevailed till Permian, whereas the Mesozoic-Cenozoic terrains dominantly represent subduction related tectonic setting.

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Bodo Bookhagen

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Remote sensing, geomorphology, climate change

Education and Professional experience:
2014-present: Full professor, Universität Potsdam
2014-present: Adjunct Professor, UC Santa Barbara
2011-2014: Associate Professor, UC Santa Barbara
2008-2011: Assistant Professor, UC Santa Barbara
2006-2007: Postdoctoral Researcher, Stanford University
2005-2006: Postdoctoral Researcher, UC Santa Barbara
2005: Dr. rer. nat., Universität Potsdam: Late Quaternary Climate Change and Landscape Evolution in the Northwest Himalaya
2001-2003: Research Associate, UC Berkeley

Five Selected Publications (relevant to the Himalaya):

Bhattacharjee, S., B**ookhagen, B.**, Sinha, R., Wieser, A., Marchhart, O., 2023, 26Al and 10 Be concentrations from alluvial drill cores across the Indo-Gangetic plain reveal multimillion-year sediment-transport lag times, *Earth and Planetary Science Letters*, **https://doi.org/10.1016/j.epsl.2023.118318**

Dongfeng, L., Xixi, L., Overeem, I., Desmond, E.W., Syvitski, J., D.W., Kettner, A.J., **Bookhagen, B.**, Zhou, Y., Zhang, T., 2021, Exceptional increases in fluvial sediment fluxes in a warmer and wetter High Mountain Asia, *Science*, https://www.science.org/doi/10.1126/science.abi9649

Olen, S.M., **Bookhagen, B.**, Strecker, M.R., 2016, Role of climate and vegetation density in modulating denudation rates in the Himalaya, *Earth and Planetary Science Letters*, https://doi.org/10.1016/j.epsl.2016.03.047

Harvey, J.E., Burbank, D.W., **Bookhagen, B.**, 2015, Along-strike changes in Himalayan thrust geometry: Topographic and tectonic discontinuities in western Nepal, *Lithosphere*, https://doi.org/10.1130/L444.1

Bookhagen, B. and M.R. Strecker, 2012: Spatiotemporal trends in erosion rates across a pronounced rainfall gradient: examples from the south-central Andes. *Earth and Planet. Sci. Letters*, 327-328 (2012) 97–110.

Five Other Publications:

Castino, F., **Bookhagen, B.**, de la Torre, A., 2020: Atmospheric dynamics of extreme discharge events from 1979 to 2016 in the southern Central Andes Climate Dynamics, *Climate Dynamics*, doi:10.1007/s00382-020-05458-1

Olen, S. and **Bookhagen, B.**, 2020: Applications of SAR interferometric coherence time series: Spatiotemporal dynamics of geomorphic transitions in the south-central Andes, *JGR Earth Surface*, doi:10.1029/2019JF005141

Boers, N., Goswami, B., Rheinwalt, A., **Bookhagen, B.**, Hoskins, B., Kurths, J., 2019: Complex networks reveal global pattern of extreme-rainfall teleconnections, *Nature*, doi:10.1038/s41586-018-0872-x

Luna, L.V., **Bookhagen, B.**, Niedermann, S., Rugel, G., Scharf, A., Merchel, S., 2018: Glacial chronology and production rate cross-calibration of five cosmogenic nuclide and mineral systems from the southern Central Andean Plateau, *Earth and Planetary Science Letters*, doi: 10.1016/j.epsl.2018.07.034

Bookhagen, B. and M.R. Strecker, 2012: Spatiotemporal trends in erosion rates across a pronounced rainfall gradient: examples from the south-central Andes. *Earth and Planet. Sci. Letters*, 327-328 (2012) 97–110.

Complete List of publications: https://bodobookhagen.github.io/publications/

Observing sediment-flux changes in space and time in the Himalaya

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Abstract:
Erosion processes driven by climatic and tectonic events move large amounts of sediments from the Himalayan mountain to the foreland regions (1,2). The sediment builds floodplains, but also shapes other landscapes and controls nutrient transport into the adjacent oceans. Measuring sediment flux in mountain regions remains a challenge. In this presentation, we will discuss field-based, geochemical, and remote-sensing approaches that help to quantify mass movements on hillslope and constrain sediment-transport rates. Specifically, we explore the applications of cosmogenic nuclides to determine rates of sediment transport in mountain and foreland regions (1, 3, 4, 5). Satellite-based time series analysis identify landscape changes during extreme events (6, 7, 8).

References and Notes:
Complete list of publications is available at: https://bodobookhagen.github.io/publications/

1. Bhattacharjee, S., Bookhagen, B., Sinha, R., Wieser, A., Marchhart, O. E*arth and Planetary Science Letter* 2023, https://doi.org/10.1016/j.epsl.2023.118318
2. Dongfeng, L., Xixi, L., Overeem, I., Desmond, E.W., Syvitski, J., D.W., Kettner, A.J., Bookhagen, B., Zhou, Y., Zhang, T. *Science* 2021, https://www.science.org/doi/10.1126/science.abi9649
3. Olen, S.M., Bookhagen, B., Strecker, M.R. *Earth and Planetary Science Letter* 2016, https://doi.org/10.1016/j.epsl.2016.03.047
4. Olen, S.M., Bookhagen, B., Hoffmann, B., Sachse, D., Adhikari, D. P., Strecker, M.R. *JGR-Earth Surface* 2015, https://doi.org/10.1002/2014JF003410
5. Bookhagen, B., Thiede, R.C., Strecker, M.R. *Geology* 2005, https://doi.org/10.1130/G20982.1
6. Bookhagen, B. and Burbank, D.W. *JGR-Earth Surface* 2010, https://doi.org/10.1029/2009JF001426
7. Bookhagen, B. and Burbank, D.W. *Geophysical Research Letters* 2006, https://doi.org/10.1029/2006GL026037
8. Bookhagen, B., Thiede, R.C., Strecker. M.R. *Earth and Planetary Science Letter* 2005, https://doi.org/10.1016/j.epsl.2004.11.014

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Prof. Dr R. Jayangondaperumal

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Prof. (Dr) R.Jayangondaperumal is a senior scientist and Honorary Professor of AcSiR in the Department of Structure and Tectonics, Wadia Institute of Himalayan Geology (An Autonomous Institute of Dept. of Science and Technology, Govt of India), Dehradun, India. He has been working on research projects in the Himalaya on earthquake geology, structural geology, and tectonics for over two decades. He and his team excavated about 32 trenches for paleoseismological study along the Himalayan frontal zone to understand the earthquake cycle. He has significantly contributed to understanding the relationship between strain accumulation and release in the context of the mechanics of earthquakes and mountain-building processes to quantify the seismic hazard associated with the Himalayan continental collision. He has also conducted seismic hazard assessments for the Subansiri hydropower project in the NE Himalaya. Dr. Perumal has received several awards, including the National Geoscience Award 2018 (Individual award) and Professor Invitee by UoS, LGCA, France, and BOYSCAST Fellow-DST, Govt. of India.

He has published over 74 papers, one lead authored book in the Springer, contributed six book chapters, and edited two special issues, five field guide books in various sections of Himalaya, and one Indian patent.

He has completed several national and international research projects. He and his large student team are currently conducting national-level research projects on earthquake geology in the NE and NW Himalaya.

BOOK

Jayangondaperumal, R., Thakur, V.C., Joe Vivek, Priyanka Singh Rao, Anil Kumar Gupta (2018) Active tectonics of Kumaun and Garhwal Himalaya, Springer Natural Hazards, 150 pp. ISBN 978-981-10-8242-9

Two Decades of Earthquake Geological Studies in the Himalaya: the compelling necessity for Seismic Hazard Assessment

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Abstract:

In the Himalaya, several earthquake geological studies have been conducted in the past two decades to infer the timing, size, rupture extent, return period, and mechanics of the faulting associated with the occurrence of large to great surface rupturing earthquakes along the Himalayan Frontal Thrust (HFT) or Main Frontal Thrust System (MFT). Defining the surface faulting segments and magnitude of earthquakes has been challenging because of the scarcity of historical records of the events and paleoseismic data along the outer ramp of the Main Himalayan Thrust, the HFT. Further, a clear need remains to investigate the morphology of the HFT fault scarps and document coseismic slip directly, as calculations of coseismic slip from scarp heights may introduce uncertainty (e.g., Jayangondaperumal et al., 2013). Boundary-element modeling has demonstrated that a >20-m-slip event with a 1000-year strain accumulation is theoretically possible on the HFT (Feldl and Bilham, 2006). Alternatively, the large fault scarps along the HFT may represent two or more events (e.g., Kumahara and Jayangondaperumal, 2013 Jayangodnaperumal et al., 2013 and 2018; Malik et al., 2017; Robyn et al. 2023) instead of one surface-rupturing earthquake (e.g., Kumar et al., 2006 and 2010; Wesnosky et al., 2017). Because the paleoseismic trenches are neither long nor deep enough on the footwall block, what looks like a one-event scarp may be a multi-event scarp (e.g., Jayangondaperumal et al., 2013 and 2017; Daniels et al., 2023). Thus, the possibility that the HFT could rupture in a giant thrust earthquake (Mw> 9 remains controversial. Khattri (1987) initially proposed seismic gaps in the Himalaya. Still, as paleoseismological studies increased, the inferred ruptures of historical earthquakes filled these gaps. Thus, no seismic gap existed but varied recurrent intervals for different segments along the Himalayan arc. Further developing a calendar of the paleo-earthquake history of the Himalayan region is the need of the hour for academic importance and practical applications in providing input parameters for SHA (Seismic Hazard Assessment) that will have implications for the safety of the Himalayan foothills. Finally, I will discuss the key areas and future research on understanding the earthquake cycle at different intervals and characterizing other crustal faults.

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Career Profile:
Dr. Thiede is an expert in tectonics, erosion and exhumation of the Western Himalaya on different timescales, who have been studying various aspects of its evolution. His current research activities focus on linking deformation pattern of the Himalayan frontal fold and thrust belt, better understanding the geometry and kinematics of fault systems. He looks at the interplay between tectonics, uplift, and erosion on exhumation and morphology of Western Himalaya million to millennial timescales using various dating methods such as thermochronometer cooling ages, both luminescence and cosmogenic dating tools. After studying in geoscience in Vienna and Potsdam, he pursued his PhD at the University of Potsdam in 2005, followed by postdoc stays at University of Michigan, Ann Arbor and ETH Zurich, before returning to Potsdam. Since 2017 he has joined the Kiel University, habilitated in 2021 and is now a DFG-founded Heisenberg Follow.

[1.] Dey, S., **Thiede, R.C.**, Chauhan, N., Nath, D., Schaaf, N. W, & Jain, V. (2022) Pleistocene-Holocene out-of-sequence faulting along the Medlicott-Wadia Thrust in the NW Himalaya. Terra Nova. https://doi.org/10.1111/ter.12587

[2.] Van Der Beek, P. A., **Thiede, R. C**., Gahalaut, V. K., & Schildgen, T. F. (2023). Topographic and Thermochronologic Constraints on the Himalayan Décollement Geometry. *Himalaya, Dynamics of a Giant 1: Geodynamic Setting of the Himalayan Range*, 151-194. Wiley. https://doi.org/10.1002/9781394228584.ch6

[3.] **Thiede, R.C.**, Robert, X., Stuebner, K., Dey, S. and Faruhn, J., (2017). Sustained out-of-sequence shortening along a tectonically active segment of the Main Boundary thrust: The Dhauladhar Range in the northwestern Himalaya. Lithosphere, 9(5), pp.715-725. https://doi.org/10.1130/L630.1

Recent advance in understanding of the tectonics of the Western Himalayan the frontal fold and thrust belt and how we can progress in the future?

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Abstract:
Constraining millennial-scale fault slip rates and understanding the related structural architecture Western Himalayan might provide important assessment of future seismic risk evaluations. An increasing number of Holocene and Late Pleistocene deformation rates have been reported throughout the Western Himalayan frontal fold-and-thrust belt (FTB), often referred to as the Siwaliks. The tectonic pattern of this region has illustrated that at the surface the deformation is divided along several arc-parallel fault splays rooted to the Main Himalayan Thrust décollement. In contrast to central Himalaya, where deformation is mainly the accommodated along a single fault, the Himalayan frontal thrust (HFT) which forms the most southern fault at the toe wedge, studies from the western Himalaya several faults of FTB are exposed and better record of faulting history is preserved. Studies report a complex pattern of out of sequence faulting, as well as spatiotemporal variations in fault growth and lateral heterogeneity within the FTB. However, what drives this lateral heterogeneity is debated and still unknown until now, but crucial for any seismic evaluation.

Beside permanent geodetic networks established in recent years and a sweet of paleoseimologic studies providing information about present day deformation pattern as well as records of large and surface rupturing Earth quakes, which are only limited to the last Millennial. Late Pleistocene – Holocene fluvial strath terraces and their offset across active faults in western Himalayan provide an opportunity to measure of time-averaged fault slip rates along the Himalayan Frontal Thrust (HFT) and the Medlicott Wadia Thrust (MWT). While the Quaternary slip rates along the HFT varies from 3 – 12 mm/y, the slip rates from the ~700 km- long MWT is steadily high (7 – 9 mm/y). In contrast, previously published balanced cross-sections proposed slip rates of ~1 – 2 mm/y along the MWT. So we have to assume that from million-year to millennial timescale, there exists a significant temporal variation in fault activity along various fault systems. Single fault system like the MWT accommodate up to 50 - 60% of the total measured geodetic rates on Holocene/Late Quaternary timescales – and shows signifant changes in displace along strike. These results document significant strain partitioning within and along strike of the Sub-Himalaya and steady - high slip on the MWT which, beside the HFT could host the next big seismic event and forms a major thread to densely populated region in north India.

SERB-DFG Week of Young Researcher 25th Nov – 1st Dec, 2023

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Research Interests:

Tectonic and climatic controls on relief and erosion rates in mountain belts, numerical modelling of erosional processes, long-term landscape development, quantifying exhumation and erosion histories using low-temperature thermochronology and cosmogenic nuclides.

Professional Experience:

2020-	Professor of General Geology, Universität Potsdam, Germany
2018-2019	Alexander von Humboldt visiting research fellow, Universität Potsdam
2011	Visiting Fellow, CIRES, University of Colorado, Boulder, USA
2006-2020	Full Professor, Université Joseph Fourier (now Université Grenoble Alpes), Grenoble, France
1998-2006	Assistant Professor (Maître de Conférences), Université Joseph Fourier, Grenoble, France
1995-1997	Post-doctoral Research Fellow, Research School of Earth Sciences, Australian National University, Canberra Australia
1991-1995	Research Assistant, *Vrije Universiteit* Amsterdam, the Netherlands

Education:

1991-1995	PhD in Earth Sciences, *Vrije Universiteit, Amsterdam*.
1985-1990:	MSc in Earth Sciences, *Vrije Universiteit, Amsterdam.*

Scientific Output:

- 154 publications; 1 textbook: 6322 citations, H-index 51 (Web of Science) / 7053 citations, H-index 55 (Scopus).
- 75 presentations in international conferences (27 invited/keynotes); 64 invited seminars (Europe, USA, Canada, Australia, Venezuela, Brazil, Peru, China, India)
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Tectonics, climate, erosion, and the relief of mountain belts

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Abstract:
Although tectonics, climate and erosion have long been considered completely independent drivers of evolution of the Earth's surface, multiple couplings and feedbacks between these driving forces have been identified in the past decades. I will discuss some of these possible linkages, including drawdown of CO_2 from the atmosphere to the lithosphere through silicate weathering and organic carbon storage in the Himalaya, and the effects of glaciation on mountain belt erosion and relief. I will also provide some examples of how we study these couplings and interactions in Potsdam, in particular through quantifying mountain-belt erosion using different thermochronological techniques. Finally, I will discuss current innovations in Potsdam, in particular the development and use of high-resolution $^4He/^3He$ thermochronology and how it can shed new light on the interaction between mountain belt topography and glaciation during the Pliocene-Quaternary.


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Career Profile:

Ankeeta Amonkar is an Assistant Professor at Department of Geology, DMC-Goa. She received her PhD in Marine Geology from CSIR-National Institute of Oceanography, Goa in the year 2020. During her tenure at CSIR-NIO, Ankeeta was an active member of two prestigious National projects 'CSIR-GEOSINKS' and 'MOES-Surveys for Polymetallic Nodules. Ankeeta has participated in 6 cruises and has more than 100 days of ship time carrying scientific work in Arabian sea, Bay of Bengal and Indian Ocean. Ankeeta work is borne out by her participation in ten conferences and has twice been a recipient of Best Poster Awards. She has published seven peer-reviewed research papers and has two book chapters to her credit. She has participated in Winter School held at Leibniz Centre for Tropical Marine Research Bremen, Germany (2020). Ankeeta is recipient of Awsar award under Ph.D. category (2020), D.S. Kothari Post-Doctoral Fellowships (2021) and SERB- Start-up Research Grant (SERB-SRG) in 2022. Her current research focuses on understanding Physiochemical and Geotechnical characteristics of Laterites of Goa, Geomorphology of Goa Coast, and hydrothermal mineralization in deep-sea and along ridge system in the Indian Ocean.

Publication Details:

Available on the below link

Research Gate: http://www. researchgate.net/profile/Ankeeta-Amonkar

Google Scholar: https://scholar.google.co.in/citations?hl=en&user=8UN7duMAAAAJ

Pyroclasts and Hydrothermal Signatures from the Central Indian Ocean Basin

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Abstract

The occurrence of Pyroclasts and Hydrothermal Components (PHC) near spreading ridges and seamounts is common, generally located at water depths less than 5,000 m, and has been of interest to many researchers. In contrast, the presence of PHC at more than 5,000 m in the sediments adjacent to intraplate seamounts and fracture zones (FZ) is uncommon. One such area is the basalt-dominated Central Indian Ocean Basin (CIOB).

Examination of several deep-sea sediments (surface, box-, spade-, and gravity-cores) recovered near seamounts and FZ revealed PHC such as silicic glass shards, basaltic fragments, and glass (fresh, altered), spherules (Fe- and Ti-rich), sand-sized palagonite, and ferromanganese micro-nodules. Grains of iron, titanium, silver, lead, and nickel were found in sulfide, sulfate, oxide, and native forms. In most samples, there is a predominance volcanic glass shards. Our studies have shown the possibility of the shards having formed during phreatomagmatic activities in the CIOB. The extensive formation of palagonite and disappearance of radiolarians in certain areas within the sediments is a result of intensive alteration caused by the intrusion of a basaltic dyke. The spherules and metallic grains present mainly in the surface sediments indicate their formation during the hydrothermal activity under sub-seafloor conditions.

The presence of the PHC in sediments points to a nexus between morpho-tectonic features and volcanic and hydrothermal events in the CIOB. Interestingly, there are hardly any reports of similar PHC from the abyssal depth of the Pacific Ocean, which, too, has a similar geology and water depth. Considering the various evidence, we believe the PHC to be widespread in the intraplate environment of the CIOB from 60 Ma to 100 years.

Keywords: Pyroclasts and Hydrothermal Components (PHC), Hydrothermal activity, Indian Ocean, Sediments, Intra-Plate activity.

References:

1. Amonkar, A., Iyer, S.D., Babu, E.V.S.S.K. and Manju, S., 2020. Extending the limit of widespread dispersed Toba volcanic glass shards and identification of new in-situ volcanic events in the Central Indian Ocean Basin, Vol. 129 (175), Page 1-Page 24.
2. Iyer, S. D., Amonkar, A., and Das., P., 2018. Genesis of Central Indian Ocean Basin Seamounts: Morphological, Petrological, Geochemical Evidence. International Journal of Earth Science. Page 1-Page 22.
3. Iyer, S.D., 2005. Evidence for the incipient hydrothermal event (s) in the Central Indian Basin: a review. Acta Geologica Sinica, Vol 79, Page 77- Page 86.
4. Iyer, S.D., Gupta, S.M., Charan, S.N., and Mills, O.P., 1999b. Volcanogenic hydrothermal iron-rich materials from the southern part of the Central Indian Ocean Basin. Marine Geology, Vol 158, Page 15-Page 25.
5. Mukhopadhyay, R., Ghosh, A.K. and Iyer, S.D. 2018. The Indian Ocean nodule field: Geology and Resource Potential. 2nd edition. Elsevier, Amsterdam, 413.

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Career Profile

PhD	2018-now	Institut für Geographie, Friedrich-Alexander-Universität
MSc	2013-2016	Central Department of Environmental Science, Tribhuvan University
BSc	2008-2012	Patan Multiple Campus, Tribhuvan University

Publications

Aryal, S., Grießinger, J., Dyola, N., Gaire, N.P., Bhattarai, T., Bräuning, A., 2023. INTRAGRO: A machine learning approach to predict future growth of trees under climate change. Ecology and Evolution 13 (10). https://doi.org/10.1002/ece3.10626.

Aryal, S., Jussi Grießinger, Mohsen Arsalani, Wolfgang Jens-Henrik Meier, Pei-Li Fu, Ze-Xin Fan, Achim Bräuning, 2023. Insect infestations have an impact on the quality of climate reconstructions using Larix ring-width chronologies from the Tibetan plateau. Ecological Indicators, 148, 110124. https://doi.org/10.1016/j .ecolind.2023.110124.

Aryal, S., Narayan P. Gaire, Nawa Raj Pokhrel, Prabina Rana, Basanta Sharma, Deepak K Kharal, Budhhi S. Poudel, Nita Dyola, Ze-Xin Fan, Jussi Grießinger, and Achim Bräuning, 2020. Spring Season in Western Nepal Himalaya is not yet Warming: A 400-Year Temperature Reconstruction Based on Tree-Ring Widths of Himalayan Hemlock (*Tsuga dumosa*). Atmosphere 11 (2), 132. https://doi.org/10.3390/atmos11020132.

Aryal, S., Martin Häusser, Jussi Grießinger, Ze-Xin Fan, Achim Bräuning, 2020. "dendRoAnalyst": A tool for processing and analysing dendrometer data. Dendrochronologia, 125772. https://doi.org/10.1016/j .dendro.2020.125772.

Aryal, S., Bhuju, D. R., Kharal, D. K., Gaire, N. P., & Dyola, N. (2018). Climatic upshot using growth pattern of pinus roxburghii from western Nepal. Pak. J. Bot., 50(2), 579–588.

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Understanding Past and Projecting Future Tree Growth Patterns Amidst Climatic Shifts: Insights from Dendrochronology

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Abstract:
Climate change is affecting the Central Himalayas and Tibetan Plateau more than other areas, and this situation is expected to worsen with global warming. Trees acts as living sensors, imprinting the effect of climate variation as inter and intra-annual growth variation due to fluctuating biomass accumulation. This inter-relationships between climate and tree growth provides tremendous opportunity to understand the past climate dynamics and their effect on annual tree growth, the role of short- and long-term climate fluctuation on intra-annual growth pattern. This presentation is a synthesis of four research representing centuries of temperature changes, taking into account the impact of tree pests on tree ring records, and advancements in dendrochronological methodologies to predict intra-annual growth.
This synthesis provides a detailed plot of the historical and prospective responses of tree growth to climate variability in the Hindu Kush Himalayan region. These findings offer valuable insights for geoscientists in understanding regional climate dynamics and developing adaptive strategies for ecosystem management in the face of climate change.

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Dr. Rakesh Bhambri has been conducting research on the Himalayan cryosphere since 2005. In 2012, he became a Scientist at the Centre for Glaciology, Wadia Institute of Himalayan Geology after completing his PhD on "Analysis of Glacier Changes in the Garhwal Himalayas using Remote Sensing and GIS". His research primarily addresses glacier dynamics, mountain geomorphological processes, cryospheric hazards, and the impacts of climate change in the Himalaya-Karakoram region. Recognizing his contributions, the International Glaciological Society appointed him as a Scientific Editor for the Journal of Glaciology, published by Cambridge University Press, in January 2019.

Dr. Bhambri relocated to Heidelberg University, Germany, in November 2020 to serve as Senior Lecturer at the South Asia Institute. During his tenure at Heidelberg University until May 2022, Dr. Bhambri introduced two new master's-level courses on the Himalaya-Karakoram Cryosphere and associated hazards. He re-joined the Wadia Institute of Himalayan Geology as a Scientist in May 2022 and continuing his work on the cryosphere and related geohazards. Dr. Bhambri has completed more than a dozen glaciological research expeditions in the Himalaya-Karakoram region, and published about 40 research papers in international and national journals.

Representative publications

Bhambri R., Schmidt, S., Chand, P., Nüsser, M., Haritashya, U., Sain, K., Tiwari, S.K. and Yadav, J.S., (2023): Heterogeneity in glacier thinning and slowdown of ice movement in the Garhwal Himalaya, India. ***Science of The Total Environment***, 875, p.162625.

Bhambri R., Hewitt, K., Haritashya, U.K., Chand, P., Kumar, A., Verma, A., Tiwari, S.K. and Rai, S.K., (2022): Characteristics of surge-type tributary glaciers, Karakoram. ***Geomorphology***, 403, p.108161.

More details about the publications are available on my webpage.

Monitoring of Himalayan Glacier and Associated Hazards using Space and Ground Observations

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Abstract:
Himalaya-Karakoram (H-K) region, which comprises extensive glaciers, is crucial in providing meltwater for irrigation and hydropower generation. Additionally, these glaciers threaten downstream communities due to debris flows and glacial lake outburst floods (GLOFs). Monitoring these glaciers is essential for effective water resource planning and hazard mitigation in the Indian subcontinent. Therefore, we will present changes in selected glaciers and case studies of associated hazards using ground and space observations.

Our results suggest that glaciers in the Karakoram region exhibit irregular behavior compared to their counterparts in the central and eastern Himalaya. The terminus fluctuations of individual glaciers lack uniformity, and unlike other areas of the Himalaya, the total ice mass has either remained stable or shown a slight increase since the 1970s. To explain these apparent anomalies, we extensively mapped surge-type glaciers and their associated impacts using multi-temporal satellite images, digital elevation models, ground-based observations, and historical records dating back to the 1840s. These surge-type glaciers experienced active phases ranging from several months to over 15 years, with repeated surges identified in 27 glaciers, including nine that have not been previously reported. The timing, intervals, and mass transfers associated with these surges vary significantly among glaciers and are primarily asynchronous with climate patterns.

The study reveals consistent glacier mass reductions in the Central and Eastern Himalaya, leading to instability in pro-glacial areas and influencing glacier-related hazards. We will present case studies on hazards in the Central Himalaya (e.g., Gangotri Glacier) and the Karakoram (e.g., Kumdan glaciers). The Karakoram exhibits approximately 150 ice-dammed lake outburst floods documented through historical records and remote sensing. These differ from Himalayan GLOFs, often linked to climate-driven glacier retreat and moraine dam failures. We will discuss potential impact of climate change on Karakoram glacier surges and ice-dammed GLOFs, as well as challenges in monitoring glacier hazards in the H-K region.

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Career Profile, and representative publications

Sayantan Chakraborty is presently working as an Assistant Professor in the Earth System Science and Engineering Division of Department of Civil Engineering at IIT Guwahati since October 2021. Before joining IIT Guwahati, he was an institute postodctoral fellow at the Department of Geology and Geophysics in IIT Kharagpur. He received his Ph.D. and Masters degree from IIT Bombay and did his graduation from Presidency College Kolkata. Essentially, he is a structural geologist with an interest in studying shear zones and fault zones, and how these structures affect the crustal architecture, fluid flow, and seismicity in orogens. Additionally, he is also interested in studying the processes operative within the shear zones and fault zones that lead to strain partitioning and aseismic behaviour. Currently, he is working on understanding the three-dimensional deformation pattern in the eastern and far-eastern Himalaya, and trying to decipher the source of aseismic creep in the Churachandpur Mao fault in the Indo-Burma wedge.

Chakraborty, S., * and Mukul, M., 2019. New insights into the position and geometry of the Main Central thrust from Sikkim, eastern Himalaya, Journal of Geology, 127, 289- 322. https://doi.org/10.1086/702566

• **Chakraborty, S**., * Mukul, M., Mathew, G., Pande, K., 2019. Major shear zone within the Greater Himalayan Sequence and sequential evolution of the metamorphic core in Sikkim, India, Tectonophysics, 770, 228183. https://doi.org/10.1016/j.tecto.2019.228183

• **Chakraborty S**., * Majumdar, A.S., Shukla A. D., 2020. The role of fluid in strain softening within the Main Central thrust in Sikkim: The origin of quartz-rich mylonites, Journal of Structural Geology, 140, 104145. https://doi.org/10.1016/j.jsg.2020.104145

• **Chakraborty, S**., * and Sengupta, A., 2022. Evaluating the distinct identity and the orogenscale nature of the Munsiari thrust in the Himalaya, Journal of Asian Earth Sciences, 223, 104991. https://doi.org/10.1016/j.jseaes.2021.104991

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Tracking the research trends in geodynamic evolution of the Himalayan metamorphic core: The past, the present, and the future

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The discovery of the High Himalayan discontinuity (HHD) and its equivalents heralded a paradigm shift in research on the geodynamic evolution of the Himalayan metamorphic core (HMC, Carosi et al., 2018; Chakraborty et al., 2019). Before the discovery of the HHD, models like channel flow and tectonic wedging considered the evolution of the HMC because of the synchronous activity on the South Tibetan detachment system (STDS) at the top and the Main Central thrust (MCT) at the base (Carosi et al., 2018 and references therein). Thrusting on the HHD led to the exhumation of the middle HMC at least ~5 Ma before the MCT or the STDS became active, and led to the metamorphism of the lower HMC rocks in its footwall (Chakraborty et al., 2019 and references therein). Furthermore, new data suggested that sequential thrusting led to the evolution of the HMC—and not the synchronous activity of the MCT and the STDS. The thrusting model reconciles with the thermobarometry and the geochronological data. However, like its previous counterparts, the model implicitly assumes plane strain deformation with the north-south plane as the transport plane, which equates with the XZ section of the strain ellipsoid.

Recent findings from central Nepal and Sikkim (Roberts et al., 2020 and references therein) highlight that the kinematic evolution of the HMC may deviate from the plane strain assumption. Keeping this caveat in mind, we have analyzed selected samples from orogen-parallel and orogenperpendicular sections of the MCT shear zone from North and East Sikkim. We carried out crystallographic vorticity axis analysis, quantified the geometric characteristics of the quartz c-axis pole figures, and additionally performed strain analysis on oriented samples collected from the orogen-parallel sections. Our analyses revealed that the quartz grains in the quartz-rich mylonites from the MCT shear zone exhibit random distribution and majority of the samples underwent pure shear-dominated deformation. The vorticity normal surface/ transport plane in these samples is oriented east-west, rather than north-south. Also, the results from strain analysis revealed that deformation is heterogeneous at shear zone scale (~1 km). These findings further attest that the deformation in the HMC was not confined to the north-south plane, as suggested in the existing models. Furthermore, the use of quartz c-axis pole figures for large-scale tectonic interpretations and conditions of deformation may lead to flawed interpretations. Therefore, the future beckons the need to transit from the existing plane strain-based models to more robust three-dimensional geodynamic models for the HMC, and the Himalaya in general.

References and Notes:

1. Carosi, R., Montomoli, C., Iaccarino, S., 2018. 20 years of geologic mapping of the metamorphic core across Central and Eastern Himalayas. Earth-Science Reviews 177, 124–138.
2. Chakraborty, S., Mukul, M., Mathew, G., Pande, K., 2019. Major shear zone within the Greater Himalayan Sequence and sequential evolution of the metamorphic core in Sikkim, India. Tectonophysics 770, 228183.
3. Roberts, A.G., Weinberg, R.F., Hunter, N.J.R., Ganade, C.E., 2020. Large-Scale Rotational Motion Within the Main Central Thrust Zone in the Darjeeling-Sikkim Himalaya, India. Tectonics 39, e2019TC005949.

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Career Profile:

- Ph.D Geology, 2017 (Physical Research Laboratory, Ahmedabad)
- Postdoctoral fellow, 2017-2018 (Physical Research Laboratory, Ahmedabad)
- Assistant Professor, 2018-present (Department of Geology, Presidency University, Kolkata)

Representative publications:

- Chatterjee, A.* (2020) A Review of Recent Provenance Studies from the Ghaggar-Hakra-Nara Alluvium: Link to the Lost River of the Harappan Civilization. Proceedings of the Indian National Science Academy, 86 (2): 1029-1041. DOI: 10.16943/ptinsa/2019/49710

- Chatterjee, A.*, Ray, J. S., Shukla, A. K., Pande, K. (2019) On the existence of a perennial river in the Harappan heartland. Scientific reports, (2019) 9:1722.doi:10.1038/s41598-019-53489-4

- Chatterjee, A.*, Ray, J. S. (2018) Geochemistry of Harappan potteries from Kalibangan and sediments in the Ghaggar River: Clues for a dying river. Geoscience Frontiers, 9 (4): 1203–1211. doi: 10.1016/j.gsf.2017.07.006

- Chatterjee, A.*, Ray, J. S. (2017) Sources and depositional pathways of mid-Holocene sediments in the Great Rann of Kachchh, India: Implications for fluvial scenario during the Harappan Culture. Quaternary International. 443 (Part B): 177-187. doi:10.1016/j.quaint.2017.06.008

A Desert in making: Exploring the Himalayan connection of the Thar Desert

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Abstract:

Deserts have perpetually captivated the global research community, offering a realm of scientific mysteries. Despite numerous endeavours to decipher the enigmatic nature of deserts, much remains unknown. The Thar Desert, situated on the eastern periphery of the vast Sahara-Arabian desert belt in the Indian subcontinent, has been a subject of comprehensive studies, encompassing climate, antiquity and mechanisms of its formation. Yet, conclusive insights into its origin have remained elusive, primarily due to the intricate nature of aeolian deposits, resulting from multiple cycles of deposition and reworking.

This study aims to illuminate the provenance of the Thar Desert. Employing a multi-faceted approach featuring Sr-Nd isotopic fingerprinting, detrital zircon geochronology, and the versatile DZmix software, it tries to quantify contributions from numerous potential sediment sources. The findings underscore the diversity of sediment sources in the Thar Desert, encompassing both local and distant origins, thereby both corroborating and challenging prior research.

Notably, the Himalayan region emerges as the primary source of sand, marking a shift from the initial dominance of local lithologies during the desert's formative stages. The findings indicate a prevalence of trans-Himalayan sediments, despite the absence of a direct route through the desert itself. The sole conduit for such sediment transport is the Indus River, even though it never coursed through the core of the desert. This phenomenon suggests a protracted aeolian transport of Indus-borne trans-Himalayan sediments from the delta region. Consequently, the quantification of various source contributions provides valuable insights into the evolutionary history of the Thar Desert.

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On completion of her tenure as a Humboldt Postdoctoral Fellow in May, 2023, Angana is currently working as a Dorothea Schlözer Fellow at the University of Göttingen, Germany. She completed her PhD (2019) in Sedimentology from the IIT Bombay. Post PhD, she briefly worked as a Research Associate in IIT Bombay and as a UGC-Dr. D. S. Kothari Postdoctoral Fellow in Jadavpur University, Kolkata. She also had a stint of teaching as an Assistant Professor at the IISER Bhopal. Her current research focusses on the provenance of Meso-Cenozoic sedimentary rocks in the Kutch Basin, western India and its implications on paleogeography and paleotectonics. She works on petrography, geochemistry, geochronology and mineral chemistry as tools for provenance analysis. Among other roles, Angana works in the Early Career Scientist Committee of the International Association of Sedimentologists.

- **Chaudhuri, A.,** Schönig, J., Le Pera, E., von Eynatten, H., Chauhan, G. and S., Lünsdorf, N. K., 2023. Provenance changes revealed by a multi-proxy approach to sandstone analysis and its implications on paleogeography: Mesozoic Kutch Basin, India. Sedimentary Geology 452. doi: 10.1016/j.sedgeo.2023.106411.
- **Chaudhuri, A**., Das, K., Banerjee, S. and Fitzsimons, I.C.W., 2020. Detrital zircon and Monazite track the source of Mesozoic sediments in Kutch to rocks of Late Neoproterozoic and Early Paleozoic orogenies in northern India, Gondwana Research 80, 188 – 201. doi:10.1016/j.gr.2019.10.015
- **Chaudhuri, A.,** Banerjee, S. and Chauhan, G., 2020. Compositional evolution of siliciclastic sediments recording the tectonic stability of a pericratonic rift: Mesozoic Kutch Basin, western India. Marine and Petroleum Geology 111, 476 – 495. doi: 10.1016/j.marpetgeo.2019.08.026

Provenance and palaeogeographic changes within the Mesozoic Kutch Basin, western India

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Abstract:
The peri-cratonic Kutch Basin preserves a largely undisturbed sedimentary record of the Indian subcontinent during its break-up from Gondwana and subsequent northward drift. The Middle Jurassic to Lower Cretaceous sedimentary record is preserved in the different sub-basins within the Kutch Basin and is classified into the Kutch Mainland Group (KMG), Pachchham Island Group (PIG) and Eastern Kutch Group (EKG). In the current study, quantification of heavy minerals using Raman Spectroscopy[1], source rock discrimination based on single-grain garnet chemistry[2], zircon and rutile U-Pb ages reveal differences in sediment source among these sub-basins. The content of heavy-minerals - apatite, garnet and staurolite suggest different course of evolution for PIG in contrast with KMG-EKG. Proportion of igneous garnets reduces in younger sedimentary rocks of PIG while this trend is opposite in KMG-EKG. While sedimentary rocks younger than Callovian are not preserved in PIG, rocks of this age in KMG-EKG exhibit significant increase in staurolite and kyanite content. The Callovian and younger rocks in KMG-EKG exhibit presence of garnets from blueschist–greenschist metamorphic facies as well as Mn-rich igneous garnets. Zircon and rutile U-Pb data for the three groups indicate source rock ages ranging from 400 to 3700 Ma. Zircon and rutile from sources equivalent to 500–650 Ma and 400–500 Ma remain dominant contributors in all three groups. The predominance of rutile from these age intervals in all three groups indicate presence of metamorphic source rocks of these ages. In KMG and EKG, contribution of zircons from source rocks belonging to 400–500 Ma and 500–600 Ma increases from the Callovian onward. Therefore, changing individual heavy-mineral content, garnet chemistry, zircon and rutile U-Pb ages in KMG and EKG indicate input from additional sources in younger sediments starting in Callovian. This, in combination with a lack of sediments in PIG correlates to the rise of a sub-surface basement ridge in the basin – the Median High. This paleogeographic change may have blocked sediment supply for PIG and diverted their transport for KMG-EKG.

References:

1. Lünsdorf, N.K.; Kalies, J.; Ahlers, P.; Dunkl, I.; von Eynatten, H. Semi-automated heavy-mineral analysis by Raman spectroscopy. Minerals 2019, 9, page 2 – 32.
2. Schönig, J.; von Eynatten, H.; Tolosana-Delgado, R.; Meinhold, G. Garnet major-element composition as an indicator of host-rock type: a machine learning approach using the random forest classifier. Contributions to Mineralogy and Petrology 2021, 176, page 1 – 21.

SERB-DFG Week of Young Researcher 25th Nov – 1st Dec, 2023

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M.Sc. Geology: Department of Geology (2009-2011)**,** University of Delhi.

B.Sc(H). Geology: Department of Geology (2006-2009)**,** University of Delhi.

Publications

1. ***Hiredya chauhan,*** *Ashima Saikia and Talat Ahmad (2018).* Episodic crustal growth in the Bundelkhand Craton of central India shield: Constraints from petrogenesis of the Tonalite-Trondhjemite-Granodiorite gneisses and K-rich granites of Bundelkhand tectonic zone, Journal of Earth System Science, 127(3), pp. 1-34.

2. ***Hiredya Chauhan,*** *Aparajita Tripathi, Dinesh Pandit, N.V.Chalapathi Rao and Talat Ahmad (2020).* A new Analytical Protocol for high precision U-Th-Pb Chemical Dating of Xenotime from the TTG Gneisses of the Bundelkhand Craton, Central India, using CAMECA SXFive Electron Probe Micro Analyzer- Journal of Earth System Sciences, 129(1), pp 1-10.

3. ***Hiredya Chauhan,*** *Nishchal Wanjari, Avinash C. Pandey, Talat Ahmad (2023).*

   Geochemistry, Petrogenesis and Tectonic Setting of the Mafic Dykes from the Amgaon and Khairagarh Regions, Bastar Craton, Central Indian Shield: Constraints on the Precambrian Crustal Evolution. HSOA Journal of atmospheric and earth sciences. D.O.I - 10.24966/AES-8780/100030.

4. ***Hiredya Chauhan, Dinesh Pandit, Talat Ahmad, Rohit Kumar Giri, Avinash C. Pandey (2023).*** "Formation of Manganoan ilmenite in the Archean tonalite- trondhjemite-granodiorite (TTG) gneisses inferred from re-equilibration of biotite and Fe-Ti oxide assemblage: a case study from the Aravalli Craton, North Western India." Aaccepted in Neues Jahrbuch Für Mineralogie Journal.

   Full list of Publications: https://www.researchgate.net/profile/Hiredya-Chauhan

Crustal evolution in the western central Indian shield through Precambrian TTG-Granitoids and the magmatic rocks of the western Himalaya, Ladakh region.

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Abstract:
Remnants of the earliest crust can be found mostly in the Archean tonalite- trondhjemite-granodiorite (TTG) gneisses which helps in understanding the crustal evolution and is a matter of scientific debate. TTGs of both the Aravalli and Bundelkhand craton show distinct groups at microscopic scale based on mineral assemblages though the geochemical results are almost similar. Geochemical data of TTGs from both the craton shows a wide spectrum of SiO_2 composition exhibiting peraluminous characteristics and the tectonic discriminant plot suggests a volcanic arc setting while REE pattern shows fractionation of Ti-bearing phases along with the involvement of crustal components. U-Pb TIMS Zircon chronology of Aravalli TTGs yield the discordant age of 2680 + 30 Ma. These zircons have moderate to high U contents with low Th/U ratios characteristic for magmatic zircons.

To understand the difference in the crustal evolution processes in the Precambrian and Post-cambrian period, we are studying the cenozoic rocks from the Ladakh Himlayas. In Ladakh Himalaya, the Cretaceous mafic magmatism is represented by Ophiolitic rocks of the Indus Suture Zone, which are considered to represent remnants of the Neo-Tethyan Ocean. The rocks vary in composition from tholeiite (N-MORB) and alkaline (OIB), intercalated with highly serpentinised ultramafic rocks tectonically intermixed with deep oceanic sediments. The Zildat ophiolitic mélange of the eastern Ladakh comprises of a minor unit of N-MORB with epsilon Nd(t) of ~+8 and a dominant unit of the Oceanic Island Basalt (OIB-type) with epsilon Nd(t) of ~+4. The epsilon Nd values for the Zildat rocks (N-MORB and OIB) indicate their derivation from depleted but unrelated mantle source regions. Similar lithological packages are reported from the Shergol ophiolitic mélange in western Ladakh. Trace element and isotopic data indicate presence of intra-oceanic island arc system being represented by the Nidar Ophiolitic Complex, these are equivalent to the Dras arc of the western Ladakh. The epsilon Nd(t) for the mafic magmatic rocks of the Nidar ophiolitic complex is about +8, indicate their derivation from depleted mantle source(s).

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As a broadly trained geologist, my academic pursuits are motivated by an ultimate goal to advance our knowledge on the driving mechanisms of crustal exhumation at multiple spatial-temporal scales, and to reciprocally understand how distinct erosional events throughout Earth's history have impacted elemental cycling within Earth's dynamic system. After completing my bachelor's degree at the University of Texas at Austin in 2013, I was invited to join as a field assistant to conduct field work in the Himalaya of northwest India—a trip that ignited my career in research. My master's research project spawned from this trip to track the exhumation and kinematic evolution of the Lesser Himalaya using in-situ and detrital zircon (U-Th)/He thermochronometry, and I completed this project in 2016 under the supervision of Dr. Daniel Stockli. I then moved to the University of Hong Kong to work on a PhD under the supervision of Dr. Ryan McKenzie, where I focused on tracking the deep-time thermal history of the Bundelkhand craton of central India. Upon obtaining my PhD in 2020, I initiated a postdoc with a focus on establishing, advancing, and applying $^{4}He/^{3}He$ thermochronology at the University of Potsdam under the supervision of Dr. Peter van der Beek. My research primarily involves the application and further development of accessory mineral geo/thermochronometry and geochemistry to track tectonic, climatic, and epeirogenic controls on crustal exhumation and basin evolution. I have coupled these techniques with thorough field investigation to assess a diverse array of geological problems, ranging from unravelling >1-billion-year burial and erosional evolutions from tectonically quiescent continental interiors, to tracking the impact of glacial erosion within modern glaciated landscapes over the past 1-10 million years. Despite having acquired a specialty in low-temperature thermochronology, my research remains largely multidisciplinary, and I have established and collaborated on various projects across the globe, including the Himalayas, European Alps, Andes, central India, southeast Asia, eastern Africa, Norway, Australia, and western Mexico.

Sediment provenance of Cretaceous–Paleogene strata from the frontal Himalaya of northwest India: Implications for India-Asia collision

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Abstract:
The Cretaceous Singtali Formation and upper Paleocene–middle Eocene Subathu Formation—preserved within the frontal Himalayan system of northwest India—provide important insights into the evolution of India-Asia collision. Considering three major contrasting models for India-Asia collision, each model provides a testable hypothesis in terms of the expected sediment provenance of the Subathu Formation. To assess these predictions, detrital zircon U-Pb and Hf isotopic data were systematically obtained from the Singtali and Subathu formations, revealing a distinct north-to-south shift in provenance, as well as evidence of detritus sourced from the Asian plate and/or the Kohistan-Ladakh arc within the Subathu deposits[1]. This major provenance shift is similar to that observed within pre- and post-collisional Tethyan Himalayan strata in the north[2,3], suggesting that a single contiguous basin linked the Lesser Himalaya and Tethyan Himalaya by the middle Eocene. This contests the notion that the Lesser and Tethyan Himalaya were separated by an oceanic "Greater India Basin" during the Eocene[4]. Coupled with the well documented Paleocene–early Eocene provenance record of the Tethyan Himalaya, these new data provide support for a collisional model in which Asian detritus reached the northernmost edge of India by ~59 Ma. However, the plausibility remains that young detritus within the Subathu Formation are exclusively derived from the Kohistan-Ladakh arc, which would favor a model with the Kohistan-Ladakh arc first colliding with India by the time of Subathu Deposition, followed by late Eocene contact between India and Asia[5].

References and Notes:

1. Colleps, C. L., McKenzie, N. R., Horton, B. K., Webb, A. A. G., Ng, Y. W. & Singh, B. P. Sediment provenance of pre- and post-collisional Cretaceous-Paleogene strata from the frontal Himalaya of northwest India. *Earth Planet Sc Lett* **534**, 116079 (2020).
2. Najman, Y., Jenks, D., Godin, L., Boudagher-Fadel, M., Millar, I., Garzanti, E., Horstwood, M. & Bracciali, L. The Tethyan Himalayan detrital record shows that India–Asia terminal collision occurred by 54 Ma in the Western Himalaya. *Earth Planet Sc Lett* **459**, 301-310 (2017).
3. Hu, X. M., Garzanti, E., Wang, J. G., Huang, W. T., An, W. & Webb, A. The timing of India-Asia collision onset - Facts, theories, controversies. *Earth-Sci Rev* **160**, 264-299 (2016).
4. Van Hinsbergen, D. J. J., Lippert, P. C., Li, S., Huang, W., Advokaat, E. L. & Spakman, W. Reconstructing Greater India: Paleogeographic, kinematic, and geodynamic perspectives. *Tectonophysics* (2018).
5. Martin, C. R., Jagoutz, O., Upadhyay, R., Royden, L. H., Eddy, M. P., Bailey, E., Nichols, C. I. O. & Weiss, B. P. Paleocene latitude of the Kohistan–Ladakh arc indicates multistage India–Eurasia collision. *Proceedings of the National Academy of Sciences* **117**, 29487-29494 (2020).

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Dr. Shamim Ahmad Dar, is working as an Assistant Professor, Department of Geology, Institute of Science, Banaras Hindu University, Varanasi. Dr. Dar has been awarded Ph.D in Geology on *"Geochemical and Mineralogical studies of Phosphorites and Associated rocks in parts of Lalitpur district, Uttar Pradesh, India"* from Aligarh Muslim University in 2013. Afterwards, he served the higher education department J & K for more than six years. In November 2020, he joined as an Assistant Professor, at Banaras Hindu University, Varanasi.

Dr. Dar has published over 16 research articles and 02 book chapters of high significance in peer-reviewed Journals. He has presented research papers at different national and international conferences/symposiums. His area of specialization is sedimentary geochemistry and stable isotopes. He is also working on sedimentary ore deposit environments, especially phosphorites.

Dr. Dar is a principal investigator of major projects funded by DST-SERB entitled *"Mineralogical, geochemical and $\delta^{13}C$ and $\delta^{18}O$ isotopic studies of Guryul section of the Kashmir Himalayas: Implications for Paleoenvironment, Paleoclimate and Tectonic evolution of the northern Gondwanaland margin at Permian-Triassic boundary"*. He has been also working on a research project *"Rare earth element and isotope geochemistry of phosphate bearing sedimentary rocks in parts of Sagar district, Madhya Pradesh, India. Implications for genesis"*, funded by IoE Seed Grant BHU as a Principal Investigator.

He is a life member of different journals like Geological Society of India, Indian Geological Congress, Indian Science Congress, Mineralogical Society of India (The Indian Mineralogist); Journal of the Indian Association of Sedimentologists; Journal of Applied Geochemistry; Himalayan Geology and South Asian Association of Economic Geologists. Dr. Shamim is also a reviewer of several international journals like Scientific Reports (Springer), Journal of Sedimentary Environments (Springer), etc.

Dr. Dar and his co-workers have worked on the different phosphorte deposits of the India, like Sonrai basin, Bijawar Group, U.P; Mussoorie Syncline; Subathu Basin of Solan District, Himachal Pradesh; Sallopat, Aravalli Basin, and Geochemistry of recent sediments of the Kurheri basin, Son River, Madhya Pradesh, Central India. The total number of citations is 156 and h-index is 07.

Mineralogical and petrological investigation of limestone and shale of Permian-Triassic section at Guryul Ravine, Kashmir, India: Emphasising on the paleoenvironmental conditions prevailed during their deposition

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Abstract

Guryul Ravine of Kashmir Himalaya is the most famous example of siliciclastic-dominated boundary successions in the world. This section shows a continuously well-exposed upper Permian and lower Triassic rocks and is considered to be one of the best sections of the world to understand the Permian-Triassic changes that led to the great mass extinction of life where nearly 70% and 80% of terrestrial vertebrate species and marine species vanished (Brookfield, 2003; Erwin, 2015). The (GR) Guryul Ravine section is also considered to be one of the global contenders for the Permian-Triassic boundary (PTB) because a continuous and complete sedimentary sequence with a gradual faunal and micro-floral change has been observed across the boundary (Kumar et al., 2017; Brookfield et al., 2002). The Guryal Ravine (34°4'25.00″N, 74°56'42.00″E) is located at Khanmouh village. It is spread over an area of 9,83,337 square meters with a face length of 1,413 meters. The Permo-Triassic sequences in Kashmir Valley are divided into the Zewan Formation of the Upper Permian age which is overlain by the Lower Triassic Khunamuh Formation.

The section has a well-preserved sequence of alternating limestone and shale with a few calcareous sandstone beds. The detailed petro-mineralogical investigation using a polarizing microscope and XRD analysis reveals that the section has undergone episodic influence of oxidizing and reducing conditions as indicated by the presence of magnetite and pyrite crystals in Upper Permian Zewan Formation as well as in Lower Triassic Khunamuh Formation. The study also reports that calcite is the dominant mineral phase in limestone with quartz, serpentine, pyrite, and covellite as the accessory minerals whereas calcite, quartz, and muscovite are the dominant mineral phases in calcareous sandstone with accessory minerals like plagioclase, serpentine, pyrite, and magnetite. Shale beds have quartz and mica as the dominant mineral phase with chlorite, vermiculite, dickite, illite, serpentine, pyrite, and magnetite as the accessory minerals. The section has experienced weak metamorphism as indicated by the presence of serpentine in the calcareous sandstone, limestone, and shale beds which might have altered some minerals, which could have been used to detect the exact paleoredox condition of the area. The section has well-preserved fossil imprints of brachiopods, crinoids, and bryozoans in the Zewan Formation whereas ammonites dominate the Khunamuh Formation. The fossils present in the section are specific of their time period. The present study also shows that an anoxic condition affecting some beds has been observed as reflected by the occurrence of pyrite crystals at the boundary (transition zone), which could be one of the major causes of the mass extinction. However, further study has been undertaken in this regard and further evidence from the geochemical signatures is being traced to justify the findings.

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10/2019- 10/2020 : Dr. D. S. Kothari Post-doctoral Fellow, University of Calcutta, India

03/2019- 10/2019 : RUSA Post-doctoral project Fellow, Jadavpur University, India

11/2012- 12/2018 : CSIR-SPM Research Fellow, Jadavpur University, India

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Publications (last five years)

- Roy Choudhury, S., Dey, A., Mukherjee, S., Sanyal, S., Karmakar, S. and Sengupta, P., **(2023)**. ***Mineralogy and Petrology***, https://doi.org/10.1007/s00710-023-00826-1
- Roy Choudhury, S., Dey, A., Mukherjee, S., Sengupta, S., Sanyal, S., Karmakar, S. and Sengupta, P., **(2023)**. ***Lithos,*** *442*, p.107058. 10.1016/j.lithos.2023.107058
- Mukherjee S., Dey, A., Roy Choudhury, S., Mayne, M. J. **(2022)** ***Lithos*** 430-431:106875. 10.1016/j.lithos.2022.106875
- Roy Choudhury, S., Dey, A., Brandt, S., Sanyal, S., Sengupta, P. **(2021)** ***Lithos***. 400–401, 106347. https://doi.org/10.1016/j.lithos.2021.106347
- Mukherjee S., Dey, A., Sanyal S., Ibanez-Mejia, M., Sengupta P. **(2019)** ***Contributions to Mineralogy and Petrology,*** 174, 67, doi: https://doi.org/10.1007/s00410-019-1601-7.
- Dey, A., Karmakar, S., Ibanez-Mejia, M., Mukherjee, S., Sanyal, S., and Sengupta, P. **(2019)** ***Geological Journal.*** 55(4), pp. 2851-2880, https://doi.org/10.1002/gj.3552
- Dey, A., Karmakar, S., Mukherjee, S., Sanyal, S., Dutta, U., and Sengupta, P. **(2019)** ***Journal of Geodynamics.*** 129, pp. 24-43, doi: https://doi.org/10.1016/j.jog.2019.03.005.
- Dey, A., Roy Choudhury, S., Mukherjee, S., Sanyal, S., and Sengupta, P. **(2019)** ***American Mineralogist,*** **104**(5), pp.744-760. doi: https://doi.org/10.2138/am-2019-6811.

The role of equilibration volume in the formation of complex microstructures: A case study on the origin of corundum-sapphirine-cordierite double corona around aluminosilicates in high grade metamorphic rocks

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Abstract:
The term 'Equilibration volume' (EV) refers to a specific portion of a rock volume over which the chemical potential of its components is spatially equivalent and thus the minerals present within that rock volume is presumed to be in equilibrium with each other (Powell et al., 2019). With metamorphism, the size of the EV for each component changes spatially and temporally as a function of various factors such as the diffusion rates of components, temperature, time, the presence or absence of fluids/melts, and grain size. etc. (Lasaga, 1998; Carlson, 2002). Thus, unless the dynamic evolution of the EV with changing metamorphic conditions is taken into account, a comprehensive understanding on the generation and preservation of certain mineral textures, like corona, might remain elusive. Furthermore, any petrological interpretation including the pressure-temperature-composition (P-T-X) or pressure-temperature-time (P-T-t) paths through which the rock evolved during various tectonic processes, derived from the micro-texture may be erroneous.

In this study we demonstrate the development of double corona texture in response to the continuously evolving EV in a suite of Mg-Al rich ortho-amphibole cordierite-bearing rock from the Cauvery Shear System in the Southern Granulite Terrane of India. The rock contains aluminosilicate porphyroblasts that are set in a matrix of ortho-amphibole ± quartz. The aluminosilicate porphyroblasts are rimmed successively by an inner symplectic corona of sapphirine + cordierite, and an outer mono-mineralic corona of cordierite (near ortho-amphibole). Locally, patches of corundum with a rind of cordierite grow preferentially along the interface of aluminosilicate and the inner symplectic corona. Based on detailed petrography and composition of individual minerals, the corona textures are interpreted to have formed through a sequence of different chemical reactions that occurred in local micro-domains.

We calculated activity-adjusted P-T petrogenetic grid in a MASH (MgO-Al_2O_3-SiO_2-H_2O) system which, suggest that the coronitic assemblages were formed in response to a steeply decompressive retrograde P-T path from >8.8 kbar to <6 kbar, at a nearly constant temperature of ~700°C. Effect of limited transport of chemical components in the formation of corona texture was investigated with the help of isothermal P-μ_{MgO}, P-μ_{SiO2}, and P-μ_{MgO}-μ_{SiO2} MASH diagrams. Our results demonstrates that a gradually shrinking EV around the central aluminosilicate during retrogression led to the sequential change of mineral reactions and equilibrium mineral assemblage, and resulted in the formation of multiple coronae. Unavailability of fluids and/or rapid exhumation is considered as the most dominant factors responsible for the decreasing elemental mobility and the consequent shrinking in EV in the studied rock.

References and Notes:

1. Carlson, W. D. *Mineralogical Society of America* **2002**, 87, 185–204.
2. Lasaga, A. C. *Princeton, NJ: Princeton university press*, **1998**.
3. Powell, R., Evans, K. A., Green, E. C. R. & White, R. W. *Journal of Metamorphic Geology* **2019, 37**, 1007–1019.

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Career Profile

I study the organic molecular fingerprints of present and past microbial life and interactions of microbes with geochemical cycles and climate. I combine expertise from organic (bio)geochemistry, geomicrobiology, and molecular biology to study how and why microbes produce organic molecules (such as lipids, pigments, and co-factors) and to learn what the rock record of these molecules can tell us about earth's climatic and geochemical evolution. My main analytical tools are lipidomics via liquid chromatography-mass spectrometry, compound-specific stable isotope analysis, experimental microbiology, and phylogenetic analyses.

Representative publications

Elling, F.J., Hemingway, J.D., Kharbush, J.J., Becker, K.W., Polik, C.A., Pearson, A. (2021). Linking diatom-diazotroph symbioses to nitrogen cycle perturbations and deep-water anoxia: Insights from Mediterranean sapropel events. Earth and Planetary Science Letters 571, 117110. doi: 10.1016/j.epsl.2021.117110

Elling, F.J., Hemingway, J.D., Evans, T.W., Kharbush, J.J., Spieck, E., Summons, R.E., Pearson, A. (2020). Vitamin B_{12}-dependent biosynthesis ties amplified 2-methylhopanoid production during oceanic anoxic events to nitrification. Proceedings of the National Academy of Sciences of the United States of America 117, 32996-33004. doi: 10.1073/pnas.2012357117

Elling, F.J., Gottschalk, J., Doeana, K.D., Kusch, S., Hurley, S.J., Pearson, A. (2019). Archaeal lipid biomarker constraints on the Paleocene-Eocene carbon isotope excursion. Nature Communications 10, 4519. doi: 10.1038/s41467-019-12553-3.

Elling, F.J., Könneke, M., Mußmann, M., Greve, A., Hinrichs, K.-U. (2015). Influence of temperature, pH, and salinity on membrane lipid composition and TEX_{86} of marine planktonic thaumarchaeal isolates. Geochimica et Cosmochimica Acta 171, 238-255. doi: 10.1016/j.gca.2015.09.004

Hydrogen isotopes of archaeal lipids as novel tracers of paleohydrology

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Abstract:

The hydrological cycle is a dynamic component of the climate system. Past changes in the hydrological cycle can be reconstructed using biomarker proxies such as the hydrogen isotopic composition (δ^2H) of plant-derived n-alkanes. This proxy traces changes in the hydrological cycle through the concomitant changes in the hydrogen isotopic composition of precipitation. However, interpretation of n-alkanes can be complicated by multiple physiological and ecological factors. Here, we propose that lipid biomarkers produced by other organisms, planktonic archaea inhabiting lakes and the ocean, can be used as paleohydrological proxies. Due to the distinct physiology of these archaea, we suggest that they are less prone to the biases affecting plant-derived n-alkanes. To assess the proxy potential of δ^2H of archaeal lipids, we studied hydrogen isotopic fractionation in two pure cultures of archaea that are ubiquitous in freshwater environments. Results from these experiments suggest a linear relationship of δ^2H of archaeal lipids and ambient water and no significant effect of temperature and pH. These results suggest that the δ^2H of archaeal lipids can be used as a proxy for changes in the hydrological cycle of freshwater environments. To further ground-truth the proxy, we plan to calibrate the δ^2H of GDGTs to δ^2H of ambient water using lake and ocean core-top sediments. Finally, we will benchmark the archaeal lipid proxy against established proxies and apply it to reconstruct changes in continental and ocean hydrology.

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Niels Meijer
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I study the evolution of continental paleoenvironments to understand the interactions between aridification, floral and faunal turnover, paleogeography and paleoclimate. Using stratigraphy and sedimentological tools, I have tracked mineral dust to reconstruct the drying of inland Asia due to the growing Tibetan orogen and Paratethys Sea retreat during the Eocene. Currently, I'm working together with biologists at the Senckenberg to study the impact of this drying on mammal biodiversity and vegetation in the region. I'm also using a combination of stable and clumped isotopes of soil carbonates to reconstruct the seasonal rainfall distribution and thus the evolution of Asian monsoons.

Representative publications:

- Meijer, N., van der Meulen, B. (2023). Loss of loess in the geological record due to poor preservation. *Terra Nova, 35*(3), 185-192.
- Meijer, N., Dupont-Nivet, G., Licht, A., Trabucho-Alexandre, J., Bourquin, S., & Abels, H. A. (2020). Identifying eolian dust in the geological record. *Earth-Science Reviews, 211*, 103410.
- Meijer, N., Dupont-Nivet, G., Abels, H., Kaya, M. Y., Licht, A., Xiao, M., Zhang, Y., Roperch, P., Poujol, M., Lai, Z.., Guo, Z. (2019). Central Asian moisture modulated by proto-Paratethys Sea incursions since the early Eocene. *Earth and Planetary Science Letters 510*, 73-84.

Extreme Eocene warmth drove proto-monsoons and desert greening in NE Tibet

Niels Meijer*, Alexis Licht, Amber Woutersen, Carina Hoorn, Faez Robin-Champigneu, Alexander Rohrmann, Mattia Tagliavento, Julia Brugger, Fanni D. Kelemen, Andrew J. Schauer, Micheal T. Hren, Aijun Sun, Jens Fiebig, Andreas Mulch, Guillaume Dupont-Nivet

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The existence and driving mechanisms of Asian monsoons before significant surface uplift of the Tibetan-Himalayan orogen remain debated. Based on palynological and isotopic records from NE Tibet, we show that rainfall temporarily doubled during the warm early Eocene, replacing the regional steppe by forested ecosystems. By reconstructing the season of pedogenic carbonate growth we constrain the soil hydrologic regime and show that most of this rainfall occurred during the summer season. This humid event is therefore attributed to an intensification and inland expansion of monsoonal moisture following the massive greenhouse gas release of the Paleocene-Eocene Thermal Maximum (PETM) as identified by a negative carbon isotope excursion in the sedimentary record. The resulting abrupt greening of the Central Asian steppe-desert would have enabled large-scale mammal dispersal corridors and could have played a role in carbon cycle feedbacks by enhancing soil organic carbon burial and silicate weathering. These extreme Eocene proto-monsoons, albeit different from the topography-driven Asian monsoon today, highlight the non-linear response of Asian hydroclimate to global warming and the associated challenges in predicting future changes.

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Showkat Hamid Mir
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Education

2022-2024 Humboldt Postdoctoral Fellow at Julius Maximilian University of Würzburg.
2020: Ph.D. University of Kashmir, India.

Thesis Title: Ecological studies on phytoliths of some grasses in Kashmir Himalaya.
Supervisors: Dr. Irfan Rashid and Prof. Zafar A. Reshi

2013: M. Phil. Guru Nanak Dev University, Amritsar, India
Thesis Title: Phytoliths as diagnostic markers of some grasses of Punjab, India
Supervisors: Dr. Amarjeet Sing Soodan

2011: M. Sc. Guru Nanak Dev University, Amritsar, India
2009: B. Sc. University of Kashmir, India

Projects

2016-2017: Senior Research Fellow (SRF), Department of Biotechnology Science and Technology, Government of India

2015-2016: Junior Research Fellowship, Department of Biotechnology Science and Technology, Government of India

Theoretical and practical classes for master's students:

Department of Botany, University of Kashmir. Total hours: 20 hrs. Topics considered Biodiversity indexes for calculating species richness and evenness, dominant species, Taxonomy of grasses, invasion status of few alien species. Extraction of phytoliths and pollen and their identification and nomenclature.

Professional recognition/award/prize/certificate:

2018: Qualified Jammu and Kashmir State Eligibility Test (JKSET), University Grants Commission

2018: Qualified National Eligibility Test (NET), Joint Council of Scientific and Industrial Research and University Grants Commission

Publications:

Mir Showkat Hamid - Google Scholar

https://scholar.google.com/citations?hl=en&vie=&user=aFXVqiMAAAAJ

Investigating uplift driven diversification of the Kashmir Himalayas using multiproxy data

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Abstract

Topographically complex regions, such as large mountain ranges, feature hotspots of biodiversity that reflect geological influences on ecological and evolutionary processes. A popular but little-tested hypothesis is that tectonic uplift creates environmental conditions. that increase the rate at which resident species divide and evolve to form new ones. Thus, one of the most common hypotheses for rich biodiversity found in mountains is uplift driven diversification known as orogeny, which creates conditions that favor rapid in-situ speciation of resident lineages. Testing hypothesis about how these topographic diversity gradients arise, persist, or diminish requires demonstrating coincidence and interaction in time and space between causal factors and biogeographic responses. The regional phytolith records and other sediment proxies along with the rate of uplift of the mountainous regions may provide evidence for this spatial and temporal turnover of the paleo-vegetation and geographic distributions respectively. The current investigation analyzes multi-proxy data including phytoliths, sedimentological (e.g., grain-size), magnetic susceptibility and geochemical data (e.g., TOC, C/N ratio, element composition) as well as the chronology of a representative sedimentary sequence (Shankerpora section) along with the rate of uplift to get insights for the uplift driven diversification in the Kashmir Himalayas. This approach will help us to trace the histories of multiple groups of plants and to infer the tempo (rate) and mode (colonization versus in situ diversification) of biotic assembly through time and space during the Late Quaternary in the high altitudinal ranges of the Kashmir Himalayas. This study will be a base for future paleoenvironmental and paleoclimate investigations using phytoliths from regional sediment archives in high-mountain ranges.

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Career Profile and representative publications:

Since 2021, I have been working as a scientist at CSIR-National Geophysical Research Institute. I received M.Sc. and Ph.D. degrees from the Indian Institute of Technology, Roorkee. In my Ph.D., I worked on the Himalayan shear zones to understand their spatio-temporal evolution. After Ph.D., I joined the Research School of Earth Sciences, Australian National University, with Prof. Gordon Lister in a 'Slab Modelling' project to model the subducting Pacific slab. My research interests are structural geology, tectonics, and plate tectonics. I have already published nine peer-reviewed articles in reputed journals, such as the Journal of Geophysical Research Planets, the Journal of Structural Geology, and Scientific Reports.

1. Joshi, G., Phukon, P., Agarwal, A., **Ojha, A.K.**, On the emplacement of the impact melt at the Dhala impact structure, India. **Journal of Geophysical Research Planets**, 128(7), 1-14.
2. Pradhan, R. M., Singh, A., **Ojha, A. K.**, Biswal, T.K., 2022. Structural controls on bedrock weathering in crystalline basement terranes and its implications on groundwater resources. **Scientific Reports**, 12(1), 11815.
3. **Ojha, A. K.**, Srivastava, D. C., Sharma, R., 2022. Fluctuation in the fluid and tectonic pressures in the South Almora Thrust Zone (SATZ), Kumaun Lesser Himalaya; paleoseismic implications. **Journal of Structural Geology**, 160, 104631.
4. **Ojha, A. K.**, Sharma, R., Srivastava, D. C., Lister, G. S., 2019. Polyphase development of chocolate-tablet boudins in the SAT zone, Kumaun Lesser Himalaya, India. **Journal of Structural Geology**, 127.
5. **Ojha, A. K.**, Srivastava, D. C., 2018. Effect of packing tightness on strain estimation from the Fry method. **Journal of Earth System Sciences**, 127(5), 61(1-12).
6. Kumar, R., Srivastava, D. C., **Ojha, A. K.**, 2014. A comparison of the methods for objective strain estimation from the Fry plots. **Journal of Structural Geology**, 63, 76-90.

Fluid and tectonic pressure interplay: A new window to understand Himalayan earthquakes

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Abstract:
Understanding earthquakes and the role of fluids is critical as it has both socio-economic importance. Previous studies have suggested that fluid is involved in Himalayan earthquakes along the Main Himalayan Thrust (MHT), but there is no geological evidence to support this hypothesis except for MT and seismic tomography. To investigate the role of fluid in Himalayan earthquakes, we have looked for signs of fossil earthquakes and fluid activity in Himalayan thrust zones. The South Almora Thrust Zone (SAT), the southern margin of the Almora Nappe, is found to be the most suitable site for this study. We have analyzed veins and rocks and found traces of past earthquakes preserved in the metamorphic fluid that formed the veins. Absolute paleostress using vein microstructures, fluid inclusion microthermometry, and Mohr circle reconstruction based on intrinsic rupture parameters is estimated. By combining the paleostress obtained from fault-slip data inversion, fluid inclusion microstructures, absolute paleostress estimates, and existing geochronological data, we have proposed that Late Oligocene- Early Miocene seismic cycles are recorded in the veins with a maximum and minimum deviatoric stress change of ~340 and 47 MPa at a depth of 7-13 km due to seismic loading and unloading. This study will help us better understand the Chamoli and Uttarkashi earthquakes, which are considered to be fluid-induced, as our research shows that earthquakes can occur and have occurred at a depth of 7-13 km in the Himalayan orogen since Late Oligocene- Early Miocene.

References and Notes:

1. Ojha, A.K., Srivastava, D.C. and Sharma, R., 2022. Fluctuation in the fluid and tectonic pressures in the South Almora Thrust Zone (SATZ), Kumaun Lesser Himalaya; paleoseismic implications. Journal of Structural Geology, 160, p.104631.

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Dr. P. Mahesh received his M.Sc. from Andhra University, Visakhapatnam and Ph.D. degree from Osmania University, Hyderabad. He worked as scientist at Institute of Seismological Research (ISR), Gandhinagar during 2011-2019 and presently working as scientist at CSIR-National Institute of Oceanography since 2019. His present research interests are focused towards understanding subduction tectonics of the Andaman-Nicobar subduction zone and seismogenesis of earthquakes associated with volcanism in the Andaman Sea. He has wide experience in installation of seismological networks in geologically complex and diverse terrains of the western Himalaya, Indian shield and Ocean bottom seismometers in the Indian Ocean. He has provided understanding of seismogenesis of the earthquakes in different seismically active tectonic regions of the Indian subcontinent such as the Continent-Continent collision zone (e.g. northwest Kumaun-Grarhwal and northeast Arunachal Himalayas), Continent-Oceanic collision zone (Andaman-Nicobar Subduction zone) and the Intraplate region (Kachchh and Saurashtra, northwestern India) through high resolution seismic imaging. Dr. Mahesh generates seismic images using earthquakes by applying different Seismic Tomography techniques to investigate the composition and structure of sub-lithospheric mantle. Dr. Mahesh has 25 scientific papers in National and International journals and presented over 20 papers at various conferences

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Seismic tomography of different seismically active tectonic regions of Indian subcontinent

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Abstract:
Indian sub-continent comprises of different tectonic units formed due to different geodynamic processes. These different tectonic units show varying orders of seismicity. We work to understand the seismogenesis of different seismically active tectonic regions of the Indian subcontinent such as the Continent-Continent collision zone (e.g. northwest Kumaun-Grarhwal and northeast Arunachal Himalayas), Continent-Oceanic collision zone (Andaman-Nicobar (A-N) Subduction zone) and the Intraplate region (Kachchh and Saurashtra, northwestern India) using local seismic tomography method. The tomographic images of the Kumaun-Garhwal Himalaya indicate the presence of quartz-rich felsic rocks in the uppermost crust and the occurrence of saline-rich aqueous fluid/partial melt in the upper-mid crust. We propose that the Main Himalayan Thrust (MHT), having a flat-ramp-flat geometry, lies at the base of these fluid zones. The small and moderate-to-strong-magnitude earthquakes are mainly confined to the fluid-rich zones along the MHT and quartz-rich rocks in the upper crust. Whereas in the Arunachal Himalaya, where seismicity trends reveal that the western Arunachal and the eastern Himalayan syntaxial zone are seismically active compared to central Arunachal and the velocity images reveal a gently dipping MHT without a clear signature of a mid-crustal ramp in the region. The seismically less active flat portion of the MHT in central Arunachal region might be related to a partially creeping segment or less deformation at the Himalayan front. For the first time using Ocean bottom seismometer data in the Andaman-Nicobar region, the produced tomographic images show high- V_P and V_P/V_S anomalies, which indicate a colder and thicker Subducting Indian Plate (SIP) beneath the A-N subduction zone. Low- V_P in the fore-arc mantle wedge indicates mantle serpentinization due to ample fluids from slab dehydration. Under the Andaman Backarc Spreading Center (ABSC), a low velocity anomaly at a depth of 60 to 100 km indicate signature of the mantle upwelling. We noticed low V_P anomalies in the crust and mantle wedge beneath the active volcanic Barren Island, which indicates arc magmas produced by corner flow in the mantle wedge and slab dehydration. The seismicity in the Andaman region is mainly controlled by the A-N trench, East Marginal Fault, Diligent Fault, A-N Fault and ABSC region. The tomographic images of the Kachchh region reveal that the majority of earthquakes, including the 2001 Mw 7.7 shock, are located in a zone of low Vp and high Vp/Vs at 20-30 km depth. This is probably a fluid saturated zone that originates from the shallow mantle, since it extends down to 40 km below the epicenter of the main shock. This fluidized medium represents a pronounced heterogeneity and facilitates stress accumulation. The tomograms in the Talala region of Saurashtra reveal that the moderate 2007 (Mw 5.0) and 2011 (Mw 5.1) shocks in Saurashtra are associated with a ~NW trending zone of higher Vp and Vp/Vs. We postulate that this high velocity zone could be an imprint of crystallized mafic magma that originated from deeper depths, and a locale for stress accumulation in this region.

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Academic qualifications:

➢ Ph.D. in Geology, Wadia Institute of Himalayan Geology, Dehradun and Banaras Hindu University, Varanasi, 2020 (July).

➢ M.Sc. in Applied Geology, Dibrugarh University, 2014 (July)

➢ B.Sc. in Geology, Sibsagar College, Dibrugarh University, 2012 (June)

Broad research areas: Metamorphic Petrology, Microstructure, Geochronology and Tectonics

Exams qualified: Gate 2014 & 2019 and CSIR-NET-2019.

Funded Research Projects:

• Indian Himalayan Central University Consortium (IHCUC) project of Niti Aayog sponsored by **Ministry of Education and University Grants Commission,** India. (**Co-PI; Status: Completed**)

• Characterizing dynamics of melting in anatectic zones of Greater Himalayan Sequence, Arunachal Himalaya, India: an integrated appraisal on deformation, phase equilibrium modelling and petrochronology, sponsored by **Science and Engineering Board Research**, DST, New Delhi. (**PI; Status: Ongoing**)

Published research articles: Click the google scholar link below
https://scholar.google.com/citations?user=vQPaCTkAAAAJ&hl=en

PhD Supervision: Two PhD thesis (Ongoing)

1. Tectono-Metamorphic Evolution of the Greater Himalayan Sequence in Western Arunachal Himalaya, NE India (Scholar: Md. Sunny Hussain)

2. Metamorphic and Geochronological studies of the Himalayan Metamorphic Core in Eastern Arunachal Himalaya, NE India. (Scholar: Himangshu Saikia)

Constraints of partial melting and melt transfer mechanisms on crustal rheology of the Himalayan orogen

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Abstract:
Partial melting and melt transfer from the deep suprasolidus crust exert a significant influence on the large-scale rheology and tectonic evolution of orogens. Migmatites, formed due to insitu partial melting of rocks, bear witness to a sequence of prograde melting reactions, loss of the majority of melts, and subsequent retrograde reactions involving melt solidification. One of the most remarkable consequences of the Himalayan orogeny has been the extensive melting of various rock types within the Greater Himalayan Sequence (GHS), resulting in the formation of migmatites and leucogranites. A noteworthy characteristic of the Western Arunachal Himalaya (WAH) in Northeast India is the abundance of migmatitic paragneiss within the lower structural level of the GHS (GHSL). This study aims to understand the mechanisms of melt generation and widespread migration and its effect on the crustal rheology of the GHS in WAH by reconstructing the metamorphic P–T path of these migmatitic paragneisses, exposed along the Bomdila-Tawang section of the WAH, and examining their associated deformation fabrics. Stromatic metatexite and layer-structured diatexite domains were identified within the GHSL via field observations. P-T pseudosection calculations using measured and meltreintegrated bulk rock compositions exhibited a clockwise P-T trajectory for both the migmatite domains. This path entails prograde burial and heating, resulting in substantial melt production and subsequent isothermal decompression, followed by melt solidification. At the peak metamorphic conditions, melt volumes reached ≥16% in both domains, surpassing the melt connectivity threshold. This melt volume was sufficient to alter the rheological properties of rocks and enable the melt escape from its site of origin through interconnected channels formed in response to deformation. Remarkably, >50% of the generated melts were expelled from the rocks at a depth of ~30–34 km. The structural features, such as the concordant and discordant interactions between the leucosomes and the primary foliation, signify the viscous flow of the melt fraction within the solid, further deforming the matrix. Melt migration occurring in the direction of the least compressive stress imposed by the GHSL rocks resulted in the formation of concordant leucosome layers corresponds to the D1 deformation. These mechanisms primarily operated within the melt source, where the protolith was in a sub-solidus state, facilitating melt segregation and movement in harmony with the foliation. The discordant leucosomes as shear bands, corresponds to D2 deformation, and the interconnected conjugate layers indicate that these discordant leucosomes stem from the buoyancy-driven viscous flow of melt within the solid matrix, directing it toward zones of dilation. The present study lends support to the notion of channelized flow within the hot, weak middle to lower crust, which plays a pivotal role in shaping the overall geometry of the Himalayan orogenic system.

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Dr. Yunus Ali Pulpadan is presently heading the Geomorphology of Mountains and Valleys Lab, Department of Earth and Environmental Sciences, at the Indian Institute of Science Education and Research (IISER) Mohali, as an Assistant Professor. His research specializes in geomorphology, remote sensing, machine learning and geographic information systems (GIS) to analyze natural hazards, particularly landslides and post-seismic landslide controls, river and coastal morphologies from local to regional and global scales. Dr. Yunus is a recipient of the Japanese Government Monbukagakusho Scholarship (MEXT). He was awarded doctoral degree from The University of Tokyo, Japan in 2014. Prior to joining IISER Mohali, he also served as Assistant Professor at Aligarh Muslim University in the Department of Geology, and postdoctoral researcher at the National Institute for Environmental Studies, Japan, and at the Graduate School of Frontier Science, The University of Tokyo. He also has working experience in premium research organizations like the State Key Laboratory for Geohazard Prevention and Geoenvironment Protection, China, and the Japan Agency for Marine-Earth Science and Technology. His groups ongoing projects include assessing potential hazards of landslide risk due to shift in climate extremes in glacio-fluvial settings, and attempt to quantify the changes caused by large landslides in fluvial settings.

Yunus et al. 2023. Earthquake-induced soil landslides: volume estimates and uncertainties with the existing scaling exponents. Scientific Reports, 13(1), p.8151.

Fan, Yunus et al. 2022. Imminent threat of rock-ice avalanches in High Mountain Asia. Science of The Total Environment 836, 155380

Yunus et al 2021. Unraveling the drivers of intensified landslide regimes in Western Ghats, India. Science of the total environment, 770, p.145357.

Yunus et al. 2020. Decadal vegetation succession from MODIS reveals the spatio-temporal evolution of post-seismic landsliding after the 2008 Wenchuan earthquake. Remote Sensing of Environment, 236, p.111476.

Yunus, et al. 2020. COVID-19 and surface water quality: Improved lake water quality during the lockdown. Science of the Total Environment, 731, p.139012.

Fan, Yunus et al. Rapidly evolving controls of landslides after a strong earthquake and implications for hazard assessments. Geophysical Research Letters, 48(1), .e2020GL090509.

Merghadi, A., Yunus, et al. 2020. Machine learning methods for landslide susceptibility studies: A comparative overview of algorithm performance. Earth-Science Reviews, 207, p.103225.

Fluvial response to mass movements in the Himalayas: quantifying rapid river incision due to the 2021 Chamoli disaster

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Abstract:
High Mountain Asia (HMA), home to the third largest concentration of glaciers on Earth, is one of the most prominent areas of glacial retreat. The region also experiences frequent natural disasters such as glacial lake outburst floods, catastrophic landslides, ice-rock avalanches, and debris flows[1]. The frequency and magnitude of these events have recently increased, owing to climate-warming-induced environmental changes. Although glacial mass loss and the rate of increase in landslides and flood activity in HMA are widely reported, the dynamics and long-term impacts of these earth surface processes on fluvial systems are poorly understood. Here we present, quantification of river morphological changes caused by the 7 February 2021 ice-rock avalanche in Chamoli district, Uttarakhand, India by combining satellite remote sensing, UAV LiDAR surveys and field observations. We used high resolution multi-temporal digital elevation models (DEM) of difference (DoD) to examine the post-disaster morphological changes in the head water river systems of Alakananda. Our results show substantial increases in river incision and channel widening in the affected zones. The average river incision measured by comparing different time period DEMs is about 5.5 meters, and a maximum of 10 m at a few locations. Considerable increase in river width was also recorded following the event. Our research demonstrates that large mass movements such as the 2021 Chamoli event act as a significant control of channel morphology in the HMA region. This understanding of fluvial geomorphic changes in HMA will maximize our efforts in accurate modeling of debris flow hazards and for developing flood inundation scenarios in downstream reaches.

References and Notes:

2. Fan, X., ***Yunus, A.P.***, Yang, Y.H., Subramanian, S.S., Zou, C., Dai, L., Dou, X., Narayana, A.C., Avtar, R., Xu, Q. and Huang, R., 2022. Imminent threat of rock-ice avalanches in High Mountain Asia. Science of The Total Environment, 836, p.155380.

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After secondary school in 2006, Jan Schönig completed a three-years professional training as draughtsman for engineering constructions in 2009. Subsequently, he reached the higher education level via second-chance education in 2011. In 2014, he received a B.Sc. degree in Geosciences, the M.Sc. degree in 2017, followed by a one-year research assistant position, and the doctoral degree in 2021 at the Georg-August-University Göttingen (Germany). His dissertation and the oral defense were marked with the grade summa cum laude and the performance has been rewarded by the Bernd-Rendel-Prize 2021 of the German Research Foundation [DFG grant SCHO 1980/1-1].
Since the doctoral degree in 2021, Dr. Jan Schönig is employed as research associate (Post Doc) in his own single PI project financed via the German Research Foundation [DFG grant SCHO 1980/2-1]. His research particularly focuses on the reconstruction of metamorphic conditions from a detrital perspective. This includes the development and application of novel provenance techniques like mineral inclusion analysis and multivariate statistical discrimination by using machine-learning algorithms. All these approaches aim in tracing and understanding geodynamic regimes and their evolution through Earth's history at the global scale.

Publications (five selected):

1. Schönig, J.; Benner, C.; Meinhold, G.; von Eynatten, H.; Lünsdorf, N. K. *European Journal of Mineralogy* **2023**, *vol 35*, page 479 – page 498.
2. Schönig, J.; von Eynatten, H.; Meinhold, G.; Lünsdorf, N. K. *Earth-Science Reviews* **2022**, *vol 227*, article number 103985.
3. Schönig, J.; von Eynatten, H.; Tolosana-Delgado, R.; Meinhold, G. *Contributions to Mineralogy and Petrology* **2021**, *vol 176*, article number 86.
4. Baldwin, S. L.; Schönig, J.; Gonzalez, J. P.; Davies, H.; von Eynatten, H. *Proceedings of the National Academy of Sciences* **2021**, *vol 118*, article number e2017231118.
5. Schönig, J.; von Eynatten, H.; Meinhold, G.; Lünsdorf, N. K. *Geology* **2019**, *vol 47*, page 715 – page 718.

Detrital Garnet Petrology

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Documenting metamorphic conditions through the geologic record is a key for understanding the evolution of plate tectonics on Earth. Minerals characteristic for deep subduction processes (i.e. modern-style plate tectonics) like glaucophane, coesite, and diamond are commonly replaced by their low-pressure polymorphs during exhumation. However, when entrapped as inclusions in resistant host minerals like garnet, these mineral phases are shielded from external metamorphic fluids and may be preserved. Finding evidence for deep subduction processes in host garnets of large volumes of (partially) re-equilibrated crystalline rocks is challenging, time consuming, and often hampered by poor outcrop conditions due to weathering and soil formation. In contrast, by analyzing detrital garnet, natural processes such as erosion and sedimentary transport can sample garnet grains sourced from fresh as well as altered crystalline rocks located in the drainage area, enabling large crustal volumes to be screened using a comparatively low number of samples. Case-studies from Norway[1], Germany[2,3], Austria, Papua New Guinea[4], and Greenland[5] demonstrate mineral inclusion analysis of detrital garnet integrated with major-element chemistry[6] to be an efficient tool for screening tectonometamorphic units on the presence or absence of rocks related to modern-style plate tectonic processes. This contribution gives a synopsis of the main findings from the five spatially, chronologically, and tectonically distinct localities.

References:

6. Schönig, J; Meinhold, G.; von Eynatten, H.; Lünsdorf, N. K. *Scientific Reports* **2018**, *vol 8*, article number 2931.
7. Schönig, J.; von Eynatten, H.; Meinhold, G.; Lünsdorf, N. K. *Geology* **2019**, *vol 47*, page 715 – page 718.
8. Schönig, J.; von Eynatten, H.; Meinhold, G.; Lünsdorf, N. K.; Willner, A. P.; Schulz, B. *Gondwana Research* **2020**, *vol 87*, page 320 – page 329.
9. Baldwin, S. L.; Schönig, J.; Gonzalez, J. P.; Davies, H.; von Eynatten, H. *Proceedings of the National Academy of Sciences* **2021**, *vol 118*, article number e2017231118.
10. Schönig, J.; Benner, C.; Meinhold, G.; von Eynatten, H.; Lünsdorf, N. K. *European Journal of Mineralogy* **2023**, *vol 35*, page 479 – page 498.
11. Schönig, J.; von Eynatten, H.; Tolosana-Delgado, R.; Meinhold, G. *Contributions to Mineralogy and Petrology* **2021**, *vol 176*, article number 86.

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Previous Position

- Postdoctoral Scientist, ***NASA GSFC*** Biospheric Sciences Laboratory, Greenbelt, MD USA (April 2019- Sept 2020)
- Postdoctoral researcher, ***Jet Propulsion Laboratory, NASA***, Caltech, Pasadena CA USA (January 2017- April 2019)

Research area

Dr. Singh's primary research interest is in understanding the eco-hydrological system at local to global scales using remote sensing and geospatial tools. She has worked extensively on hydrological mass variations and lake/ reservoir dynamics, drought, ground water, flood, forest fire, and carbon-water nexus. Currently she is exploring data driven modelling of ground water estimation using AI/ML.

Education

- Ph.D., Technical University of ***Munich, Germany*** (2010-2016), Department of Civil, Geo and Environmental Engineering. Dissertation title "Dynamics of water mass variations in lake/reservoir dominated regions from multi-sensor Earth observation data and hydrological model outputs".
- M.Sc., Geoinformatics (2009), Faculty of Geo-Information Science and Earth Observation (ITC), Enschede ***(Netherlands***) with Indian Insti. of Remote Sensing, Dehradun (India)

Selected Publications

Singh, A.; Reager, J.T.; Behrangi, A.; **Estimation of hydrological drought recovery based on GRACE water storage deficit**. Hydrology and Earth System Sciences HESS 25, 2, 511–526, 2021. doi.org/10.5194/hess-25-511-2021

Singh, A.; Seitz, F.; Eicker A.; Güntner A. **Water budget analysis within the surrounding of prominent lakes and reservoirs from multi-sensor Earth observation data and hydrological models: case studies of the Aral Sea and Lake Mead**; Remote Sensing, Vol. 8, pp 953, 2016. DOI: 10.3390/rs8110953

Singh, A.; Seitz, F.; Schwatke, C.: **Inter-annual water storage changes in the Aral Sea from multimission satellite altimetry, optical remote sensing, and GRACE satellite gravimetry**; Remote Sensing of Environment, Vol. 123, pp 187-195, Elsevier, ISSN 0034-4257, DOI: 10.1016/j.rse.2012.01.001, 2012

Ground water scenario of Northwest India derived from remote sensing and deep learning tools

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Abstract:
Ground water (GW) is mostly considered a more reliable water source for meeting human needs both spatially and temporally (Taylor et al., 2013). In past few decades, with easy access of GW through tubewells and other advancements in technologies, production of water-intensive crops like rice, sugarcane, coconut, etc are increasing in many parts of India. Many studies have demonstrated severe GW depletion in northwest (NW) India using NASA's Gravity Recovery and Climate Experiment (GRACE) gravity field data (Tiwari et al., 2009; Rodel et al., 2009; Shivani et al. 2022; Taylor et al. 2013). This presentation will discuss GW scenario of India with special focus on NW India. The study integrates different remote sensing data like GRACE, SAR, Optical images, and in-situ data along with model outputs to provide a wholistic picture of the region. The top-down and bottom-up approaches will be integrated using AI/ML models such as a combination of spatial (convolutional neural network-based networks) and temporal (Long Short-Term Memory LSTM) networks. By combining both spatial context and temporal change information, we expect to obtain a higher resolution mapping of the ground water changes occurring in various parts of Northwest India (NWI). Results show that continuous over abstraction is leading to significant land subsidence at many places in NW India. The pixelwise trend map for the study area showed that groundwater storage has been declining significantly in NWI, with the most pronounced decline in Punjab, Delhi, and Haryana

References:

Rodell, M., Velicogna, I., & Famiglietti, J. S. (2009). Satellite-based estimates of groundwater depletion in India. *Nature*, *460*(7258), 999–1002. https://doi.org/10.1038/nature08238

Shivani, S. M., Srivastava, S. , & Singh, A (2022). *Critical analysis of hydrological mass variations of northwest India*. 012032. https://doi.org/10.1088/1755-1315/1032/1/012032

Taylor, R. G., Scanlon, B., Döll, P., Rodell, M., Beek, R. V., Wada, Y., Longuevergne, L., Leblanc, M., Famiglietti, J. S., Edmunds, M., Konikow, L., Green, T. R., Chen, J., Taniguchi, M., Bierkens, M. F. P., Macdonald, A., Fan, Y., Maxwell, R. M., Yechieli, Y., … Treidel, H. (2013). Ground water and climate change. *Nature Climate Change*, *3*(4), 322–329. https://doi.org/10.1038/nclimate1744

Tiwari, V. M., Wahr, J., & Swenson, S. (2009). Dwindling groundwater resources in northern India, from satellite gravity observations. *Geophysical Research Letters*, *36*(18). https://doi.org/10.1029/2009GL039401

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My research focuses on extracting signals from complex and diverse environmental datasets. My current projects are focused on monitoring high-altitude rivers, quantifying the state and fate of snow-water resources, and measuring the resilience of natural ecosystems. My methods are data-driven, and rely on the combination of high-performance computing and novel statistical methods to explore changes in the earth system.

Selected Publications

- **T Smith** and N Boers. "Reliability of Vegetation Resilience Estimates Depends on Biomass Density." Nature Ecology & Evolution (2023). https://doi.org/10.1038/s41559-023-02194-7
- **T Smith** and N Boers. "Global vegetation resilience linked to water availability and variability." Nature Communications 14, 498 (2023). https://doi.org/10.1038/s41467-023-36207-7
- **T Smith**, D Traxl, and N Boers. "Empirical evidence for recent global shifts in vegetation resilience." Nature Climate Change (2022). https://doi.org/10.1038/s41558-022-01352-2
- **T Smith** and B Bookhagen. "Assessing Multi-Temporal Snow-Volume Trends in High Mountain Asia From 1987 to 2016 Using High-Resolution Passive Microwave Data." Front. Earth Sci. (2020) 8:559175. https://doi.org/10.3389/feart.2020.559175
- **T Smith** and B Bookhagen. (2020). "Climatic and Biotic Controls on Topographic Asymmetry at the Global Scale." Journal of Geophysical Research: Earth Surface, 125, e2020JF005692. https://doi.org/10.1029/2020JF005692
- **T Smith**, A Rheinwalt, and B Bookhagen. "Determining the Optimal Grid Resolution for Topographic Analysis on an Airborne Lidar Dataset'', Earth Surface Dynamics 7 (2019): 475-489 https://doi.org/10.5194/esurf-7-475-2019
- **T Smith** and B Bookhagen. "Changes in seasonal snow water equivalent distribution in High Mountain Asia (1987 to 2009)'', Science Advances 4 (2018): 1, https://doi.org/10.1126/sciadv.1701550

Full publication list can be found here: https://tasmi.github.io/publications/

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Recent Changes in Snow-Water Resources in High Mountain Asia

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Abstract: High Mountain Asia (HMA) is one of the most important stores of freshwater on the globe (Bolch et al., 2012). Through a network of rivers, canals, and irrigation systems, water that originates in the mountains supports the health and livelihoods of more than a billion people in some of the most densely populated regions of the world. The ability of these water resources to support both the natural and built environments has come under pressure from rising human demands and increasing precipitation variability in recent decades. Snow and glacier resources play a key role in stable annual water provision – one that is coming under increased stress as the volume and persistence of glacier and snow resources shift (Barnett et al., 2005; Smith and Bookhagen, 2018). Without transient cryospheric water storage, environmental, hydropower, agriculture, and human demands will increasingly conflict.

In some catchments, snowmelt makes up more than half of the yearly water budget (Wulf et al. 2016). In the absence of reliable in-situ data, both complex and simple models have been developed to constrain the overlapping roles of rainfall, snowmelt, and glacier melt in maintaining downstream water availability throughout the year and assessing hydro-meteorological hazards. While satellite rainfall measurement and glacier monitoring have improved over the past decade, there remains a gap in effective measurement of snow-water storage, and in particular snowmelt contributions to river hydrology.

During the DFG-funded STRIVE project, a more detailed and local-scale assessment of the impact of changing snow-water resources on river systems will be undertaken, using a mix of low-cost in-situ sensors, hydro-meteorological data, and satellite-based products. Large-scale trends in snow-water resources (Smith and Bookhagen, 2018), while broadly useful, lack key local context and links to catchment-level hydrology. It is hypothesized that high-temporal resolution in-situ data will help to contextualize satellite-based measurements, and yield an improved understanding of how large-scale trends in snow-water storage and snowmelt timing translate into downstream impacts on alpine rivers and the communities which rely upon them.

References and Notes:

1. Barnett, T. P., Adam, J. C., and Lettenmaier, D. P.: Potential impacts of a warming climate on water availability in snow-dominated regions, Nature, 438, 303–309, 2005.
2. Bolch, T., Kulkarni, A., Kääb, A., Huggel, C., Paul, F., Cogley, J., Frey, H., Kargel, J., Fujita, K., Scheel, M., et al.: The state and fate of Himalayan glaciers, Science, 336, 310–314, 2012.
3. Smith, T., and Bookhagen, B.: Changes in seasonal snow- water equivalent distribution in High Mountain Asia (1987 to 2009), Science Advances 4: 1, 2018.
4. Wulf, H., Bookhagen, B., and Scherler, D.: Differentiating between rain, snow, and glacier contributions to river discharge in the western Himalaya using remote-sensing data and distributed hydrological modeling, Advances in Water Resources, 88, 152–169, 2016.

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Career Profile:

Mjahid Zebari (PhD, University of Jena, 2021) is a geologist with an interest in investigating earth crust deformation across different timescales and its expression on evolving landscapes. Mjahid works on integrating geological and geophysical data for constraining 2D and 3D structural models. He utilizes remote sensing tools including satellite imagery to obtain geological information and digital elevation models to quantify landscape maturity and to analyze river profiles for reading traces of uplift and faulting. Mjahid also uses numerical modeling of landscape evolution. Additionally, he employs SAR interferometry to detect short-term ground surface deformations. He worked on research projects in the Zagros Fold-Thrust Belt, Moroccan Rif, Bohemian Massif, and Sub-Himalaya. Mjahid Zebari has been working as a postdoctoral researcher at LMU München since 2021.

Representative publications:

Zebari, M., Preusser, F., Grützner, C., Navabpour, P., & Ustaszewski, K. (2021). Late Pleistocene-Holocene Slip Rates in the Northwestern Zagros Mountains (Kurdistan Region of Iraq) Derived from Luminescence Dating of River Terraces and Structural Modeling. Tectonics, 40, e2020TC006565. https://doi.org/10.1029/2020TC006565

Zebari, M., Balling, P., Gruetzner, C., Navabpour, P., Witte, J., & Ustaszewski, K. (2020). Structural style of the NW Zagros Mountains and the role of basement thrusting for its Mountain Front Flexure, Kurdistan Region of Iraq. Journal of Structural Geology, 141, 104206. https://doi.org/10.1016/j.jsg.2020.104206

Zebari, M., Gruetzner, C., Navabpour, P., & Ustaszewski, K. (2019). Relative timing of uplift along the Zagros Mountain Front Flexure (Kurdistan Region of Iraq): Constrained by geomorphic indices and landscape evolution modeling. Solid Earth, 10, 663-682. https://doi.org/10.5194/se-10-663-2019

Zebari, M., Burberry, C. M. (2015). 4-D evolution of anticlines and implications for hydrocarbon exploration within the Zagros Fold-Thrust Beld, Kurdistan Region, Iraq. GeoArabia, 20 (1), 161-188. https://doi.org/10.2113/geoarabia2001161

Expression of Active Tectonics in the Maturity of the Evolved Landscape: A Case from the Western Sub-Himalaya

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Abstract:

In active mountain ranges, tectonic processes elevate the topography via rock uplift while erosional processes break it down. Numerous factors, among them the intensity of tectonic activity, climate, and lithology shape this interaction. Active tectonics influence the reorganization of the drainage system and thereby leave an expression in the evolved topography. To understand the active tectonics and the related hazards, analyzing the topography using digital elevation models provides a first-order cost-effective method. The underlying idea is that the state of erosion of a landscape allows distinguishing between slow and fast deformation. Additionally, the maturity of a landscape as expressed in its erosion pattern is seen as a function of the time that has passed since erosional processes started. Here, we investigate the influences of active tectonics, climate, and lithology on the landscape evolution of the western Sub-Himalaya between the Chenab and Dehradun re-entrants. We analyze the spatial variability of a set of morphometric parameters (among them hypsometric integral and surface roughness) obtained from digital elevation models. Considering structural location, deformation rates, and lithology there, the spatial distribution of the geomorphic parameters correlates with the relative rock uplift rates, highlighting the structures dominated by younger tectonic activity and the effects of differential rock erodibility. The variation in geomorphic parameters is visible through the extent of river incision and the changes in the local base level within the same lithology. Our results emphasize the importance of distinguishing the contributions of relatively young tectonic movements and rock erodibility to the landscape evolution of the western Sub-Himalaya.


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Dr. Arvind Chaudhary did Masters in Chemistry from University of Allahabad. He continued his study towards Ph.D. at Indian Institute of Technology Kanpur, his focus of research centred around Synthesis of Porphyrin / Bisporphyrin based Donor-Acceptor Systems for Photosynthetic Reaction Center. Thereafter, he did his postdoc at NISER-Bhubaneswar where he had received training for Synthesis of Core-modified expanded porphyrin and application for Nonlinear optical properties. In 2015, he joined as Scientist in SERB, New Delhi. His area of research expertise is Porphyrin based supramolecular chemistry, Expanded porphyrin analogues and Bio-inorganic chemistry. He has authored various publications in high impact journals of Chemical Sciences including review articles and book chapters. He is associated as reviewer with journals and member of scientific societies.

In SERB at present Dr. Arvind is handling for some programme related to Lifesciences. Along with these, he is also programme officer for International programme like SERB International Research Experience (SIRE) and Member Secretary for ASEAN-India collaborative R&D programme.

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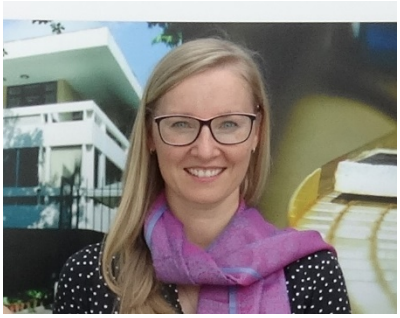
Dr. Franziska Langer



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Dr. Prahlad Ram obtained his master degree from Indian Institute of Technology (Indian School of Mines), Dhanbad in Applied Geology and Ph D degree in Hydrogeology from Banaras Hindu University, Varanasi. Dr. Ram joined Science and Engineering Research Board (SERB) as Scientist 'C' in 2015. Prior to joining SERB, Dr. Ram had been serving at Central Ground Water Board, Ministry of Jal Shakti, Government of India from 2009 to 2015. He was inducted in CGWB through Union Public Service Commission (Geologist Exam. 2006). Dr. Ram also served as Engineer (Geo-Tech.) at Rail India Technical Economic Services (RITES, Ltd), Ministry of Railway, Government of India from 2007 to 2009. Dr. Ram specializes in hydrogeology and published nearly 12 research papers in national and international journals. He also qualified CSIR-UGC-NET-JRF and GATE 2004. Dr. Ram has also been VMC Member, Kendriya Vidyalayas, Faridabad, Haryana, and Expert Member for the Board of Studies (BoS) in Environmental Science, Mizoram University and member of Scientific Advisory Committee, SRTM University, Nanded.

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Dr. Praveenkumar Somasundaram, a Scientist of the Department of Science and Technology (DST), Government of India has been involved in several R&D promotional schemes of DST at various levels. He, a doctorate in Physics (Perovskites and Ferrites) had steered some significant R&D Programs for Young Scientists in Physical & Mathematical Sciences. He also worked as an Examiner of Patents and Designs in Patent Office, Government of India. He was closely involved in the establishment of the Science and Engineering Research Board (SERB), a Statutory body of DST. Currently, he is responsible for implementing Overseas Doctoral and Postdoctoral Fellowships; Visiting Doctoral Fellowships; Internship Programs of SERB such as S.N Bose Scholar Program, GROW of NSF and National Postdoctoral Fellowship. He is instrumental in building partnerships with top-ranking Universities across the globe. VAJRA Faculty Scheme, presumed to be a game-changer in Indian S&T, for bringing international R&D expertise to the Indian ecosystem is the latest responsibility assigned to him for implementation. He is also associated with IMPacting Research, INnovation and Technology (IMPRINT) Scheme of Ministry of Human Resource Development (MHRD), Government of India and DST to address major engineering challenges relevant to India through an inclusive and sustainable mode of translational research steered by the top engineering institutions in the country. SERB-SUPRA (Scientific and Useful Profound Research Advancement) for practicing scientists who are working in realms of highly unconventional pathways of transformative research is the new assignment given to him for implementation.

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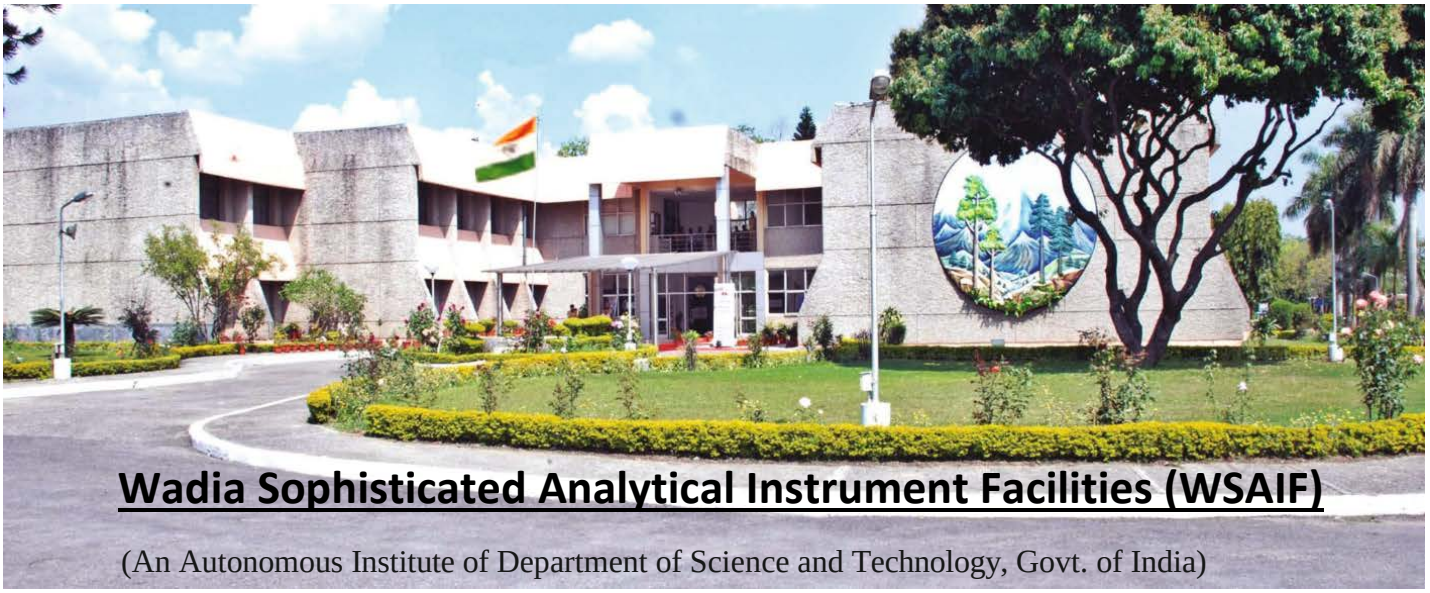

Wadia Sophisticated Analytical Instrument Facilities (WSAIF)

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Wadia Sophisticated Analytical Instrument Facilities (WSAIF) is a core research division of the Wadia Institute of Himalayan Geology (WIHG) that provides professional and world-class analytical services.

The state-of-the-art sophisticated analytical laboratories strongly substantiate the field data for understanding the geodynamic evolution of the Himalaya, geological surface processes such as landslides, avalanches, cloud bursts and extreme events, and to characterize and mitigate natural geohazards. Additionally, the sub-surface processes such as earthquakes, crustal heterogeneities, elastic strain and convergent rate, crustal and mantle interaction are probed by profound geophysical instrumentation and modern analytical-techniques. Besides adding significance to the knowledge base, the Institute also provides geoscience support to other government agencies and stakeholders. WSAIF also caters to the analytical facilities of various universities, IIT's, IISER, and other state and central government organizations.

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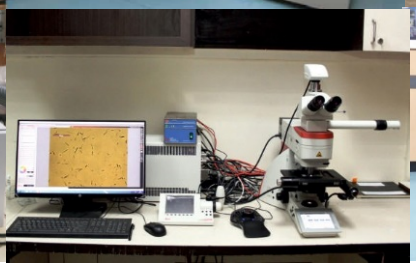
Overview about Technical Laboratories and Facilities

- Scanning Electron Microscope (SEM) using Energy dispersive X-Rays (EDX)
- X-Ray Fluorescence (XRF) Spectrometer
- Quadrapole-Inductively Coupled Plasma Mass Spectrometer (Q-ICPMS)
- Water Chemistry Lab: Ion-Chromatograph & Auto Titrator, Bacteriological Analysis
- Stable Isotope Lab Isotope Ratio Mass Spectrometer (IRMS)
- Laser Ablation-Multi Collector- Inductively Coupled Plasma Mass Spectrometer (LA-MC-ICPMS)
- Thermo Luminescence (TL) & Optically Stimulated Luminescence (OSL) Lab
- Fission Track Dating
- Mineral Separation Lab
- Fluid Inclusion and Raman Spectroscopy Lab
- Total Organic Carbon (TOC) Lab
- Paleomagnetic Lab
- Thin Section Preparation & Crushing/Powdering Facility
- Sedimentology Lab (Laser Particle size analyzer & Vibratory sieve shaker)
- Geotechnical Lab
- Paleoseismology and Active Tectonics Laboratory
- Seismic Interpretation Laboratory
- Isotopic Characterization
- Seismic Network
- Multiple onsite field instruments





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