

Abstract Volume
National Conference
On

Advances and Multidisciplinary Approach in Geosciences (AMAG-2024)

17th February 2024



Department of Geology,
Toshniwal Arts, Commerce and Science College,
Sengaon Dist. Hingoli-431542 (M.S.) India

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Convener (AMAG-2024)

Dr. Bhagwan B. Ghute
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Publisher

Department of Geology,
Toshniwal Arts, Commerce and Science College, Sengaon



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Publisher

Department of Geology, Toshniwal ACS College, Sengaon

Dist. Hingoli 431542 (M.S.) India

www.toshniwalcollege.ac.in

ISBN Number: 978-93-340-1919-3

President's Message



Dear esteemed guests, colleagues, and fellow researchers. It is my great pleasure to welcome you all to the One Day National Conference on Advances and Multidisciplinary Approach in Geosciences (AMAG-2024). The field of geosciences has always been a crucial area of research, playing a significant role in shaping our understanding of the Earth and its processes. With the ever-increasing complexities in the world around us. It has become more important than ever to explore new approaches and delve deeper into this fascinating field. This conference aims to bring together experts, scholars, and researchers from various disciplines to share their experiences, insights, and research findings. Our goal is to foster a collaborative and multidisciplinary environment that will enable us to explore new ideas and approaches in the field of geosciences. I am confident that this conference will provide an excellent platform for meaningful discussions and insightful presentations. As you are aware, the conference was a great success, with many insightful presentations and discussions. I believe that publishing the abstracts in a volume would be a valuable contribution to the field of geosciences and would allow our research to reach a wider audience. Additionally, it would serve as a valuable resource for future researchers who are interested in exploring the topics addressed at the conference.

Once again, on behalf of the organizing committee, I extend a warm welcome to all our guests and delegates. Let us make the most of this opportunity to learn, grow, and collaborate.

Thank you.

Date: 17/02/2024

Shri. Brijgopal Ramnarayan Toshniwal
President, SGSPM, Yeldari Camp

Principal's Message



Dear participants of the One Day National Conference on Advances and Multidisciplinary Approach in Geosciences (AMAG-2024). It is our pleasure to welcome you all to this important event, where we have the opportunity to learn from each other and explore new ideas and approaches in the field of geosciences. As you are aware, the study of geosciences plays a vital role in shaping our understanding of the Earth and its processes. With the ever-changing world around us, it is more important than ever to explore new approaches and delve deeper into this fascinating field. We are confident that this conference will provide a collaborative and multidisciplinary environment that will enable us to share our experiences, insights, and research findings. Our goal is to foster meaningful discussions and insightful presentations that will contribute to the advancement of geosciences. We hope that this conference will be a valuable experience for all of you, and we look forward to seeing the presentations and discussions that will take place. On behalf of the organizing committee, we extend our deepest thanks to all our guests and delegates for being a part of AMAG-2024.

Thank you and have a great conference!

Best regards,

Date: 17/02/2024

Prof. (Dr.) S. G. Talnikar

Principal, Toshniwal College, Sengaon

Convener and Co-convener's Message

We welcome to all the guests and fellow participants for the One Day National Conference on Advances and Multidisciplinary Approach in Geosciences (AMAG-2024). We extend a warm welcome to each of you on behalf of the organizing committee. This conference provides an exceptional opportunity to share knowledge and explore novel ideas and approaches in the field of geosciences. As you are well aware with the study of geosciences is vital in shaping our comprehension of the Earth and its processes. With the world constantly evolving, it is becoming increasingly an essential to explore new approaches and delve deeper into this fascinating field. We are confident that this conference will offer a collaborative and multidisciplinary environment that enables us to exchange experiences, insights, and research findings. Our ultimate goal is to foster meaningful discussions and insightful presentations that will contribute to the advancement of geosciences. We anticipate that the conference will be an enriching experience for all participants, and we eagerly await the knowledge-sharing and discussions that will take place.

We express our heartfelt gratitude to all the delegates, research students, faculty members and students for attending AMAG-2024. Your participation in this conference is highly appreciated. Thank you for your attention, support, and love. We wish you an engaging and informative conference.



Dr. U. L. Sahu
Convener (AMAG-2024)

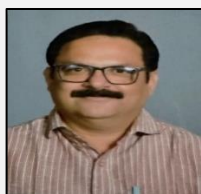


Dr. B. B. Ghute
Co-convener (AMAG-2024)

Date: 17/02/2024



About the Abstract Volume Editors



Dr. Udaykumar L. Sahu is an Associate Professor, Department of Geology, Toshniwal Arts, Commerce, and Science College in Sengaon, Maharashtra, India. He completed his graduation and post-graduation from Osmania University, Hyderabad. His research interests include geology, GIS, remote sensing, groundwater, watershed, and more. Dr. Sahu has been recognized as a Post-Graduate (PG) teacher and Ph.D. research supervisor by Swami Ramanand Teerth Marathwada University in Nanded. He has completed two MRPs funded by different agencies and is currently working on one MRP funded by SERB, India. Dr. Sahu attended the International Training for Geographical Analysis Systems (GIS) at the Department of Ecological Statistics at Penn State University in Pennsylvania, USA. He is a life member of various societies and journals and also elected as a Member of the Board of Studies in Geology at SRTM University for the years 2023-2027. Dr. Sahu has published research papers in national and international reputed journals.



Dr. Bhagwan B. Ghute is an Assistant Professor at the Department of Geology, Toshniwal Arts, Commerce, and Science College, Sengaon, Dist. Hingoli (Maharashtra), India. He has been working there since 2011. Dr. Ghute completed his B.Sc. and M.Sc. in Geology from Swami Ramanand Teerth Marathwada University in Nanded in 2006 and 2008, respectively, with first-class. He has been awarded Dr. Bhimrao Pingale first merit award during his M.Sc. geology. In December 2010, he secured the first rank from Maharashtra for the State Eligibility Test for the Earth, Atmospheric, Ocean, and Planetary Sciences for the lectureship. Swami Ramanand Teerth Marathwada University, Nanded, recognized him as a Post-Graduate (PG) teacher and Ph.D. Research supervisor. Dr. Ghute has completed two MRPs funded by Swami Ramanand Teerth Marathwada University, Nanded, and Rajiv Gandhi Science and Technology Commission, Mumbai. He is a life member of various societies and Journals and was nominated as a Member of the Board of Studies in Geology at SRTM University for 2023-2027. His primary research areas include Quaternary geology, groundwater, remote sensing, and GIS. Dr. Ghute has published more than 25 research papers in national and international journals.



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Assessment of groundwater quality for agricultural and industrial purposes in Shahada tehsil, Maharashtra, India

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Abstract:

The study of subsurface water quality to evaluate its aptness for agricultural and industrial practice has become essential due to the variability in rainfall intensity and uncertainty in its distribution. In view of this, the geochemical properties of 45 groundwater samples, including electrical conductivity (EC), pH, total dissolved solids, major cations, and anions, are measured and evaluated for suitability. The suitability for irrigation purposes is advised by appraisal of various cultivation water quality parameters such as sodium percentage (Na%), sodium adsorption ratio (SAR), Kelly's ratio (KR), residual sodium carbonate (RSC), magnesium adsorption ratio (MAR), and permeability index (PI). The industrial applicability was analyzed using the Langelier saturation index (LSI), Ryznar stability index (RSI), and Larson–Skold index (LSkI). Geographic information systems (GIS) used the analytical results to produce the numerical spatial dispersion of the indexes. The comprehensive technique of suitability evaluation indicates that subsurface water in the research region is ideal for cultivation. Also, the spatial variation maps of LSI, RSI, and LSkI illustrated that most pre-monsoon period samples were largely unaffected by minor scaling and corrosive potentials. Hence, the study indicates that continuous monitoring of quality groundwater resources can play a major role in achieving the goal of sustainable development of the region.

Keywords: *Water quality; Agriculture; Industry; Shahada Tehsil; India*

Lithological control on groundwater geochemistry of the Vel River basin, Western Maharashtra, India

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Abstract:

We have studied the major ion geochemistry of groundwater from the Vel River Basin, Pune district, Maharashtra, India, to know the lithological control over it. The study area is located in the western part of the Deccan Trap. Major lithologies exposed in the area are part of Lonavala and Diveghat subgroup. The Indrayani and Karla Formations are part of the Lonavala subgroup, while the Diveghat Formation is from the Diveghat subgroup. Based on the variations in the geomorphological, and geological factors, a network of Thirty-Two (32) groundwater sampling stations was selected and analyzed using standard methods. Analytical results confirm the order of cations dominance in groundwater is $\text{Ca} > \text{Mg} > \text{Na} > \text{K}$ observed in both seasons while anionic concentration showing $\text{HCO}_3 > \text{Cl} > \text{NO}_3 > \text{SO}_4$ in pre-monsoon and $\text{HCO}_3 > \text{Cl} > \text{SO}_4 > \text{NO}_3$ in post-monsoon. The data were plotted on Piper's trilinear diagram, showing $\text{Ca} + \text{Mg}$, $\text{Na} + \text{K}$, HCO_3 , $\text{Cl} + \text{SO}_4$ dominating hydrochemical facies in both seasons. Furthermore, chemical data plotted on the Gibbs diagram suggest Rock Dominance is the principal factor controlling the groundwater chemistry of the area during both the pre and post-monsoon season. The groundwater quality data is also studied to ascertain the suitability of water for agricultural and drinking purposes. It is observed that all the parameters are within the prescribed limits except Na , NO_3 , and HCO_3 . The irrigation indices values of Kelly's index (KI), Sodium Absorption ratio (SAR), Sodium percent ($\text{Na}\%$), and Residual Sodium Carbonate (RSC) of both seasons showing all samples are suitable for irrigation purposes. The water from the study area can, thus, be graded as good for irrigation use. In a nutshell, groundwater chemistry and quality of the Vel River basin are modified due to geological and anthropogenic sources.

Keywords: Groundwater Chemistry; Vel River; Deccan Basalt



An analysis of physiochemical and microbial parameters in the soil samples from Akola District, Maharashtra, India

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Abstract:

In this study, soil samples were collected from different spots in the Barshitakli, Patur, and Balapur tehsil regions of the Akola district. The physicochemical parameters were analyzed to understand the soil health, and the microbial parameters were studied for the characterization of microbes. The pH indicates the soil is slightly acidic in nature and the electrical conductivity indicates the good soil. The organic content of soil is moderately high, which indicates it is beneficial for supplying water to plants and increases the fertility of soil. The bulk density of soil is beneficial for holding the water capacity. The nitrogen concentration in soil samples is in the required range, indicating good soil health. The concentration of potassium in the soil sample is much higher than the required range, suggesting the draining and filtering of the soil and switching the fertilizer type, whereas the phosphorous concentration in the soil sample is low, suggesting an increase in the organic material in the soil, which will increase the availability of phosphorous in the soil. The microbial analysis of soil samples collected from Barshitakli, Patur, and Balapur has *Escherichia coli*, *Pseudomonas*, and *Bacillus cereus* in the soil samples.

Keywords: Soil samples; Physiochemical; Microbial Parameters; Akola district



Morphotectonic characterization of the basins along SEDVP-EDC contact-Adampur (Nanded, Maharashtra) to Bhaisa (Nirmal, Telangana), India

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Abstract:

A field study mainly focused on the margin of Deccan Traps and East Dharwar Craton exhibits strong deformations, observed small faults and folds within veins. The present research area has analyzed the morphotectonics characterization of Easter Dharwar Craton and Deccan traps, contact associated with geological and structural relationship of basin morphology. The results shows that morphometric and geomorphic indices for Active Tectonics (GATs) analysis of sub-basin occurs in basalt formation. An over the part of contact SEDVP-EDC and granitic sub-basins indicated consistent lithological and structural control. While basaltic sub-basins are relatively more stable and tectonically inactive depending on the attributes of GATs (Geomorphic Indices for Active Tectonics) assessments. The field observations and data interpretation results are: 1) The region has been tilting with southwest slopes. The tilting direction is deduced due to the asymmetry of basins. 2) Elongation ratio (Re) of study basins denoted tectonically moderately active. 3) The tectonically active and tilting of basins are supported by structural features.

Keywords: *Morphotectonic; Basins; SEDVP-EDC Contact; Geomorphic Indices*



Change detection analysis of Wan dam area of Akola district: A case study using Remote Sensing and GIS

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Abstract:

The principle aim of this section is to deliver an analysis of change in land use land cover pattern from Wan dam area of Akola district, Maharashtra, India. The assessment of land use and land cover change is extremely important for understanding the association between humans and nature. However, we greatly simplified the process of tracking historical variations in land cover and land use pattern. The geospatial data from remote sensing satellites are primary source that provide an opportunity to acquire information about LULC change in recent years. The information derived from detecting the various changes in the LULC pattern help in planning, development, management of agriculture and water resources. To identify land cover changes detection used image processing procedures had done for 1999 and 2022 using Land data. Google Earth Pro, Survey of India toposheets, ArcGIS software and satellite imageries were used to distinguish the alterations. The classification had done using four land cover (Agriculture Land, Barren Land, Build up /Vegetation, Water Bodies) class. This work has shown the capability of GIS and remote sensing tools in capturing the various classes and change in detection in the study area using the satellite data for development of land use pattern and considering the environmental and water resources.

Keywords: Remote sensing & GIS; Land Use/Land Cover; Wan Dam; Geospatial tools

Study of BOD and COD levels in the Dawarwadi lake, Paithan, Sambhaji Nagar, Maharashtra

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Abstract:

The human race for development and modernization is putting pressure on natural resources. This makes a huge impact on the existence and sustenance of natural resources, specifically freshwater bodies. Oxygen is also a natural resource that is present in gaseous form in air and in dissolved form in water. In both states, it is essential for the living system. In this investigation, the levels of BOD and COD were observed. The method for analysis used is APHA 2005. The levels of BOD are between 10 mg/L to 25 mg/L, and COD is 40 to 60 mg/L. This is an undesirable range, which indicates there is a source of pollutants in the lake.

Keywords: *Development; Modernization Gaseous; Dissolved Natural resource*



Morphometric analysis of Chargarh River Basin, Morshi, Chandur Bazar, District Amravati, Maharashtra by using Remote Sensing and GIS

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Abstract:

GIS is a useful tool for planning and defining groundwater potential and drainage patterns. It is possible to identify morphological features and analyze basin properties. In this study, Chargarh River basin, tributaries of Wardha River, has been selected for detailed morphometric analysis. Morphometric parameters viz; stream order, stream length, bifurcation ratio, drainage density, stream frequency, form factor, circulatory ratio, etc., are calculated. The drainage area of the basin is 548 km² and shows a sub-dendritic to dendritic drainage pattern. The stream order of the basin is mainly controlled by the physiographic and lithological conditions of the area. The study area is designated as six-order basin. The bifurcation ratio of the study area is low, which means the drainage patterns are not affected by the structure. The value of stream frequency shows that low class means low relief. The elongation ratio of the Chargarh River basin is 0.33, which implies that basin is elongated in shape. The drainage density of the basin is 2.27, indicating a very coarse drainage that shows limited surface runoff and a uniform rock type. The form factor ratio (Rf) value of the study area is 0.27, also indicating an elongated basin with lower peak flows of longer duration than the average. The research area showing a circularity ratio of 0.3654 indicates low Rc, which shows the absence of structural control. Based on the relief ratio and the ruggedness of the basin, we can conclude that the terrain has a low relief and a gentle to moderate slope, and the area is less prone to erosion. Terrain analysis shows a high degree of slope is noticed in the western and north-western parts of the basin. The present study would be helpful to decision-makers for watershed management and sustainable natural resources management.

Keywords: Morphometric analysis; Chargarh River; Geomorphology; Drainage basin; GIS



Flow stratigraphy and palaeomagnetic polarity of the Deccan Basalt, exposed around Eastern part of Amravati city, Central India

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Abstract:

The Deccan Volcanic Province (DVP) is well exposed and spread over a 5 lakh km² area of central India. It preserves the palaeomagnetic information for establishing basalt flow stratigraphic sequence and is useful in the correlation of the rocks. The present study explained the palaeomagnetic polarity of the Deccan basalt lava flows exposed in Chhatri Talao hill (part of Chirodi hill ranges) Amravati district, Maharashtra State, India. During the present research, an area comprised of moderate plateaus was covered by Deccan basaltic lava flow mapping carried out by rock samples and an existing GSI quadrangle map. The output of the research exhibited mainly three lava flows at the elevation 365 to 435 m (amsl), that has distinguished between (i) lower flow-I has fine to medium frained textures, mafic plagioclase micropheric basalt; (ii) middle flow-II has coarser textures grained with mafic plagioclase phyric basalt and (iii) upper flows-III is fine to medium grained associated with mafic plagioclase micropheric basalt. The palaeomagnetic study indicates a Normal-Reverse sequence, with normal polarity observed in upper lava flows (flow-II and flow-III) and reverse polarity in lower flow (flow-I). Accordingly, flow stratigraphy and palaeomagnetic polarity were established for 70 a 70-meter-thick basalt lava pile, which can be further useful for correlation and determination of palaeo-latitudes.

Keywords: Deccan basalt; Lava flows; Palaeomagnetism; Flow stratigraphy

Spatiotemporal analysis of Godavari River flood zone in Nanded City, Maharashtra, India

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Abstract:

The present study deals with rapid urbanization and encroachment occurring in Nanded city near the banks of Godavari river flood zones. The Godavari river flowing within Nanded city west to south direction. The unexpected increase in the specific rainfall in monsoon periods and the Godavari River's elevated water level are causing issues in flood zones near Nanded city, including house submergence, loss of life, management failure, and disruption of normal life. The left bank of Godavari river of Nanded city merging the number of tributaries like Idhgah nala, Pakiza nala, Bilal nala, Burgh nala, Habib nala, Gadipura nala, Gayatri nala, Urwashi nala, Datta Nagar nala, Mitra Nagar nala, Chandrlok nala and Harsh Nagar nala. The study area is presently spatiotemporal analysis and interpreted flood zone boundaries on the basis of field survey using GPS, satellite imagery, topographical map, and rainfall data of Nanded city. The flood zones mapping revealed the partial encroachment in the Godavari river bank of Nanded city has been identified by using ArcGIS software.

Keywords: Godavari River; Flood zone Mapping; Encroachment Mapping; Urban settlement



Exploring the stratigraphy and geochemical profile of Dahinala Formation in the Asirgarh region, Madhya Pradesh, India

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Abstract:

The exploration of the Dahinala Formation's stratigraphy and geochemical profile in the Asirgarh region of Madhya Pradesh, India. The study of various flows in the Asirgarh regions has provided valuable characters of the basalt flow stratigraphy. The study area is located between latitudes 21°11' to 21°52' N and longitudes 75°55' to 76°30' E in the north-eastern part of Burhanpur District. The Deccan trap formation is broadly classified based on the landform heights, lava flow stratigraphy, and distinguished geochemical character flows. The Deccan trap is categorized into lower, middle, and upper stratigraphic groups according to their distribution and intertrapean sediments and ash layers. This comprehensive study examines the characteristics of rock through a detailed analysis of its megascopic and microscopic features. The lava pile of the Malwa Formation has a thickness of 465m and is associated with 16 various lava flows, and its subgroups include the Dahinala, Asirgarh, and Amba formations. These classifications provide a framework for understanding the intricate dynamics and compositional variations within the volcanic formations of the region. The Dahinala formation boundaries of vary based on field character, phenocrystic assemblages, and the appearance of the giant phenocrystic basalt horizon (GPB). The present study area specifically collected the rock samples for geochemical analysis, and extracted the minerals phase's textural characters and distributions. The geochemical classifications CT1, CT2, CT3, CT4, and CT5 exhibit varying characteristics, including aphyric to microphyric, mafic phyric, plagioclase phyric, plagioclase phyric, and giant plagioclase basalt. The interpretation results show a correlation in the stratigraphic sequence. By integrating data from both disciplines, the research offers insights into the volcanic history of the formation, enhancing our understanding of igneous province formation and its impact on Earth's surface and geological evolution.

Keywords: Geochemical Profile; Stratigraphy; Chemical Types; Dahinala Formation



Soil texture analysis of Nirguna (Bhikund) River watershed in Akola & Washim Districts, Maharashtra, India with relation to the management of water resources

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Abstract:

A qualitative classification approach for soil texture has been used to the hydro geomorphological regime of the Nirguna (Bhikund) River watershed through field and laboratory investigations in an attempt to categorise the different classes of agricultural soils according to their physical texture. Using grading sieve to separate sand, silt, clay proportions of the various classes are further identified in the field with the help of particle size distribution and distinguished by their textural feel. Class is used to evaluate crop compatibility as well as the way the soil reacts to parameters related to the environment and management, such as the need for lime or drought. Eight unique landforms units have been identified in geomorphologic studies: pediment and pediplain complex, water bodies, highly dissected, low dissected, moderately dissected, dam and reservoir, flood plain, and alluvial plain. The thick weathered mantle of the low dissected plateau, extending from 5 to 8 meters, is characterised primarily by a lack of dissection and lineaments suggesting a possible storage zone. Water levels varied from 6 to 11 meters below the surface during the pre-monsoon and post-monsoon. With sustained discharge lasting more than three to four hours, the safe yield ranges from 44 to 68 m/d, indicating phreatic and semi-confined aquifer conditions. The studied area's fairly dissected plateau, which is found along the bottom portion of steep scarps, indicates horizons with intermediate thicknesses of 2-4 m. The interflow zone's location, which indicates the recharge nature and greater hydraulic capacity, determines the depth to water level, which is shallow and ranges from 4 to 9 meters below ground level. The presence of compact and large lava flows that exhibit an extensive network of dissection defines the highly dissected plateau. Except where the top section is changed due to the existence of vesicles that may store groundwater, the study area's limited groundwater availability is caused by low-weathered rock masses. Because aquifer zones are present, the undulating plains reveal potential groundwater horizons. There is a 16–19 meter (bgl) depth to water in regions that are highly dissected. On the northern side, the region is divided into low-lying plains and multiple scarps on the southern side. The pediment and pediplain complex, alluvial plain, and moderately dissected plateau comprise the majority of the study area.

Keywords: Soil texture; Sieves; Plateau; Pediment; Lineament, Scarp



Identification of groundwater potential zones using dug well inventory and geomorphology of (Wazur) watershed in Parbhani district, Maharashtra

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Abstract:

Groundwater is an important resource contributing significantly to the total annual supply. Over utilization of groundwater has depleted the groundwater availability. Evaluating the potential zone of groundwater recharge is extremely important for better groundwater management. In the study area, increasing demands of groundwater for agriculture and extensive groundwater withdrawal for more production will trigger the depletion of groundwater. In the present paper, we tried to study and put the observations on the geomorphological and hydrogeological characteristics of the Wazur watersheds in the Parbhani district. Groundwater potential zones are demarcated with the help of dug well inventory, remote sensing, and Geographic Information System (GIS). The thematic layers were referred from Bhukosh (GSI portal) and executed in ArcGIS (10.3). Geologically, the study area belongs to the Deccan Volcanic Province (DVP) of late Cretaceous to early Eocene age. The study area belongs to Toposheet no. (56 A/11, 56 A/7, 56 A/12, 56 A/8, 56 A/3, 56 A/4), which covers 184.90 km² basin area. The present study aims to evaluate the groundwater condition of the Wazur watershed through hydro-geomorphological characteristics. The study area belongs to Godavari river drainage in Pathri and Manwat Taluka, Parbhani District, Maharashtra. The study area covers a total of 78 Dugwells from 7 villages in the Wazur watershed. The 13 dug wells are from Sarola Bk., 26 dug wells from Kekarjvala, 07 dug wells from Wazur Kh., 7 dug wells from Wazur Bk., 08 Dugwells of Chate pimpalgaon, 17 dug wells of Waghala. The present paper studies hydrogeological characteristics of the Wazur watersheds of the Parbhani district by using well inventory. The paper studies and finds potential groundwater systems in concern with weathered amygdaloidal basalt and compact basalt flows.

Keywords: ArcGIS (10.3); Groundwater potential zones; Geomorphology



Geogenic enrichment of fluoride in groundwater from southern part of Chandrapur District, Maharashtra, India: An area prone to fluorosis

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Abstract:

In the pre- and post-monsoon seasons, 100 groundwater samples were collected in the Rajura and Korpana tahasil of Chandrapur district area to investigate fluoride pollution from geogenic sources and seasonal variations in groundwater quality. By evaluating the physicochemical characteristics of groundwater, the hydrogeochemistry was investigated. The bulk of the samples had higher quantities of fluoride (F^-). To determine the source of fluoride in groundwater, petrographic analyses of various litho units were conducted. The concentration of fluoride and fluoride-bearing minerals in the rock and soil samples from the research region were determined using X-Ray Diffraction (XRD) analysis, and the petrographic results were also compared and validated. The primary geogenic natural sources of fluoridated groundwater are the numerous fluoride-bearing minerals found in soil and rock samples, as confirmed by X-Ray Diffraction (XRD) investigations. The interaction between the rock and water, in conjunction with physiochemical circumstances such as breakdown, dissociation, and subsequent dissolution, is the principal process responsible for the source of F^- enrichment in the groundwater of the research region. The groundwater is stabilized by high levels of Na^+ and HCO_3^- , as shown by the positive correlation of F^- with Na^+ and HCO_3^- . The hydrogeochemical characteristics of groundwater containing excess F^- show that, ion exchange and weathering regulate the amount of F^- .

Keywords: Hydrogeochemistry of groundwater; fluoride; geogenic contamination; Petrography; XRD analysis

From magmatic reservoirs to solid rocks: A deep dive into the origin and evolution of Deccan Trap

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Abstract:

The term "Deccan Trap," introduced by W.H. Sykes in 1833, characterizes the step-like or terrace-like topography found in the Deccan Trap terrain, the second most extensive geological formation in peninsular India. The Deccan Traps, a vast and intriguing geological formation, have captivated the attention of researchers and geologists for decades. Spanning across the Marathwada region, this extensive lava plateau holds a profound story within its solidified rocks, one that unfolds through the intricate processes of magma origin and evolution. This research paper delves into the intricacies of the Deccan Trap, specifically in the Marathwada region. The total thickness of the Deccan Trap varies across different areas due to the undulating nature of the underlying terrain. The west coast, near Bombay, exhibits a thickness of over 2000m, while other regions, such as Matheran, Sahyadri, and Melghat scarp, display varying thicknesses. Understanding the nature of volcanic activity that produced these lava flows is crucial for deciphering the geological history of the Deccan Trap. The study employs a detailed analysis of lava flows, considering their field characters as indicators of volcanic activity. The classification of flows into compact basalt and amygdaloidal basalt reveals distinct characteristics. Compact basalt flows, thick and extensive with a high ratio, are devoid of gas cavities. In contrast, amygdaloidal flows, limited in lateral extent with a low ratio, display vesicular characteristics throughout their thickness, indicating the influence of gas cavities. This research contributes valuable insights into the volcanic history of the Deccan Trap, shedding light on the fluidity and viscosity of the lava that shaped its unique topography. The findings provide a foundation for understanding the geological processes that led to the formation of one of India's most remarkable geological features.

Keywords: *Deccan Trap; Geological Formation; Magma Origin; Lava Flows; Volcanic Activity*

A change detection evaluation with special emphasis on morphotectonic analysis in and around the Lonar crater area of Buldhana District, Maharashtra, India by using Remote Sensing and GIS tools

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Abstract:

The principle aim of this section is to deliver an analysis of change in land use land cover pattern of Lonar Crater present in the Buldhana district of Maharashtra state in India. The assessment of land use and land cover change is extremely important for understanding the association between humans and nature. The conservative methods of detecting changes in the land use pattern are costly and low in exactness, remote sensing technology, and GIS tools together have made it way easier to monitor the variations in land use land cover from the past the data from remote sensing satellites are primary sources that provide an opportunity to acquire information about LULC change in recent years. The LULC pattern based on remote sensing data is a vital source of information for making various decisions for the benefit of society. Information derived from detecting the various changes in the LULC pattern helps in the planning, development, and management of agriculture and water resources. To identify land cover changes detection; remote sensing data, satellite imagery, and image processing procedures had done within two dates of 1994 and 2020, using Land data of ESRI (2020), Google Earth Pro, survey of India Toposheet NO: 56A/5, 56A/9, 55D/8, 55D/12 and Arc GIS software and satellite images were used to distinguish the alterations. The classification was done using five land cover (Agriculture Land, Barren Land, Build/Residential Land, Vegetation/Forest Area, and Water bodies) classes. This work has shown the capability of GIS and remote sensing tools in capturing the various classes and change detection in the study area using the satellite data for the development of land use patterns and considering the environmental and water resources apprehensions. The outcome of the work shows rapid growth in the built-up areas as well as a decrease in the area of water bodies and vegetation due to an increase in urbanization. Therefore, proper management, Better policies, local community participation should be implemented to avoid undesirable changes in the study area.

Keywords: *Morphotectonic Analysis; Remote Sensing and Geospatial analysis tools; Land Use /Land Cover; Change Detection*

Industrial effluents impact on groundwater from drinking, irrigation and corrosion perspective: A case study of Chincholi Industrial area of Solapur, Maharashtra, India

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Abstract:

Water is an essential component of life, but for that, it must be qualitatively and quantitatively sufficient to meet the standards required by the end user. For different purposes, we need different amounts as well as the quality of the water. For drinking purposes, the standards need to be strictly followed, whereas for agriculture standards are lowered. Water quality is affected by either natural or anthropogenic sources. In man-made activities, industries play a crucial role in spoiling the quality of environmental components, including soil, air, and water. For the drinking suitability analysis, two types of water quality indices are used to identify the most accurate result producing index. The irrigation suitability indices are well defined and used frequently includes SAR, MH, RSC, %Na, PI and KR. It is essential to know the corrosion potential as industries and farmers are using groundwater. To identify corrosion potential several indices like CR, RSI, PSI and L-S index had been calculated through the AquaChem software. The statistical analysis was conducted to know the causative agents so it will be easy to identify the possible sources of contaminants. Correlation matrix, cluster analysis and principle component analysis performed to know the water quality degrading parameters. The results depicted that water quality is mostly affected in the surroundings of the industrial area. The irrigation potential is good as so far concerned except few samples. Few samples have high corrosion potential whereas rest of the samples shows their fitness for industrial applications.

Keywords: *Industrial effluent; Drinking; Irrigation; Corrosion; Statistical analysis*

Detailed morphometric analysis of Ambada watershed of Pedhi River basin Bhatkuli Taluka, Amravati District, Maharashtra

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Abstract:

The morphometric analysis of the drainage basin and channel network plays a vital role in understanding the geo-hydrological behavior of the drainage basin and expresses the geology, geomorphology, structural features, etc., of the river basin. Morphometric analysis of a river basin is a means of numerically analyzing or mathematically quantifying various parameters of a river basin catchment area. Morphometric analysis is an important means of understanding drainage basin using mathematically derived parameters. In the present study, we have carried out the morphometric analysis of Ambada river watershed of Pedhi river basin, by using observatory data and Arc GIS techniques. Morphometric parameters have been generally analyzed under three broad aspects such as linear, aerial, and relief aspects. The Present river basin is the part of Purna saline alluvial basin. The study area is a part of the Amravati district situated north west part of the Amravati City. Ambada river is the 5th order stream confluence with the Pedhi River at village Kolsara at co-ordinate 20°50'09"-77°27'57". The river area is bounded by latitude 20°50' to 21°15' and longitude 77°28' - 77°42' and it is recorded in survey of India Toposheets number 55H/5 55H/9 & 55G/12. In the present research work, we have calculated near about 30 parameters, including Bifurcation ratio (4.4), Lemniscate's Ratio (10.7), drainage density (1.119), Drainage Intensity(0.8045), Circulatory ratio (0.0012), Drainage Texture (1.45), Elongation ratio (0.0400), Ruggedness Number (0.089) and Relief Ratio(1.71)

Keywords: Morphometric analysis; Purna alluvial basin; Lemniscate's Ratio; drainage density; Circulatory ratio, Elongation ratio; Ruggedness Number; Relief Ratio

Aquifer demarcation using geophysical methods in Lakhmapur village, Dindori taluka, Nashik, Maharashtra, India

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Abstract:

Aquifer demarcation is an essential thing for socioeconomic activities like irrigation, and domestic and industrial uses. Farmers and rural people are dependent on agricultural land, causing externalities and implications on labour scarcity, groundwater depletion, welfare loss, and inefficiency. Hydrogeological and Geophysical studies are carried out in Lakhmapur village, to know the groundwater availability which is based on analysis and assessment for convenience of groundwater, where resistivity anomalies are validated with groundwater available in weathered zones at the interface between the overburden and bedrock. Due to heterogeneity in lithological units, the electrical resistivity also varies locally. In the present study, the three-layer sounding curves are found to be of two types, depending on the resistivity values, these are AA and HA types. Depth to the basement in Lakhmapur village varies from 8.616 m. to 12.13 m (bgl); at the confluence of the village, the depth of the basement is maximum at about 12.13 m (bgl); it seems good groundwater zones. Depths are 7.712 m (bgl) to 8.616 m (bgl) in the west side, and depths are 10.17 m (bgl) to 12.13 m (bgl) in the east side of the study area, which also seems to be good groundwater zones.

Keywords: Geophysical methods; Ohms law; AA and HA curves; aquifer depth



Groundwater estimation of Pimpalgaon Baswant village, Niphad Taluka, Nashik, Maharashtra, India

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Abstract:

Estimating groundwater availability in a village can be a complex process, as it involves analysing various factors such as geological formations, rainfall patterns, land use, and hydrological data, existing water conservative structure data. Groundwater availability in a village is a crucial aspect of managing water resources effectively. Several methods can be used to estimate groundwater in a village. By using hydrological model in Pimpalgaon Baswant village can provide valuable insights into groundwater estimation by simulating the movement of water through the soil and aquifer systems. This model considers various parameters such as long-term rainfall trends, evapotranspiration, land use, and soil properties to estimate groundwater recharge and availability, assessing the sustainability of groundwater resources in a village. It is important to note that estimating groundwater availability is an ongoing process, as it needs to account for fluctuations in rainfall patterns, other environmental factors, multidisciplinary expertise and local knowledge to ensure accurate results. Regular monitoring and updating of data are essential for accurate estimations.

Keywords: Groundwater estimation; Run off estimation; hydrological model; Pimpalgaon Baswant

Hydrogeomorphometric analysis of Nani River basin in Satara and Sangali district, Maharashtra, India-Using Geographical Information Techniques

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Abstract:

The Nani River basin is situated in the Satara and Sangali district of Maharashtra, India. It covers an area of 491.5 km². It serves as a major tributary to the Yerla river and flows over geological formations of Deccan Volcanic Basaltic (DVB) origin, dating from the Upper Cretaceous to Lower Eocene periods. A recent study conducted on the basin utilized Geographic Information System (GIS) software to analyze various morphometric parameters and study the hydrogeomorphology characteristics. The average rainfall in the area due to the southwest monsoon is 606 mm, and the minimum temperature is 12°C the maximum goes up to 42°C during May. The climate of the area is semiarid, sub-tropical characteristically hot summer. The drainage pattern of the Nani River exhibits a dendritic to sub-dendritic type. The highest drainage order observed in the Nani River is 6th. The entire river basin encompasses 1098 streams, its total length is 1034.41 km. The drainage density is calculated at 2.10 km/km². The stream frequency value of the Nani River is reported as 2.23 streams/km². The textural ratio for the river is reported as 10.18 km⁻¹, indicating a fine drainage texture. In the case of the Nani River, the form factor value is reported as 0.36, constancy of channel maintenance value is recorded as 0.48 and basin elongation ratio is 0.45 indicates basin is elongated in shape. Nearly four geomorphic units observed in the study area. These are low dissected structural upper plateau, moderately dissected structural upper plateau pediment pediplain complex, and water bodies covering the area. The slope is classified into four categories such as gentle, moderate, moderate to steep, and steep. Hydrogeomorphometric analysis of the present study shows that the terrain is impermeable and has less infiltration. So surface water recharge sites are essential in this area.

Keywords: GIS; Hydrogeomorphology; Morphometry; Nani River

Assessing contamination levels and ecological impacts in Indian lakes: A comprehensive review

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Abstract:

Lakes are crucial in maintaining global and regional water balances, natural and socio-economic resources, and habitats. Over the last decades, the lakes have gone through enormous changes derived from both natural processes and anthropogenic activities. In this review paper, we have discussed heavy metal contamination in lake sediments. To carry out the study, we have selected a total of 52 important lakes from all over the world and distinguished them as Global Lake, National Lake and lakes in Maharashtra state. We have taken 33 lakes globally and further categorized them as per their location like African lake, Asian lake, American lake, and European lake. 15 lakes of national importance from all over India have been chosen for study as well as 4 lakes from to know heavy metal contamination in lake sediments, we have mainly focussed on heavy metals such as Co, Cr, Ni, Cu, Pb, and Zn. The results obtained by analyzing show that nearly all African lakes show the presence of Cu and Zn in their sediments in large proportion which indicates lakes in Africa are highly polluted by Cu and Zn. Lakes like Manzala Lake in Egypt show a higher proportion of Cu while Zn is seen in Naivasha Lake in Kenya in very large quantity. American lakes show the presence of heavy metals like Cu, Pb and Zn in large proportions. Asian lakes show the presence of heavy metals like Cr, Ni, Pb, Zn, and Cu in nearly all lakes. The presence of Zn in Asian lakes like Manchar lake in Pakistan, Hazar lake in Turkey and Nansi lake in China in large proportion indicates that lakes in this region are heavily influenced by anthropogenic pollution. Asian lakes show the presence of all types of heavy metals in sediments except Cobalt. Cr is present in very large quantity in Constance Lake in Germany which may lead to serious health issues. Nearly all lakes in India show the presence of Ni, Cu, Pb, and Zn in their lake sediments. Cr is also present in most lakes and some of them exceed the average crustal value. Lakes in Maharashtra state show the presence of Cr and Pb in all lakes in large quantities. Cu and Zn are also observed in most lakes which exceeds the average crustal value clearly indicating that these lakes are contaminated by heavy metals. The high proportion of heavy metals in the lake ecosystem is harmful to all which is directly or indirectly dependent on the lake.

Keywords: Heavy Metal Contamination; Lake, Sustainability; Pollution

Air pollution: A slow Poisoning

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Abstract:

Today's industrialized world is very concerned about air pollution since it poses a substantial toxicological risk to both the environment and human health. Although there are many other sources of emissions, the majority of air pollution is caused by automobiles and other anthropogenic activities. The World Health Organization lists lead, sulfur oxides, nitrogen oxides, carbon monoxide, particulate matter, and ground-level ozone as the six main air pollutants. Humans exposed to air-suspended toxicants for short or long periods of time may have varying toxicological effects, including respiratory and cardiovascular disorders, neuropsychiatric issues, ocular irritation, skin conditions, and long-term chronic illnesses like cancer. The occurrence and progression of a number of diseases, such as asthma, lung cancer, ventricular hypertrophy, Alzheimer's and Parkinson's disease, psychiatric difficulties, autism, retinopathy, fetal growth, and low birth weight infant respiratory disorder, are badly influenced by air pollution. The effect of air pollutants on susceptible populations: the preponderance of data shows that exposure to pollutants causes a significant increase in human morbidity and mortality. In this paper, we have discussed the effect of every pollutant on human health and why it is slow poisoning in India.

Keywords: *Air pollution; Human health; Anthropogenic activities; Chronic diseases*

Lithologic and Morphologic implications of Vaidarbha River a tributary stream of the Penganga River Basin

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Abstract:

The lithological and morphometric assessment of the Vaidarbha River is carried out by utilizing the NGDR data and SOI toposheet maps of scale 1:50000. The delineation of the present Vaidarbha River shows 45.406 km stretch, and it is a part of the Penganga River basin. The study area comprises a total of nine watersheds. The total area of the Vaidarbha macro watershed is 382.32 km². A total of six meso watersheds show 228.35 km² area and a total of three micro watersheds show 27.36 km² area. This meso-micro watershed occupies a total of 255.72 km² area. The remaining area, other than the watershed, is 126.50 km². Geologically, the study area shows the occurrence of Deccan basalt and the lower Gondwana group of rocks. The Penganga river is partially active which is influenced by nearby Kinwat and Kaddam faults. As the Vaidarbha River is a part of the Penganga River so, the current analysis is an attempt to integrate both morphological expression and its lithological implications applied to Meso-Micro level watersheds to check whether such activity has contributed to such activity or not. The geoprocessing of the available data has been applied to bring out the linear, aerial, and shape aspects of the present area, and further analysis carried out with respect to its lithological implications.

Keywords: *Tectonics; Geomorphic indices; Morphometry; Geoprocessing; Vaidarbha River; NGDR Data*

Integration of geospatial technologies, artificial intelligence (AI), and machine learning (ML) in geosciences

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Abstract:

The integration of geospatial technologies, artificial intelligence (AI), and machine learning (ML) in geosciences presents a transformative opportunity for enhancing our understanding of the Earth's complex systems. It has immense potential to revolutionize various aspects of the field. These technologies can collectively enable advanced spatial analysis, predictive modeling, and data-driven decision-making in geosciences. By combining geospatial data with AI and ML algorithms, researchers can gain deeper insights into geological processes, environmental changes, and natural resource management. The synergy of these technologies opens new possibilities for applications such as landslide prediction, mineral exploration, and environmental monitoring. As these fields continue to evolve, the integration of geospatial technologies, AI, and ML promises to contribute to more effective and sustainable practices in the geosciences. This paper provides an in-depth analysis of the challenges and opportunities inherent in the convergence of these technologies, with a focus on their potential impact on geospatial data analysis, predictive modeling, and automated image recognition. However, this integration also confronts challenges related to the complex nature of geospatial data, encompassing issues such as data quality, scalability, and computational intensity for handling vast datasets. Ethical considerations and responsible utilization of AI in geosciences, as well as the need to bridge the skill gap in AI and ML implementation, further compound the challenges. By addressing these challenges and embracing the opportunities, the geosciences community can pave the way for ground breaking advancements. Interdisciplinary collaboration, investment in research, and strategic development of AI and ML capabilities hold the potential to revolutionize geosciences, leading to more accurate predictions, improved resource management, and innovative solutions to environmental challenges.

Keywords: *Artificial intelligence; Machine learning; predictive modelling; geospatial data*



Study of Hydro-geochemistry based on land use patterns in Aundha Nagnath Tehsil, Hingoli using statistical techniques

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Abstract:

Groundwater occurrence in hard rock basaltic terrains is restricted due to isolate weathered and fractured zones and pockets where in slow movement of groundwater, prolonged rock-water interactions and higher residence times raise quality issues. Therefore, suitability assessment of groundwater for various purposes becomes imperative in Aundha Nagnath Tehsil. With consideration of LU/LC, geology, geomorphology and groundwater accessibility and beneficial use, 60 representative groundwater samples were collected in pre monsoon season of 2022. The physicochemical parameters like pH, EC, TDS, TH, Ca, alkalinity, chloride, sulfate, fluoride, sodium, potassium, phosphate and nitrate were analyzed by following standard analytical methods of American Public Health Association (APHA). Groundwater samples were analyzed for the suitability of water for drinking, domestic, and agriculture purpose with comparison of WHO drinking standards. As per WHO drinking standards, parameter like pH (18.33%), TH (11.66%), PO₄ (5%), F (1%) and NO₃ (3.33%) found to exceeded the permissible limits. The water quality for drinking purpose was evaluated using the water quality index. The WQI, result shows that the 51.66% of groundwater samples comes under poor water class and 48.33% samples fall in good water quality. The outcomes of the study will be baseline information to the local inhabitants and new researcher for further water management plan for the study area.

Keywords: *Land use patterns; Groundwater; WHO drinking standards; WQI, Hingoli*

Deformational structures in the vicinity of Lonar crater, Maharashtra

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Abstract:

The studies on deformational structures in the vicinity of Lonar lake is carried out with reference to field characters of Quaternary sediments, extent and occurrence of folds, faults, ejecta blanket, impact breccias and cross laminations found in the Quaternary formations. Geologically, the whole study area corresponds to the Deccan Basaltic Province (DBP) and consists of the Compact/massive (aa type) and vesicular-amygdaloidal (pahoehoe type) of basalt flows. During the fieldwork, the deformational structures were found in the Quaternary sediments and in the ejecta blanket formed after the impact of the meteorite in the Lonar area. The crater wall dips between 5° and 25°, with overturn observed in the rim fold. The most conspicuous fault deformation observed directly is layer-parallel slip along the contact on the crater wall. In rare localities, there are normal faults with hanging wall down into the crater with offsets of less than about 10 m.

Keywords: *Deformational structures; Deccan basalts; ejecta blanket; Lonar Lake*

Water resource management in Amarpatan block, Satna District, Madhya Pradesh, India

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Abstract:

This research focuses on the intricate task of water resource management in Amarpatan Block, Satna District, Madhya Pradesh, India, where water scarcity poses a significant challenge to sustainable development. The study employs a multi-faceted approach, integrating watershed management, hydrogeological investigations, and Geographic Information System (GIS) technologies to comprehensively address the complexities of water resource dynamics in the region. The main objective of this research is to comprehensively evaluate the current state of water scarcity, gain a deep understanding of the hydrogeological features of the area, and develop a strategic plan for managing the watershed. Key aspects of the hydrogeological assessments will involve delineating aquifers, analyzing the quality of groundwater, and pinpointing potential areas for recharge. The integration of GIS technologies facilitates spatial mapping and analysis, enabling the visualization of critical water resource data. In order to enhance the sustainability of our water resources, this study recommends the utilization of various watershed management techniques such as check dams, contour trenches, and percolation ponds. By strategically placing these structures in accordance with hydrogeological data and utilizing GIS technology, we can effectively optimize rainwater harvesting and groundwater recharge for maximum impact. The results of this study will make a substantial contribution to the creation of an all-encompassing plan for the management of water resources of Amarpatan Block. This study intends to provide useful advice for addressing water scarcity and ensuring sustainable water resource exploitation in the region to policymakers, local authorities, and community stakeholders.

Keywords: *Water Resource Management; Amarpatan Block; Satna District; Madhya Pradesh*

Morphometric Analysis of Kanola river basin in Ahmednagar and Solapur district, Maharashtra, India

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Abstract:

In the present study, morphometric analysis conducted on Kanola River and its 11 watersheds using Geographical Information System (GIS) techniques. The objective of this study is to analyze the drainage characteristics and topographical relations of the Kanola basin and its watersheds using GIS techniques. It is major tributary of river Sina. Average rainfall in the basin is 700 mm/year. The highest temperature is 45°C during May, and lowest is 10°C during January. The entire study area is covered by the Deccan Volcanic Basaltic Province (DVBP), dating from Late Cretaceous to Early Eocene age. More than third-order stream watersheds are selected for the present work. It is observed that small change in drainage density and stream frequency watershed values within the basin indicates the differential erosional and local geological influence of the development of the streams in the Kanola river. The bifurcation ratio of the watersheds number K8 to K11 is more than 5, indicating hilly terrain with a structurally controlled basin. The drainage density of the watershed number K11 is 3.71 km/km². Indicates this watershed is more impermeable compared to other watersheds and high runoff from this watershed. The form factor, circularity ratio, and basin elongation ratio show most of the watersheds are elongated in shape except watershed numbers K5 and K6.

Keywords: GIS; Kanola; Morphometry; Form factor; Circularity ratio; basin elongation ratio

Study of plant diversity in forest hotspots and their environmental significance in Nanded District, Maharashtra

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Abstract:

The biodiversity is defined as the variety and variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems. Conservation of biodiversity is important to mankind for various reasons. It facilitates ecosystem functions (carbon exchange, watershed flows, soil fertility, climate, etc.), offers aesthetic, scientific, cultural, and other values, and forms the basis for foodstuff, fibers, pharmaceuticals, chemicals, etc. Nanded forest division has a good deciduous forest hotpot, and it is only available in Bhokar taluka (Sitakhandi forest area), Hadgaon taluka (Kedarguda forest area), Kinwat and Mahur talukas. Bhokar Plateau covers parts of Hadgaon, Himayatnagar and Bhokar Tahsils. This plateau has an altitude varying between 400 and 550 meters and makes the water divide between the Godavari and the Penganga rivers. It is partly covered with dry mixed deciduous forests. Kinwat and Mahur taluka of Nanded districts has old heritage of medicinal plants and herbal medicine. Forest is rich in biodiversity and consists of rare medicinal plants. Biogeographical condition such as altitude, soil type and average rain fall make the vegetation diversity in this area. Mostly the selected forest areas were dominated by tribal populations which are directly dependent on forest resources of forest fringe villages. The available literature gives the data about the tribal population available in the Nanded district mainly, Schedule Tribe Population of Andh; Koli Mahadev, Dongar Koli; Kolam, Mannervarlu; Gond, Rajgond, Arakh, Arrakh, Agaria, Asur, Badi Maria, Bada Maria, Bhatola, Bhimma, Bhuta, Koilabhuta, Koilabhuti, Bhar, Bisonhorn Maria, Chota Maria, Dandami Maria, Dhuru, Dhurwa, Dhoba, Dhulia, Dorla, Gaiki, Gatta, Gatti, Gaita, Gond Gowari, Hill Maria, Kandra, Kalanga, Khatola, Koitar, Koya, Khirwar, Khirwara, Kucha Maria, Kuchaki, Maria, Madia, Maria, Mana and Manne. Due to overexploitation of trees by the villagers for their daily needs like fuelwood, wood for house construction and due to introduction of new species has resulted in declining the native species along the forest fringe areas. In this scenario there is urgent need of conservation of native species by forest department, local people and tribals for multiplication of valuable useful medicinal trees. In present investigation various forest types occur in the study area will be discussed.

Keywords: *Plant diversity; selected forest hotspots; Nanded district; Tribal Populations.*



Identification of groundwater potential in part of Pedhi River basin, taluka Bhatkuli of Amravati district, Maharashtra using RS and GIS

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Abstract:

Groundwater, as a fundamental resource, sustains life and facilitates numerous human activities. However, its availability is under constant threat due to factors like overexploitation and environmental changes. This study concentrates on evaluating the groundwater potential within a specific segment of the Pedhi River basin, located in Bhatkuli taluka, Amravati district, Maharashtra, India. Leveraging remote sensing (RS), geographic information systems (GIS), and the Analytical Hierarchy Process (AHP), the research integrates several geoenvironmental factors such as geomorphology, land use/land cover, geology, slope, and drainage density to delineate groundwater potential zones. Through this comprehensive analysis, the study categorizes the study area into four distinct zones based on their groundwater potential: very good, good, moderate, and poor. These zones respectively occupy 13.54%, 67.20%, 15.99%, and 3.27% of the total area. Such detailed categorization enables a nuanced understanding of the groundwater resources in the region, facilitating informed decision-making in sustainable water resource management and planning. This assessment assumes heightened significance in light of the escalating challenges posed by water scarcity, particularly in regions experiencing rapid population growth and increasing demand for water resources. By employing advanced spatial analysis techniques and integrating multiple datasets, this study provides valuable insights into groundwater availability and lays the groundwork for effective strategies aimed at preserving and managing this critical resource for future generations.

Keywords: Remote Sensing; GIS; Groundwater Potential; Pedhi River; AHP



Impact of Manganese from agrarian waste on the water quality of Limboti water reservoir

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Abstract:

Manganese, a transition element, is a crucial metal with sophisticated roles in various biological as well as environmental processes. From vital nutrient to versatile resource, manganese plays a hidden hand in both life and our environment. Within living organisms, manganese works as an enzyme helper, supporting energy production, antioxidant defenses, and bone health. Even soil and water systems rely on its presence for critical biogeochemical cycles that sustain ecosystems. Manganese originates from both nature's bounty, like mineral deposits, and human activities including industry and agriculture. This complex journey sees it move through air, water, and soil, undergoing transformations mediated by tiny microbes. This study examined waste discharge from agricultural livestock and land at three different sites. The concentration of manganese discharge from the agrarian field in the form of storm water and waste at each site was measured and it denotes that the concentration of manganese surpasses its standard limits. Limboti reservoir is free from industrial pollution as per this research. The water samples were collected from 3 different sites during the period of two year from February 2019 to January 2020. The Minimal value was found during the Post monsoon season i.e., 0.14 mg/L at site S1 and maximum was 1.8 mg/L in the Monsoon season at sampling Site S2. The Manganese concentration was analyzed by Persulphate Method using Shimdzu U.V-1800 Spectrophotometer.

Keywords: *Manganese; Enzyme; Limboti reservoir; Persulphate Method; Spectrophotometer.*

Geospatial analysis and Lithostratigraphic study of Gharni River Sub-basin of Manjra River, Latur district, Maharashtra, India

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Abstract:

North-south trending Gharni river is originated from Balaghat hill range in Latur district of Maharashtra, India. Geologically, it is flowing over Deccan Basaltic Province (DBP) of late Cretaceous to early Eocene age. In this study, important quantitative morphometric and geomorphic Indices of Active Tectonics (GIAT) parameters are applied to Gharni River basin and its nineteen watersheds in order to study the tectonic setting of the basin. It is a tributary of Manjra River covers an area of 472.11 km². The climate of the area is semiarid and sub-tropical, with a characteristically hot summer. The highest elevation noted near Chakur village is 733 m, and the lowest is 565 m above mean sea level (MSL) near Sangavi village (confluence part of Gharni and Manjra river). Based on quantitative morphometric analysis, it is found that the Gharni River is a 6th order stream; it flows over homogeneous and semi-permeable rock formation, and the slope is moderate to steep. The drainage density (1.48 km/km²), stream frequency (1.28 streams/km²), and drainage texture (6.25 km⁻¹) show that the river is flowing over a semi-permeable basaltic formation. The average Rb value is 4.47; it is less than 5, indicating drainage is not disturbed due to tectonics. However, the basin elongation ratio (0.71) shows that the basin is semi-elongated in shape, the basin asymmetry factor is 29.6, and the transverse topographic symmetry factor is 0.69, indicating that the basin is tectonically slightly tilted. The hypsometric integral value is 40.7, which shows that the basin is in the early mature stage of river development, and the stream gradient length ratio pointed towards the basin shows a second-order anomaly. The litho-sections along the Gharni river are studied from eleven sites from four villages such as Gharni, Lakkhajawala, Shirur Anantpal, and Hortal.

Keywords: Geospatial; GIAT; Lithostratigraphy; Morphometry.



Unveiling the Secrets of the Sindphana: A Morphometric Voyage using GIS

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Abstract:

Embedded within the intricate tapestry of the Wardha River basin, the Sindphana River whispers tales of a vibrant hydrological soul. Yet, beneath its glistening surface lies a hidden symphony of geomorphic forces, their secrets waiting to be unraveled. This study embarks on a captivating voyage of discovery, wielding the potent lens of Geospatial Information Systems (GIS) to decipher the morphometric language of the Sindphana basin. Employing the wizardry of ArcGIS or QGIS, we embark on a transformative journey: meticulously extracting the intricate river network from raw data, pre-processing it with surgical precision, and then calculating a plethora of morphometric parameters. Stream length whispers of the river's expansive reach, while sinuosity unveils its flirtation with curves, and the bifurcation ratio unveils the intricate branching patterns that define its network. Drainage density paints a vibrant picture of runoff tendencies, while stream order chronicles the hierarchical evolution of the channels, offering a glimpse into the basin's developmental history. Through the captivating language of thematic maps and meticulous statistical analysis, we weave these parameters into a mesmerizing tapestry, revealing the spatial distribution patterns and mesmerizing interrelationships that govern the basin's behavior. Erosional and depositional processes come alive as sinuosity and drainage density waltz across the landscape, their intricate dance painting a vivid picture of geomorphic dynamism. Potential areas vulnerable to erosion and flooding emerge from the shadows, whispering warnings and guiding the way towards sustainable water resource management. This study transcends mere data collection; it is a transformative odyssey, unearthing the secrets of the Sindphana River and weaving them into a tapestry of knowledge that holds the power to nourish ecosystems, empower communities, and guide the region towards a sustainable future. Hydrologists and geomorphologists will find newfound clarity in the fluvial processes and basin evolution. Water resource managers will be gifted with invaluable data to craft sustainable strategies for the region's future. Environmental planners will be empowered to identify vulnerable areas and orchestrate symphonies of flood mitigation and soil conservation. And for the communities that call the basin home, this knowledge will be a beacon, illuminating potential hazards and fostering responsible water use practices.

Keywords: Sindphana River; morphometric analysis; hydrology; water resource management

Unraveling the Earth's depths: geochemical tomography with lamprophyre clues

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Abstract:

This chapter explores the intriguing world of lamprophyres, a type of volcanic rock that has long puzzled geologists and geochemists alike. These rocks are known for their unusual composition and geochemical signatures, which suggest that they may have formed in unique and complex geological environments. Lamprophyres are important witnesses in the subterranean investigation of the Earth's interior, and their study has provided valuable insights into the processes that shape our planet. Through the use of advanced analytical techniques, geochemists are now able to decipher the complex geochemical signals contained within these rocks, shedding new light on the mysteries of our planet's past and present.

Keywords: *Lamprophyre; Geochemical tomography; hydrology; water resource management*

Land use practices and its change with time around the mining areas of Sinhgori coal mine by using Remote Sensing in parts of Saoner, Parshivni and Kamptee taluka of Nagpur district, Maharashtra

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Abstract

The Nagpur district, located in the heart of Maharashtra, is renowned for its rich mineral resources, particularly coal reserves. Sinhgori Coal Mine, situated in Parshivni talukas, has been a significant contributor to the district economy. However, the rapid expansion of coal mining activities in the region has raised concerns regarding its environmental and socio-economic impact, particularly on groundwater resources. With the district being home to numerous coal mines, including both underground and open-cast operations, the extraction of groundwater during mining processes has become a burning issue. This has led to a notable decline in water levels and water quality and subsequent repercussions on local communities and ecosystems. Recognizing the urgent need to address the depletion of groundwater levels in the vicinity of Sinhgori Coal Mine, this study aims to assess the extent of groundwater withdrawal, develop a comprehensive understanding of land use changes resulting from mining activities, and propose effective remedies to mitigate these issues. A variety of changes in land utility have taken place with time. Therefore, the comparative changes in land use patterns with time in the study area need to be studied in detail, and its socio-economic impact needs to be understood. Utilizing advanced Remote Sensing and Geographic Information Systems (GIS) techniques and satellite imagery, the study analyze land use patterns over two distinct time periods (2015-16, and 2022-23, before and after the commencement of mining activity) to track the evolution of land utilization in the study area. Land under irrigation, build-up areas, forest and wasteland areas, waterbodies, mining areas, and industrial areas will be studied in detail. The research will provide valuable insights into the transformation of land use, highlighting the increasing footprint of mining and industrial activities over time.

Keywords: *Groundwater withdrawal; Remote Sensing; Geographic Information Systems (GIS); land use pattern*

Hydro-geochemical investigations of Domi River basin, Bhatkuli, district Amravati, Maharashtra

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Abstract

Groundwater quality assessment and well inventory were carried out along the Domi River basin, which is a tributary of the Pedhi River, Amravati, Maharashtra. A total of eighteen water samples were collected from the study area and analyzed for hydrogeochemical variation and quality of groundwater. Eight water quality parameters viz. Temperature, pH, TDS, Acidity, Alkalinity, Calcium, and Hardness have been calculated. The study area falls under a semi-arid climate with a wide mean temperature range, and the average rainfall is 49.700 mm. The observed well inventory data from the study area shows the depth of the groundwater table varies from 20 m to 40 m. The pH value of the samples shows a variation from 7.34 to 7.89, which indicates the normal PH range of water. The observed TDS of the samples varies from 438 - 654 mg/l. The village Shivani (Bujurg) and Badnera are showing higher values of TDS, which fall in the less acceptable category for drinking purposes. Calcium values ranging from 27 - 156 mg/l, Akoli and Uttamsara show less than 50 mg/l, which is lower than the acceptable limit according to BIS standard. The observed Alkalinity value ranged from 123 - 345 mg/l, the lowest value of alkalinity recorded at Borgaon. The Carbon dioxide value varies from 40 - 80mg/L. The average value of carbon dioxide 40 - 60 mg /l is seen in a number of villages. The observed Acidity value ranges from 108 – 204 mg/l. According to the BIS standards as well as overall evaluation during the period of the study shows that all groundwater samples except a few are suitable for drinking and irrigation purposes.

Keywords: *Groundwater quality; Domi river basin; Hydro-geochemical; Acceptable limit; BIS*



Estimation of agricultural soil based on irrigated and non-irrigated area in Ardhapur, India

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Abstract:

Soil is the fundamental base of any nutrients present on Earth. The soil is made up of complex weathered material from different rocks, contains minerals and organic constituents. It provides supports to the terrestrial life and it is main medium of plant growth. An attempt was made to study soil characteristics using various parameters like soil pH, macronutrients (N, P, K, Ca and Mg) and micronutrients (Fe, Mn, Cu and Zn). In the present investigations, 30 representative soil samples were collected at a depth of 0–20 cm and analysed in School of Earth Sciences, Swami Ramanand Teerth Marathwada University Nanded to assess the agricultural soil quality. The obtained result of Irrigated soil samples showed pH in the range of 6.54-7.15, N is 204.75-247.92 kg/ha, and Phosphorus is 4.85-6.07 kg/ha. K is 438.27-632.06 kg/hac. Ca is 30.83 ppm, Mg is 34.91-45.53 ppm, Zn is 0.21-2.45 ppm, Cu is 1.10-2.43 ppm, M is 2.35-3.43 ppm, Fe is 1.97-2.73 ppm. The soils from the non-irrigated area showed result for pH in the range of 7.38-7.65, N is 266.58-349.42 kg/hac, P is 5.14-6.13 kg/hac, K is 487.33-686.65 kg/hac, Ca is 28.89-42.88 ppm, Mg is 37.40-43.64 ppm, Zn is 0.28-2.42, Cu is 1.13-2.51 ppm, Mn 2.31-3.82 ppm, Fe is 2.11-2.84 ppm. N and K are all above the BIS standards except phosphorus. This study shows the soil lacks micronutrients in selected areas, and it may be because of excessive farming and continuous cropping without any break to take cash crops. Based on lab results in given soil samples, only available Cu is sufficient level and other metals are less according to BIS standard.

Keyword: *Macronutrients; Micronutrients; Agricultural soil; Soil analysis*

Assessment of groundwater quality at Basmath, District Hingoli

Maharashtra

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Abstract:

Groundwater, as a vital resource, plays a pivotal role in sustaining various ecological systems and meeting the burgeoning water demands of human populations worldwide. However, its quality is increasingly under threat due to anthropogenic activities and natural processes. Contaminated groundwater can lead to waterborne diseases, soil degradation, and loss of biodiversity, thereby jeopardizing the sustainability of ecosystems and community well-being. The present investigation has been made at Basmath. The ground water samples were collected from 24 locations including 18 bore wells and 6 open wells. The parameters were analyzed for pH, TDS, Hardness, Calcium, Magnesium, sodium, potassium, chloride, and sulfate with the help of standard methods of APHA 2005. Hardness, TDS and Calcium were found elevated for drinking purpose. The assessment of groundwater quality is crucial for understanding the dynamics of subsurface water systems and devising effective management strategies to preserve environmental sustainability.

Keywords: Groundwater; Sustainability; Ecosystems; Degradation; Anthropogenic



GIS based hydrogeological investigation of Suryaganga River a sub-tributary of Wardha River, Amravati District, Maharashtra

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Abstract:

A hydrogeological assessment is a comprehensive evaluation of the groundwater conditions and characteristics within a specific area. This assessment involves the study of geological formations, hydrological processes, and the distribution and movement of groundwater. This research paper presents a comprehensive GIS-based hydrogeological investigation of the Suryaganga River, a vital tributary of the Wardha River in the Amravati District, Maharashtra. Employing advanced Geographic Information System (GIS) techniques, the study integrates spatial data, hydrological analyses, and geological assessments to gain insights into the hydrogeological dynamics of the region. Data collection involved the compilation of topographic, geological, rainfall, land use/land cover, and hydrological datasets. GIS data preparation encompassed the digitization of river networks, watershed delineation, and georeferencing of relevant information. Hydrological analyses included the delineation of watersheds, calculation of key parameters using morphometric analysis and identification of groundwater recharge and discharge areas with help of well inventory. Geological analyses focused on understanding rock formations, soil types, and structural features influencing groundwater movement. GIS emerges as a powerful and dynamic tool in facilitating qualitative hydro-geological research studies.

Keyword: GIS; Hydrogeological; Tributary; Watershed; Groundwater

Hydrogeomorphological studies of the Upper Purna River basin by using Remote Sensing and GIS techniques, Maharashtra, India

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Abstract:

To evaluate the hydrogeomorphological condition has been carried out along the Upper Purna River in parts of Aurangabad, Jalna, Buldhana, Washim, Parbhani and Hingoli districts in the state of Maharashtra, India. It is an important for planning and management of water resources and sustainable development in this area. Survey of India (SOI) maps, and Landsat images are used to prepare various thematic layers such as geomorphology, geology, drainage patterns, and slopes, which are responsible for the occurrence, movement, and yield of groundwater. The satellite image of 1-C, IRS-1D, LISS IV has been used to delineate the hydrogeomorphological units. The study is focused on delineating groundwater potential zones for future development and exploration. The different hydrogeomorphic units and features identified using remote sensing data, GIS and conventional information with limited ground truth are alluvial plains, flood plains, paleochannels ravines, etc. The groundwater potential of each geological and geomorphologic unit has been evaluated in order to obtain a complete hydrogeological picture of UPR. The final result shows the prosperous groundwater zones in the study area and can be helpful in better planning and management of groundwater resources, especially in rock terrains. Groundwater potential index will be generated using a groundwater potential map.

Keywords: *Hydrogeomorphology; Upper Purna River; Groundwater potential zones; Remote sensing*



Basin Asymmetry and Basin Elongation ratio analysis of Karanja River a tributary of Manjra River- using Geographical Information System

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Abstract:

In the present study, basin asymmetry and basin elongation ratio analysis of Karanja River basin have undertaken using Geographical Information System (GIS) techniques. For this, Alaska Satellite Facility, digital elevation maps (DEM) having 12.5 m resolution have used. Geologically present study area is covered by Deccan volcanic province (DVP) and lateritic formations. The Karanja River covers 2940.76 km² area and it have again classify in to its 109 watersheds. The basin asymmetry of Karanja and its watersheds have classified in to three categories such as less than 45%, 45% to 55% and more than 55%. The ratio in between 45% to 55% is for symmetrical basins and less than 0.45 and more than 0.55 are for the asymmetrical basins. More than 55.0% AF value shown by watershed numbers 2, 5, 12, 16, 18, 25, 27, 33, 35, 44, 46, 47, 50, 51, 54, 57, 67, 68, 70, 72, 74, 75, 78, 79, 80, 81, 82, 84, 87, 88, 92, 95, 96, 98, 107. Less than 45.0% shown by 3, 7, 8, 10, 13, 14, 15, 23, 24, 26, 28, 29, 30, 31, 32, 36, 38, 39, 40, 43, 52, 56, 64, 71, 76, 83, 85, 86, 89, 91, 93, 94, 97, 99, 101, 105, 106 watersheds. All this watershed show is asymmetrical in nature. Similarly, the basin elongation ratio of the watersheds is also classified into three categories such as less than 0.50, 0.50 to 0.75, and more than 0.75 for highly elongated, semi-elongated, and oval or circular basins. A basin elongation ratio less than 0.50, shown by watershed numbers 10, 30, 55, 57, 58, and 65, indicates a highly elongated shape.

Keywords: Asymmetry; Elongation; GIS; Karanja River

Mapping Of Transportation Network Using Remote Sensing And GIS Tools

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Abstract:

The present study was carried out to utilise remote sensing and GIS tools for mapping of transportation network. Mapping of transportation network is crucial for planning, transportation engineering and geography as well as development of different activities. The use of GIS tools in combination with remote sensing for transport network mapping encompasses sophisticated process that combines the capabilities of both technologies to collect, analyze and visualize transportation infrastructure and its usage patterns over wide geographic areas. The current investigation was carried out for mapping of transportation network of the Hingoli district of the Maharashtra state, India using multispectral satellite images and SOI Topographic maps. The geocoded ground truth data was collected through the field surveys. Thematic maps of road and railway networks of the study area was prepared with UTM projection with WGS 84 datum (Zone 43N). The present study revealed that Hingoli district is endowed with 5333.61 km of road network with estimated road density of 1.13 km/sq. km. The road network density of the Hingoli district was found to be much lower than estimated road density (1.8 km /sq. km) for road network of the India. Out of the total road network, almost 53.69% of road network was found to be Bitumen Roads (BT) and 46.31% were Water Bound Macadam (WBM) type. The share of village roads in total road network of the district was found to be 69.52% with very low stake of national and state highways. The railway network of the district comprised of meter gauge railway with total length of 100.22 km under South Central Railway (SCR). The study concludes that the transport network of the Hingoli district was found to be below the average transport network at national level.

Keywords: *Transport Network, Roads, GIS, Remote Sensing, Road Density*

Geology Department

The Geology Department of Toshniwal Arts, Commerce, and Science College, Sengaon is a dynamic and innovative department that was established in 2009. The department has two highly qualified and experienced faculty members who are dedicated to providing a challenging and rewarding learning environment for their students. The department offers a comprehensive BSc. undergraduate course that covers a wide range of topics related to geology. Over the years, the department has completed several major and minor research projects that have been funded by various agencies, which demonstrates the quality of research work that is being carried out in the department. The department is proud to have the best rock and mineral museum, which is a great resource for students to learn about different types of rocks and minerals. Additionally, every year, the department conducts geological field visits to various places, which is an excellent opportunity for students to apply the theoretical knowledge they have gained in the classroom to real-world situations. Overall, the Geology Department is a great place to learn and explore the fascinating world of geology.



ISBN: 978-93-340-1919-3

