

Structural Controls of the Expansion of Small-Scale Artisanal Gold of Bouda Area (Kaya-Goren Greenstone Belt, Burkina Faso) From Remote Sensing

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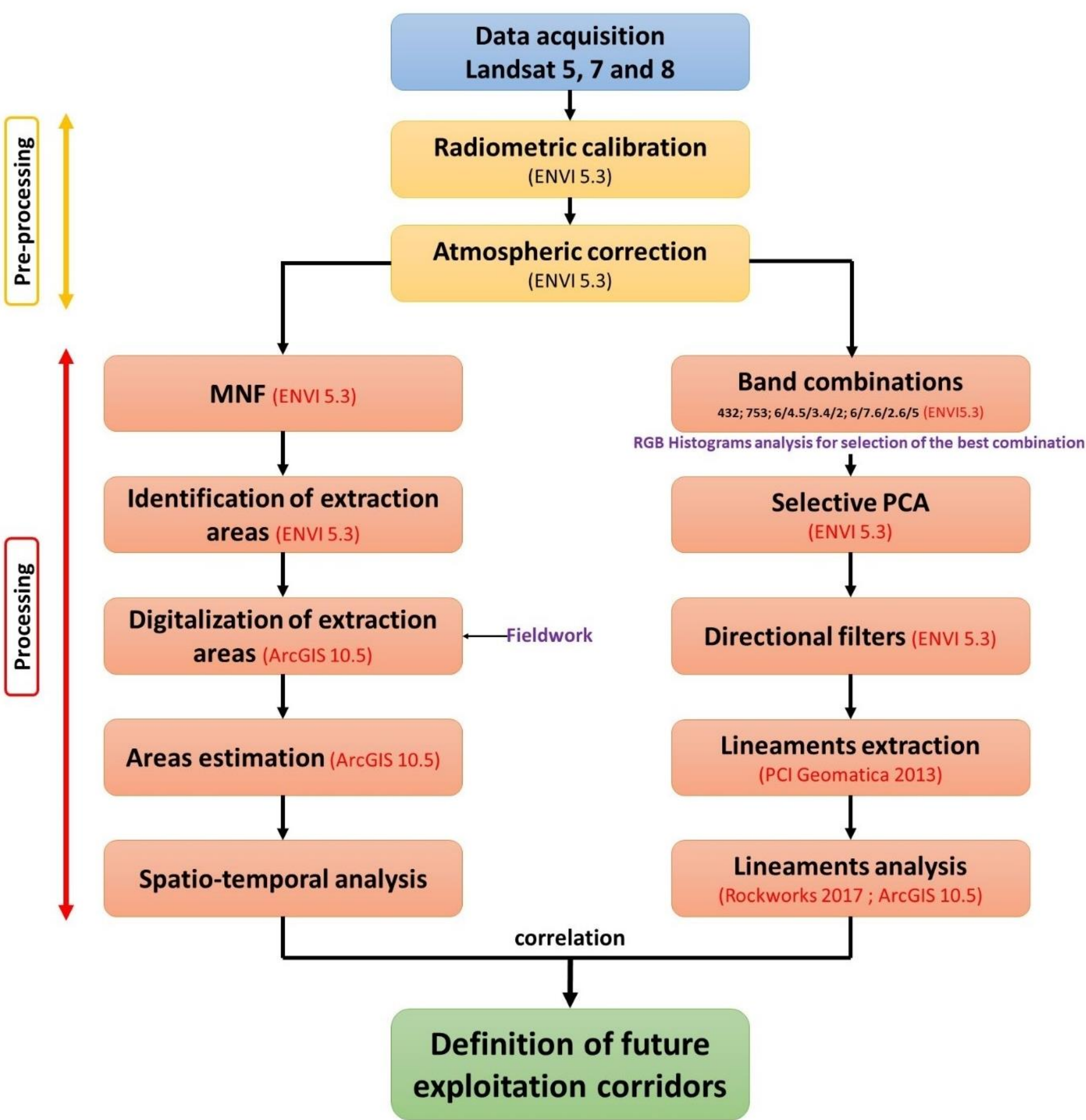
ABSTRACT

Artisanal gold mining plays a key economic role in Burkina Faso, despite security challenges since 2015. Regulated properly, it remains vital for local livelihoods. This study uses remote sensing to analyze the structural control of small-scale gold expansion at Bouda and to identify future mining corridors. Landsat images (2000, 2011, 2022) processed using Minimum Noise Fraction (MNF) and Principal Component Analysis (PCA) reveal the spatial evolution of extraction zones. Near and mid-infrared bands proved effective for detecting mining areas. Morphological and lineament analyses show that gold occurrences align with dense NE–SW structural features, indicating strong structural control over mining expansion. The results highlight five prospective corridors suitable for sustainable artisanal gold exploitation while offering a framework for monitoring environmental changes through satellite data.

INTRODUCTION

Artisanal mining, once a survival activity for farmers facing poor crop yields and climate challenges, has become Africa's most significant rural non-agricultural sector. In Burkina Faso, it operates legally under the Artisanal Exploitation Authorization (AEA) issued by the DGMG; without it, mining is illegal. The Bouda site in Passoré province, discovered in 1987, remains active despite insecurity since 2015, demonstrating strong community resilience. However, instability limits geological exploration. Remote sensing emerges as a valuable alternative for monitoring artisanal mining dynamics, defining new prospecting corridors, and supporting sustainable, scientifically guided artisanal gold exploitation in the Bouda area.

MATERIALS & METHODS



DISCUSSIONS

This study confirms the key role of NIR and SWIR 1 bands in detecting artisanal gold mining areas using Landsat data. The simple, low-cost MNF-based method is well suited to Burkina Faso's context, offering reliable monitoring despite limited field data. Results show a clear link between gold price trends, structural controls (NE–SW orientation), and mining expansion. Five exploration corridors were identified, aligning with major geological structures. The approach demonstrates strong potential for routine monitoring and for guiding sustainable, better-organized artisanal mining development.

CONCLUSION

This study shows that remote sensing can effectively reveal the structural control of artisanal gold mining at Bouda, using MNF, PCA, and band analyses. The low-cost, rapid approach demonstrates the potential of space-based tools to support regulated and sustainable mining development in Burkina Faso.

REFERENCES

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[2] Ngom (2022). *Thèse de Doctorat, Université Cheikh Anta Diop de Dakar, Sénégal*. 168 p.
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RESULTS

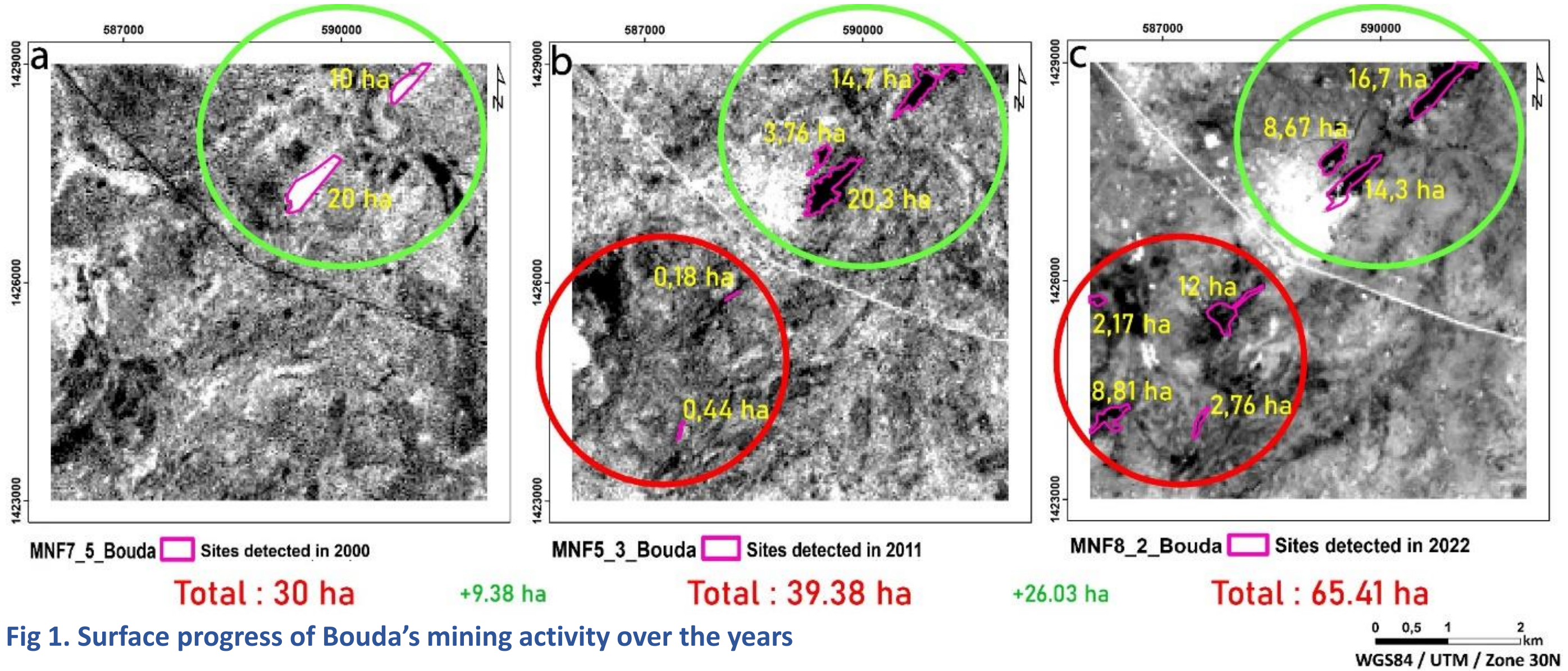


Fig 1. Surface progress of Bouda's mining activity over the years

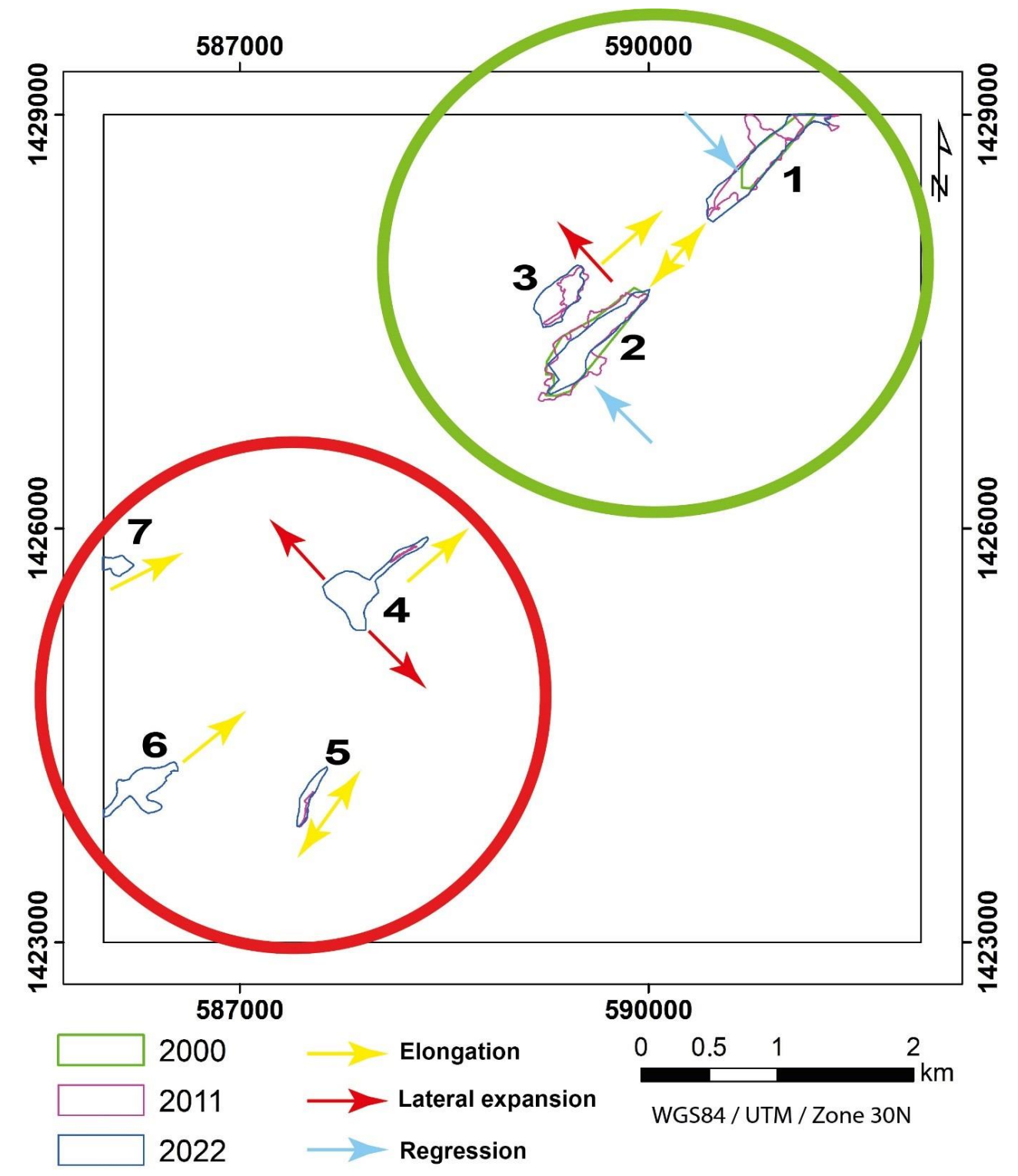


Fig 2. Morphological analysis of extractive activity evolution

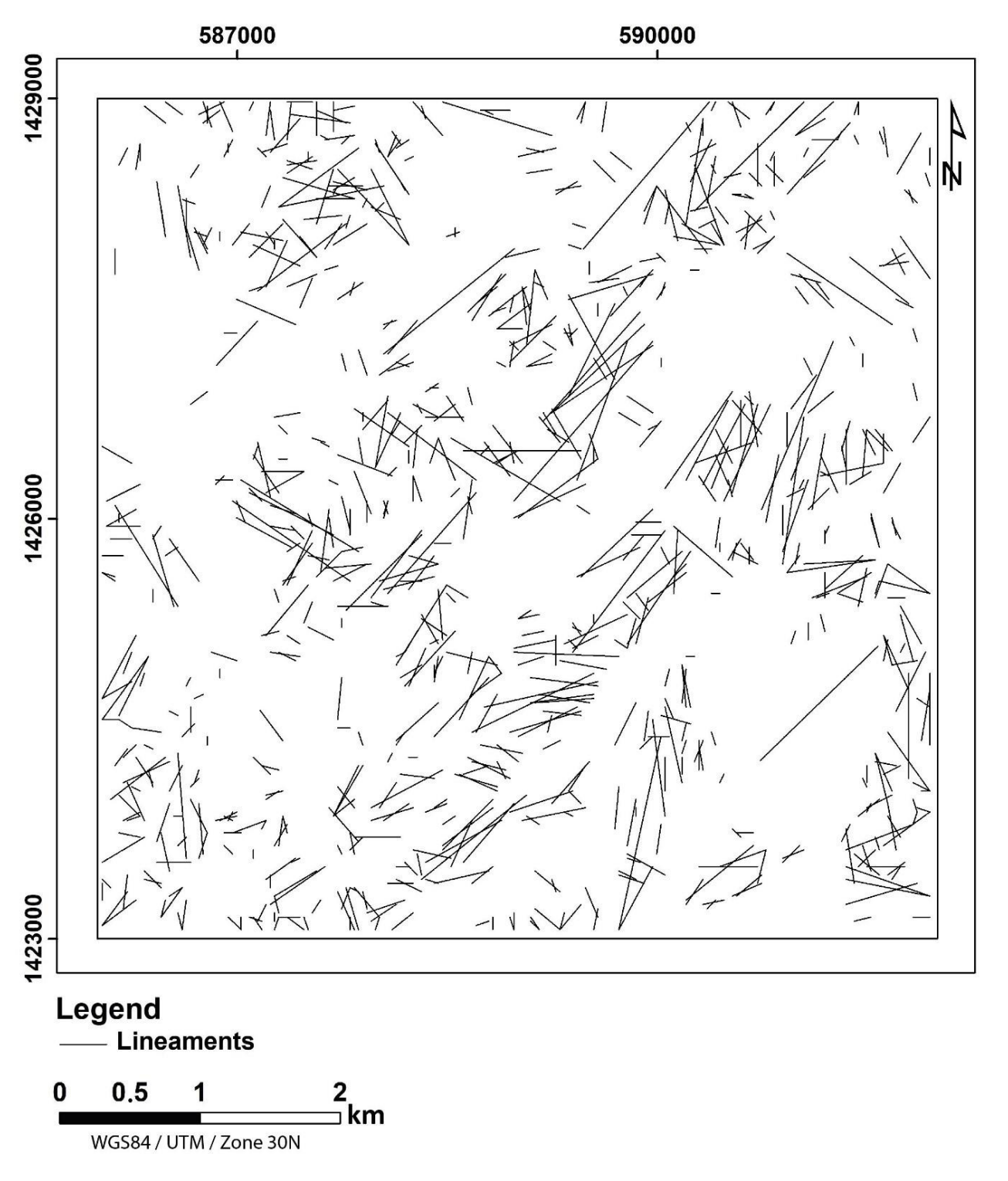


Fig 3. Lineament map

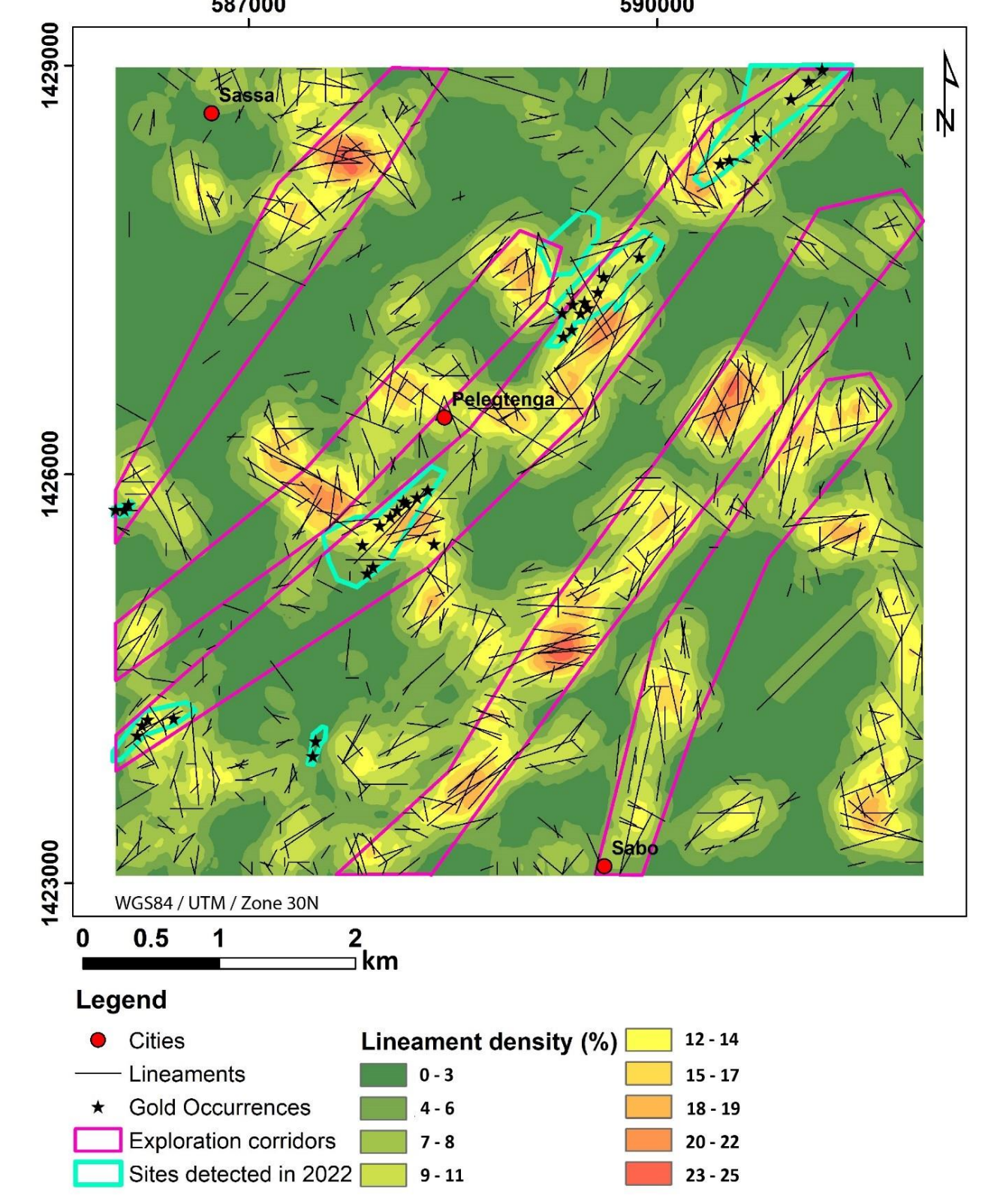


Fig 4. Prospective map defining exploration corridors

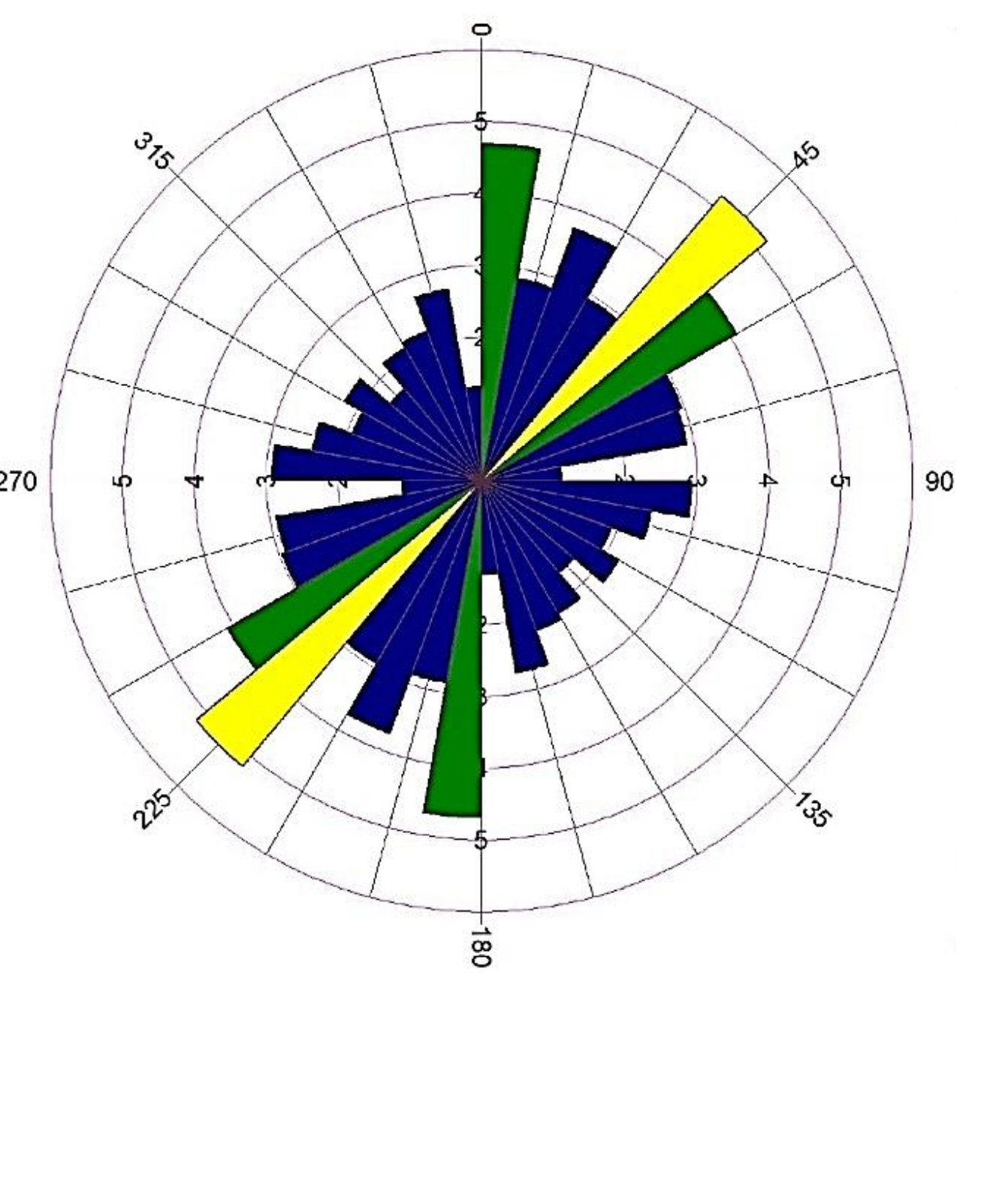


Fig 5. Directional rosette



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