



**MANAGING WAVEFORM DATA AND METADATA FOR SEISMIC NETWORKS;
14-18 January 2013,**

Kuwait City, Kuwait

SEISMIC OBSERVATION NETWORK IN ZIMBABWE

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Zimbabwe is bounded on the north and northwest by Zambia , southwest by Botswana , Mozambique on the east, South Africa on the south.

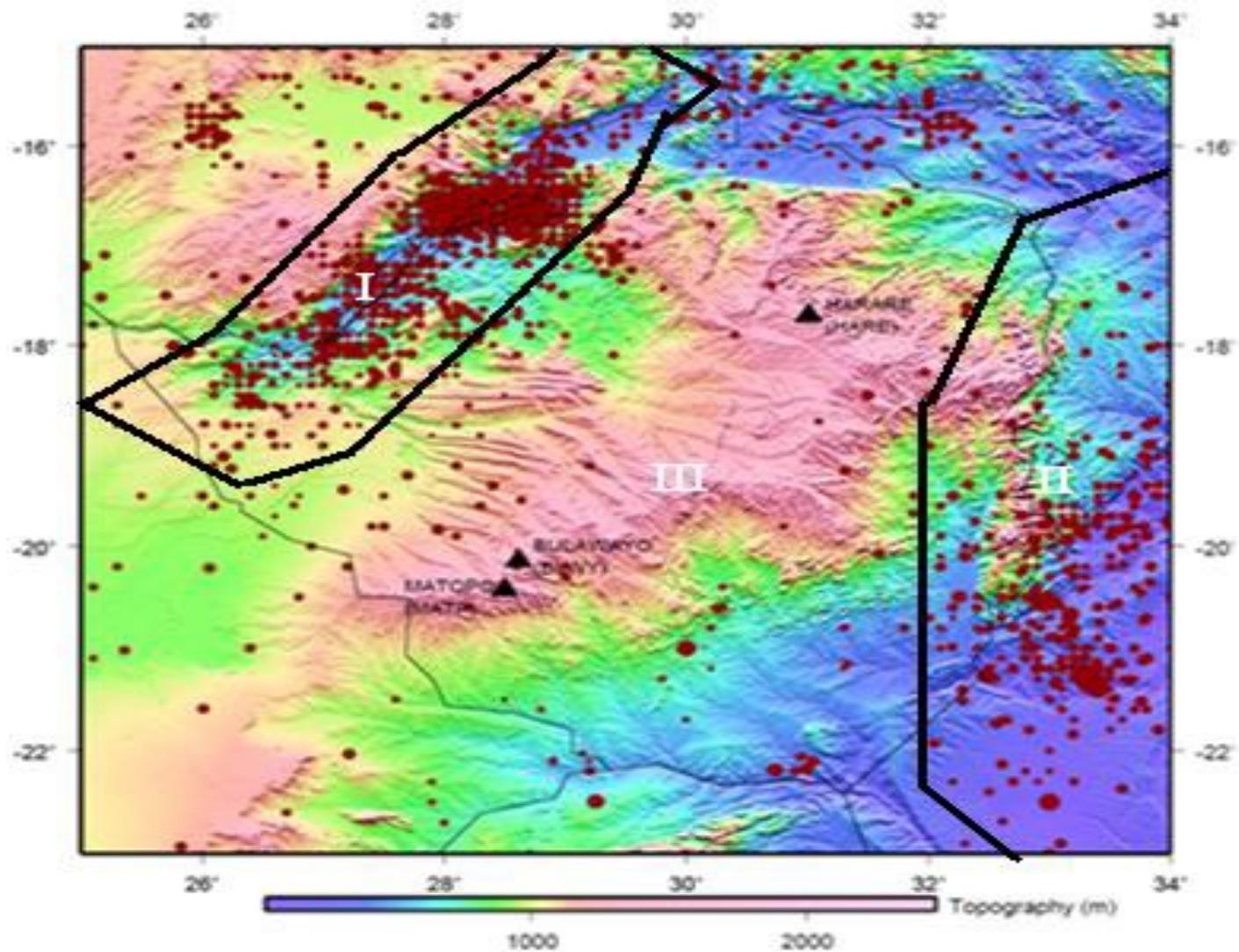
ZIMBABWE IN BRIEF

- Zimbabwe is a landlocked country in Southern Africa, covering an area of 390,757 square kilometres (150,872 square miles). .
- Zimbabwe lies between latitudes 15° and 23°S, and longitudes 25° and 34°E
- The country has a tropical climate with a rainy season usually from late October to March. The climate is moderated by the altitude.

INTRODUCTION

- Zimbabwe has been monitoring earthquakes since 1959 when the first seismic station was installed in Bulawayo.
- In 1963 Zimbabwe operated a six component World Wide Seismograph Station Network (WWSSN). By then the system was analogue.
- Recording was by ink and pen on photographic paper and then continuous running paper. Data from these stations was then sent to Goetz (BUL) for analysis and archiving.
- Zimbabwe signed a facility agreement that resulted in the building of an auxiliary station **AS120-MATP**

SEISMICITY OF ZIMBABWE



The MAP above shows that the country can be divided into three seismic zones namely.

- a. **Mid-Zambezi basin (area I)**-Most active seismic zone, this is mainly due to reservoir induced seismicity from the Lake Kariba and the EARS.
 - Seismic activity around Lake Kariba is attributed to induced seismicity and it correlates with the infilling of the dam in 1963 and pure tectonics.
 - **(1963/9/ 23 0901UTC -16.6,28.8 Magnitude 6.)**
- b. **Eastern Highlands (area II)**-Also a seismic active zone. Activity is of pure tectonic origin due to EARS.
- c. **Central Area (III)**- considered a relatively aseismic zone with events of very small magnitude being recorded.

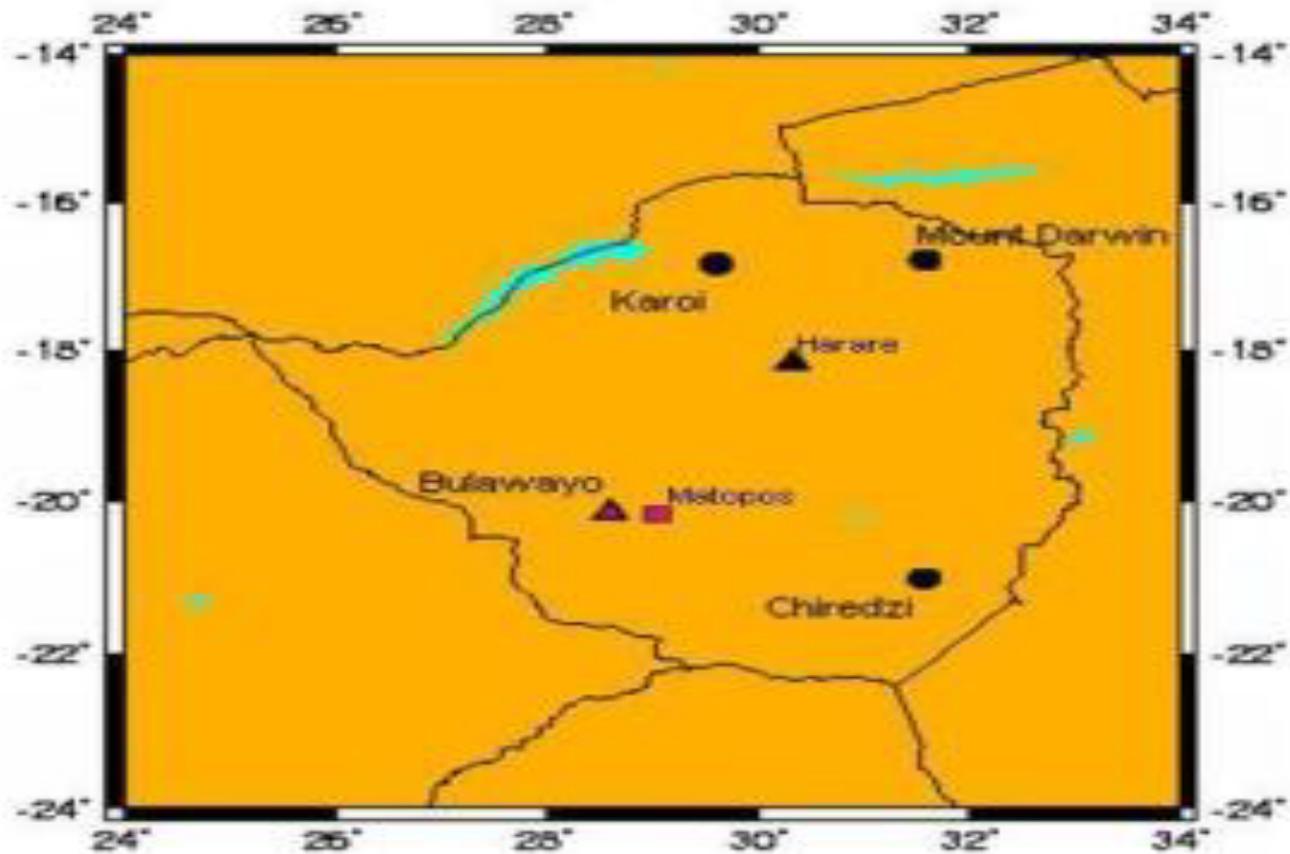
NB Of late some events of moderate magnitude have been recorded in Nyamadhlovu area which has been associated with the EARS (Shumba,2010)



Main fault scarp of the 2006 Machaze Earthquake in Mozambique (Fenton & Bommer, 2006)

NB:The country has been experiencing some events more frequently. The 22/02/2006 Mozambique event of magnitude $M_w=7.0$, shook the entire country with some losses recorded in the eastern borders of the country in Chipinge. (2006/2/ 22 22.19UTC,-21.3233.58 .Depth 11,Magnitude 7.5)

THE SEISMIC STATION NETWORK OF ZIMBABWE

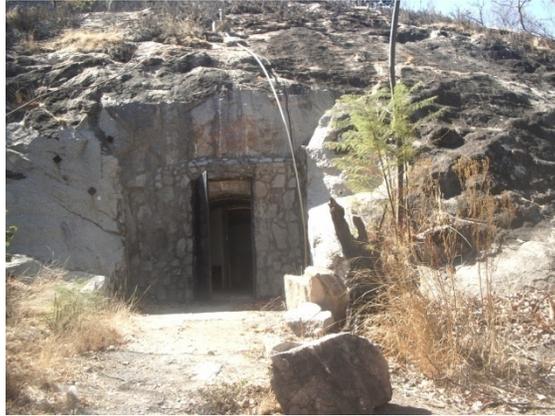


- Currently working IMS station
- ▲ Currently working Africa Array stations
- Goetz Observatory station not working
- ▲ Africa Array stations not working

OPERATION TIMES OF SEISMIC STATIONS IN ZIMBABWE

NAME	CODE	OPERATION TIME	LAT	LONG	ALT(M)
MATOPOS	MATP	2003 to date	2025.55s	2829.96E	1215
BULAWAYO	BLWY	2004 to date	20 8.60s	2836.80E	1341
CHIREDDZI	CIR	1959 to 1993	21 0.80s	3134.80E	430
KAROI	KRI	1959 to 1993	1649.76s	2936.88E	1343
MOUNT DARWIN	MTD	1959 to 1993	1646.80s	3135.00E	967
HARARE	HRE	2004-2007			

MATP AND BLWY STATIONS IN ZIMBABWE



Cont



Data Analysis at NDC

- We are using Geotool and Seisan software.
- We get data from IRIS and other IMS stations through AutoDRM.
- This helps in epicentral locations since most of our stations are down.

SEISAN SOFTWARE ANALYSIS

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Gmail - print screen - Mozilla Firefox
Command Prompt - eev 20111013
Bula SZ hdist: 664.0 coda: 232.0 mc = 3.8
2011 1021 1139 55.1 R -24.468 24.148 0.0 BUL 3 0.7 3.6CBUL
OLD: 1021 1139 55.1 R -24.468 24.148 0.0 BUL 3 0.7 3.6CBUL
# 52 21 Oct 2011 11:39 55 R -24.468 24.148 0.0 0.7 3.6CBUL 3 ? q
C:\Seismo\WOR>eev 20111013
2011 10 Reading events from base BUL 67
# 36 13 Oct 2011 02:10 28 R -17.658 26.681 0.1 4.7 3.9CBUL 10 ? 1
Station AUSN is not on station list: ignored
Station AUSN is not on station list: ignored
date hrmn sec lat long depth no m rms damp erln erlt erdp
111013 210 28.81 1739.48S 26 40.9E 0.1 15 3 4.74 0.000 45.7 32.2 94.5
stn dist azm ain w phas calcphs hrmn tsec t-obs t-cal res wt di
LSZ 309 31.6 50.4 0 P PN4 211 14.9 46.05 43.90 2.15 1.00 12
LSZ 309 31.6 50.4 0 S SN4 211 47.8 78.98 76.39 2.59 1.00 25
Bula 342 143.8 50.4 0 P PN4 211 13.1 44.29 48.08 -3.78 1.00 22
Bula 342 143.8 50.4 0 S SN4 211 52.1 83.30 83.65 -0.35 1.00 12
MATP 361 148.3 50.4 0 P PN4 211 15.8 46.97 50.43 -3.45 1.00 22
MATP 361 148.3 50.4 0 S SN4 211 57.2 88.34 87.74 0.60 1.00 11
LBTB 822 187.7 46.8 0 P PN6 212 17.0 108.15 106.10 2.06 1.00 1
LBTB 822 187.7 46.8 0 S SN6 213 39.3 190.48 184.61 5.87 1.00 4
WIN 1139 239.9 46.8 0 P PN6 212 0.3 151.47 143.48 7.99 0.97* 8
KJAB 1216 255.7 46.8 0 P PN6 212 54.3 145.51 152.42 -6.91 0.90*10
BOSA 1222 186.6 46.8 0 P PN6 213 0.8 151.96 153.17 -1.21 0.89* 3
BOSA 1222 186.6 46.8 0 S SN6 214 57.3 268.44 266.52 1.92 0.89* 3
UPI 1309 204.1 46.8 0 P PN6 213 4.2 155.35 163.36 -8.01 0.81* 1
UPI 1309 204.1 46.8 0 S SN6 215 19.4 290.57 284.25 6.32 0.81* 4
KOMG 1638 213.1 45.3 0 P Pn 213 51.2 202.34 209.39 -7.04 1.00 4
LSZ BZ hdist: 309.0 coda: 136.0 mc = 2.9
Bula SZ hdist: 342.0 coda: 414.0 mc = 4.1
MATP BZ hdist: 361.0 coda: 225.0 mc = 3.5
BOSA BZ hdist: 1222.0 coda: 385.0 mc = 4.9
2011 1013 0210 28.8 R -17.658 26.681 0.1 BUL 10 4.7 3.9CBUL
OLD: 1013 0210 28.8 R -17.658 26.681 0.1 BUL 10 4.7 3.9CBUL
# 36 13 Oct 2011 02:10 28 R -17.658 26.681 0.1 4.7 3.9CBUL 10 ?
# 37 13 Oct 2011 02:10 29 R -19.106 31.841 10.0F 0.9 4.0CBUL 3 ? 1
date hrmn sec lat long depth no m rms damp erln erlt erdp
111013 210 29.77 19 6.38S 31 50.5E 10.0* 6 2 0.91 0.000 16.6 19.1 0.0
stn dist azm ain w phas calcphs hrmn tsec t-obs t-cal res wt di
Bula 358 250.7 50.4 0 P PN4 211 19.2 49.46 48.96 0.50 1.00 12
Bula 358 250.7 50.4 0 S SN4 211 53.5 83.68 85.19 -1.51 1.00 15
MATP 379 246.8 50.4 0 P PN4 211 21.6 51.87 51.68 0.20 1.00 9
MATP 379 246.8 50.4 0 S SN4 212 0.9 91.14 89.92 1.23 1.00 14
BOSA 1248 211.2 46.8 0 P PN6 213 4.1 154.31 155.12 -0.81 0.87*16
BOSA 1248 211.2 46.8 0 S SN6 214 59.9 270.17 269.91 0.26 0.87*34
Bula SZ hdist: 358.1 coda: 282.0 mc = 3.7
MATP BZ hdist: 379.1 coda: 205.0 mc = 3.4
BOSA BZ hdist: 1248.0 coda: 390.0 mc = 5.0
2011 1013 0210 29.8 R -19.106 31.841 10.0F BUL 3 0.9 4.0CBUL
OLD: 1013 0210 29.8 R -19.106 31.841 10.0F BUL 3 0.9 4.0CBUL

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FUTURE PLANS

- Zimbabwe needs to upgrade its seismological network to keep abreast with technological developments in earthquake monitoring.
- Currently most of the Seismological network of Zimbabwe has been down, rendering its event detection capability and with two stations the exact epicentral location cannot be accurately ascertained.
- The Department is on a drive to try resuscitate the old network.
- Plans to resuscitate the other seismic stations in Zimbabwe are under way and two stations are being installed now.
- We hope that before the end of 2013' s first quarter the two stations should be operational.

•WEB:

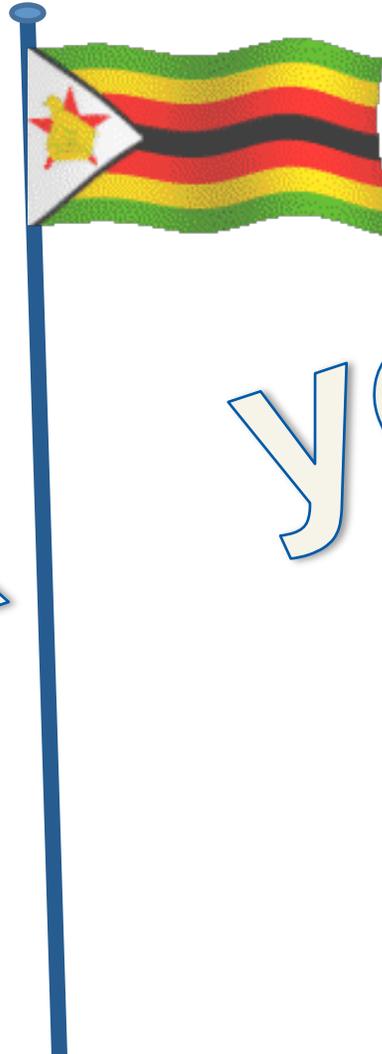
http://www.weather.co.zw/index.php?option=com_content&view=article&id=63&Itemid=77



CHALLENGES FACED BY THE NDC

- Poor station network.
- Power cuts on the national grid.
- Lack of funding for station operations.
- Lack of spare parts of hardware and competent expertise to maintain stations
- Brain drain.





Thank you