Tshwane University of Technology

We empower people

10th Inkaba YeAfrica Workshop

29 August to 3 October 2014

Matjiesfontein

THE SEISMICITY OF THE EASTERN CAPE PROVINCE

C.M. Mahlagaume, I, Saunders and C.J.S. Fourie – Environmental Water & Earth Sciences

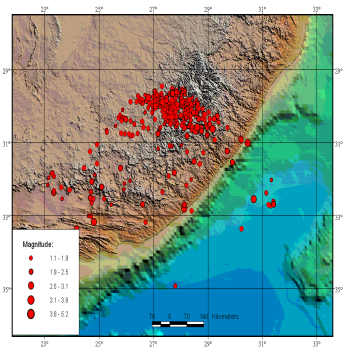
ABSTRACT

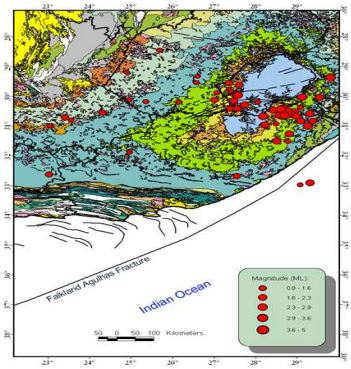
The fundamental requirement to the study and understanding of seismicity in any region is through the accurate location of earthquakes within the area of interest, determining spectral parameters and seismic moments. The principal aim of this study is re-evaluating the phase readings and location of the instrumentally recorded earthquakes in the Eastern Cape Province of South Africa during the period of 1980 to 1989. The basis of this research was from the earthquake bulletins compiled through routine seismic analysis. These bulletins in principle consist of phase information observed at different seismological stations, which are then reduced to earthquake locations.

INTRODUCTION

- Re- evaluation of Earthquake locations in the Eastern Cape Province.
- Determine hypocentre depth of earthquakes using ray tracing (Chapman et.al 1988) to identify additional seismic phases after relocation.
- Re- evaluate the phase readings.
- Evaluate Earthquake epicentres in the Eastern Cape Province.

Seismicity of Eastern Cape before re-location



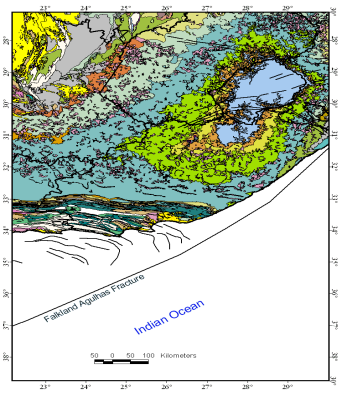


Seismicity of Eastern Cape after re-locations

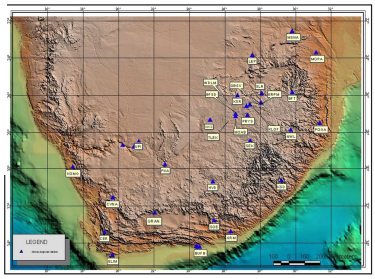
Methodology

- Fault plane mechanism (FOCMEC, FPFIT), determine fault plane through a grid search method (Snoke et.al.1988)
- Ray tracing software called the WKBJ, Secondary phases were identified
- Seisan Earthquake Analysis Software version 9.0 (Jens Havskov et.al, 2011, Lars Ottemoller, Peter Voss).
- Depth determination.
- Determine errors related to data.
- Refined the original phase picks by re-picking seismic phases.

The Geology of the Eastern Cape without Seismicity



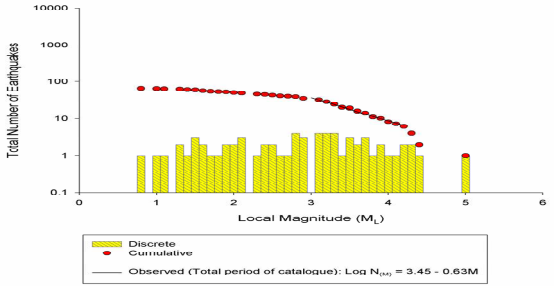
Network Geometry/Stations



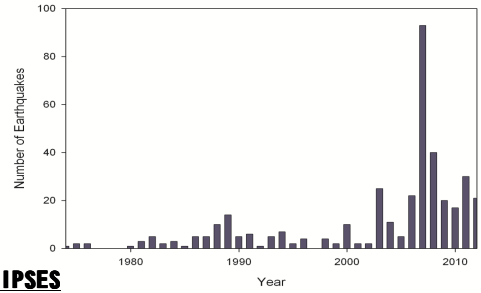
RESULTS

B-VALUE

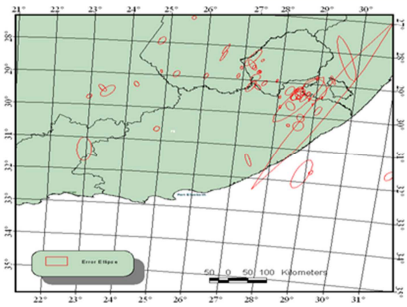
The bars are number of events and crosses the accumulated number of events. The more the number of events the popular it becomes.



YEARLY DISTRIBUTION



ERROR ELLIPSES



DISCUSSION/CONCLUSION

Seismologic events that occur in the Eastern Cape are mostly naturally induced, which are characterized by earthquakes of tectonic origin.

RECOMMENDATIONS

- There must be a comparison of historical seismic data of the KwaZulu Natal with the current seismic data, to improve and give more understanding of seismicity in the KZN Province.
- The Seisan Software must be improved to allow reading P polarity using a filter because it was difficult to read polarity for more than 90% of the events due to seismic noise.

References

- **Fernandez, L. M., M. A. Otto, and J. Steyn.,1991**. The South African National digital Seismological System (SANDSS), a dial-up telephone-linked network.Tectonophysics 209,35-42.
- **Saunders, I., M. B. C. Brandt, J. Steyn, D. L. Roblin and A. Kijko.,2008**. The South African National Seismograph Network, *Seismological Research Letters*,79,2, 203-210.
- **Havskov, j., Ottemöller, , L, and Voss , P., 2011**. Editors of SEISAN: The earthquake analysis software for windowsris, Linux and Marcos. Version 9.0. *University of Burgen, Norway.*
- **Chapman, C.H.C., Jen-Yi and Lyness, D.G., 1988.** The WKBJ seismogram algorithm. *In: Seismological Algorithms*, edited by Doornbos, D.J. *Academic Press*, London.
- **Snoke,J.A.,2003a**.FOCMEC:focal mechanism determination.In:Lee,W.handbook of earthquake and engineering seismology Academic Press,San Diego,815.

Contact details

charmainemamong@gmail.com

086 110 2421 • www.tut.ac.za

Tshwane University of Technology
Private Bag X680
Pretoria 0001