

IDENTIFICATION OF GEOPATHIC STRESS WITH BLACK SPOT MAPPING USING AUTOCAD

¹ Rahul Matkar, ² Krishna Bhattagoud, ³ Shivani Dombale, ⁴ Gautam Gaikwad, ⁵ Uma Garud

¹ Assistant Professor, ² U.G. Student, Department of Civil Engineering,

³ U.G. Student, Department of Civil Engineering, ⁴ U.G. Student, Department of Civil Engineering, ⁵ U.G. Student, Department of Civil Engineering, Zeal College Of Engineering And Research, Pune, MH 411041, India

Abstract : Geopathic Stress (GS) refers to harmful earth energies and distorted electromagnetic fields produced by subsurface features such as underground water streams, geological faults, mineral deposits, and cavities. These anomalies influence human health and can adversely affect the performance and durability of transportation infrastructure. This study aims to identify and analyze geopathic stress zones along road corridors and investigate their association with accident black spots and pavement deterioration. Field investigations were conducted using L-rod dowsing and geo-resistivity meter techniques, with validation through GP 3D and NAAV meter based on the Light Interference Technique. Variations in rod deflection and reduced electrical resistivity values indicated the presence of underground water veins and stress zones. Laboratory analysis of soil samples revealed increased moisture content, void ratio, and plasticity in GS-affected areas, leading to premature pavement failures such as cracking and surface distress. Accident-prone locations were identified using ranking, severity index, and accident density methods based on NHA1 and MSRDC records. The collected data were digitized and represented through AutoCAD-based mapping to develop black spot maps. The study highlights the integration of traditional detection techniques with modern mapping tools for improving road safety and infrastructure management.

KEYWORDS: Geopathic Stress, Black Spot Mapping, AutoCAD, Pavement Distress, Road Accidents, Highway Safety.

INTRODUCTION

Road accidents continue to be a major challenge in transportation engineering, with many incidents repeatedly occurring at specific locations known as accident black spots. In several cases, accidents persist despite adequate road geometry, pavement condition, and traffic control measures, indicating the possible influence of hidden environmental factors.

Geopathic Stress (GS) is a natural phenomenon associated with weak electric and magnetic field distortions caused by subsurface geological features such as underground water streams, fault lines, and mineral deposits. Previous studies suggest that GS may affect human alertness and contribute to pavement deterioration through changes in soil properties. However, its influence on road safety and pavement performance has received limited scientific attention.

This study investigates the relationship between geopathic stress zones and accident black spots using geophysical instruments and spatial mapping techniques. Geopathic stress locations are identified and drafted in AutoCAD to analyze their correlation with accident-prone areas. By integrating geophysical observations with transportation engineering, the study introduces a novel approach for understanding hidden factors affecting road safety and infrastructure performance.

The findings are expected to support improved road safety assessment, pavement management, and sustainable infrastructure planning.

NEED OF THE STUDY.

Road accidents remain a major cause of fatalities despite improvements in highway design, traffic management, and pavement engineering. Conventional accident studies mainly consider factors such as road geometry, traffic volume, driver behavior, and pavement condition. However, accidents often continue to occur at specific locations even after corrective measures, indicating the possible influence of hidden environmental factors.

Geopathic Stress (GS), caused by subsurface features such as underground water streams, fault lines, and mineral deposits, is a potential factor affecting both driver performance and pavement condition. Research suggests that GS may contribute to driver

fatigue, reduced concentration, and delayed reaction time, while also accelerating pavement distress through changes in soil moisture and resistivity.

Since GS has received limited attention in transportation engineering, there is a need to investigate its relationship with accident black spots. This study integrates geophysical instruments such as GP-3D, dowsing rods, and geo-resistivity meters with GIS-based mapping to identify GS zones and analyze their correlation with accident-prone locations. The findings can contribute to improved road safety, enhanced pavement performance, and the development of sustainable infrastructure planning strategies.

AIM AND OBJECTIVE

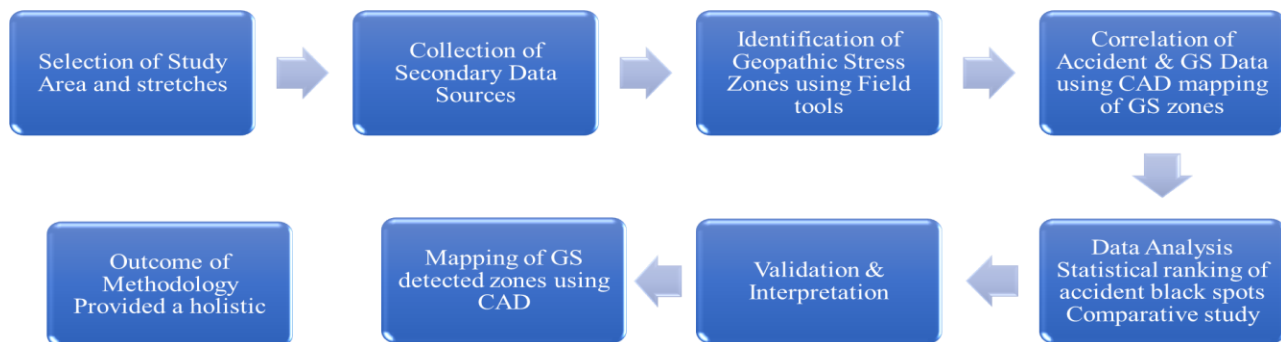
3.1 Aim

Identification of geopathic stress zones and mapping with the help of Automated computer aided drawing.

3.2 Objectives

1. To detect geopathic stress zones along selected road corridors using L-Rod and GP-3D.
2. To map stress zones with the help of AutoCAD.
3. To analyze the relationship between geopathic stress zones and accident black spots.
4. To recommend suitable mitigation and design measures to minimize the effects of geopathic stress.

RESEARCH METHODOLOGY



1. **Selection of Study Area:** A 2.1 km stretch of NH-48 from New Katraj Tunnel to Dari Pool, Pune, was selected due to frequent accidents and pavement distress.
2. **Collection of Secondary Data:** Accident records, highway data, geological information, and maintenance records were collected from NHAI, MSRDC, police departments, and published reports.
3. **Division by Chainage Method:** The study stretch was divided into 20 m intervals to facilitate systematic observations and data collection.
4. **Identification of Geopathic Stress Zones:** L-Rod dowsing and GP-3D instruments were used to detect and verify geopathic stress zones.
5. **AutoCAD Mapping:** GPS coordinates, chainage data, accident locations, and stress zones were digitized and mapped using AutoCAD.
6. **Correlation Analysis:** Accident records and pavement distress locations were compared with geopathic stress zones to identify possible relationships.
7. **Data Analysis:** Statistical and comparative analyses were carried out to evaluate accident frequency and pavement performance within stress zones.
8. **Validation and Interpretation:** Results were cross-verified using repeated surveys and historical records to draw conclusions regarding the influence of geopathic stress on road safety and pavement distress.

3.1 INSTRUMENT



Fig: 1 – L-Rod (copper or Brass)



Fig:2 – GP-3D

IV. RESULTS AND DISCUSSION

The present study was conducted to analyze the possible relationship between geopathic stress and accident black spots using AutoCAD mapping and geological survey interpretation. Different survey reports and mapping profiles were studied to identify underground stress zones, depth-frequency variations, and spatial distribution patterns. The obtained results were analyzed using contour mapping, depth profiles, and frequency distribution graphs to understand the possible impact of underground geological disturbances on road safety.

4.1 Survey Analysis of Study Area

Three different survey locations were analyzed in the present study. The survey reports provided information regarding underground source depth, rock strength, permeability factor, water quantum, salinity, and frequency mapping patterns. These parameters were useful in identifying possible geopathic stress zones.

4.2 Results

Table 4.2: Survey Data Analysis

Parameters	Katraj Ghat Down Slope	Shindewadi Stretch	Katraj Vaiduct
Latitude	18.4404643	18.4485519	18.4514333
Longitude	73.8398991	73.8347385	73.8296393
Total BHD (m)	262	271	271
Rock Strength (%)	47	60	69
Water Quantum (LPH)	3713	4415	3646
Water Quality (%)	66	59	42
Salinity (%)	76	43	37
Permeability Factor (%)	56	57	60

4.3 Analysis of 3D Surface–Depth–Frequency Mapping

The 3D mapping results obtained from the survey reports showed noticeable changes in frequency values with increasing depth. Higher frequency regions were mainly observed between depths of 80 m to 160 m. These regions are represented by red and orange color bands in the contour profiles, indicating comparatively high underground activity. Lower frequency regions were represented by green and blue shades near the surface level.

3D Mapping:Surface-Depth-Frequency

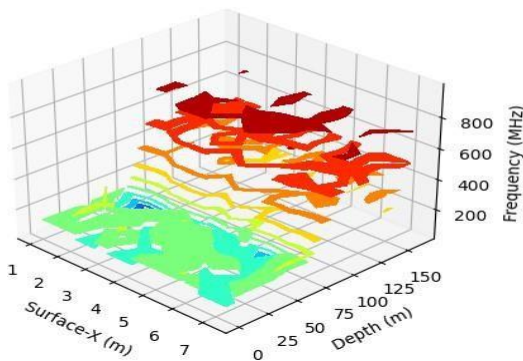


Fig: 2 - 3D Mapping Surface Depth
Frequency (Katraj Ghat DownSlopes)

3D Mapping:Surface-Depth-Frequency

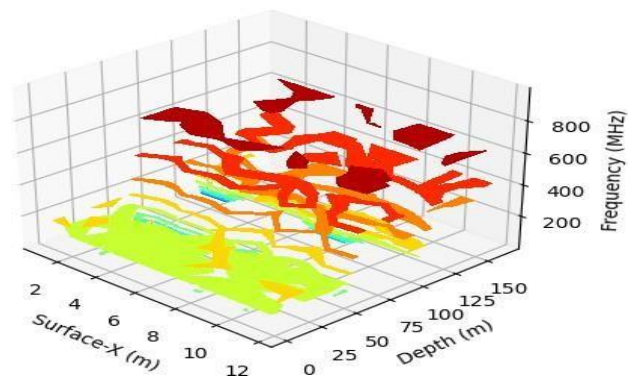


Fig: 3 - 3D Mapping : Surface – Depth -
Frequency (Shindewadi Stretch)

3D Mapping:Surface-Depth-Frequency

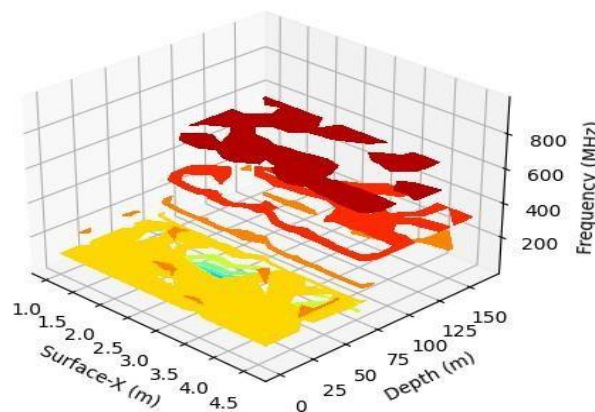


Fig:4 - 3D Mapping : Surface – Depth - Frequency (Katraj Vaiduct)

4.4 Earth Depth Profile Analysis

The Earth Depth Profiles showed that high-intensity regions were concentrated at deeper levels. In Katraj Ghat Down Slopes, major stress concentration was observed between 80 m and 150 m depth. Similar trends were also observed in Shindewadi Stretch and Katraj Vaiduct survey reports. These regions showed high-frequency values represented by red-colored contours.

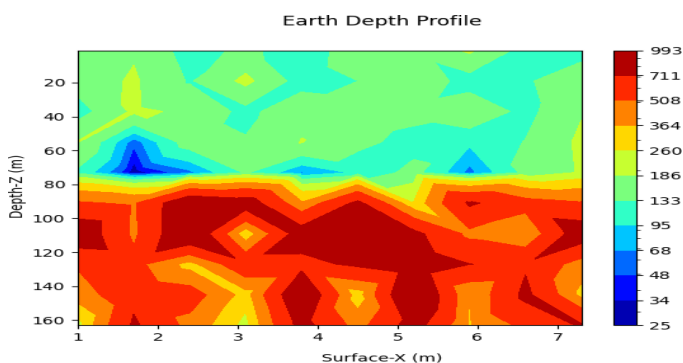


Fig: 5 - Earth Depth Profile (Katraj Ghat Down Slopes)

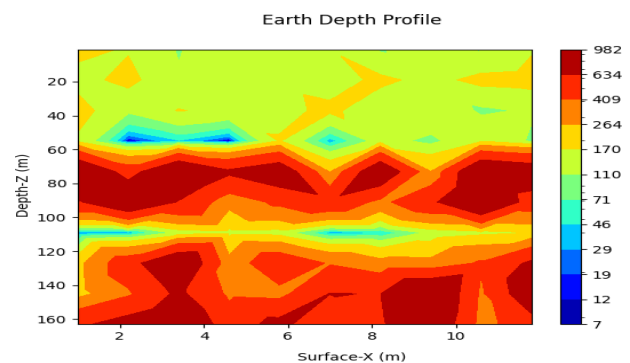


Fig: 6 - Earth Depth Profile (Shindewadi Stretch)

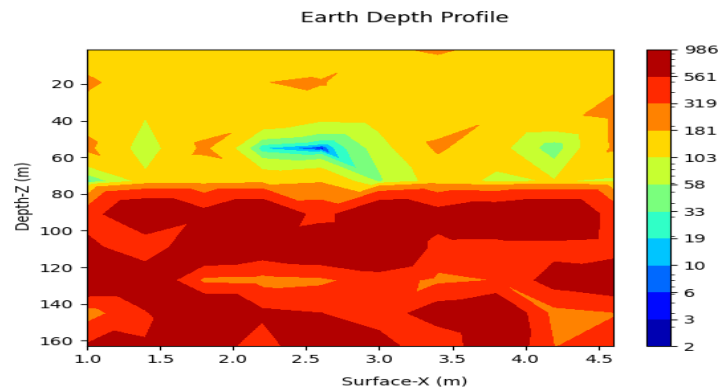


Fig: 7 - Earth Depth Profile (Katraj Vaiduct)

4.5 Latitude–Longitude Profile Analysis

The latitude–longitude mapping showed uneven spatial distribution of stress intensity throughout the study area. Some zones consistently showed higher frequency concentration compared to surrounding areas. These high-frequency regions may represent potential geopathic stress zones. The mapping technique helped in identifying the exact geographical regions where underground anomalies were concentrated.

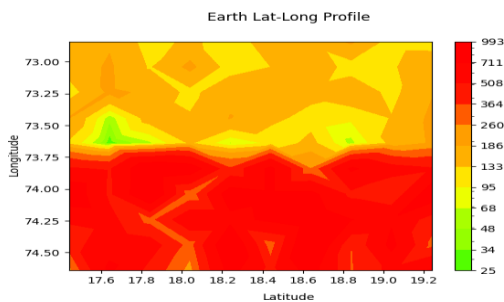


Fig:8 - Earth Lat-Long Profile (Katraj Ghat Down Slope)

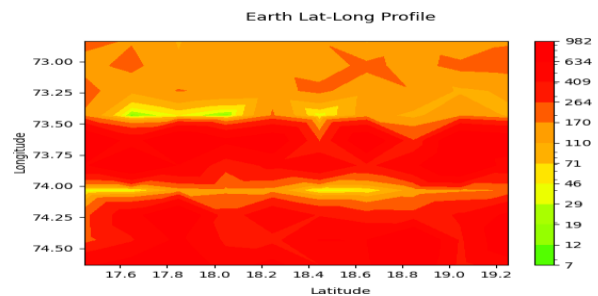


Fig:9 - Earth Lat-Long Profile (Shindewadi Stretch)

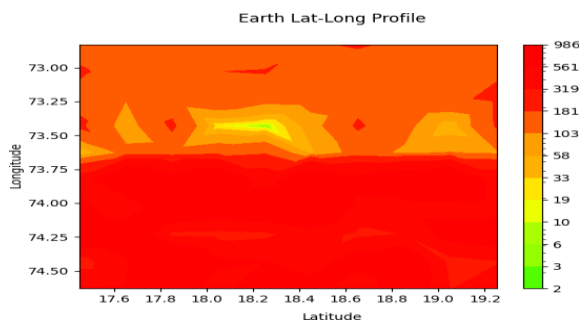
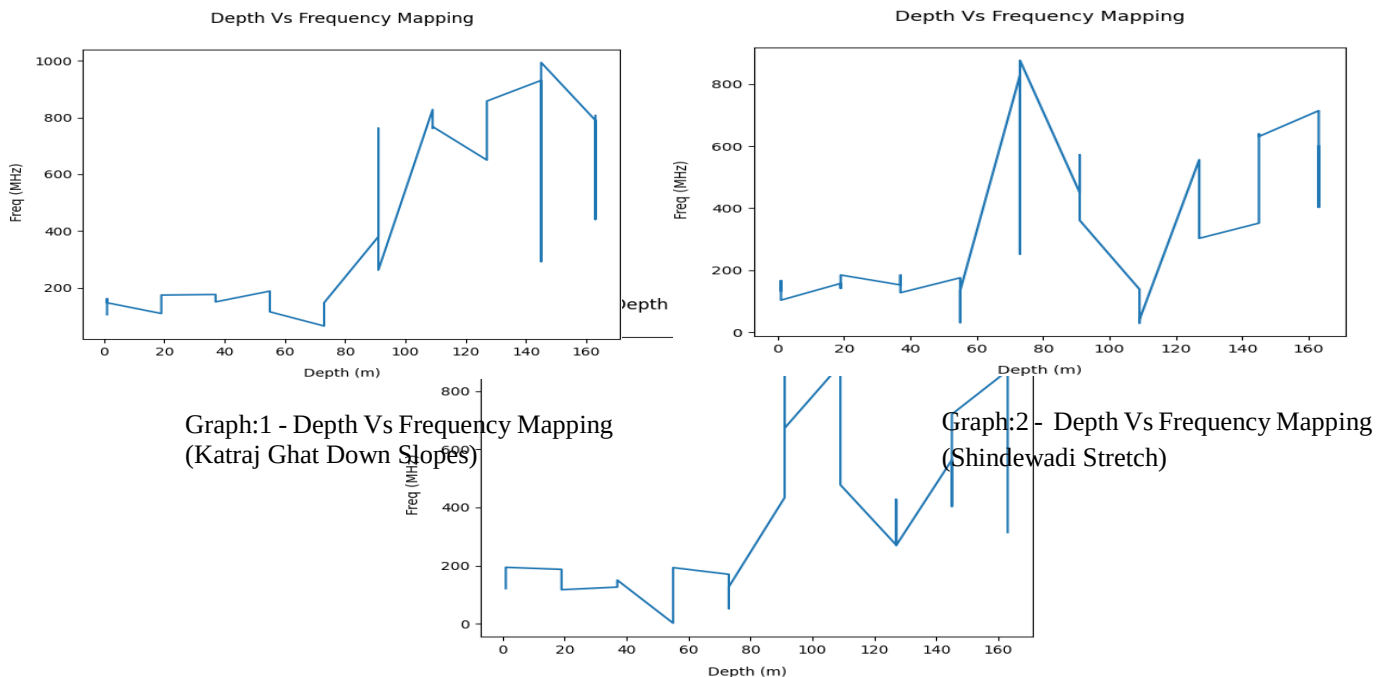


Fig:10 - Earth Lat-Long Profile (Katraj Vaiduct)

4.6 Depth Vs Frequency Analysis

The Depth Vs Frequency graphs showed that frequency values increased gradually with increase in depth and reached peak values near 140 m to 160 m depth. In some locations, sudden spikes in frequency values were observed, indicating abrupt underground geological changes



Graph:3 - Depth Vs Frequency Mapping (Katraj Vaiduct)

CONCLUSION

This study investigated the potential relationship between geopathic stress zones and accident black spots using AutoCAD-based spatial mapping techniques. While conventional factors such as road geometry, traffic volume, pavement condition, and driver behavior remain primary causes of accidents, recurring incidents at certain locations suggest the possible influence of additional environmental factors.

The mapping and analysis indicated a spatial correlation between suspected geopathic stress zones and accident-prone locations. AutoCAD proved to be an effective tool for visualizing accident data, identifying clustering patterns, and analyzing their relationship with geophysical features. The study demonstrates that integrating geophysical observations with transportation engineering can provide a broader perspective on road safety assessment.

The findings suggest that geopathic stress may influence driver alertness and contribute indirectly to accident occurrence. Although the scientific validation of geopathic stress requires further investigation, the observed correlations highlight the need for additional research in this area. The study also emphasizes the importance of interdisciplinary approaches that combine engineering, geological, and environmental analyses for comprehensive road safety evaluation.

Overall, the research establishes a foundation for future studies on the role of geopathic stress in transportation infrastructure. Advanced tools such as GIS, geophysical surveys, and real-time accident databases can further strengthen the understanding of this emerging field and support the development of safer and more resilient road networks.

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