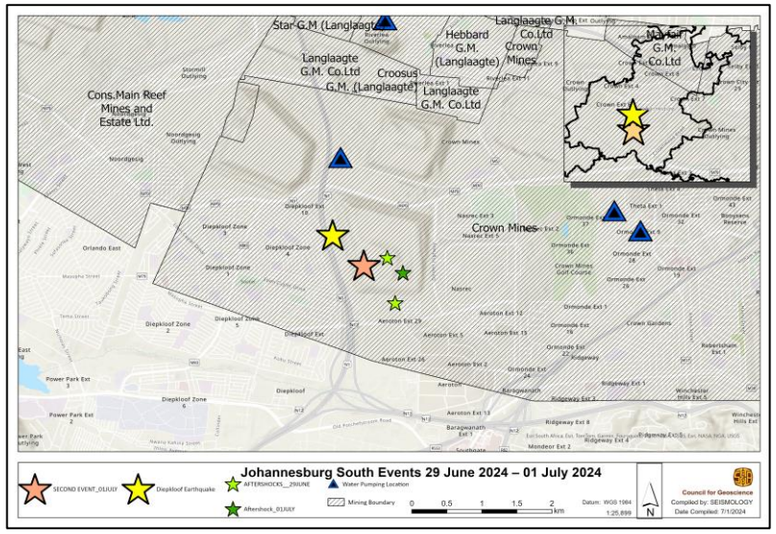
JOHANNESBURG SOUTH SEISMIC EVENTS | Gauteng | South Africa

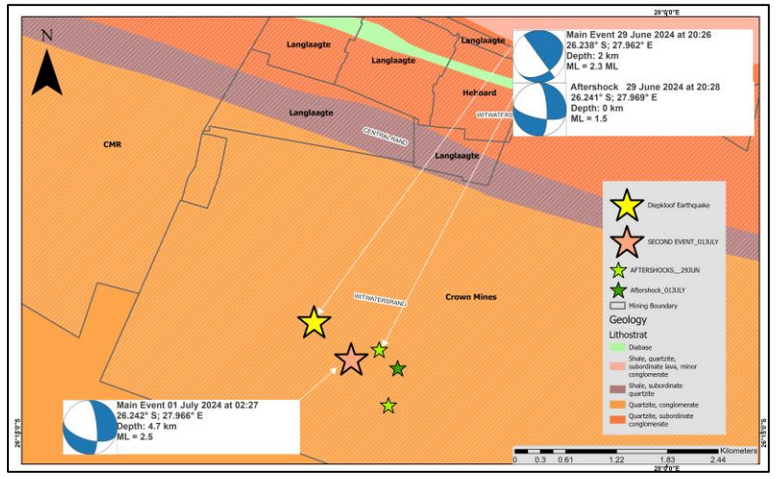
29 JUNE 2024 – 01 JULY 2024

EPICENTRAL REGION



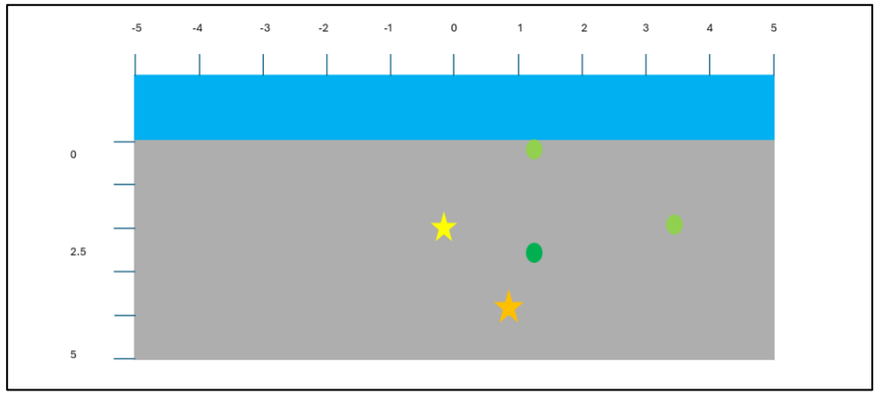
The epicentres are situated within the Central Rand mining boundary, within proximity to the ceased Crown Mine. The map shows the two main events in yellow and orange and the aftershocks in green. The blue triangles show previous water pumping stations.

GEOLOGICAL SETTING



The epicentre region is underlain by basement units from the Quaternary deposits. Composed primarily of sediments of the Witwatersrand Supergroup. Partly covered by granitic rocks of the Archaean age. The focal mechanism shows a strike-slip faulting NE/SE.

DEPTH PROFILE



A depth profile (x-axis and y-axis in kilometres) showing all the approximated depths of the events that occurred between 29 June 2024 – 01 July 2024. These events are all relative to the event on 29 June 2024 at 20:26:43.1

EARTHQUAKE SUMMARY AND HISTORY

Summary

- 29 June 2024 at 20:26:43.1 SAST with a magnitude of 2.3 ML
  - Aftershock on 29 June 2024 at 20:28:28.4 SAST with a magnitude of 1.5 ML
  - Aftershock on the 30 June 2024 at 07:52:05.5 SAST with 1.2 ML
- 1 July 2024 at 02:37:26.6 SAST with a magnitude of 2.5 ML
  - Aftershock at 02:42:06.4 SAST magnitude of 0.9ML

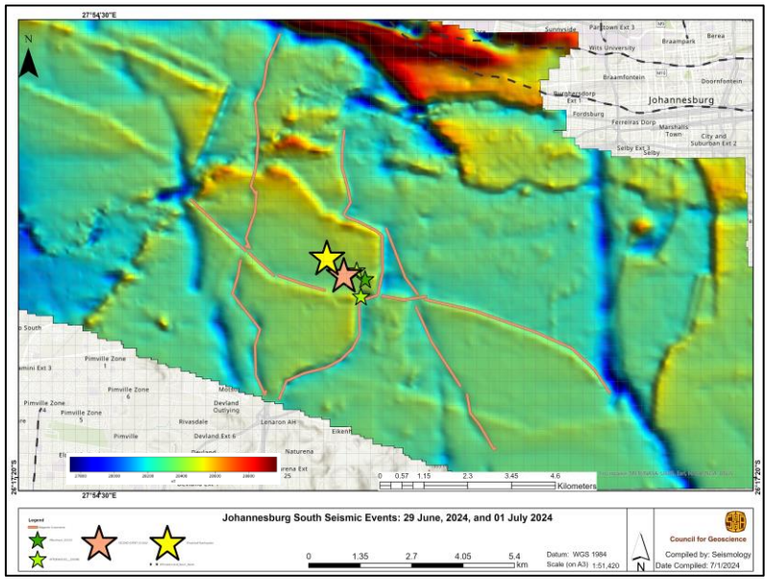
Earthquake history

- 20 June 2023, ML 2.8, in the West Rand, with surrounding areas around Roodepoort
- 11 June 2023, ML 5.0, in the East Rand, in Boksburg and surroundings
- 22 January 2024, ML 1.4, in Soweto, Tshepisong

Regional interpretation

Our preliminary seismic findings indicate that the probable epicentral area (Mooifontein tailings dams located southwest of Johannesburg CBD) could lie between a network of fault or fracture structures that are intersecting each other (as shown on the magnetic map) and over time these structures could fail due to the weight exerted by of the tailing dams' stockpile of waste material. This is evident from the fault plane solutions, of the main events and aftershocks, which show a strike-slip normal fault focal mechanism and stresses oriented approximately northeast-southwest. Another hypothesis suggests that past precipitation could form a water table within the tailing's stockpile. Water infiltration through conduits could easily cause differential movements within the stockpile, leading to stress redistribution in underground fault/fracture structures and triggering of seismic events.

REGIONAL STRUCTURES



A total magnetic intensity map in the region, showing the interpreted intersection of the lineaments near the seismic events

FAQ

What causes an earthquake?
An earthquake occurs when there is a build-up of stresses in the Earth's crust that need to be released and this can occur through weakness in the rock, such as a fault. This sudden release of stress is what we experience as an earthquake.

What is the difference between an earthquake and a tremor?
In seismology, the terms are the same. However, in some areas, the terms are differentiated. In regions that experience frequent large earthquakes, they might classify seismic events less than M~5.0 as tremors and those larger than M~5.0 as earthquakes. Whereas in SA seismic events less than M~4.0 could be considered as tremors because they happen frequently and are felt in most mining towns and nearby areas.

Can we expect aftershocks after an earthquake has occurred?
Yes, aftershocks are a common occurrence after the main shock. Aftershocks happen during the elastic relaxation of the Earth after the release of the stress of the main shock.

Are earthquakes caused by mining activities?
It is difficult to determine what causes an earthquake because there are several stresses involved that could lead to an earthquake.

Does SA have the technology to predict earthquakes?
To date, there are no credible methods or technologies to predict earthquakes globally. However, there is research looking to find credible and accurate methods.

What should the public do when an earthquake occurs?
The CGS has disseminated a host of simple guidelines on their website, (https://www.geoscience.org.za/wp-content/uploads/2022/10/CGS-Earthquake_-Safety-Procedures-1.pdf) as a safety precaution when earthquakes occur.

REFERENCES

- Van Tonder, D. M. and C. B. Schoeman (2021). Re-watering of West Rand Dolomitic Compartments: Implications for JB Marks Local Municipality IMESA Conference, North-West University.

Copies of the Map and Explanation (if available) are obtainable from the Council for Geoscience:
280 Pretoria Street, Silverton, Pretoria, South Africa, 0184
Private Bag X112, Pretoria, South Africa, 0001
Tel: +27 (0)12 841 1911
Email: info@geoscience.org.za and data@geoscience.org.za
Website: www.geoscience.org.za

Data Source

Council for Geoscience : South African National Seismic Network (SANSN)
Council for Geoscience GIS Database

Council for Geoscience