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INTRODUCTION



Fig 1: Location of Botswana

Botswana is located in Southern Africa (Fig 1) that is geologically characterized by kimberlite outcrops. Strong earthquakes are rare in Botswana because of its location in a stable continental region. Botswana experienced an earthquake on April 3, 2017 that was felt in South Africa, Zimbabwe and Swaziland. Data were collected from IMS seismic, infrasound and hydroacoustic (SHI) stations that were at local, regional and teleseismic (Fig 2) distances from the epicentre of the earthquake.



Fig 2: Location of IMS stations

DATA AVAILABILITY AND INTERPRETATION

Station	Type	Distance	Time	Wave signal clarity
LBTB	Auxiliary 3-C	2.42	17:41:18	Very Good
I47ZA	Infrasound array	5.98	17:41:20	Very Good
BOSA	Primary 3-C	5.98	17:41:57	Very Good
LSZ	Auxiliary 3-C	7.79	17:4.59	Very Good
TSUM	Auxiliary 3-C	7.98	17:42:10	Very Good
I35NA	Infrasound array	7.99	17:42:12	Very Good
OPO	Auxiliary 3-C	20.86	17:44:53	Very Good
KMBO	Primary Array	24.31	17:45:32	Very Good
ATD	Auxiliary 3-C	38.03	17:46:47	Very Good
DBIC	Primary 3-C	41.46	17:48:01	Very Good
TORD	Primary Array	42.41	17:48:09	Very Good
H08	Hydrophone	47.69	17:48:54	Very Good
KEST	Auxiliary 3-C	59.96	17:50:13	Very Good
MDT	Auxiliary 3-C	62.08	17:50:36	Very Good
H01	Hydrophone	76.52	17:52:08	Very Good

Table 1 shows that 11 Seismic, 2 infrasound and 2 hydroacoustic stations within a distance of 2 - 80 degrees from the epicentre of the event were used for analysing the event for good location of the event (Fig 8).

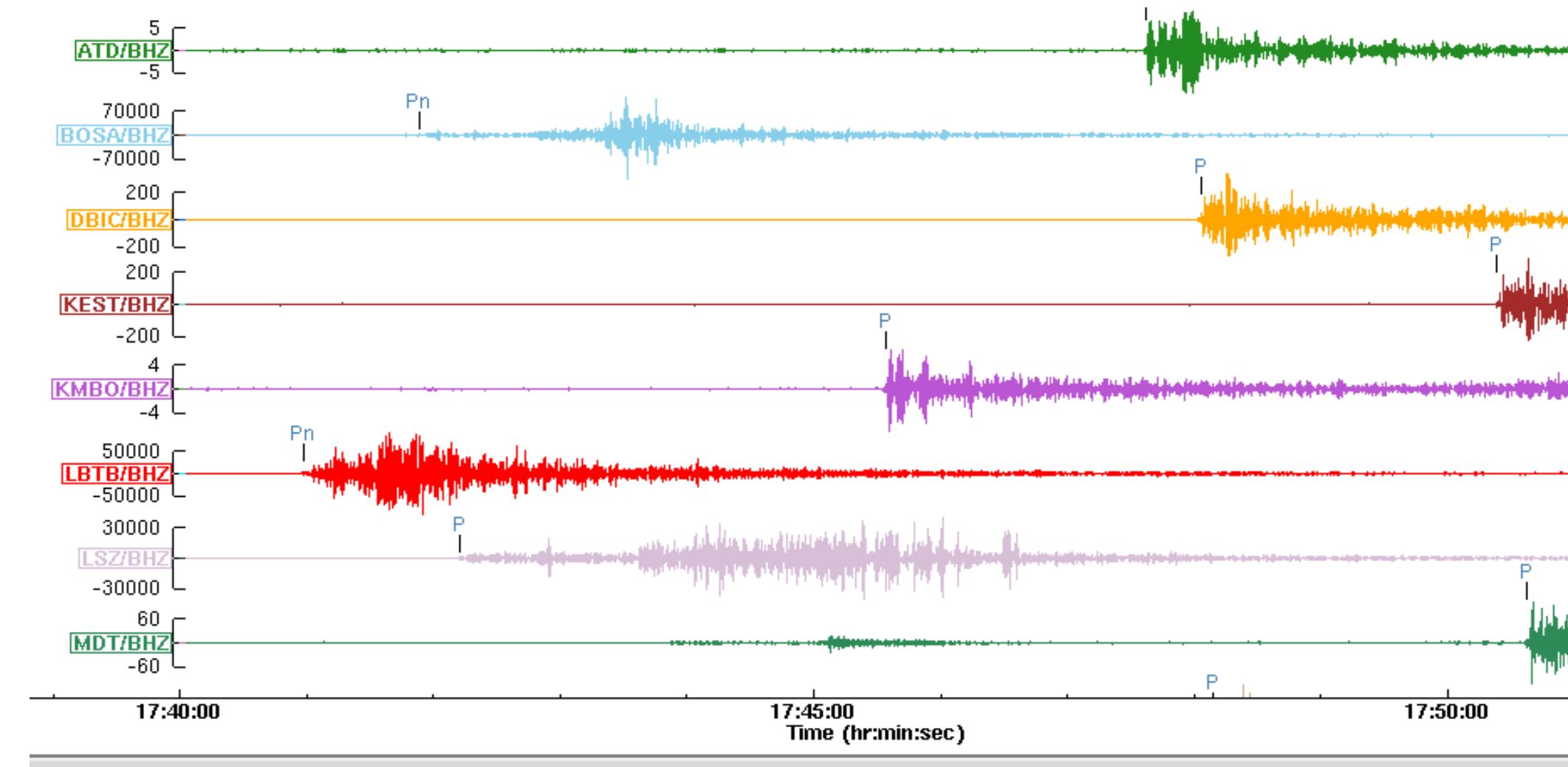


Fig 3: Seismic waves

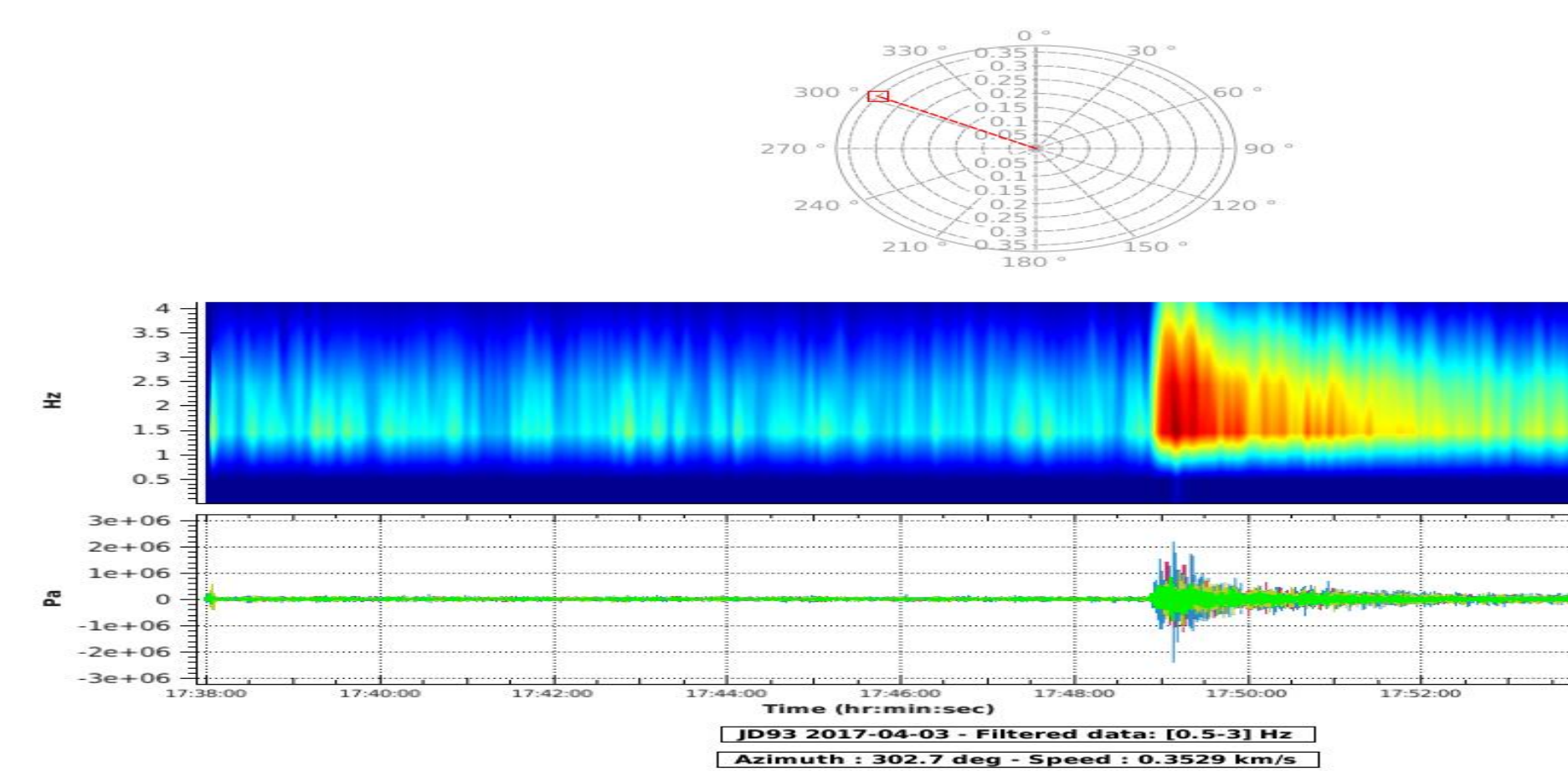


Fig 4: H08 Analysis

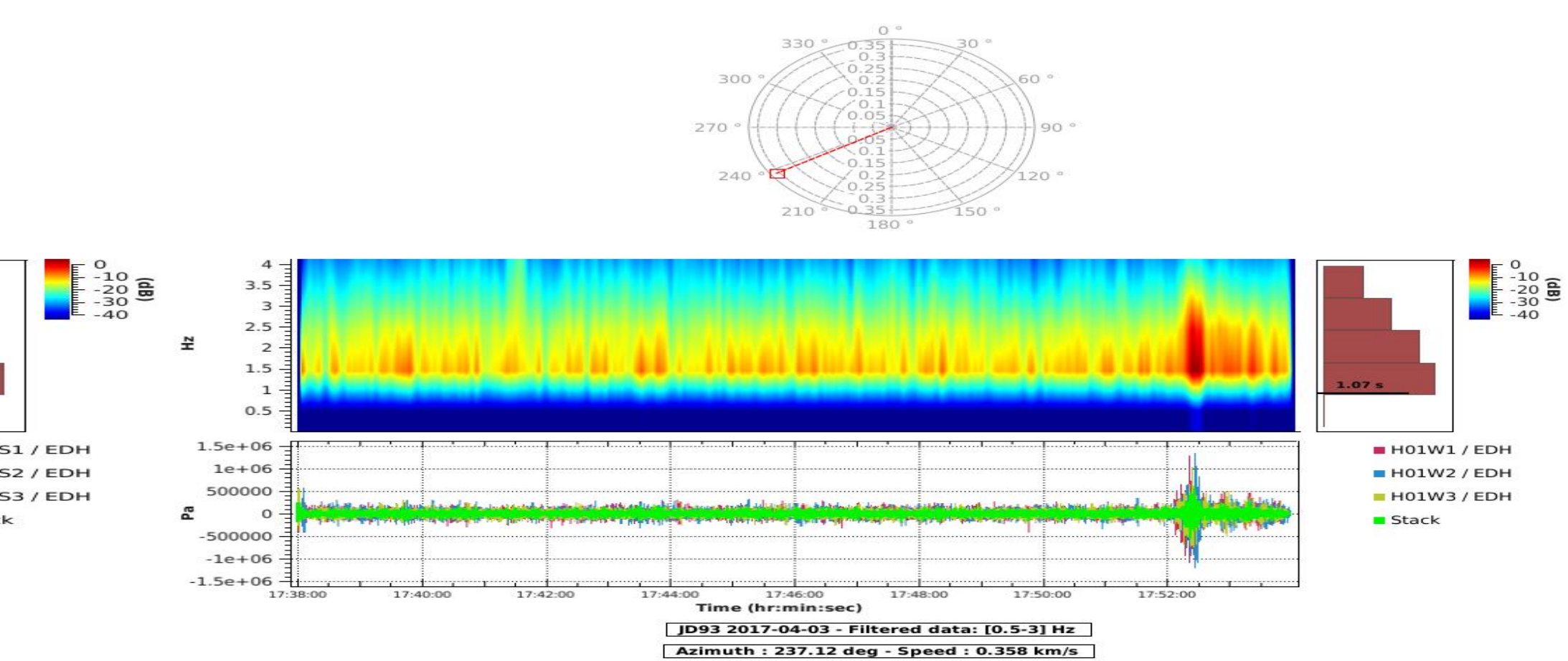


Fig 5: H01 Analysis

GPMCC analysis of the hydroacoustic and infrasound data for azimuth and speed estimation is shown in Fig 4 -7.

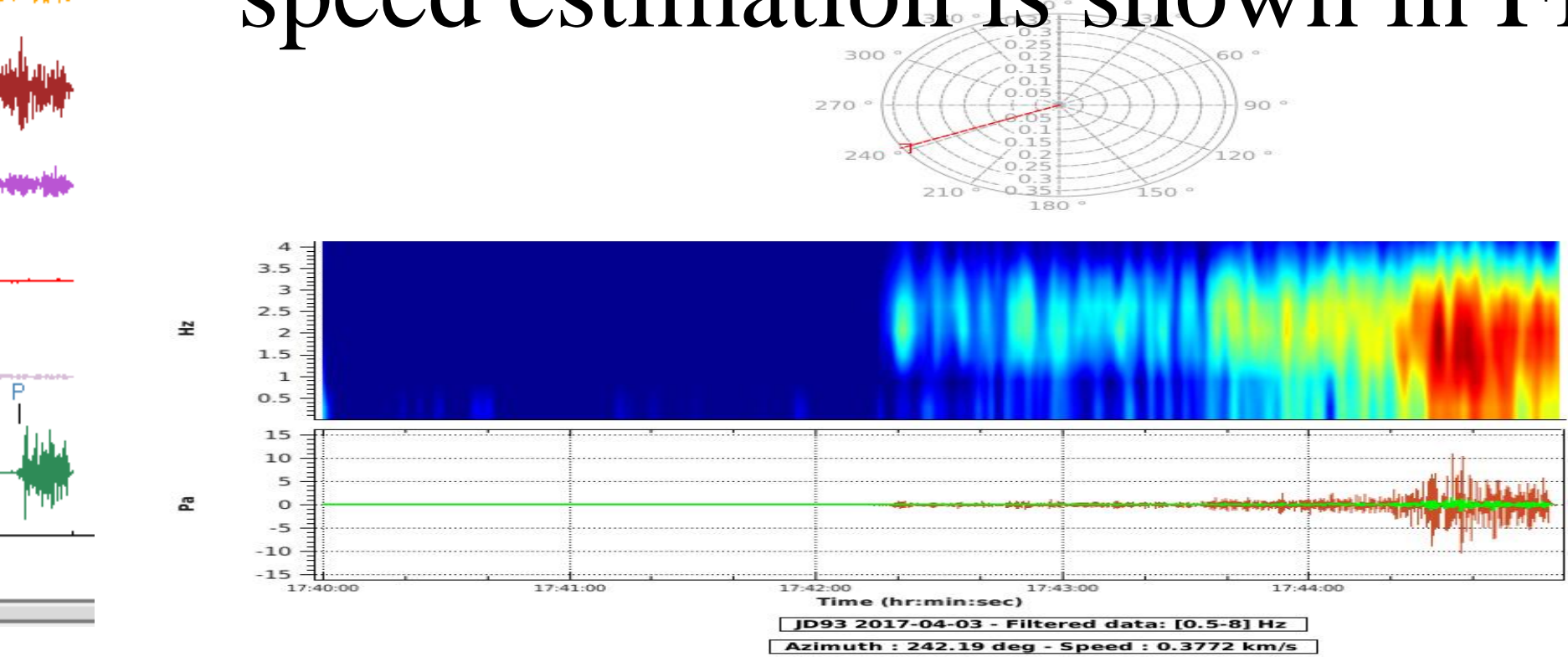


Fig 6: I35NA Analysis

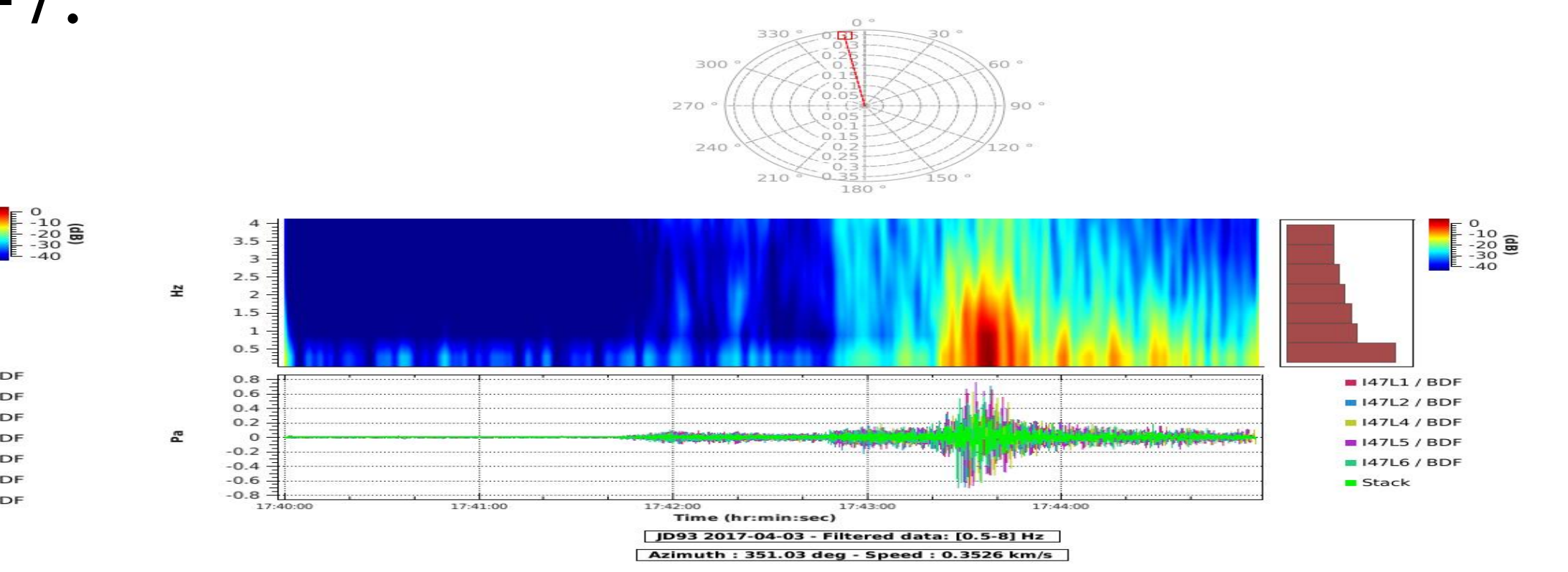


Fig 7: I47ZA Analysis

Table 1: List of stations
GPMCC and Geotool software was used to analyse waveforms from SHI. The seismic data were analysed. The analysis for f-k analysis and the slowness and azimuth was done using geotool (Fig 3).

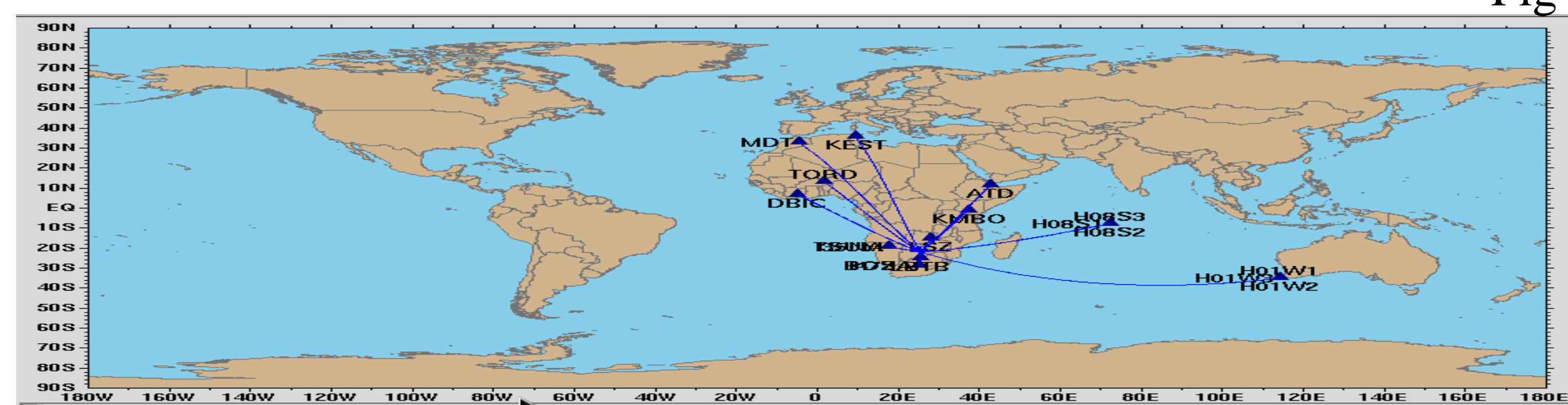


Fig 8: Location of the event

The Botswana 2017 earthquake was of M_w 6.5 and occurred in a region considered as stable because there is no known local strain build-up as a result of plate tectonics. The earthquake can be classified as an intraplate earthquake. The depth (30km) of the earthquake suggests that it was not triggered by anthropogenic activities (Matteo *et al.*, 2017) but resulted from elevated local pulse of fluid pressure occasioning failure at the ductile lower crust from low differential stress (Gardonio *et al.*, 2018).

CONCLUSION

GPMCC as an analytical tool was used to estimate the phase, magnitude, azimuth, arrival time and slowness associated with the Botswana earthquake. The results also showed GPMCC can be deployed for assessing the operational readiness of the SHI stations towards achieving nuclear test monitoring goal for which they were set up.

References:

Gardonio, B., Jolivet, R., Calais, E., & Leclère, H. (2018). The April 2017 Mw6.5 Botswana earthquake: An intraplate event triggered by deep fluids. *Geophysical Research Letters*, 45. <https://doi.org/10.1029/2018GL078297>
Matteo A., Marco, P., Christian, B., Marco, M., Michele, S., and Salvatore, S. (2017). Did Anthropogenic Activities Trigger the 3 April 2017 Mw 6.5 Botswana Earthquake? *Remote Sens.*, 9, 1028

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