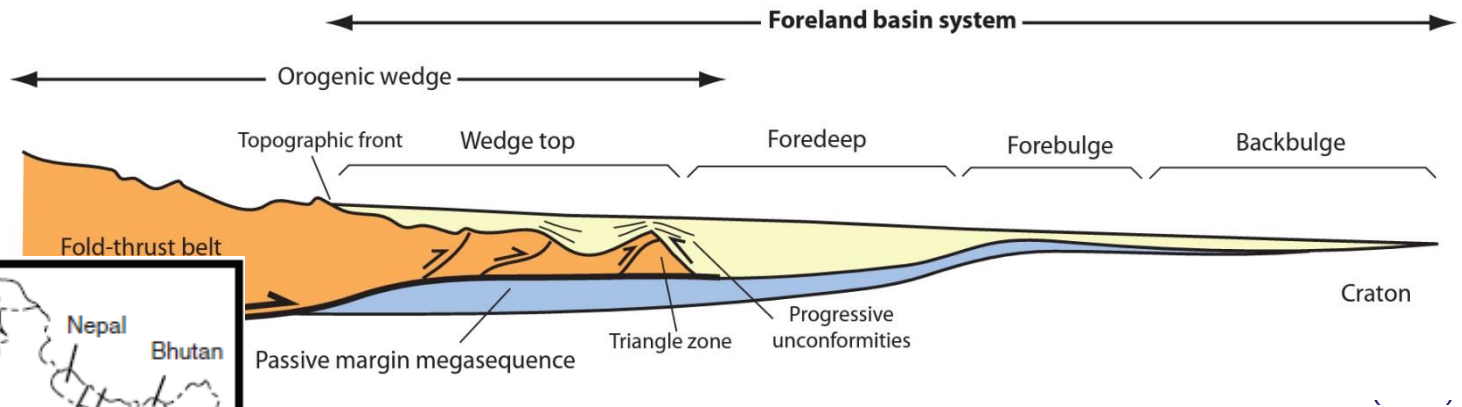
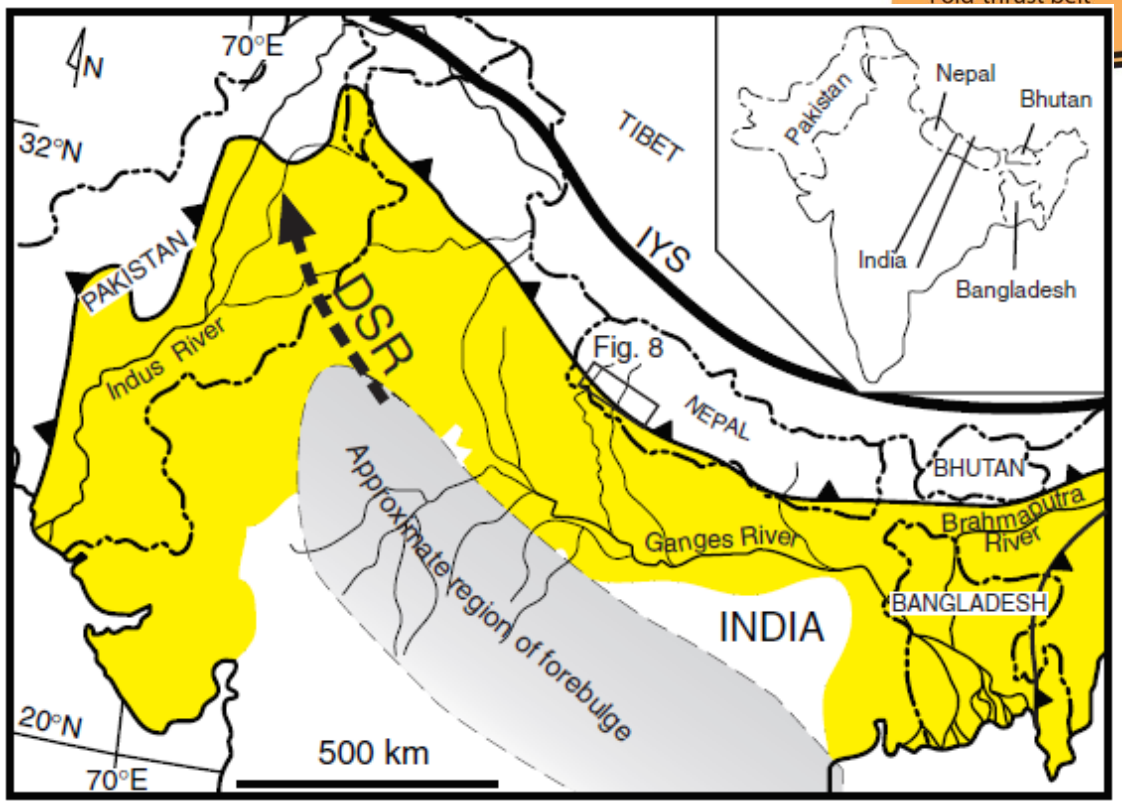
INVESTIGATION OF PERIPHERAL FOREBULGE OF THE HIMALAYA FOR CONTROLS ON LANDSCAPE EVOLUTION

Parv kasana,
Dr. Vimal Singh, Dr. Rahul Devrani
Department of Geology
University of Delhi

AGU FALL MEETING

HIMALAYAS-THE FORMATION OF FOREBULGE AND UPLIFTED CENTRAL INDIAN VINDHYAN PLATEAU

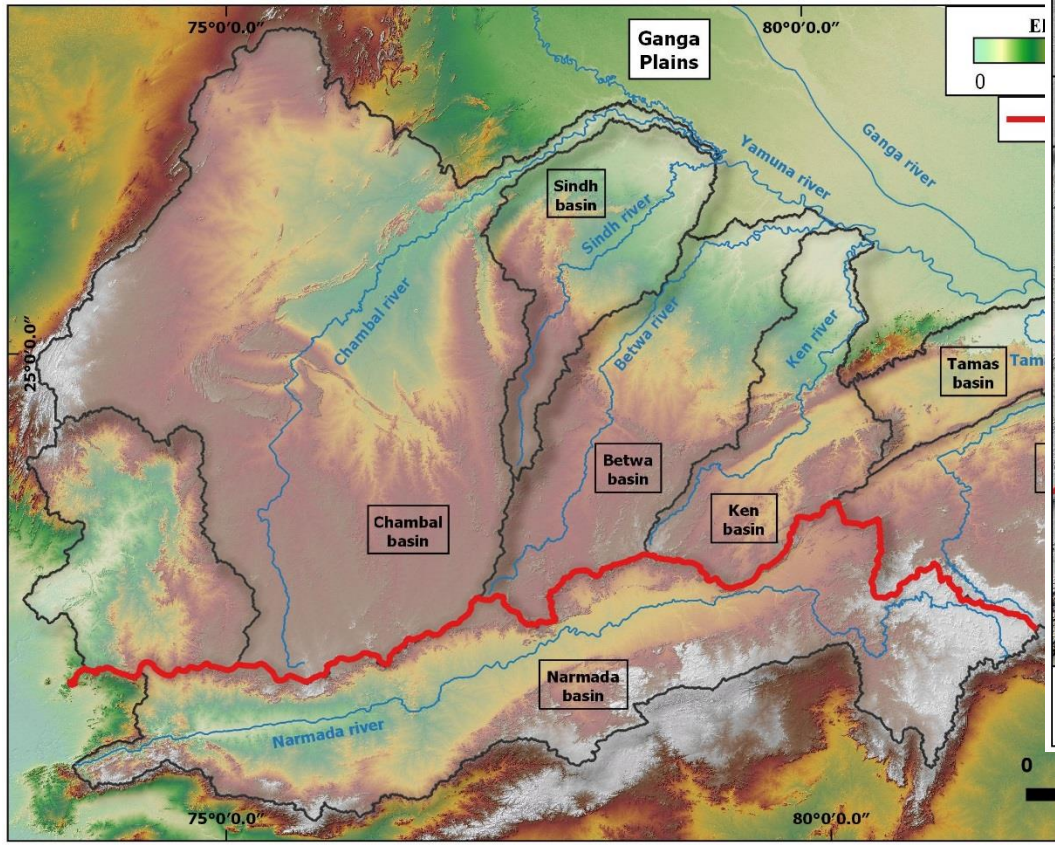


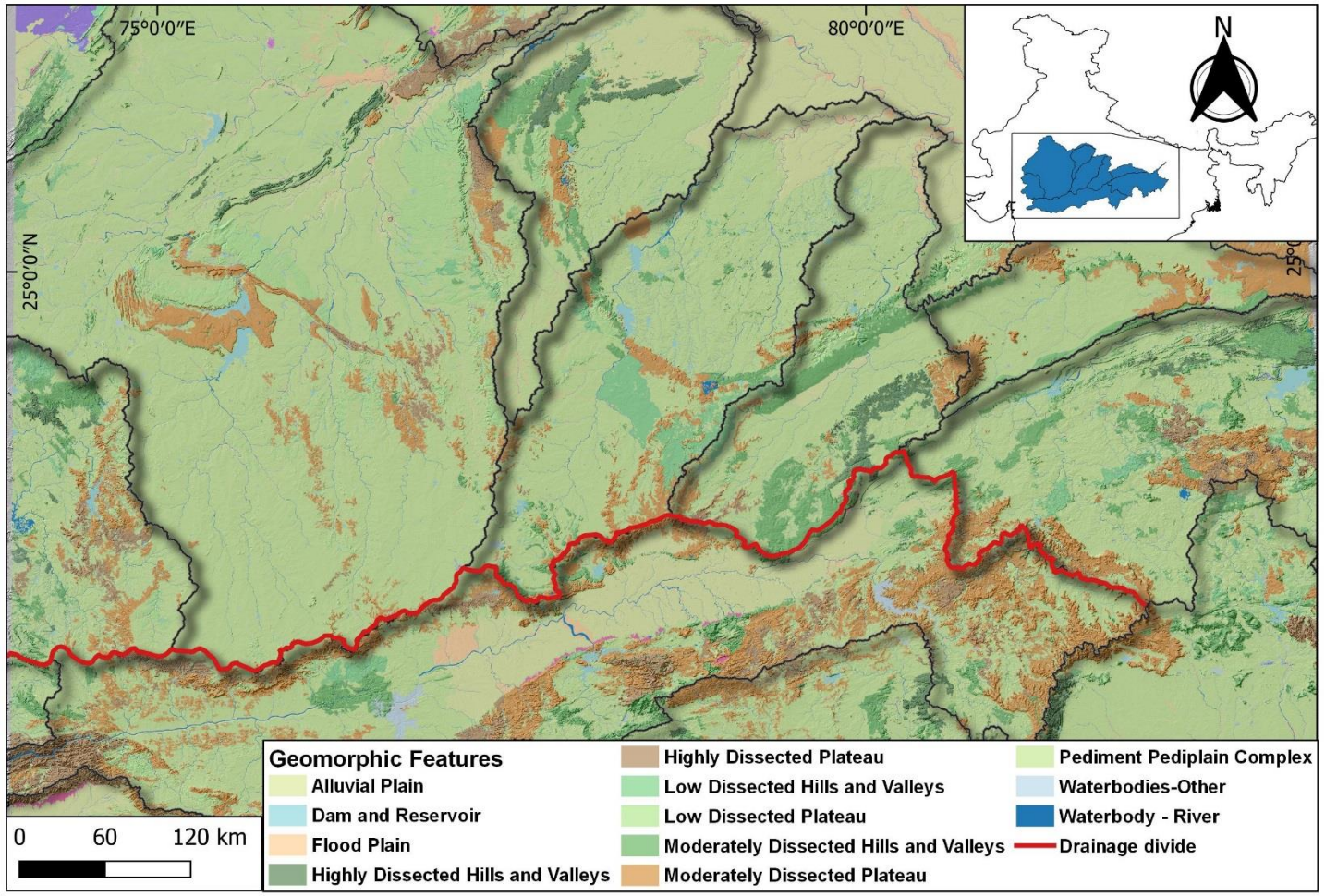


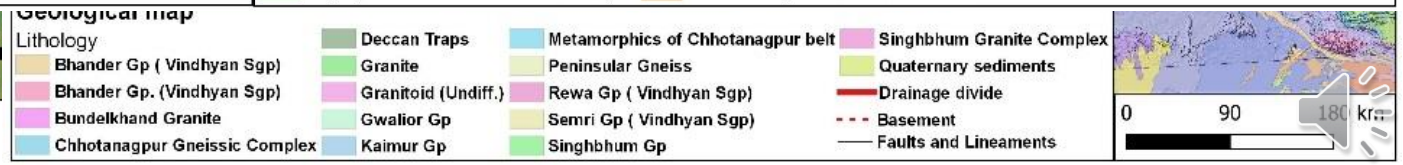
Taken from DeCelles(2012)

AGU FALL MEETING

STUDY AREA: CENTRAL INDIAN VINDHAYAN PL







METHODS: 1. <u>TOPOGRAPHIC ANALYSIS</u>: WE CALCULATED NORMALIZED STEEPNESS INDEX (KSN) FOR THE RIVERS FLOWING ON THIS LANDSCAPE, USING THETA (Θ) = 0.45 & A0 = 1M^2.

- WE USED CHI COORDINATE BASED APPROACH TO CALCULATE KSN, USING SRTM DEM 30M.
- KSN CAN BE USED AS A PROXY TO RELATE THE FLUVIAL ERODIBILITY OF CHANNELS.
- WE USED LSDTOPOTOOLS TO CALCULATE THE KSN AND CHI VALUES

$$S = k_s A^{-\theta}$$

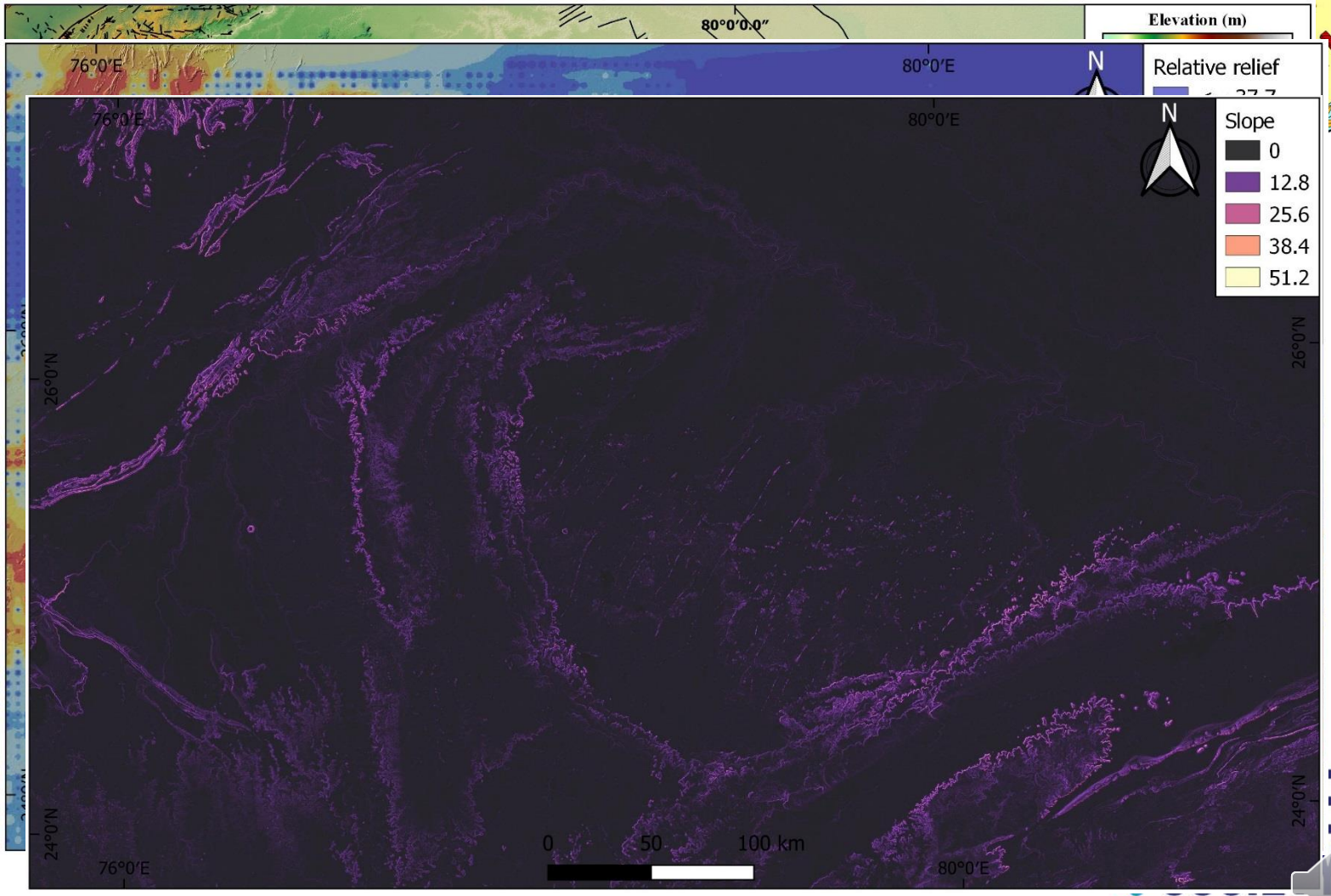
LSD Topo Tools

METHODS: 2. <u>FIELD ANALYSIS</u>: WE MEASURED INTACT ROCK STRENGTH OF MAJOR ROCK TYPE EVIDENT IN FOREBULGE/ PLATEAU REGION USING A N-TYPE SCHMIDT HAMMER.

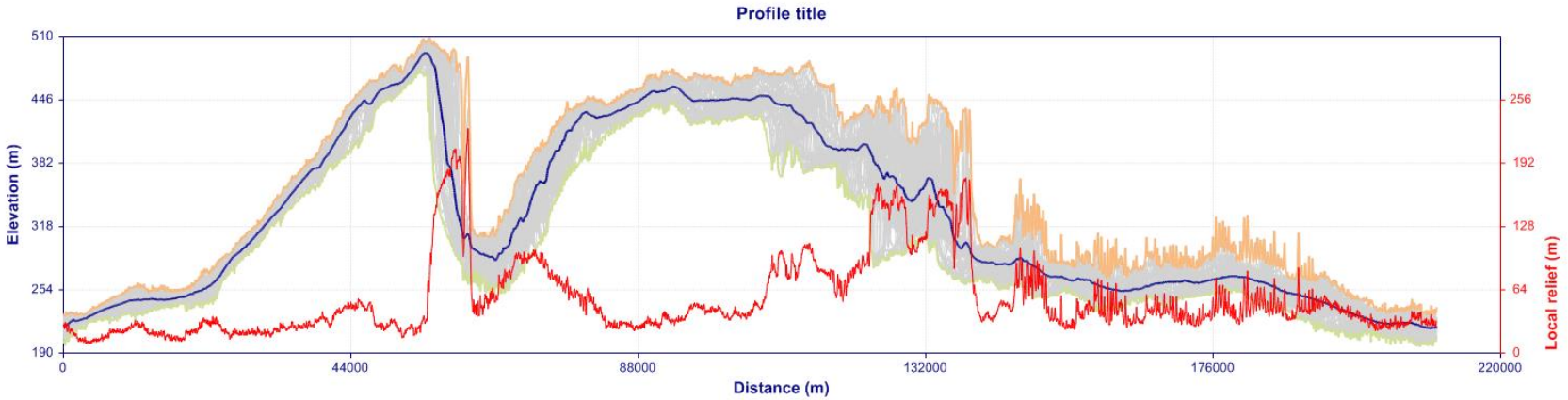
- THE ROCK STRENGTH IS INVERSELY PROPORTIONAL ERODIBILITY, I.E HIGHER THE ROCK STRENGTH LOWER WILL BE THE FLUVIAL ERODBILITY

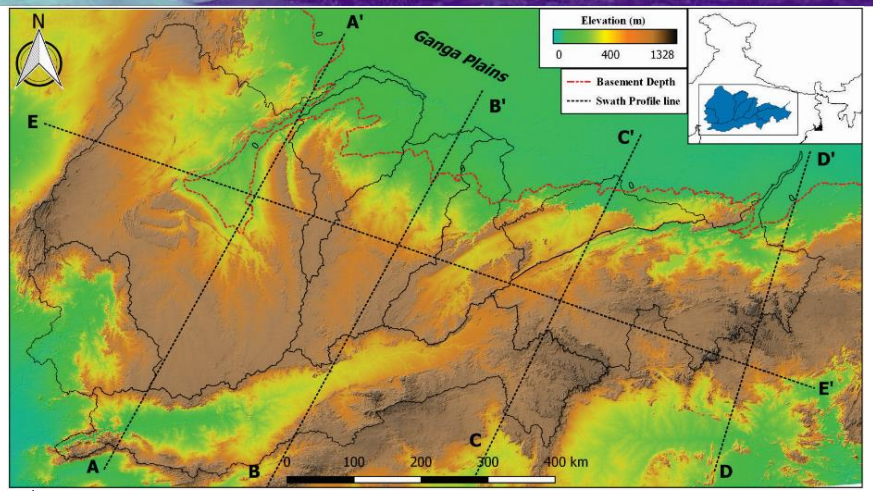
METHODS: 3. GIS ANALYSIS: WE USED LINEAMENT DATA OF CENTRAL INDIA PROVIDED BY GSI TO CONDUCT LINEAMENT ORIENTATION ANALYSIS.

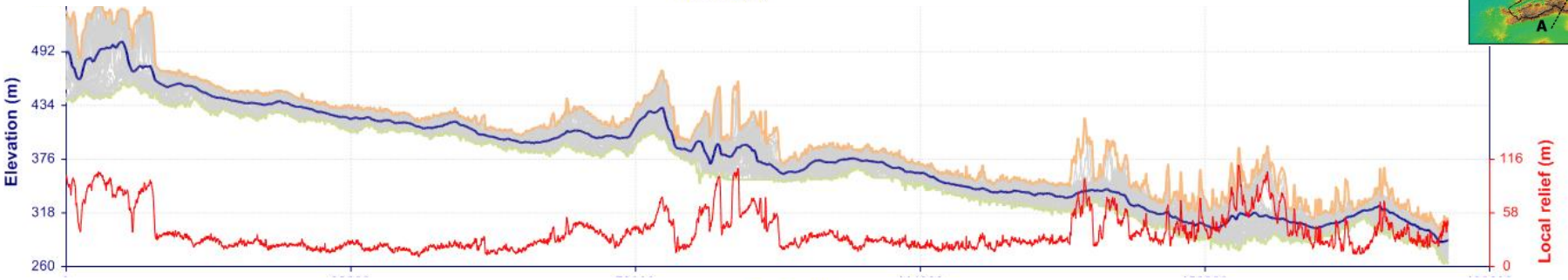
- WE CALCULATED SLOPE AND RELATIVE RELIEF TO IDENTIFY THE ZONES HIGHER SLOPES AND RELIEF VARIATION.
- WE ALSO GENERATED TOPOGRAPHIC SWATH PROFILES TO BETTER UNDERSTAND TOPOGRAPHIC VARIATION IN THIS REGION

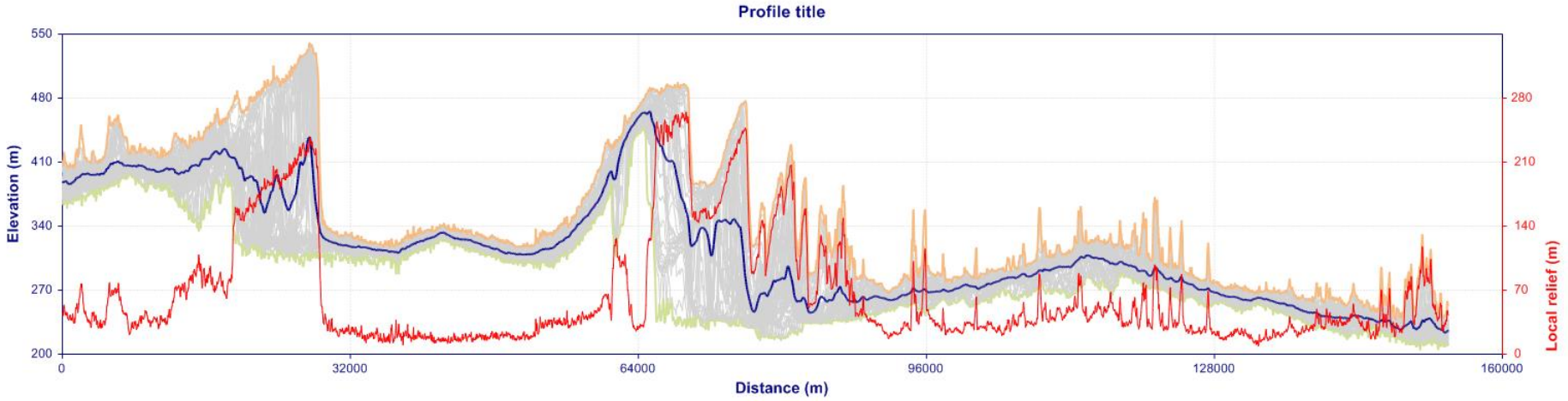


AGU FALL MEETING



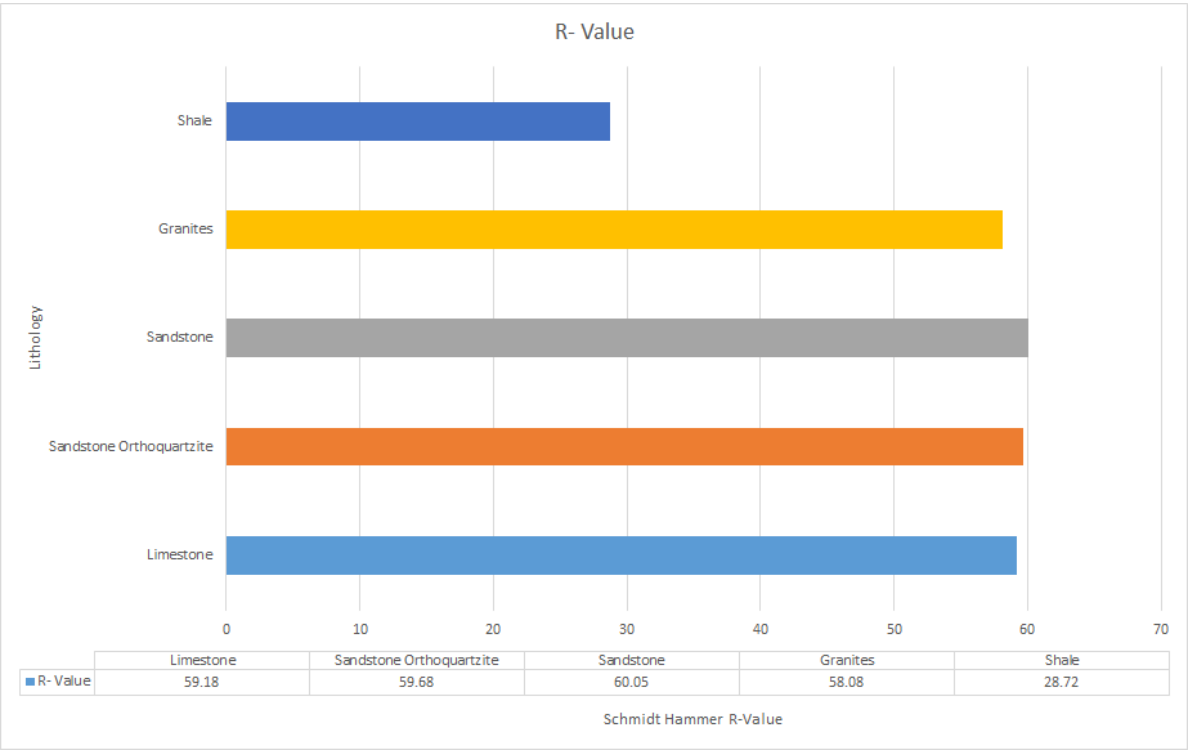


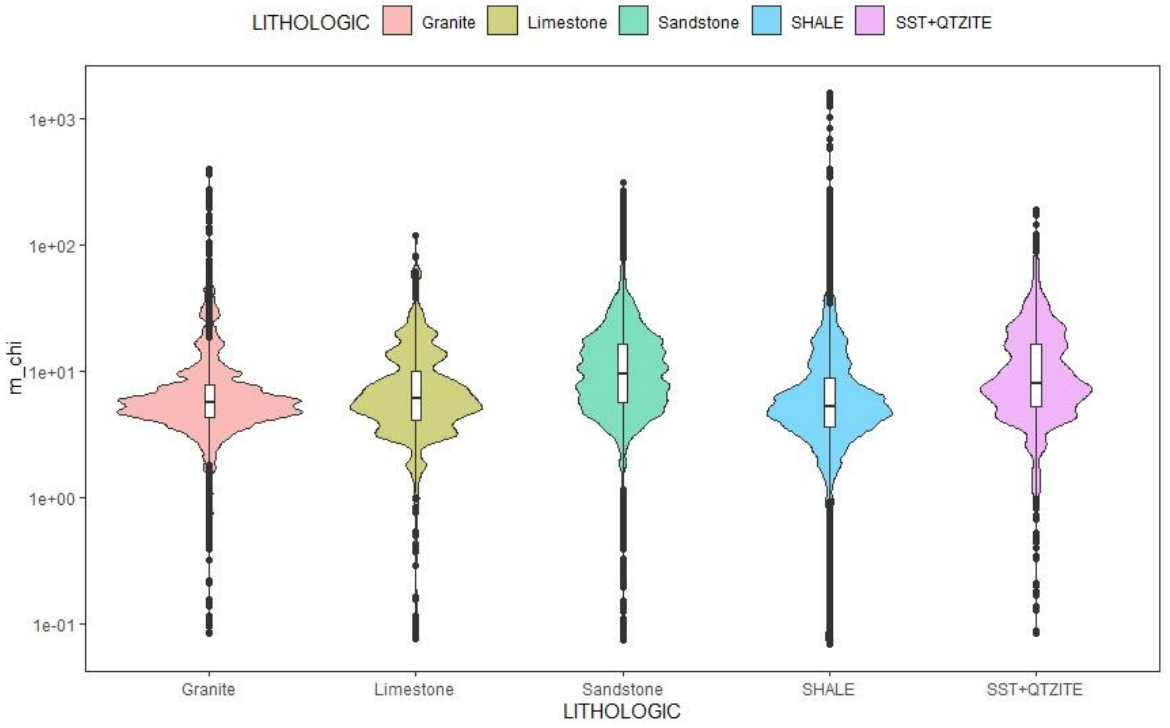




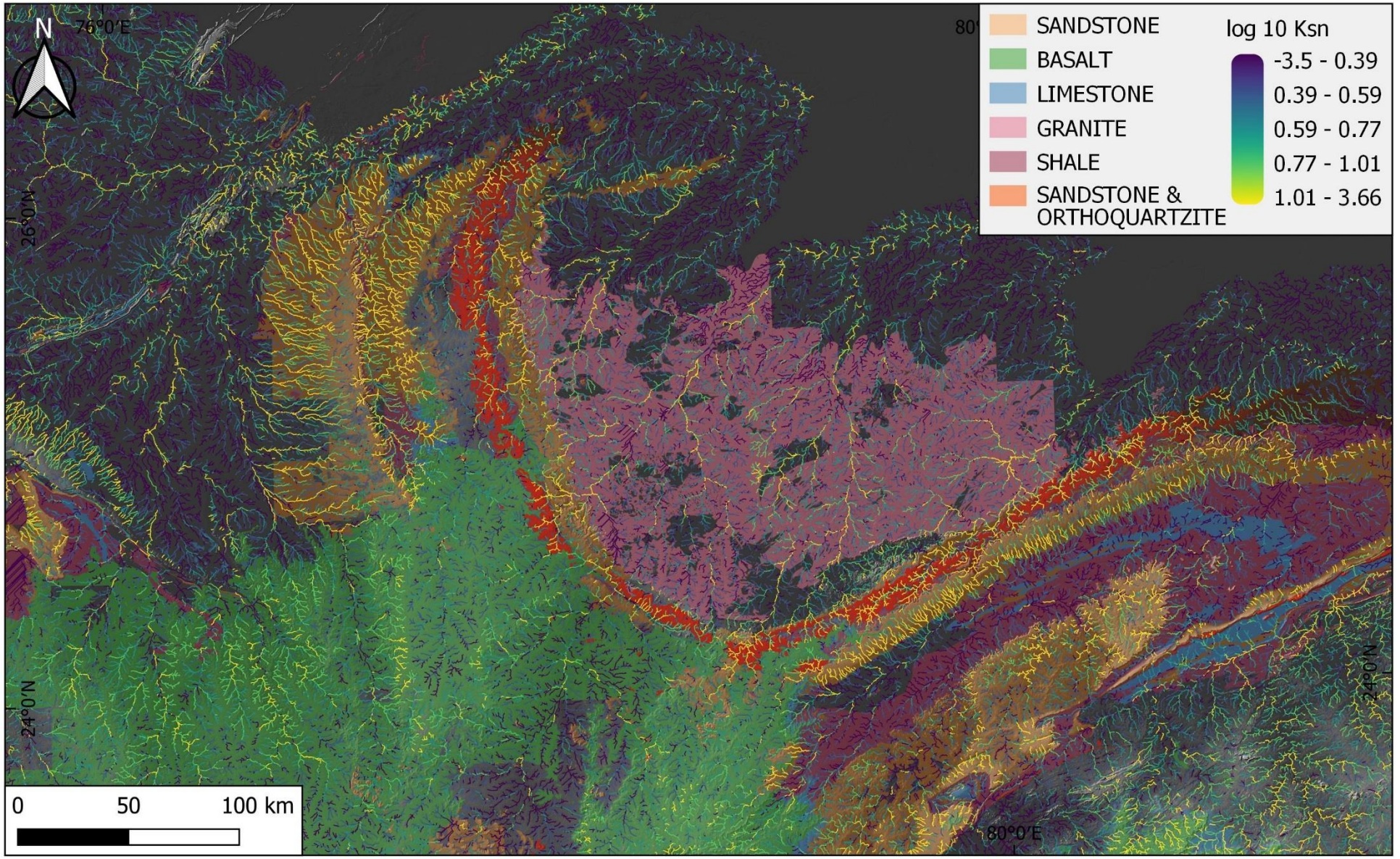
SCIENCE is SOCIETY

RESULT: ROCK STRENGTH DATA AND NORMALIZED STEEPNESS INDEX (KSN) DATA SUGGEST THAT LITHOLOGY PLAYS A MAJOR ROLE IN GUIDING EROSIONAL PATTERN ON CENTRAL INDIAN FOREBULGE REGION

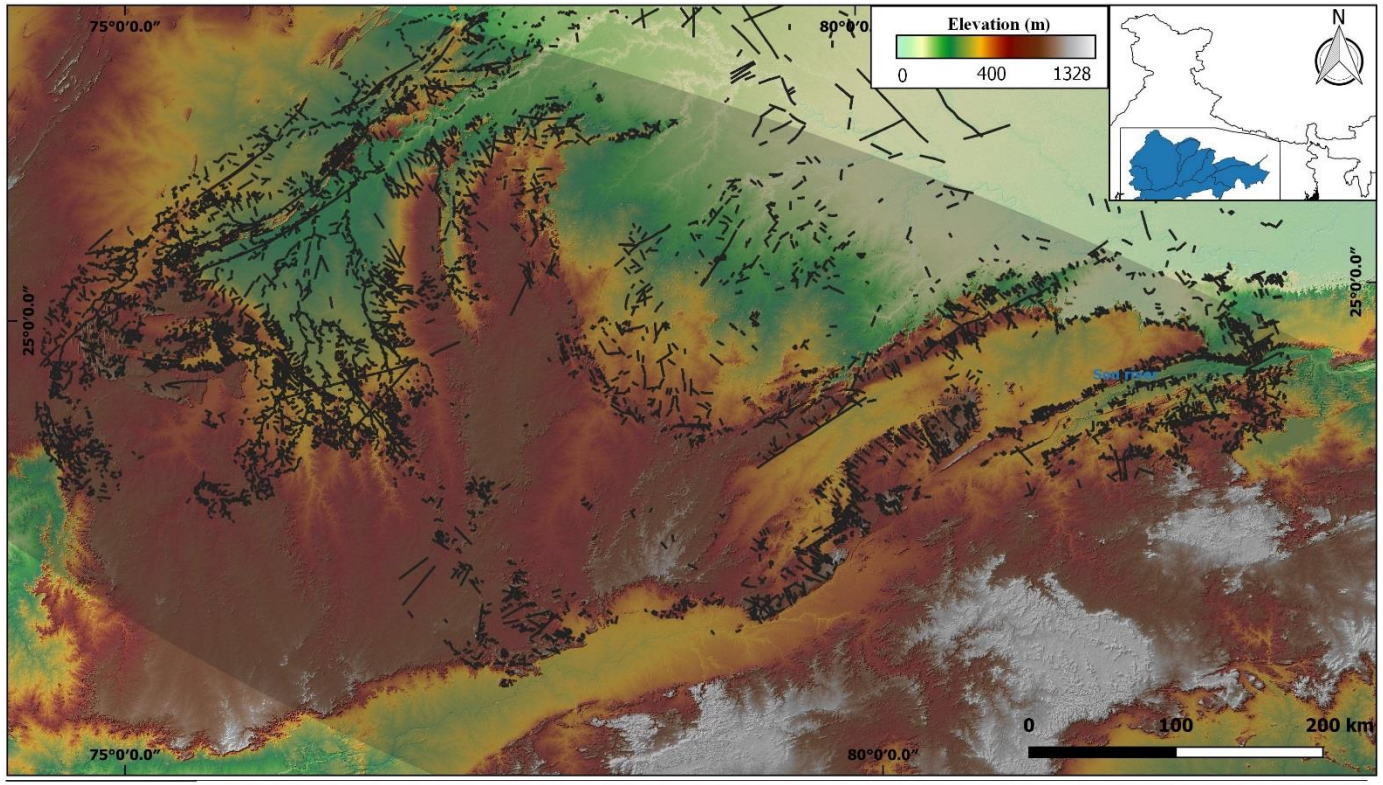


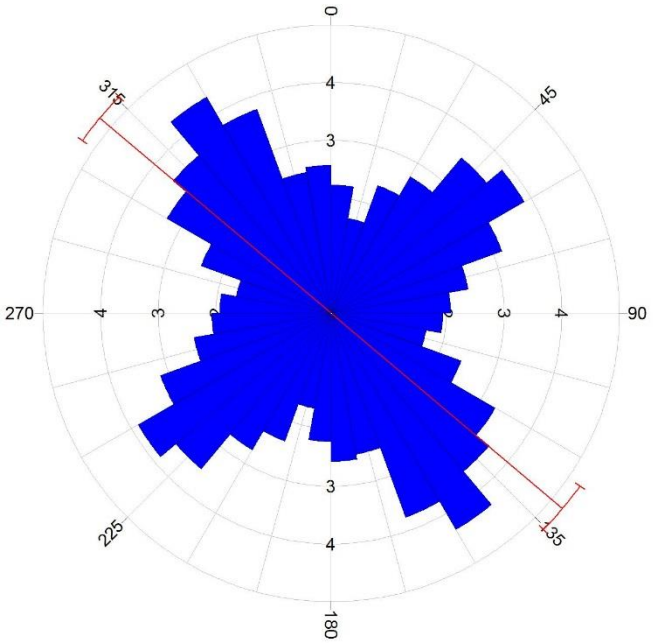


SCIENCE is SOCIETY



RESULT: LINEAMENT ORIENTATION ANALYSIS HIGHLIGHTS THAT MAJOR LINEAMENTS ARE ALIGNED ALONG NW-SE, WHICH IS APPROXIMATELY PARALLEL TO HIMALAYAN MOUNTAIN BELT. THE KNICKPOINTS ARE ALIGNED ALONG THESE LINEAMENTS.

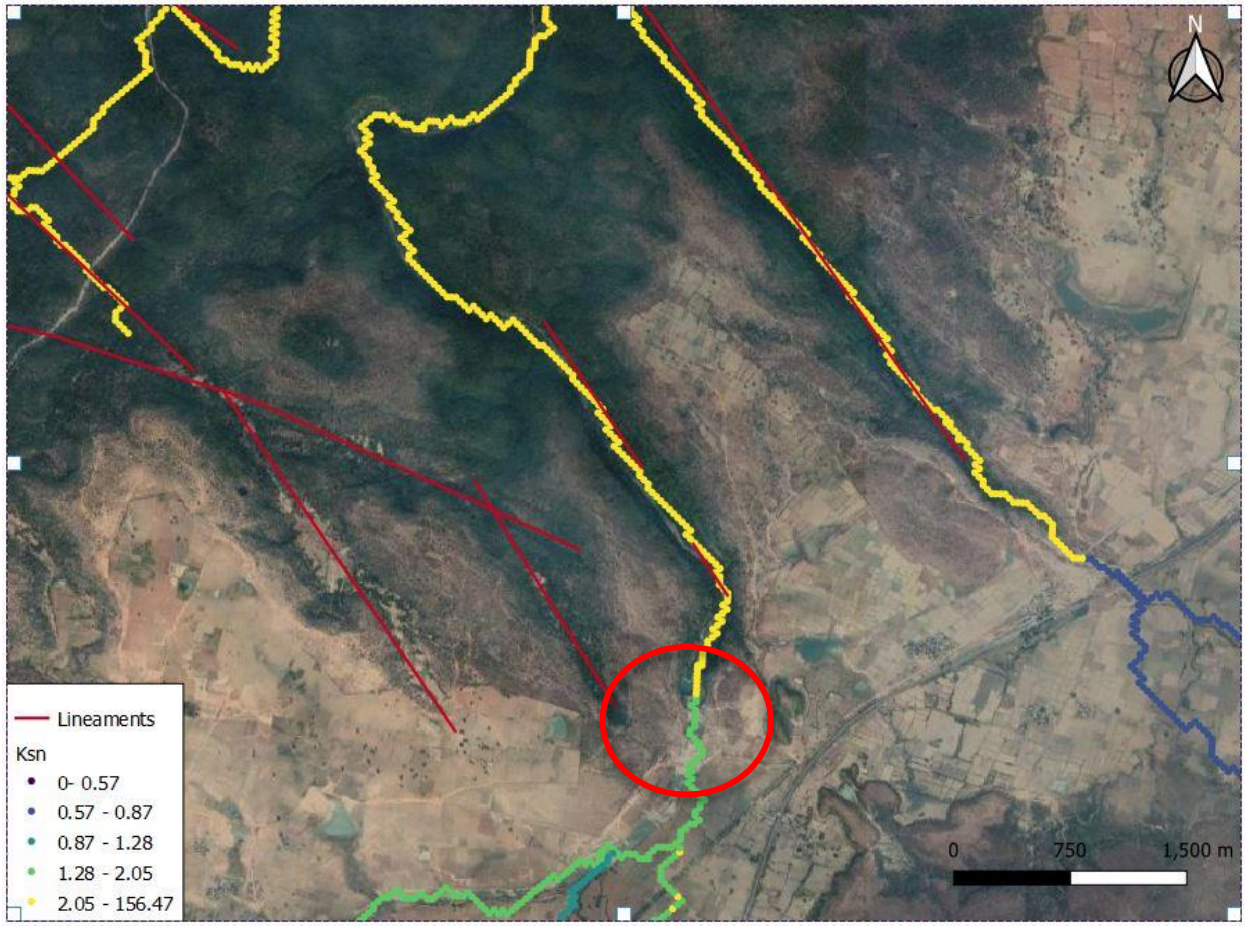




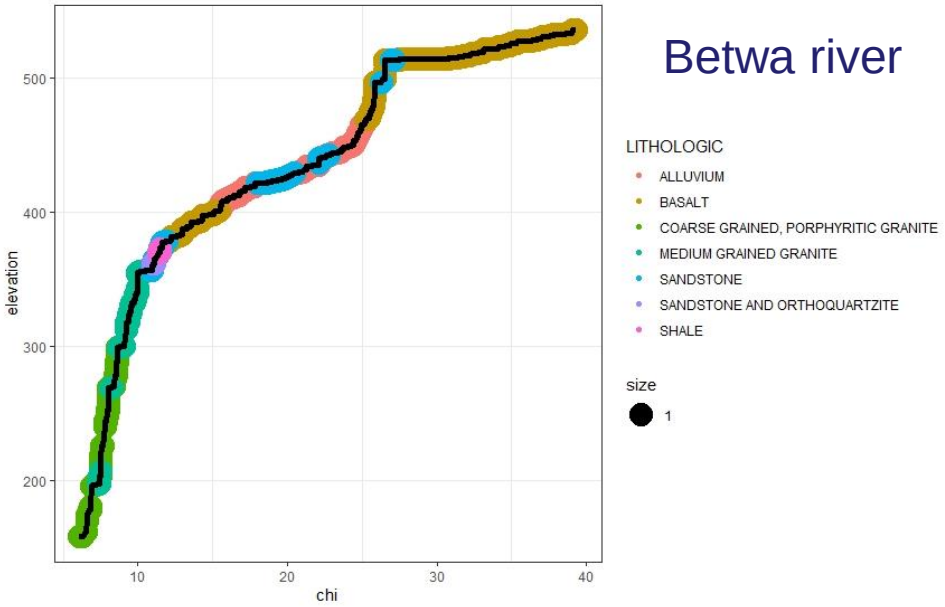
Rose Diagram

Statistical Summary	
Calculation Method:	Length
Class Interval:	10.0 Degrees
Min.Length Filtering:	Deactivated
Max.Length Filtering:	Deactivated
Azimuth Filtering:	Deactivated
Data Type:	Bidirectional
Population:	38,686
Total Length of All Lineations:	42,039,818.93
Maximum Bin Population:	3,348.0
Mean Bin Population:	2,149.22
Standard Deviation of Bin Population:	604.63
Maximum Bin Population (%):	4.33
Mean Bin Population (%):	2.78
Standard Deviation of Bin Population (%):	0.78
Maximum Bin Length:	2,012,598.74
Mean Bin Length:	1,167,772.75
Standard Deviation of Bin Lengths:	403,657.07
Maximum Bin Length (%):	4.79
Mean Bin Length (%):	2.78
Standard Deviation of Bin Lengths (%):	0.96
Vector Mean:	130.1 Degrees
	310.13 Degrees
Confidence Interval:	5.4 Degrees
	(80 Percent)
R-mag:	0.05

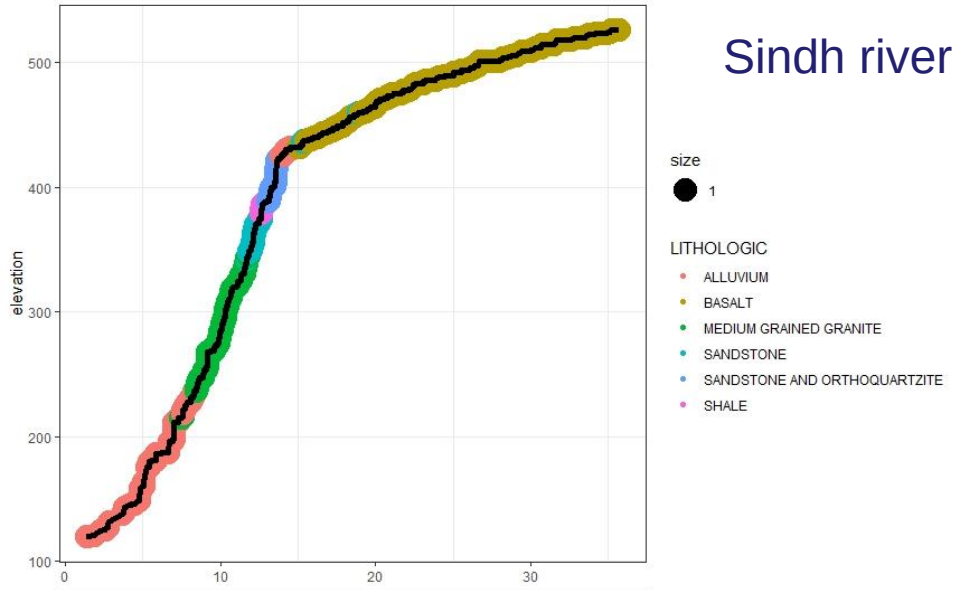
SCIENCE is SOCIETY



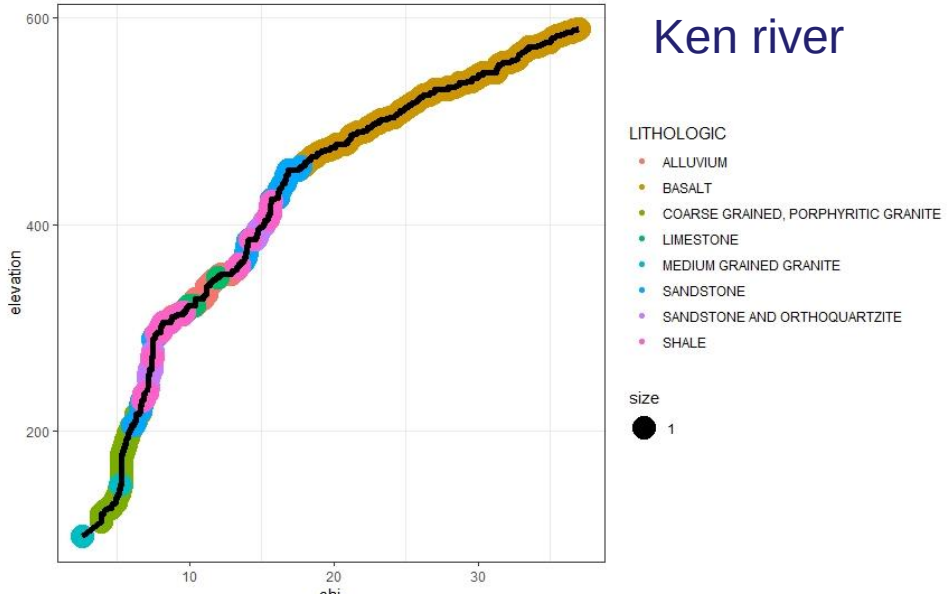
Betwa river



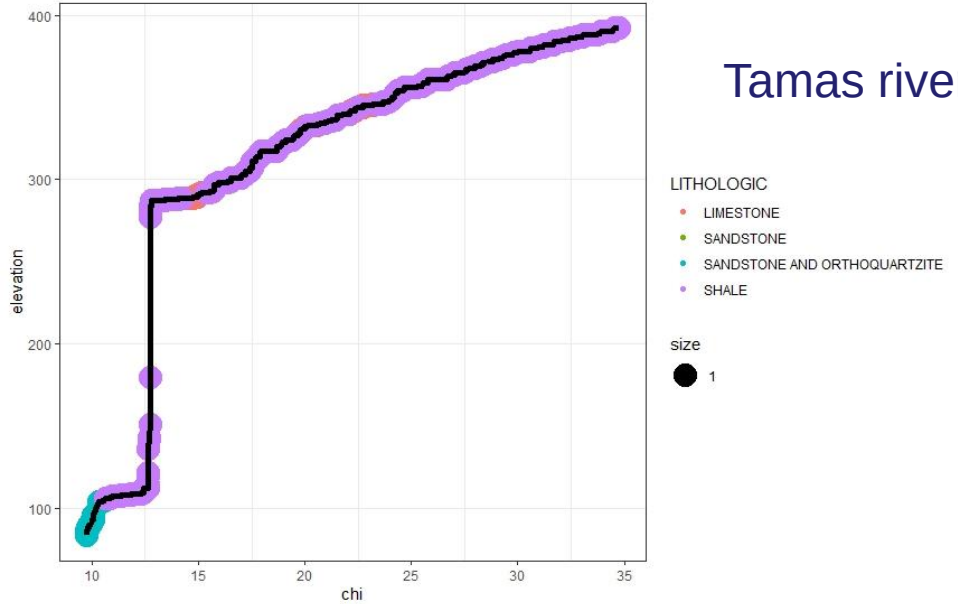
Sindh river



Ken river



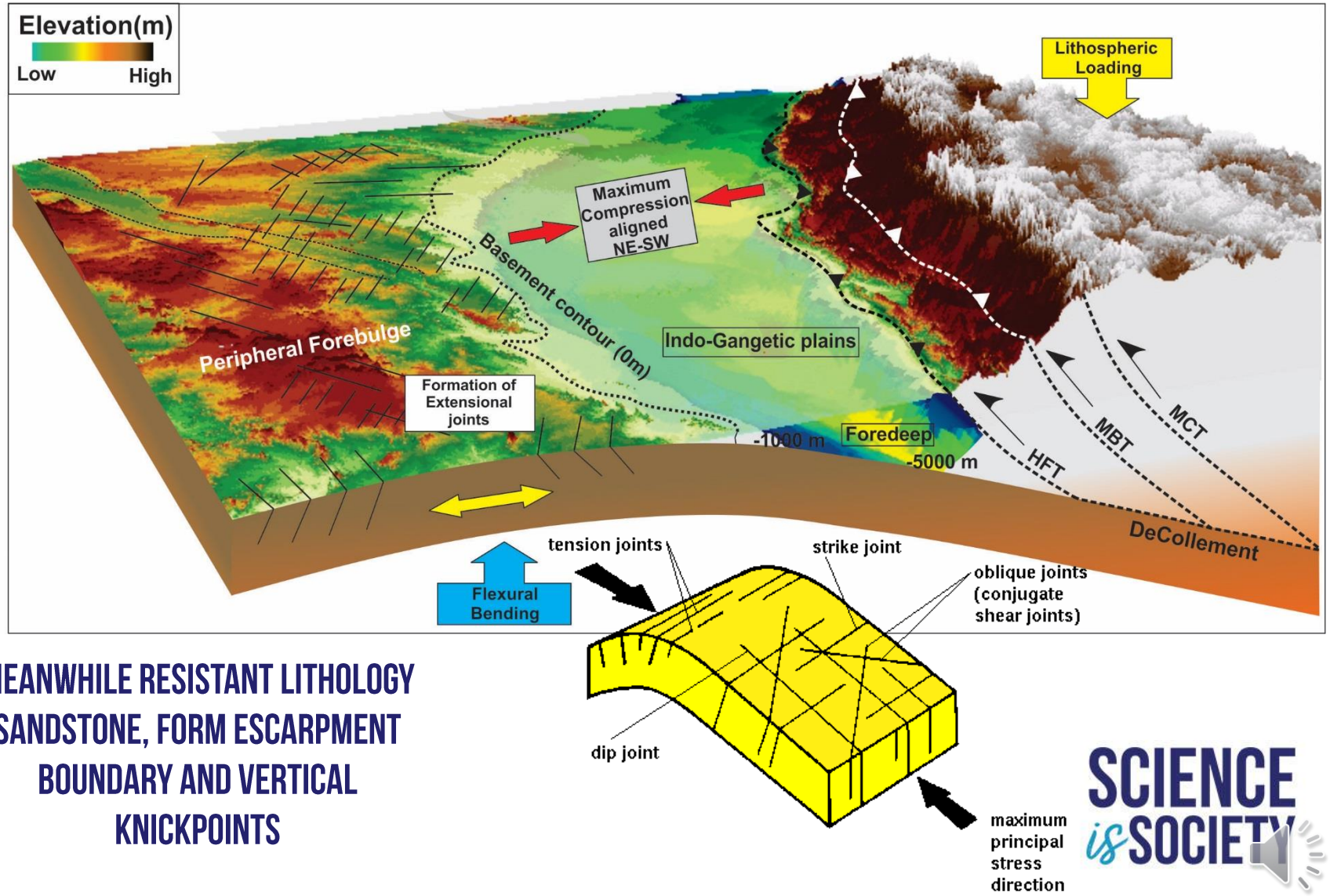
Tamas river



LITHOSPHERIC LOADING IN THE HIMALAYAS CREATED A FLEXURE IN INDIAN PLATE WITH FIBRE STRESS>100MPA

FIBRE STRESSES CREATE LINEAMENTS AND TENSION JOINTS ALIGNED PERPENDICULAR (NW-SE) TO MAXIMUM STRESS DIRECTIONS (NNE-SSW).

LINEAMENTS ACTS AS THE CONDUITS OF FOCUSED EROSION, WHEREAS THE CONTRAST IN THE ROCK STRENGTH CREATE A DIFFERENCE IN FLUVIAL ERODIBILITY RESULTING IN FAST EROSION OF WEAK LITHOLOGIES.



MEANWHILE RESISTANT LITHOLOGY SANDSTONE, FORM ESCARPMENT BOUNDARY AND VERTICAL KNICKPOINTS

SCIENCE is SOCIETY

THANK YOU

We conclude that forebulge tectonics and lithological contrast, guides the evolution of landscapes in central India

Questions?

Email: kasanaparv009@gmail.com

Research gate: https://www.researchgate.net/profile/Parv-Kasana

AGU FALL MEETING

SCIENCE is SOCIETY