FOCAL MECHANISM SOLUTION OF THE 15th MARCH 2008, NYAMANDLOVU EARTHQUAKE

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Abstract

Focal mechanism solution of the 15th March 2008 earthquake (mb = 4.3) that occurred in the Nyamandlovu area, northwest of Bulawayo City, Zimbabwe, has been determined from P-wave first motion polarities. Results show normal oblique left lateral faulting. The earthquake mechanism bears a signature that is almost synonymous with that for events in the Zambezi branch of the East African Rift zone. Synthetic seismograms computed with observed data from regional stations were employed for depth determination. This event had a shallow depth of 5km. Earthquakes in the area tend to occur either after a significant drought or a wet season of considerable length. The area is underlain by thick Karoo sandstones that form an aquifer of high potential water storage. These events are therefore most probably induced by pore–pressure differentials in the underlying rock.

Introduction

On 15th March 2008, at 0221 hrs (UTC), a small magnitude earthquake (ma = 4.3), occurred in the Nyamandlovu area, approximately 60km, northwest of Bulawayo City. The epicenter of the event was 19°7’S - 27°39’E (Figure 1). The parameters were calculated at Goetz observatory, national seismic data center for Zimbabwe. The earthquake was felt in the entire City of Bulawayo, which has a population of over 1 million people. No injuries to humanity and destruction to structures and property were reported after the event. This is the largest earthquake on record from the area. The event was recorded as far as the Antarctica region. The Nyamandlovu area has for some time been experiencing shaking from small to medium-size events very important in future studies such as seismic hazard assessment.

Seismotectonics of the Nyamandlovu area

The focal mechanism solution of the 15 March 2008 Nyamandlovu earthquake was determined from P-wave first motion polarities recorded within the region by seismic stations in South Africa, Zimbabwe, Malawi, Botswana, Ivory Coast and Namibia.

Conclusions

The scope of this paper attempts to address the focal mechanism of the 15th March 2008 Nyamandlovu earthquake and to determine the depth of this event. This study is necessary in order to improve the understanding of the Seismotectonics of the Nyamandlovu area and also to try to understand the causes of the Nyamandlovu tremors. The results obtained in this study are very important in future studies such as seismic hazard assessment.

<table>
<thead>
<tr>
<th>Depth (km)</th>
<th>Vp (km/s)</th>
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<tbody>
<tr>
<td>0</td>
<td>6.20</td>
</tr>
<tr>
<td>15</td>
<td>6.50</td>
</tr>
<tr>
<td>36</td>
<td>8.00</td>
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<tr>
<td>52</td>
<td>8.10</td>
</tr>
<tr>
<td>81</td>
<td>8.3</td>
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<tr>
<td>301</td>
<td>8.7</td>
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</table>

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The analysis described here, was performed using data from stations of the council of Geoscience in South Africa, the Africa array, International Seismological Center and CTBTO. We would like thank these institutions for providing us with this valuable data.

References

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