Quarterly Newsletter
Wadia Institute of Himalayan Geology, Dehradun
(www.wihg.res.in)

Bhugarbh Vani

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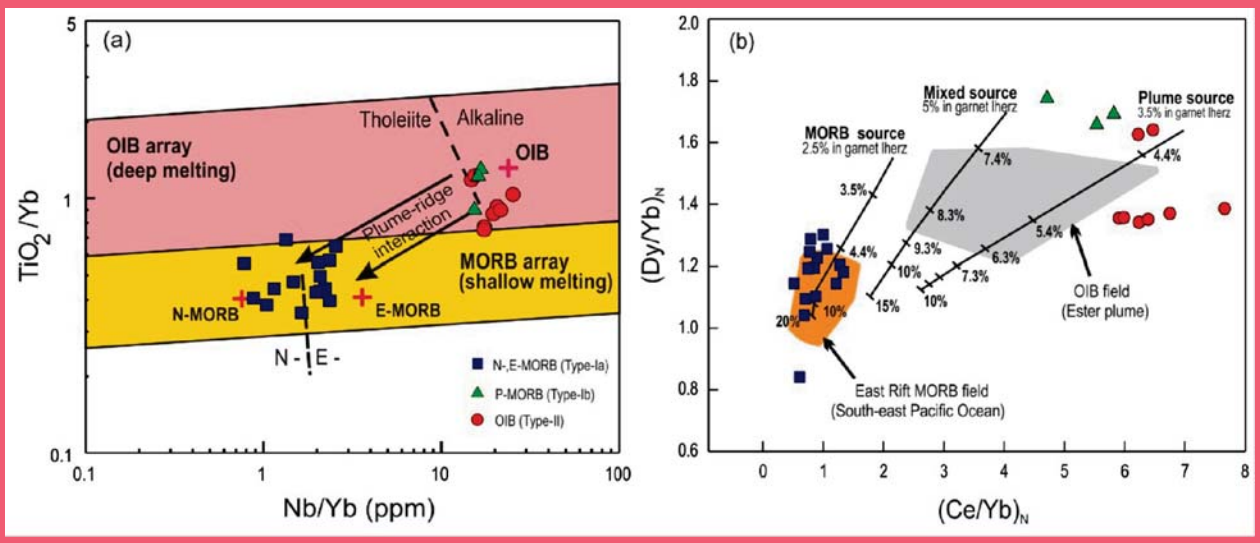
RESEARCH ACTIVITIES

Coexistence of MORB and OIB-type mafic volcanics in the Ophiolites of Indo-Myanmar Orogenic Belt, northeast India:

The coexistence of tholeiitic mid-ocean ridge basalt (MORB)- type and alkaline ocean island basalt (OIB)- type mafic volcanics from the Manipur ophiolite complex (MOC) has been reported from Indo-Myanmar orogenic belt, northeast India. The MORB-types have comparatively lower TiO_2 concentrations (0.6-1.6 wt. %), show almost flat REE patterns with depleted LREEs [$(La/Sm)_N$ = 0.62-1.03]. However, few samples in the MORB group show enrichment in LREE [$(La/Sm)_N$ = 2.83-2.95] which is the typical composition of P-MORB. Alkaline OIB-types are characterized by high concentration of TiO_2 (1.7 to 3.5 wt. %) with highly enriched LREE pattern as compared to their HREE [$(La/Sm)_N$ = 2.27-3.44, $(Sm/Yb)_N$ = 2.56-3.29)]. Such geochemical variation implies more than two magma sources. Possibly, one for OIBs (enriched mantle) and several ones for MORBs from depleted MORB mantle (DMM) source to significantly enriched DMM source by OIB-type components. Petrogenetic modelling suggests that 20% partial melting of depleted mantle within spinel stability facies zone (shallow depth) is responsible for generation of MORB tholeiites and 5-10% partial melting of enriched mantle or plume material at garnet facies stability zone (deeper depth) is responsible for production of alkaline OIB-type. Geochemical signatures of

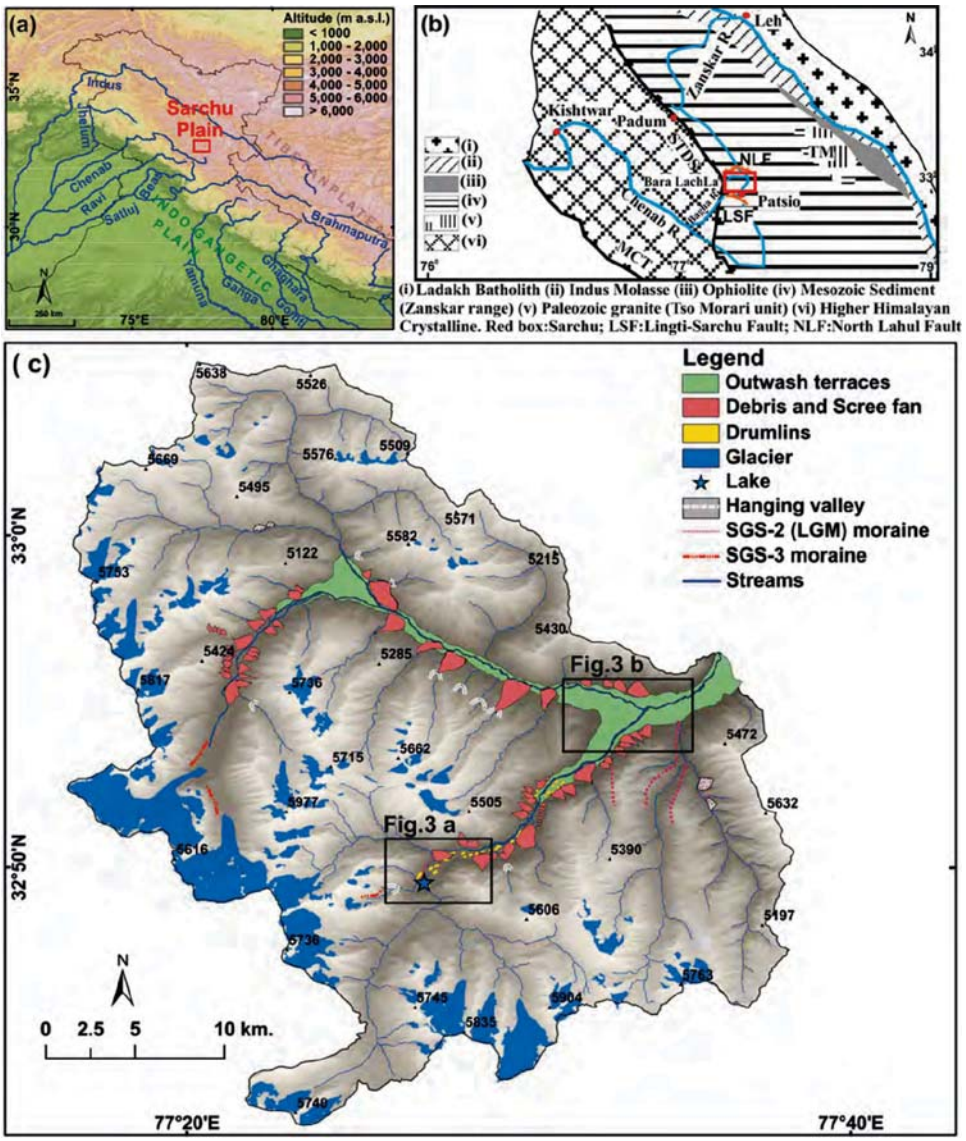


(a) Ti/Yb vs. Nb/Yb diagram (Pearce, 2008) highlighting the shallow and deep melting array for MOC basaltic samples. (b) $(Dy/Yb)_N$ vs. $(Ce/Yb)_N$ diagram and melt model (Haase and Dewey, 1996) for MORB and OIB samples from Manipur Ophiolite Complex (MOC).

variably enriched MORB and P-MORB samples further suggest possible scenario of mixing of depleted N-MORB and enriched OIB melt. It is therefore likely that mafic volcanics of the MOC were derived from chemically heterogeneous mantle sources erupted i. at the sea floor spreading zone as MORB generated by partial melting of depleted upper mantle and ii. as OIB generated by partial melting of enriched mantle or a plume source, at the proximity of the spreading axis. Later, due to prolonged subduction of the Indian plate beneath the Myanmar plate and afterward collisional activity, they might have accreted along the Indo-Myanmar Orogenic belt as upthrust ocean crust. (*Journal of Asian Earth Sciences 116, 42-58*)

Factors responsible for driving the glaciation in the Sarchu Plain, eastern Zanskar Himalaya, during the late Quaternary:

Detailed geomorphological investigation supported by field stratigraphy and optical dating enabled to identify three major events of glaciation in the eastern Zanskar Himalaya (Sarchu Plain). The oldest and most extensive glaciation is the Sarchu Glaciation Stage-(SGS-1) that pre-dates the Last Glacial Maximum (LGM) and is assigned to the cold and wet Marine Isotope Stage-4 (MIS-4). The second glacial advance (SGS-2) is optically dated to ~20 ka and the youngest SGS-3 is assigned to the 8.2 ka cooling event. Evidence of deglaciation is preserved as outwash terrace gravels and is assigned to the pluvial MIS-3 and the early Holocene (~9 ka). Increased strength of westerlies (winter precipitation) and associated temperature decline were responsible for driving the glaciation in the study area, a conclusion that accords well with modern meteorological data



(a) Map of the western Himalaya showing the study area (box). (b) Geological map of the Sarchu Plain in the eastern Zanskar; box indicates the study area (modified after Srikantia and Bhargava, 1976). Patsio weather station is located _30km south of the Sarchu Plain. (c) Map of the Yunam catchment (Sarchu Plain) showing the distribution of modern glaciers, moraines corresponding to different glacial stages, drumlins, outwash gravel, alluvial fans and scree fans.

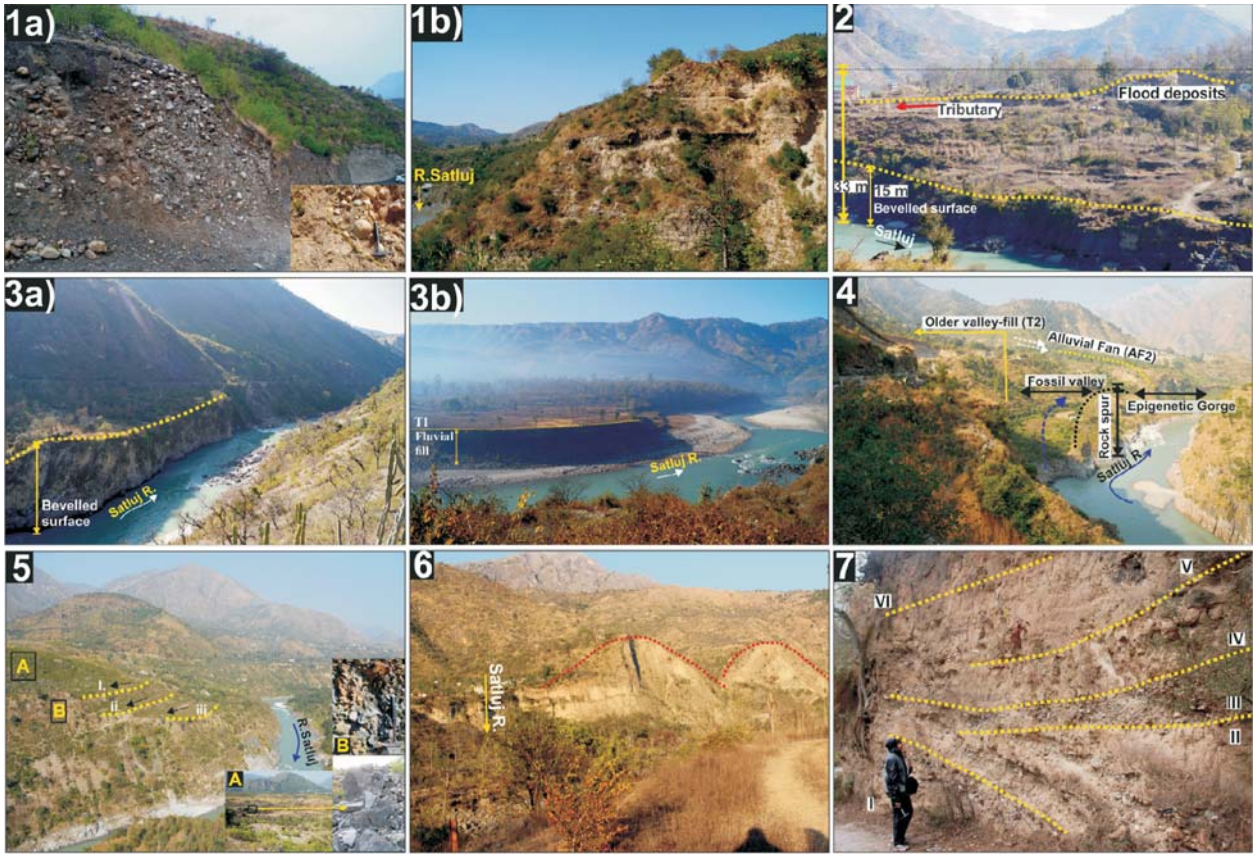
showing a reasonable correlation between the modern equilibrium line altitudes, enhanced mid-latitude westerlies and winter temperatures. The phases of deglaciation occurred during periods of warmer climatic excursions. Overall a broad correspondence between the Sarchu Plain glaciation phases and northern latitude ice sheet dynamics is suggested, implying that the glaciers in the trajectory of the mid-latitude westerlies are likely to respond in phase with northern latitude glaciation. (*Journal of Quaternary Science 31*(*5*), *495-511*)

Finite element analysis of failed slope by shear strength reduction technique: a case study for Surabhi Resort Landslide, Mussoorie township, Garhwal Himalaya:

Finite element analysis of failed slope of the Surabhi Resort landslide located in the Mussoorie township, Garhwal Himalaya has been carried out using shear strength reduction technique. Two slope models viz. debris and rock mass were taken into consideration in this study and have been analysed for possible failure of slope in future. Critical Strength Reduction Factor (SRF) for the failed slope is observed to be 0.28 and 0.83 for the debris and rock mass model, respectively. A low SRF value of the slope revealed significant progressive displacement in the zone of detachment. This has also been evidenced in the form of cracks in the building of Surabhi Resort and presence of subsidence zones in the Mussoorie International School. These results are consistent with the study carried out by other workers using different approach. (*Geomatics*, *Natural Hazards and Risk* 7(*5*), *1677-1690*)

Post-glacial landform evolution in the middle Satluj River Valley, India: Implications towards understanding the climate tectonic interactions:

Late Quaternary landform evolution in monsoon-dominated middle Satluj valley is reconstructed using the fragmentary records of fluvial terraces, alluvial fans, debris flows, paleo-flood deposits, and epigenetic gorges. Based on detailed field mapping, alluvial stratigraphy, sedimentology and optical chronology, two phases of fluvial aggradations are identified. The

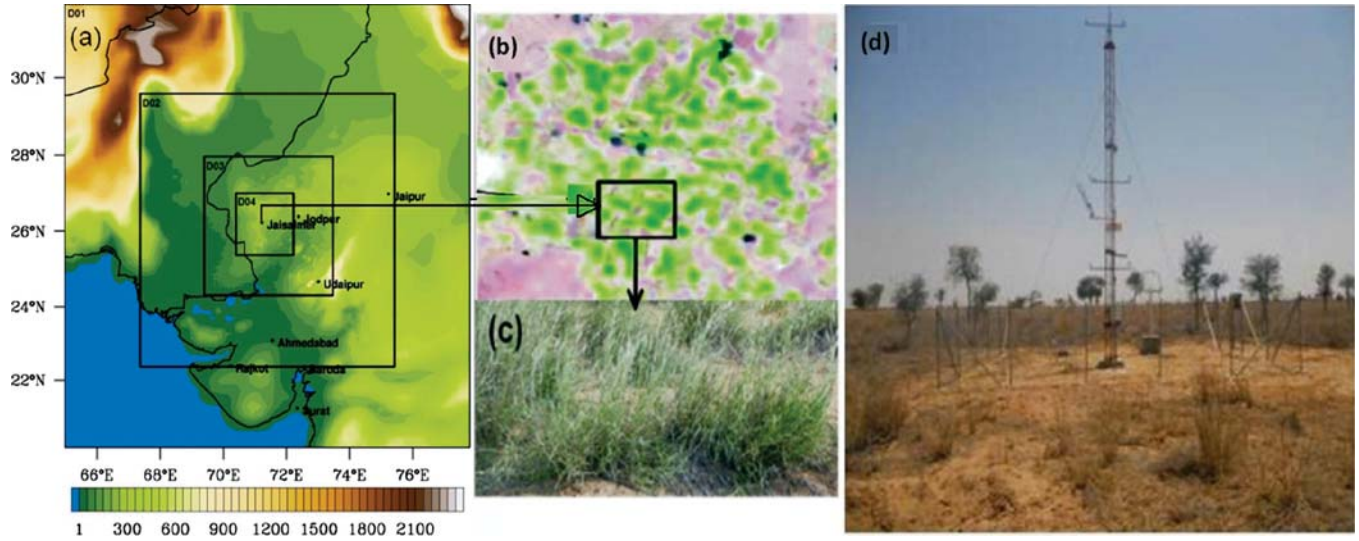


Field photographs in (1a and 1b) represent older aggradation surface (T2) at Shakra with inset in (1a) showing the contact with debris flow deposits. (2) Paleo-flood deposits at Sunni overlying the younger aggradation surface (T1). Seasonal tributary stream (marked with red arrow). (3) (a and b) Bevelled bedrock at Shakra and at Tattapani respectively. (4) Epigenetic gorge at Ogli associated with younger aggradation surface (T1). (5) Undulating surface of *Ghanghar* composed of multiple debris flows (marked as (B)), with landslide deposits on the surface (marked as (A)). The distal end of the *Ghanghar* is modified into three levels of terraces (marked i, ii and iii). (6) Red dotted line marks the alluvial fan incised by Satluj River which appear as triangular facets opposite Sunni. (7) Fining upward sedimentary units of alluvial fan at Shakra.

older aggradation event dated between ~ 13 and 11 ka (early-Holocene), occurred in the pre-existing topography carved by multiple events of erosion and incision. Climatically, the event corresponds to the post-glacial strengthened Indian Summer Monsoon (ISM). The younger aggradation event dated between ~ 5 and 0.4 ka (mid- to late-Holocene), was during the declining phase of ISM. The terrain witnessed high magnitude floods during transitional climate (~ 6.5–7 ka). The fluvial sedimentation was punctuated by short-lived debris flows and alluvial fans during the LGM (weak ISM), early to mid-Holocene transition climate and mid- to late-Holocene declining ISM. Based on the terrace morphology, an event of relatively enhanced surface uplift is inferred after late Holocene. The present study suggests that post-glacial landforms in the middle Satluj valley owe their genesis to the interplay between the climate variability and local/regional tectonic interactions. (*Journal of Earth System Science 125*(*3*), *539-558*)

Land surface processes simulation over Thar Desert in northwest India:

Land surface processes in data scarce arid northwestern India and their influence on the regional climate including monsoon are now gaining enhanced scientific attention. In this work the seasonal variation of land surface parameters and surface-energy flux components over *Lasiurus sindicus* grassland system in Thar Desert, western India were simulated using the mesoscale WRF model. The data on surface fluxes from a micrometeorological station, and basic surface level weather data from the Central Arid Zone Research Institute's experimental field station, Jaisalmer, were used for comparison. Simulations were made for typical fair weather days in three seasons [12–14 January (peak winter); 29–31 May (peak summer), 19–21 August (monsoon)] during 2012. Sensitivity experiments conducted using a 5-layer soil thermal diffusion (5TD) scheme and a comprehensive land surface physics scheme (Noah) revealed the 5TD scheme gives large biases in surface fluxes and other land surface parameters. Simulations show large variations in surface fluxes and meteorological parameters in different seasons with high friction velocities, sensible heat fluxes, deep boundary layers in summer and monsoon season as compared to winter. The shortwave radiation is underestimated during the monsoon season, and is overestimated in winter and summer. In general, the model simulated a cold bias in soil temperature in summer and monsoon season and a warm bias in winter; the simulated surface fluxes and air temperature followed these trends. These biases could be due to a negative bias in net radiation resulting from a high bias in downward shortwave radiation in various seasons. The Noah LSM simulated various parameters more realistically in all seasons than the 5TD soil scheme due to inclusion of explicit vegetation processes in the former. The differences in the simulated fluxes with the two LSMs are small in winter and large in summer. The deep mixed layers are distributed in the northeastern parts in summer, northern areas in southwest monsoon and in southwestern parts during winter seasons and associated with the land-cover and vegetation dynamics. A baseline simulation study in this data scarce arid region is presented here. (*Pure and Applied Geophysics 173*, *2195-2214*)

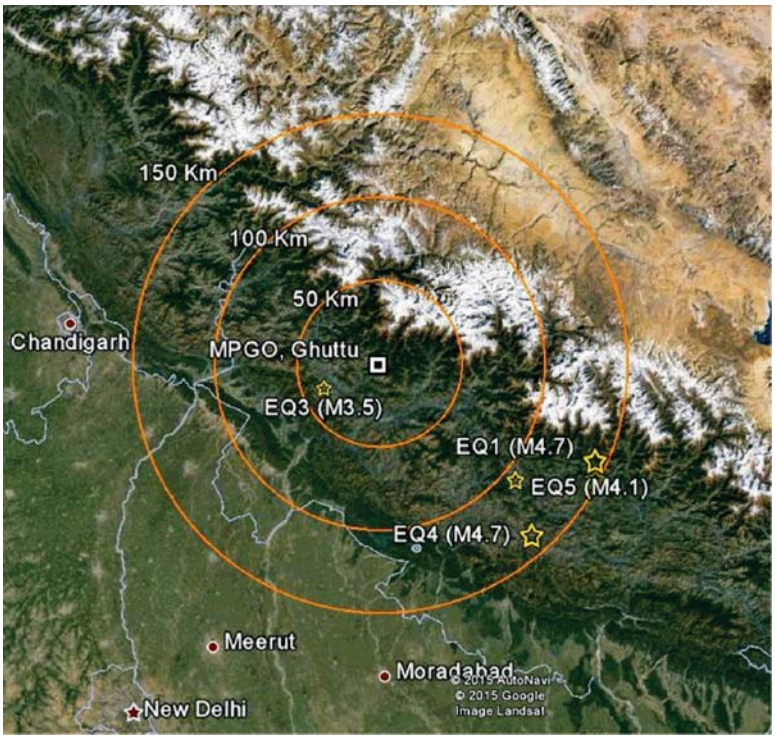


Location map of the study area: a. Modelling domains used in ARW surrounding Jaisalmer, Rajasthan in the arid northwestern India, b. experimental site at Chandan (CAZRI) (true color composite from Landsat-7 (ETM?) on over grassland at peak growth stage), c. field photograph of grass growth pattern, d and box in panel 'c' denotes the location of the micrometeorological station.

Fractal dimension variability in ULF magnetic field with reference to local earthquakes at MPGO, Ghuttu:

Ultra-low Frequency (ULF) geomagnetic data recorded during 1 January, 2010 to 31 December, 2010 at multi-parametric geophysical observatory (30.53°N, 78.74°E) in Garhwal Himalaya region of Uttarakhand, India, are analyzed. From the

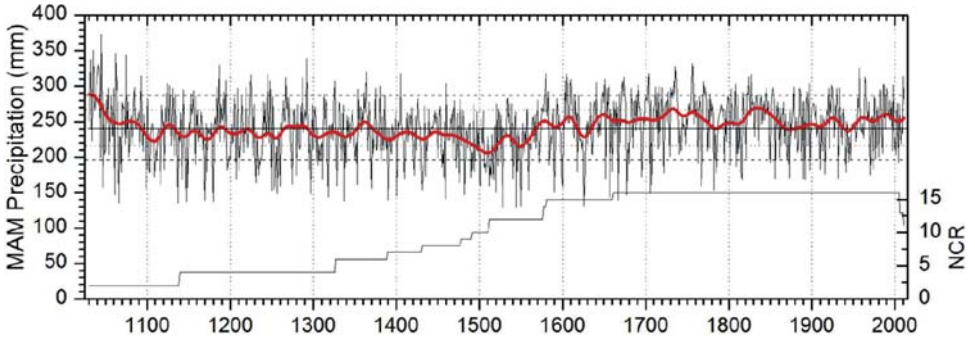
temporal variation of polarization ratio, the presence of seismo-magnetic disturbances superposed upon background geomagnetic variations are inferred. Considering earthquake process as a self-organized critical system based on flicker noise characteristics, fractal dimension for each day is estimated using two methods namely power spectral (FFT) method and Higuchi method. Variability in fractal dimension is studied in the background of local earthquakes ($M \geqslant 3.5$) within a zone of radius 150 km from observing station multi-parametric geophysical observatory (MPGO), Ghuttu. Fractal dimension variability indicates that average fractal dimension for first half of the year is increased as compared to average fractal dimension of second half of the year and there is gradual increase in the fractal dimension before earthquakes. It is also observed that during the first half of the year, there is seismic activity within zone of 150 km radius centered at around MPGO, Ghuttu. There are no earthquakes during the second half of the year. Gradual increase in the fractal dimension before earthquakes, observed elsewhere in the world, is considered precursory signature of seismo-electromagnetic field emissions. **(***Geomatics*, *Natural Hazards and Risk 7* (*6*), *1937-1947*)



Location of MPGO, Ghuttu and epicenters of the earthquakes within a distance of 150 km from MPGO, Ghuttu

Boreal spring precipitation variability in the cold arid western Himalaya during the last millennium, regional linkages, and socio-economic implications:

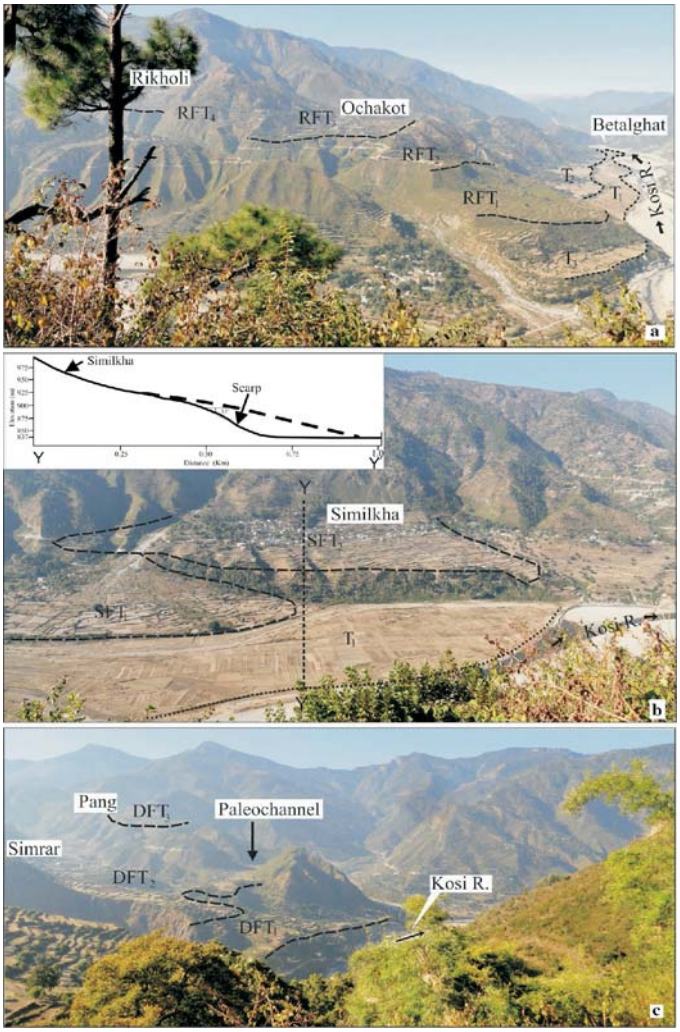
Precipitation in the monsoon shadow zone of the western Himalayan region, largely under the influence of mid-latitude westerlies, is the dominant regional socioeconomic driver. Current knowledge of long-term regional precipitation variability is scarce due to spatially and temporally limited weather and high-resolution proxy climate records. First boreal spring precipitation reconstruction for the western Himalaya covering the last millennium (1030-2011 C.E.) is shown in the present study. The annually resolved reconstruction is based on a large tree-ring data set of Himalayan cedar (*Cedrus deodara*) and neoza pine (*Pinus gerardiana*) from 16 ecologically homogeneous moisture stressed settings in Kinnaur, western Indian Himalaya. The precipitation reconstruction revealed persistent long-term spring droughts from the 12th to early 16th century C.E. and pluvial from the late 16th century C.E. to recent decades. The late 15th and early 16th centuries (1490-1514 C.E.) displayed the driest episode, with precipitation being ~15% lower than the long-term mean. The early 19th century (1820-1844 C.E.) was the wettest period of the past millennium, with mean precipitation ~13% above the long-term mean. The reconstructed boreal spring precipitation from the western Himalaya revealed large-scale consistency with hydrological records from westerly dominated regions in Central Asia, indicating synoptic-scale changes in atmospheric circulation during the major part of the Medieval and Little Ice Age periods. Protracted droughts in Central Asia could have caused severe contraction of the regional economy, as indicated by striking coherence of reconstructed drought periods and historic social upheavals and invasions of India from Central and Western Asian invaders. Vulnerability to climatic extremes underpins the need to develop a better understanding of the temporal and spatial variability in regional hydroclimate in order to devise viable water resource management plans. (*Quaternary Science Reviews 144*, *28-43*)



Boreal spring (March-April-May) precipitation reconstruction from cold and arid regions in the western Himalaya (1030-2011 C.E.). Thick line is a low pass filter showing fluctuations on timescales of 40 years and above. The dotted and dashed upper and lower lines are the 10% and 20% above and below the long-term mean precipitation. The number of ring-width chronologies used over time in the nested reconstruction is shown at the bottom of the figure (NCR).

Quaternary extensional and compressional tectonics revealed from Quaternary landforms along Kosi River valley, outer Kumaun Lesser Himalaya, Uttarakhand:

A portion of the Kosi River in the outer Kumaun Lesser Himalaya is characterized by wide river course situated south of the Ramgarh Thrust, where huge thickness (~200 m) of the landslide deposits and two to three levels of unpaired fan terraces are present. Brittle normal faults, suggesting extensional tectonics, are recognized in the Quaternary deposits and bedrocks as



a. Very wide Kosi River valley between Betalghat and Ochakot characterized by huge thickness of Quaternary deposits (fans and terraces). b. At Simalkha, two levels of fans and one level of terrace are observed (*inset* cross section *y–y′*—showing the erosional scarp). c. At Pang–Simrar area, three well-developed fans are observed.

further supported by surface morphology. Trending E–W, these faults measure from 3 to 5 km in length and are traced as discontinuous linear minihorst and fault scarps exposed due to cutting across by streams. Active normal faults have displaced the coarsely laminated debris fan deposits at two sites located 550 m apart. At one of the sites, the faults look like bookshelf faulting with the maximum displacement of ~2 m and rotation of the Quaternary boulders along the fault plane is observed. At another site, the maximum displacement measures about 0.60 cm. Thick mud units deposited due to blocking of the streams by landslides are observed within and above the fan deposit. Landslide debris fans and terrace landforms are widely developed; the highest level of fan is observed ~1240 m above mean sea level. At some places, the reworking of the debris fans by streams is characterized by thick laminated sand body. Along the South Almora Thrust and Ramgarh Thrust zones, the valleys are narrow and V-shaped where Quaternary deposits are sparse due to relatively rapid uplift across these thrusts. Along the South Almora Thrust zone, three to four levels of fluvial terraces are observed and have been incised by river exposing the bedrocks due to recent movement along the RT and SAT. Abandoned channel, tilted mud deposits, incised meandering, deep-cut V-shaped valleys and strath terraces indicate rapid uplift of the area. Thick mud sequences in the Quaternary columns indicate damming of streams. A ~10-km long north–south trending transverse Garampani Fault has offset the Ramgarh Thrust producing tectonic landforms. (*International Journal of Earth Sciences* (*Geol Rundsch*) *105*, *965–981*)

RESEARCH PUBLICATIONS

In SCI Journals

Gupta, V., Bhasin, R., Kaynia, A.M., Kumar, V., Saini, A.S., Tandon, R.S. and Thomas, P. 2016. Finite Element Analysis of failed slope by Shear Strength Reduction technique: a case study for Surabhi Resort Landslide, Mussoorie township, Garhwal Himalaya. Geomatics, Natural Hazards and Risk 7(5), 1677-1690.

Khogenkumar, S., Singh, A.K., Bikramaditya, R.K., Khanna, P.P., Singh, N.I. and Singh, W.I. 2016. Coexistence of MORB and OIB-type mafic volcanics in the Manipur Ophiolite Complex, Indo-Myanmar Orogenic Belt, northeast India: Implication for heterogeneous mantle source at the spreading zone. Journal of Asian Earth Sciences 116, 42-58.

Luirei, K., Bhakuni, S.S., Kothyari, G.Ch., Tripathi, K. and Pant, P.D. 2016. Quaternary extensional and compressional tectonics revealed from Quaternary landforms along Kosi River valley, outer Kumaun Lesser Himalaya, Uttarakhand. International Journal of Earth Sciences 105, 965-981.

Raja, P., Srinivas, C.V., Hari Prasad, K.B.R.R. and Singh, N. 2016. Land Surface Processes Simulation over Thar Desert in Northwest India. Pure and Applied Geophysics 173, 2195-2214.

Rawat, G., Chauhan, V. and Dhamodharan, S. 2016. Fractal dimension variability in ULF magnetic field with reference to local earthquakes at MPGO, Ghuttu. Geomatics, Natural Hazards and Risk 7(6), 1937-1947.

Sharma, S., Bartarya, S.K., Marh, B.S. 2016. Post-glacial landform evolution in the middle Satluj River valley, India: Implications towards understanding the climate tectonic interactions. 125(3), 539-558.

Sharma, S., Chand, P., Bisht, P., Shukla, A.D., Bartarya, S.K., Sundriyal, Y.P. and Juyal, N. 2016. Factors responsible for driving the glaciation in the Sarchu Plain, eastern Zanskar Himalaya, during the late Quaternary. Journal of Quaternary Science 31(5), 495-511.

Yadava, A.K., Braeuning, A., Singh, J. and Yadav, R.R. 2016. Boreal spring precipitation variability in the cold arid western Himalaya during the last millennium, regional linkages, and socio-economic implications. Quaternary Science Reviews 144, 28-43.

PARTICIPATION IN CONFERENCES/SEMINARS/WORKSHOPS/MEETINGS

Workshops

- Sh. Arun Prathap Participated in the 31st Himalaya-Karakorum-Tibet (HKT) Workshop held in Aussios, France during May 9-12, 2016 and presented a paper entitled:
  - Repeating earthquake sequence identified in Garhwal Himalaya region of Northwest Himalaya, India: Implication of the influence of flexure bend in the Indian lithosphere

Seminars/Symposia

- Dr Reet Kamal Tiwari participated in 10th SPIE Asia-Pacific Remote Sensing Symposium organised by SPIE during 4 - 7 April 2016 at New Delhi and presented papers entitled:
  - Comparison of FLAASH and QUAC atmospheric correction methods for Resourcesat-2 LISS-IV data. (Authors: Saini, V., Tiwari, R.K. and Gupta, R.P.)
  - Comparisons of different methods for debris covered glacier classification. (Authors: Tiwari, R.K., Garg, P.K., Saini, V. and Shukla, A.)
  - Geomorphic and morphometric analysis of surface ice velocity variation of different valley type glaciers. (Authors: Tiwari, R.K., Garg, P.K., Shukla, A., Ahluwalia, R.S., Singh, N., and Chauhan, P.A.)

Meetings

- Drs Vikram Gupta and D.P. Dobhal attended meeting with Additional Secretary, Disaster Management, GoUA regarding Flood Protection work in the Mandakini township during May 03, May 11 and June 01, 2016.

WORKSHOPS/SEMINARS/SYMPOSIA HELD IN THE INSTITUTE

National Geo-Scholar's Meet-2016 (NGEOSM-2016):

A four days National Geo-Research Scholars Meet was organised by the Institute in its premises from June1-4, 2016. The meet has been designed keeping in view the needs of the young researchers from diverse fields of geosciences to facilitate interaction and to explore new ideas for promotion of geoscience research in the country. Out of 300 scientific abstracts featuring quality research on the mighty Himalaya, earthquakes and natural hazards, environment and climate, etc., were received from research scholars working in IITs, universities, PG departments of colleges, and Research Institutes spread across the country, only the best 188 were selected for presentation. The meet featured 09 technical sessions including 12 keynote addresses, 91 oral presentations and 97 posters. Following papers were presented by the research scholars and research associates working in the WIHG.

Oral presentations in the Meet:

- 'Spatio-Temporal Variability of Air Temperature in the Dokriani Glacier Catchment, Central Himalaya' (Jairam Singh Yadav)
- 'Process based facies analysis and geochemical investigation of shale intervals from late Paleo-Mesoproterozoic Vindhyan basin: implications towards depositional motif, paleoweathering, provenance and ocean redox state' (Arvind K. Singh)

- 'Metamorphic evolution of silica deficient Mg-Al granulites from Jagtiyal section, Eastern Dharwar craton, India: constraints from thermobarometry, quantitative phase equilibria modeling' (Praveen Chandra Singh)
- 'Forearc magmatism near the eastern flank of the Indian plate: Evidence from geochemistry of mafic intrusive rocks of the central part of Nagaland-Manipur Ophiolite, Northeast India' (S. Khogenkumar)
- 'A preliminary one dimensional crustal Velocity model for Himachal Pradesh, India' (Mahesh Prasad Parija)
- 'Hazard Evaluation of Progressive Pawari Landslide Zone, Kinnaur, Satluj Valley, Higher Himalaya, India' (Vipin Kumar)
- 'Dynamic Response, Mass Balance and the State of Dokriani Glacier, Garhwal Himalaya from 1992-2015' (Bhanu Pratap)
- 'Debris cover variations and dimensional changes in the glaciers of Western Himalaya using geospatial techniques' (Purushottam Kumar Garg)

Poster presentations in the Meet:

- 'Speleothem: proxy for Indian summer monsoon variability' (Sonu Jaglan)
- 'Sedimentary Diatoms based Tropic status of Renuka Lake, Himachal Pradesh, India' (Pranaya Diwate)
- 'Variability of Indian Summer Monsoon (ISM) during 313-260 ka: Implication of stalagmite oxygen isotope ($\delta^{18}O$)' (Jooly Jaiswal)
- 'Morphometric analysis of ravinous area of Marginal Ganga Plain and its implication with peripheral bulge tectonics' (Rupa Ghosh)
- 'Surface ablation modeling (2011-2015) over the debris-covered ablation zone and sensitivity of Chorabari Glacier, central Himalaya, India' (Kapil Kesarwani)
- 'Analysis of river profiles across frontal fold-thrust belt in the Dikrong river valley, Arunachal Himalaya, northeast India: Implication for fold propagation' (Rajeeb Lochan Mishra)
- 'Reckoning long-term deformation rate between the Saralbhanga and Kameng river' (Arjun Pandey)
- 'Recent deformation activity along the Main Boundary Thrust in the western flank of eastern Himalayan Syntaxis, Arunachal Himalaya, India' (Ishwar Singh)
- 'Shortening rate across the Surin Mastgarh anticline, Chenab re-entrant, NW Himalaya' (Arvind Anilkumar)
- 'Geochemistry of Shyok sediments: Implication to weathering and erosion' (Nikita Parmar)
- 'Crustal structure beneath the Satluj valley, North West Himalaya from receiver function analysis' (Monika Wadhawan)
- 'Moment Tensor Inversion of ML4.9, Chamoli Earthquake of 20th June, 2011 and it's aftershocks in Garhwal Himalaya' (Arun Prasath R.)
- 'SWS measurements and source characteristics of local earthquakes in Garhwal region, Northwest Himalaya' (Rakesh Singh)
- 'Crustal anisotropy in the trans-Himalaya (Eastern Ladakh): constraints from splitting analysis of P-to-S converted phase at Moho discontinuity' (Arpita Paul)
- 'Geomagnetic Field Variation Associated with Seismic Activity in Garhwal Himalaya, India' (Dhamodharan S.)
- 'Seasonal groundwater variability in few selected sectors of North Eastern Region of India using GRACE' (Swakangkha Ghosh)
- 'Hydrochemistry Of Waters In The Peidmont Zone Of Udham Singh Nagar, Uttarakhand, India' (Divya Thakur)
- 'Retrieval of glacier facies area of Gangotri glacier at sub-pixel level using AWiFS data' (Bisma Yousuf)
- 'Lineament vis-à-vis spatial distribution of landslides between Uttarakshi and Gangnani in the Bhagirathi valley, NW Himalaya' (Meenakshi Devi)
- 'Geochemical investigation of sediment evacuation pattern in glacerized and non glacerized catchment of Himalaya' (Tanuj Shukla)
- 'Grain size characteristics of suspended sediments evacuated from debris-covered Chorabari glacier, Mandakini basin, central Himalaya, India' (Anupam Anand Gokhale)
- 'Evolution of hydro-geochemical processes and solute sources study of Dokriani *(Bamak)* glacier meltwater, Garhwal Himalaya, India' (Sipika Sundriyal)

FIELD VISITS

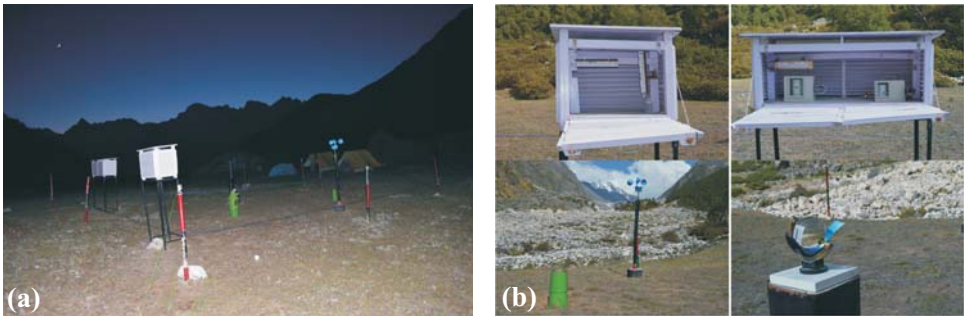
- Dr Dr R.K. Bikramaditya Singh carried out geological field work in Dibang and Lohit sections of Eastern Arunachal Himalaya, from March 27 to April 21, 2016 under the DST sponsored Fast track project. Representative rock samples were collected for further detail investigations in the laboratory.

Outcrop of the Lesser Himalayan Crystallines, Eastern Arunachal Himalaya.

- Drs Vikram Gupta and D.P. Dobhal visited Kedarnath as Members of the Technical Task Force constituted by the Govt. of Uttarakhand to look after the Flood protection work in and around Kedarnath township during April 22-23, 2016.
- Sh Ishwar, Sh Aravind and Ms Shraddha carried out a detailed geological investigation of Jammu, Riasi, Akhnoor, Udhampur, Kadhua, Bilawar and Pathankot region of J&K. They collected structural data, Quaternary samples for OSL dating to understand the kinematics of Surin- Mastgarh Anticline for seismic hazard study.
- Dr Devajit Hazarika, Dr Naresh Kumar and Ms Arpita Paul, established 10 broadband seismological stations along Kali River, Kumaon Himalaya during May 18-31, 2016.
- Dr Akshaya Verma, and Sh Anupam Anand Gokhale, visited Dokriani Glacier, Uttarkashi District, for retrieving of data from three automatic weather stations, stake networking for mass balance and repair of hydrological observatory/ discharge site. A snow pit (81cm depth) was made near the accumulation zone of the glacier for snow density measurements. Samples of snow and ice were collected for isotopic and geochemical analysis. Sediment and debris samples were collected for particle size and shape analysis along with XRF and XRD analysis in order to characterize the sediment generated from Dokriani Glacier.

Snow pit near the accumulation zone of Dokriani Glacier.

- Dr Sameer Tiwari, and Sh Purshottam Garg visited Gangotri Glacier, from June 19- 24, 2016, to collect samples of snow, ice and melt-water stream for stable isotope and geochemical analysis.
- Dr Amit Kumar and Sh D.D. Khandelwal visited Dunagiri and Bangini glaciers, Chamoli District from June 1-15, 2016. They established meteorological and hydrological observatories near the snout of Dunagiri Glacier in order to carry out observations for the ablation season (June to September, 2016). Apart from this, a manual staff gauge and an Automatic water level recorder were also installed on the melt-water streams. Samples of seasonal snow, surface ice and precipitation were collected for isotopic studies. Samples were also collected for suspended sediment transfer studies.



(a) Glacier Base Camp and Meteorological Observatory at Dunagiri- Bangni Glacier. (b) Dry Bulb and wet Bulb Thermometers; minimum and maximum Thermometers, Thermograph and Hygrograph; Ordinary Rain Gauge and Anemometer and Sun Shine Recorder.

- Dr Indira Karakoti, Sh Jairam Singh Yadav, Sh Anshuman Misra, and Sh Akhilesh Chandra Gairola, carried out field work on Dokriani Glacier, Central Himalaya during June 21–29, 2016. The team performed Ground Penetrating Radar (GPR) survey over the glacier surface, stake networking over the glacier for mass balance studies and for retrieved data from the Aethalometer for black carbon studies.

(a) Ground penetrating radar (GPR) survey to measure ice thickness and determine the internal structure of Dokriani Glacier. (b) Data retrieval from Aethalometer installed at Dokriani Glacier for Black carbon measurements

- Dr Nilendu Singh, Dr Pankaj Chauhan and Sh Mohit Singhal (CFG) installed a state-of-the-art micrometeorological station at the Pindari glacier, Kumaun Himalaya during June 6-18, 2016. This station would help to understand the detailed physical processes regulating the melting behavior of India's fastest receding glacier. It would help in understanding the energy and water balance of the Pindari glacier valley.

State-of-the-art micrometeorological station at Pindari glacier

FOREIGN VISIT

- Sh Arun Prathap visited Aussios, France to participate in the 31st Himalaya-Karakorum-Tibet (HKT) Workshop during May 6-12, 2016.

INVITED/INTERACTIVE LECTURE

- Dr Vikram Gupta delivered an Invited lecture in the National Geotechnical Facility on the topic "Landslide problems in the northwestern Himalaya" during Kick off meeting of the Indo-Norwegian Project on Hazard Assessment in the Garhwal Himalaya on April 28, 2016.

Ph.D. DEGREE AWARDED

- Smita Gupta has been awarded a Ph.D. degree by the HNB Garhwal University, Srinagar on her thesis entitled "Paleontological and geochemical study of Subathu succession of NW sub-Himalaya with reference to PETM and India-Asia collision". She completed the research work under the supervision of Dr Kishor Kumar (WIHG) and Dr R.S. Rana (HNBGU).

NEW APPOINTMENTS

- Sh Atul Kumar joined as JRF (DST-INSPIRE Scheme) under Dr R. Jayangondaperumal.
- Sh Govinda Chaurasia joined as Institute JRF under Dr Vikas and Sh Amber Solanki joined as Institute JRF under Drs Vikram Gupta and S.S. Bhakuni.

CELEBRATIONS

Technology Day:

Technology Day was observed in the Institute on 14th June, 2016. Professor J. N. Goswami of Physical Research Laboratory, Ahmedabad delivered a talk entitled "From a fishing village to the Red Planet" on this occasion.

Foundation Day:

The 48th Foundation Day of the Institute was celebrated on 29th June in the Institute. The special guest of the function was Prof M.P. Singh of Lucknow University and Prof Anil K Gupta, Director chaired the function. On this occasion "Prof R.C. Misra Gold medal in Geosciences" was awarded to Dr Seema Singh of Panjab University, Chandigarh and the Best paper award of the Institute was given to Dr Suman Lata Rawat.

Editorial Team

Dr (Mrs) Meera Tiwari, Dr Sushil Kumar, Dr Vikram Gupta, Dr Pradeep Srivastava, Dr S.S. Bhakuni and Dr Barun K. Mukherjee

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