



FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

Application of UAV-based Photogrammetry in Monitoring Slope Deformations in Open Pit Mining Environments: A Systematic Review

Janet Praise TANGADZANI, Charles PARADZAYI and Tanaka Grey MUROMO, Zimbabwe

22 May 2024

MIDLANDS STATE UNIVERSITY



Our Hands Our Minds Our Destiny

ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

PRESENTATION OUTLINE

- Introduction
- Objectives
- Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA)
- Results and Analysis
- Observations
- Conclusion

ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

INTRODUCTION

- **Triggers of slope failures**
 - Local geological conditions
 - Mining activities
- **Consequences of slope failures**
 - Catastrophic accidents
 - Equipment damage
 - Production delays
- **Traditional approaches**
 - Limited coverage
 - Accessibility challenges
 - Safety concerns

Janet and Eureka Gold Mine





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

OBJECTIVES OF THE SYSTEMATIC REVIEW

- **Systematically review the current state of research on using UAV photogrammetry for open pit slope monitoring**
- **Identify the key advantages, challenges, and potential areas for future exploration**



ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

PRISMA APPROACH

- Tricco *et al* (2018)
- Systematic review followed PRISMA guidelines.
- Scopus indexed journals and Google Scholar
- Keywords: "mine", "slope", "photogrammetry", "open pit", "temporal analysis", "UAV", "deformation monitoring".
- Screening process resulted in 24 relevant studies for in-depth analysis.

ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

RESULTS

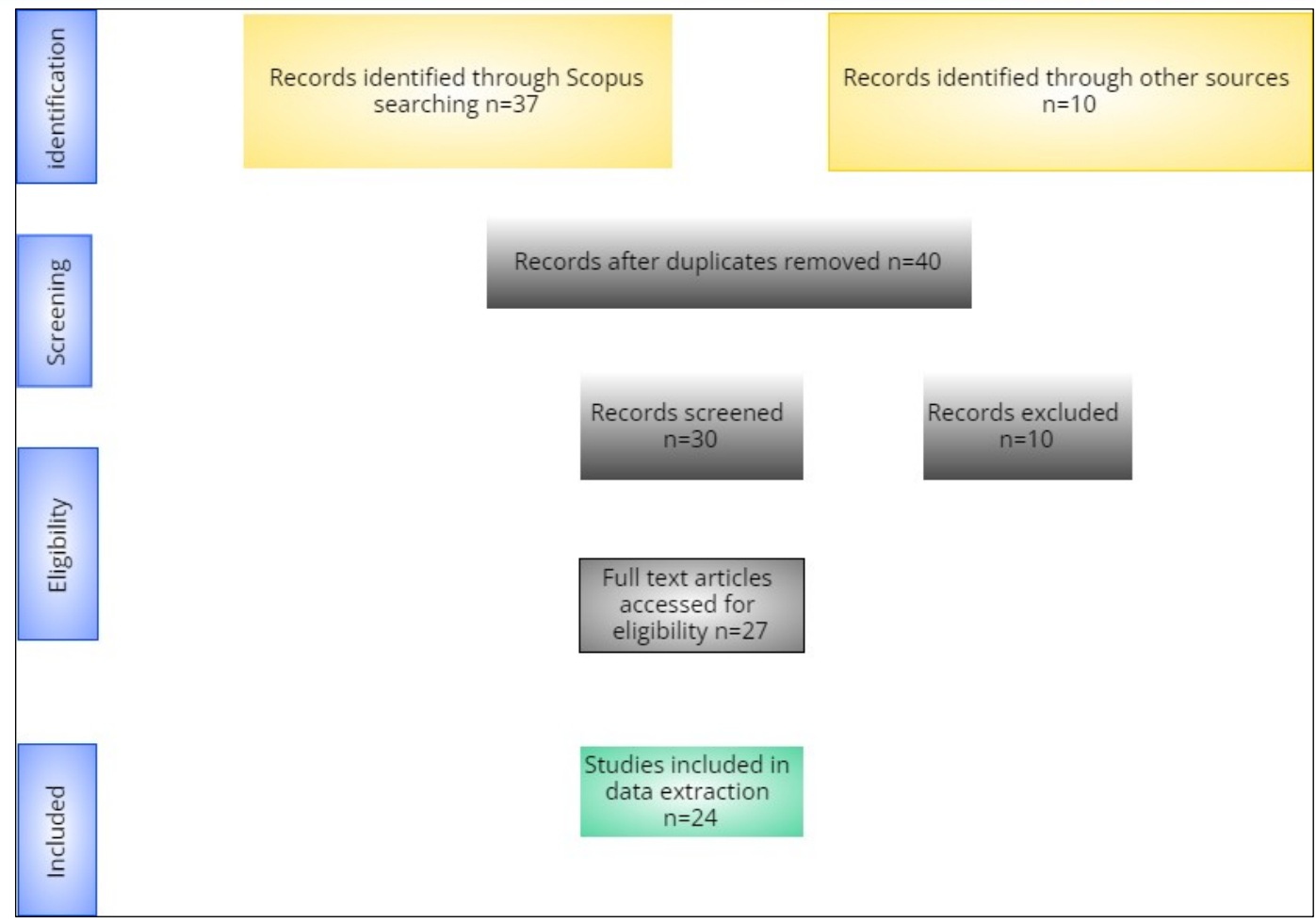




FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

RESULTS

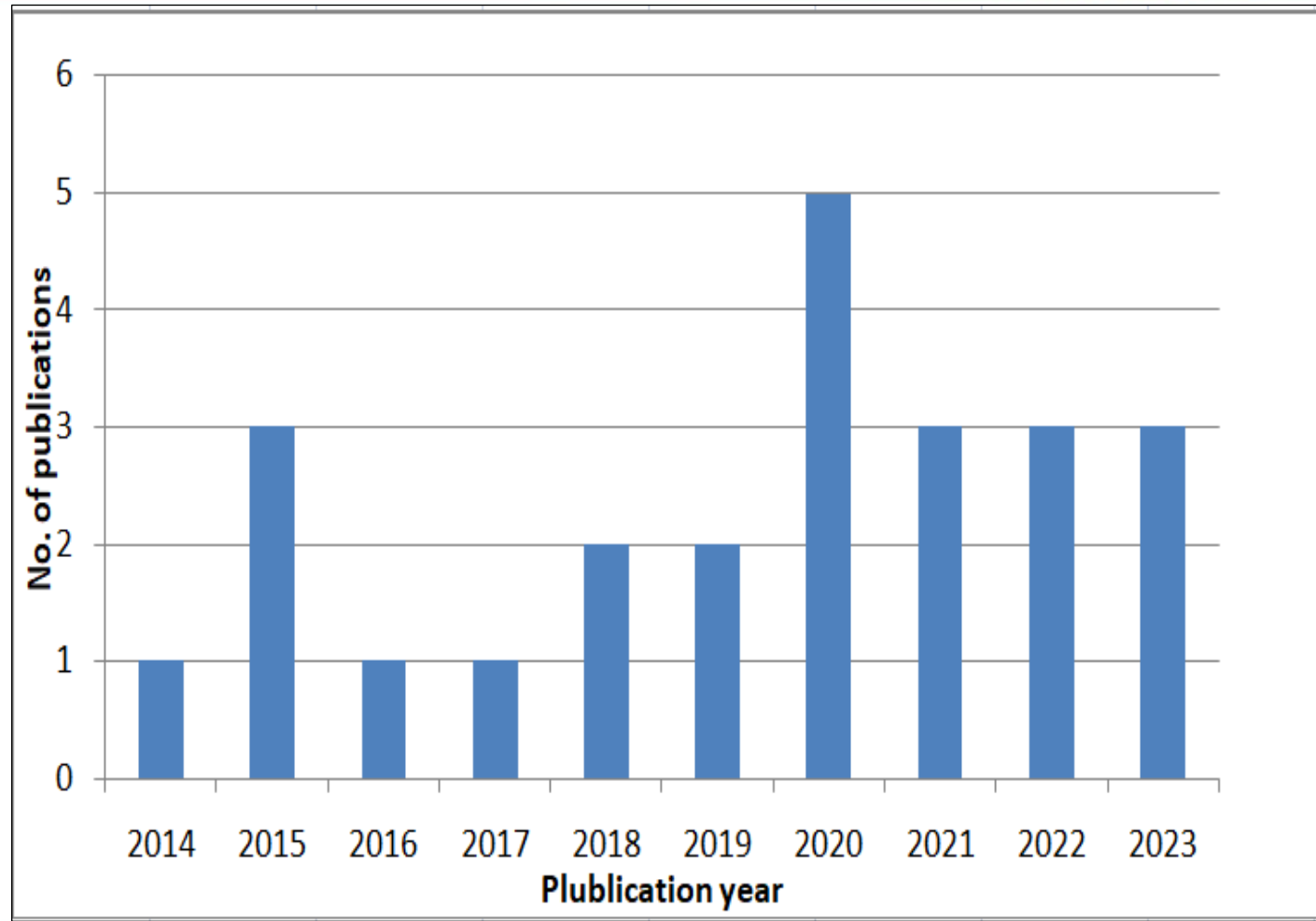




FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

RESULTS

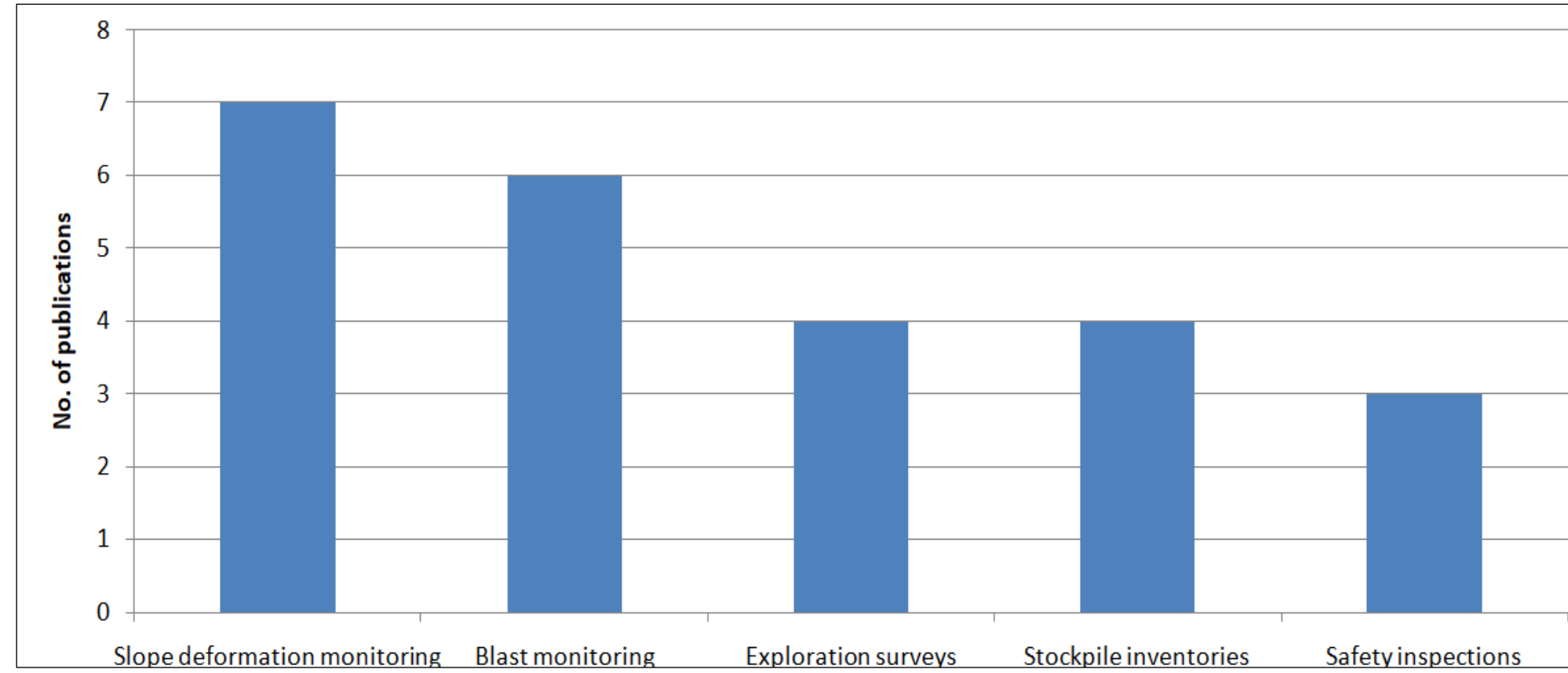




FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

RESULTS

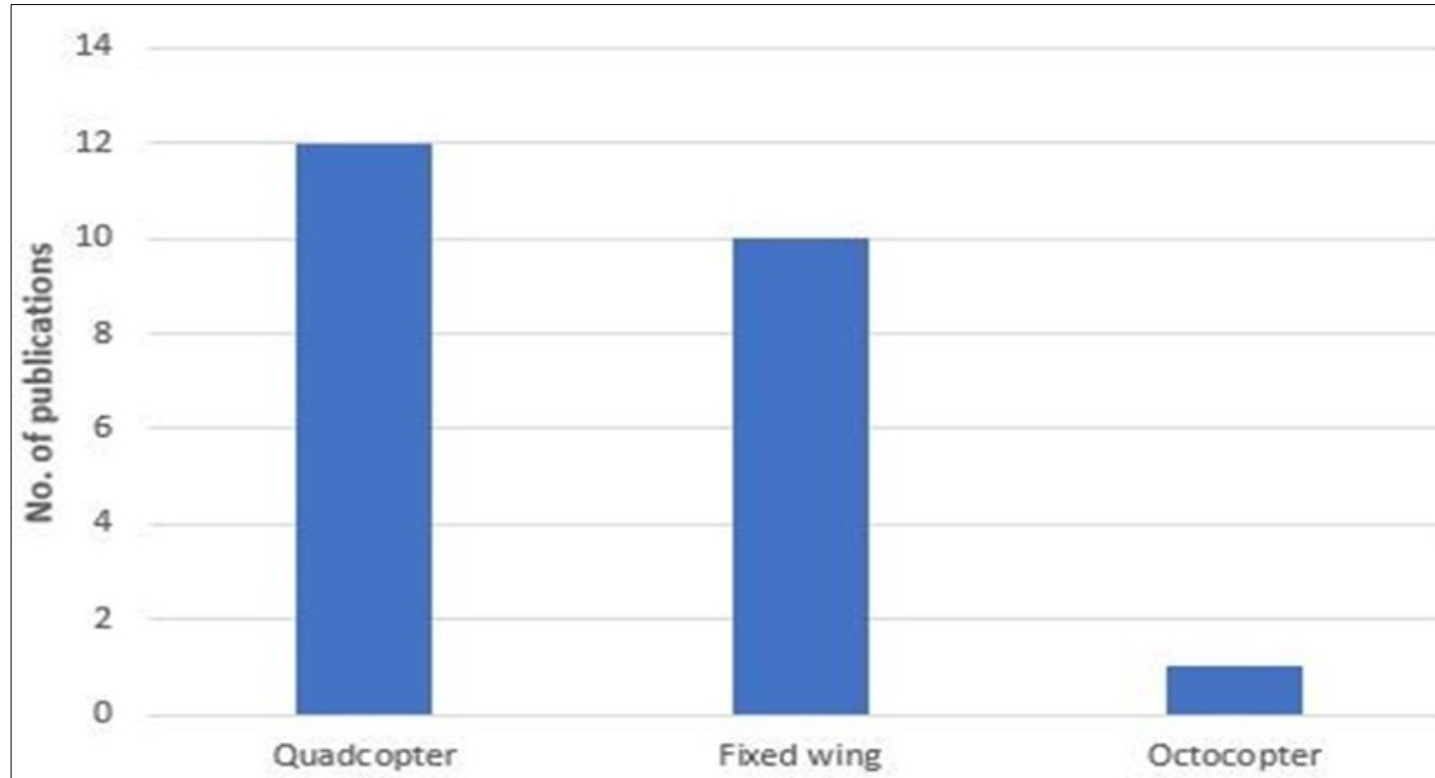




FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

RESULTS

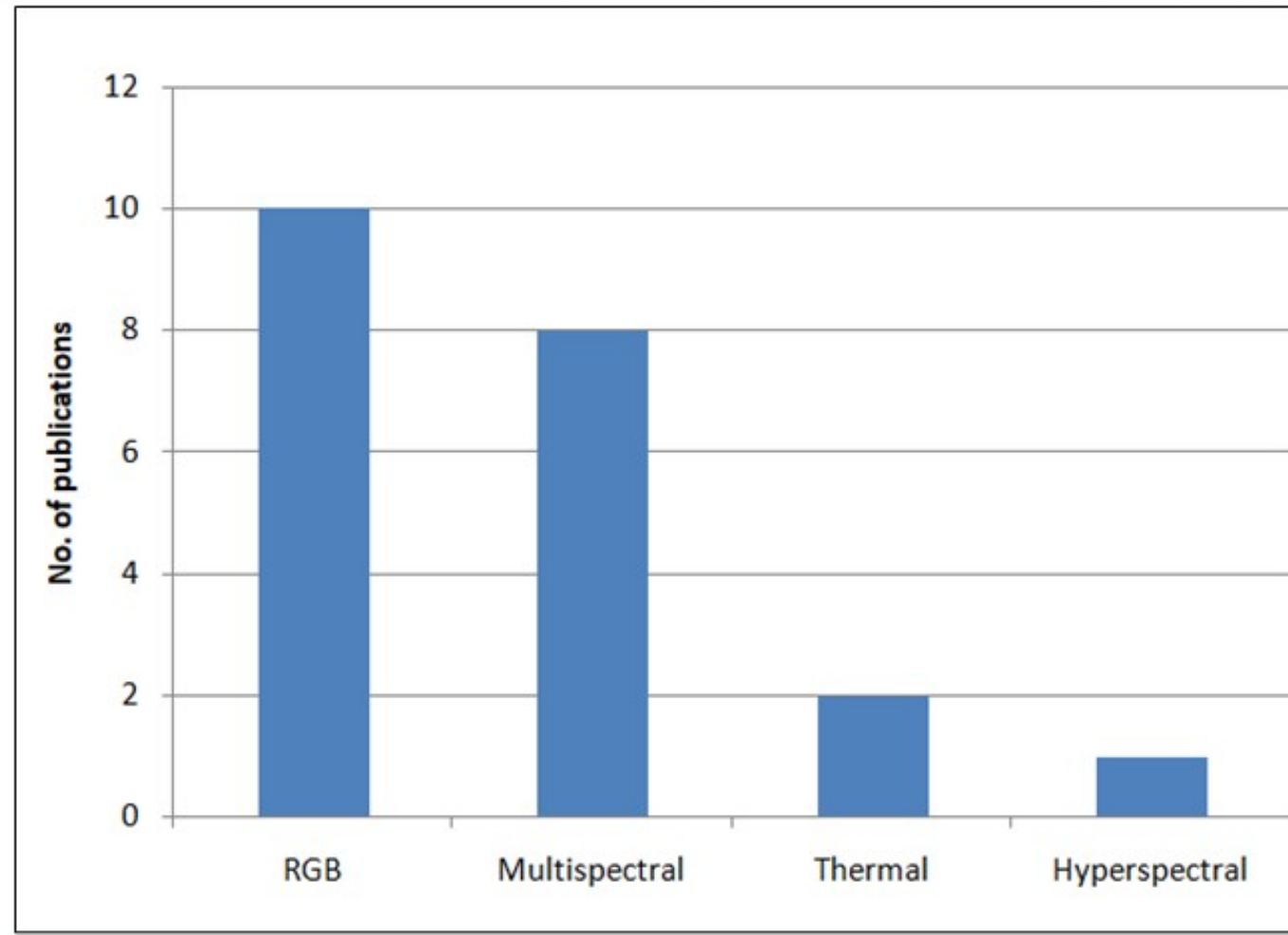




FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

OBSERVATIONS

- Switch to **Unoccupied Aerial Vehicle terminology**
- Emergency of many flight planning and processing softwares
- Structure from motion for 3D models
- Detection of horizontal and vertical displacements
- **Challenges with using only photogrammetry for slope detection**
- Coupled with the low temporal resolution of UAV data acquisition

ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

CONCLUSION

- UAV technology offers cost-effective alternative to traditional survey methods for both temporal resolution and spatial coverage
- Integrated with other technologies, UAVs offer significant potential for assessing and monitoring slope deformations
- Improved temporal resolution can result in detailed 3D analysis

ORGANISED BY



PLATINUM SPONSORS





FIG Working Week 2024

19-24 May

Accra, Ghana

Your World, Our World:
Resilient Environment
and Sustainable
Resource Management
for All

ACKNOWLEDGEMENTS

- Commission 5 and navXperience
- Eureka Gold Mine
- Midlands State University

We Thank You
Tinotenda
Medaase
Dankeschön

