Moment Seismic Inversion with ISOLA of the 2013-08-13 Earthquake at the Colombian Pacific Ocean.

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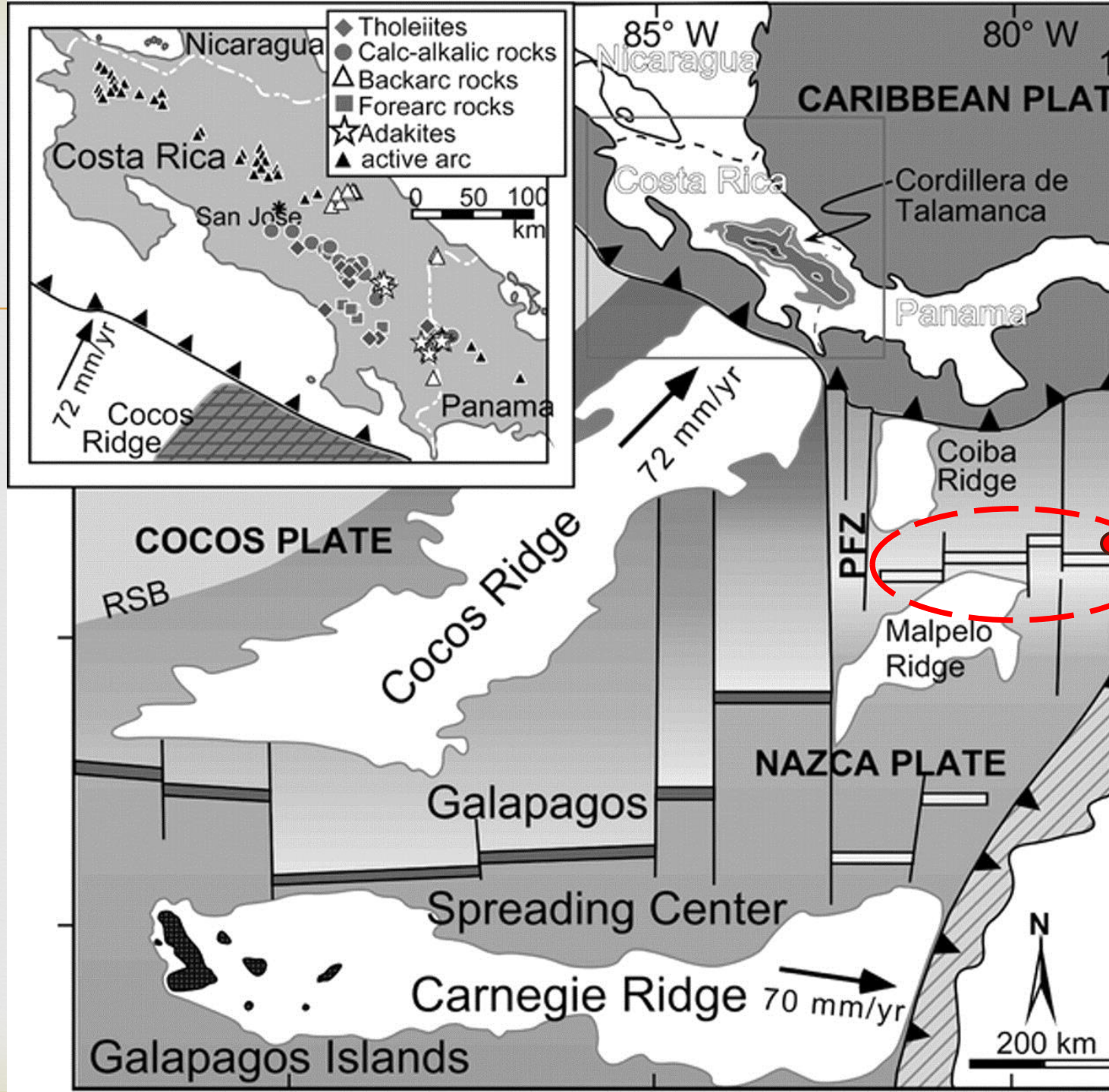
Tectonic Setting

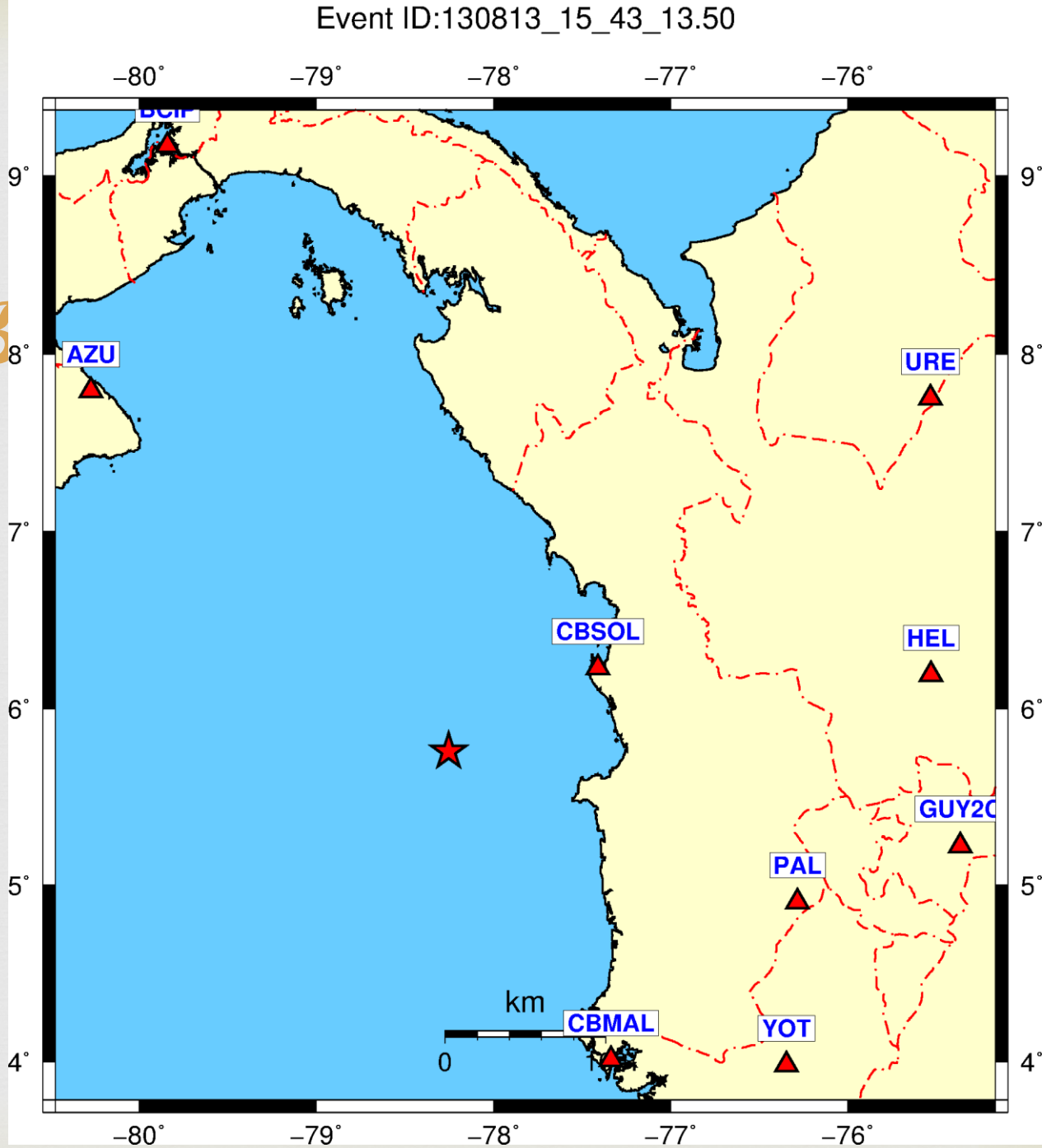
Recovered from: Missing history (16-71 Ma) of the Galápagos hotspot: Implications for the tectonic and biological evolution of the Americas. Geology, September,2002, v. 30, p.795-798



Event Location
Station Selection

Epicenter event location.

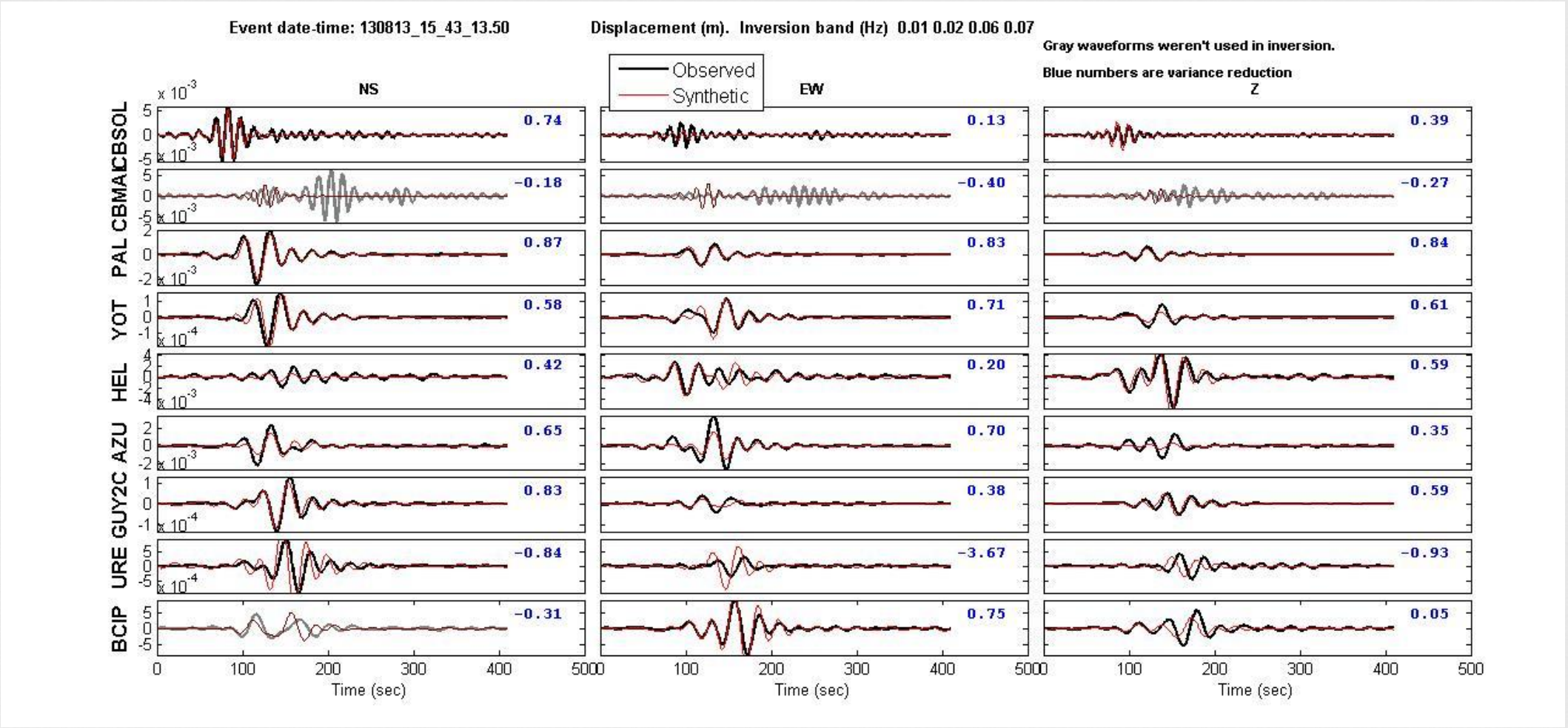
Latitude: 5.755
Longitude: -78.254
Depth: 12.3 km
Magnitude: 6.5 Mw

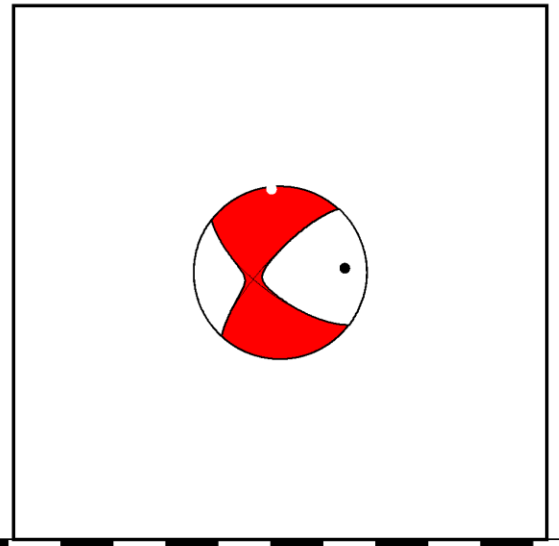


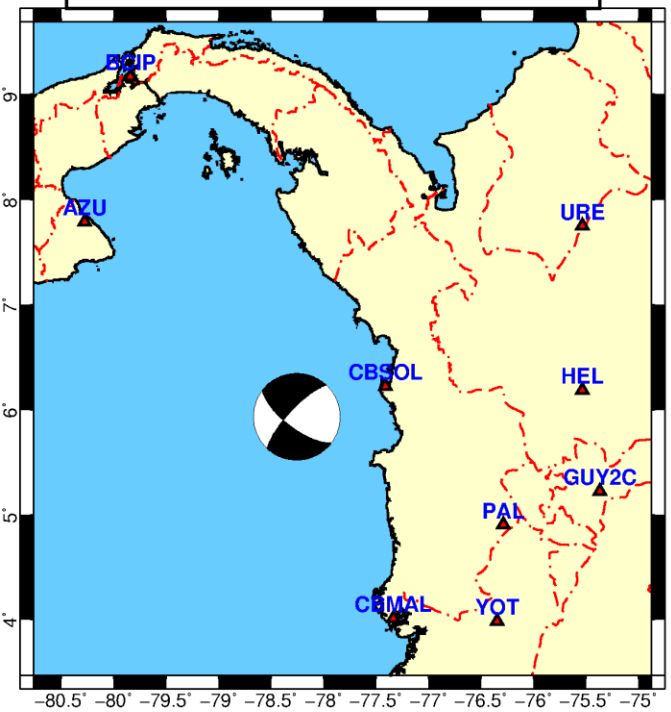
Quality assess

- For the inversion was used 9 stations, 2 of this are accelerographs.
- After assess the quality of the data, the 7 seismograph station were chosen and only one of the accelerograph stations.
- Frequency range used
  - Seismograph stations
    - 0.01-0.02 0.04-0.05
  - Accelerograph stations
    - 0.05-0.06 0.09-0.1

Real and synthetic data







MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (RSNC)

Origin time 20130813 15:43:13.50
Lat 5.755 Lon −78.254 Depth 12.3

CENTROID

Trial source number : 27 (Multiple Source line or plane inversion)
Centroid Lat (N)5.9359 Lon (E)−78.254
Centroid Depth (km) : 14
Centroid time : +4.5 (sec) relative to origin time

Moment (Nm) : 6.969e+18
Mw : 6.5
VOL% :0
DC% :95.7
CLVD% :4.3

		SNR	CN	FMVAR	STVAR
Var.red.:	(for stations used in inversion):0.61	NaN	3.2	18±10	0.03
Var.red.	(for all stations) :0.2				

Strike	Dip	Rake
223	75	−158
Strike	Dip	Rake
127	69	−16

P-axis	Azimuth	Plunge
	86	26
T-axis	Azimuth	Plunge
	354	4

Mrr	Mtt	Mpp
−1.203	6.778	−5.575
Mrt	Mrp	Mtp
0.248	2.869	1.018

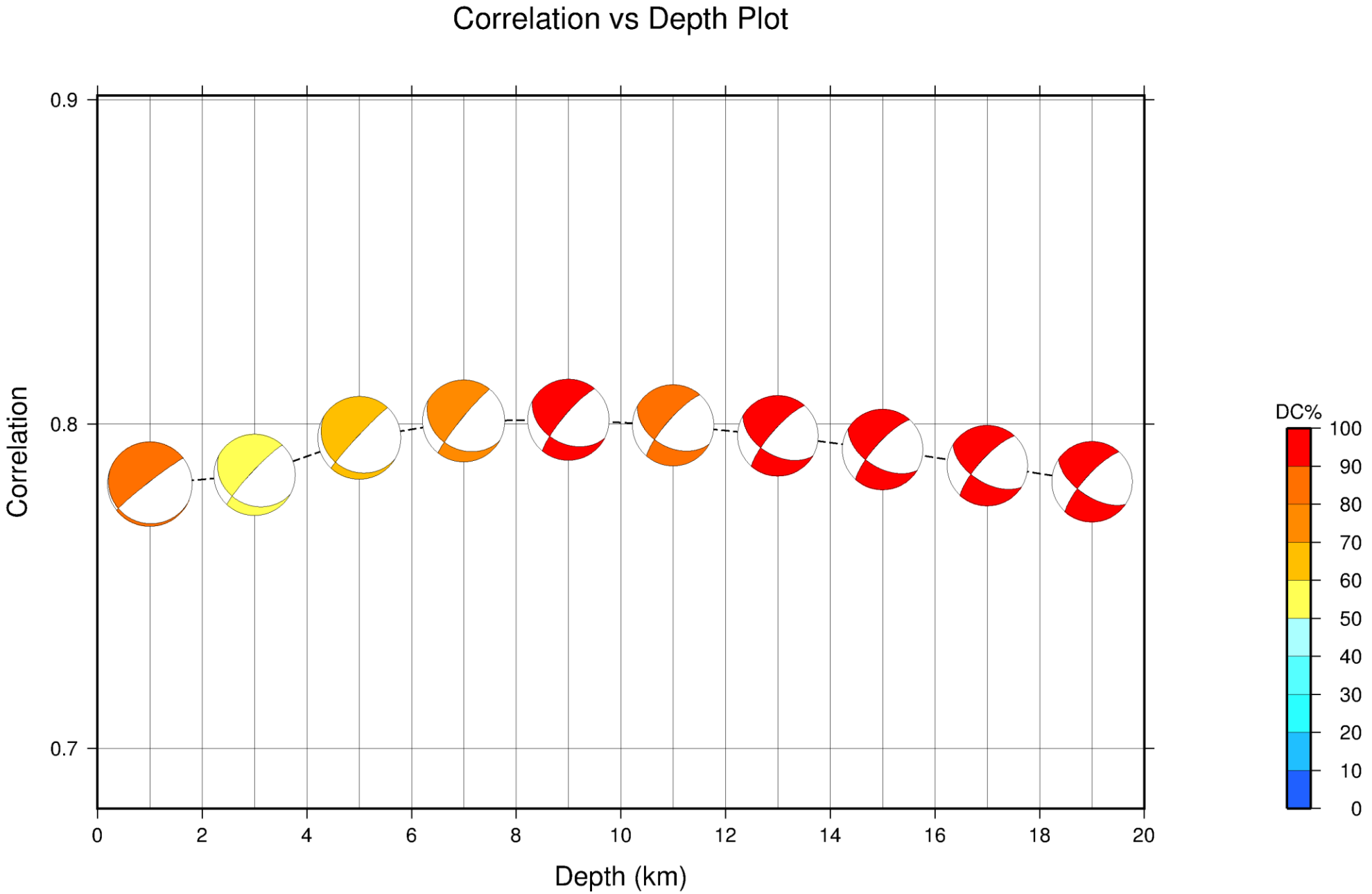
Exponent (Nm): 18

Frequency band used in inversion (Hz)
0.01 - 0.02 -- 0.06 - 0.07

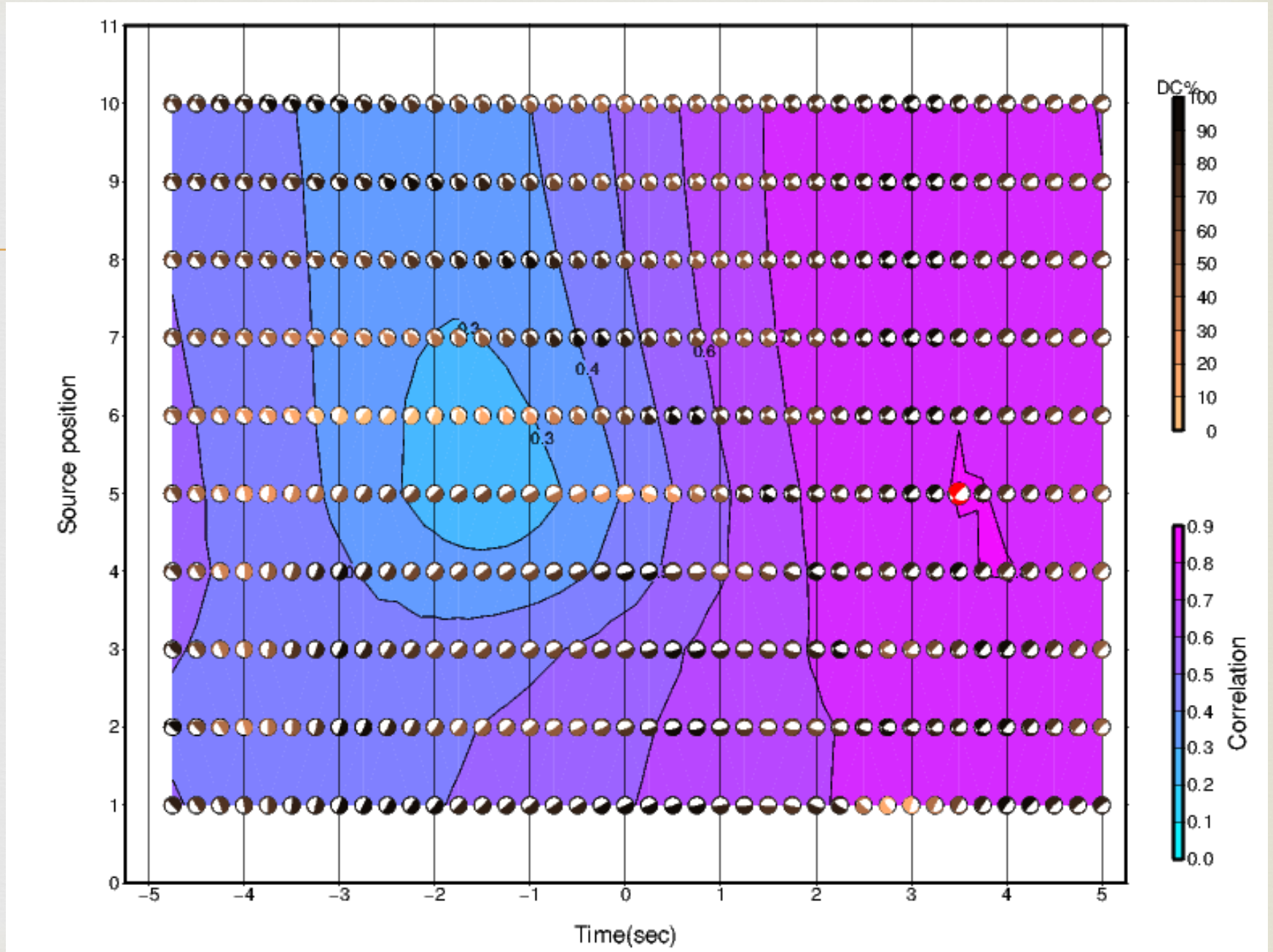
Stations-Components Used-Distance

	NS	EW	Z	D(km)
CBSOL	+	+	+	107
CBMAL	−	−	−	218
PAL	+	+	+	238
YOT	+	+	+	288
HEL	+	+	+	306
AZU	+	+	+	317
GUY2C	+	+	+	326
URE	+	+	+	373
BCIP	−	+	+	416

Solution


Correlation vs Depth Plot
Correlation
0.9
0.8
0.7
0
2
4
6
8
10
12
14
16
18
20
Depth (km)
DC%
100
90
80
70
60
50
40
30
20
10
0

Source Vs. Time



CMT SOLUTION

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13/08/13 15:43:15.19

Epicenter:    5.780   -78.174
MW 6.7

USGS CENTROID MOMENT TENSOR
13/08/13 15:43:32.79
Centroid:     5.943   -77.582
Depth   10            No. of sta:105
Moment Tensor;    Scale 10**19 Nm
   Mrr=-0.46          Mtt= 1.05
   Mpp=-0.59          Mrt= 0.42
   Mrp= 0.64          Mtp= 0.32
  Principal axes:
   T   Val=   1.28   Plg=18   Azm=344
   N         -0.12      42       237
   P         -1.17      43        92

Best Double Couple:Mo=1.2*10**19
 NP1:Strike=223 Dip=75 Slip=-133
 NP2:          118     45       -21
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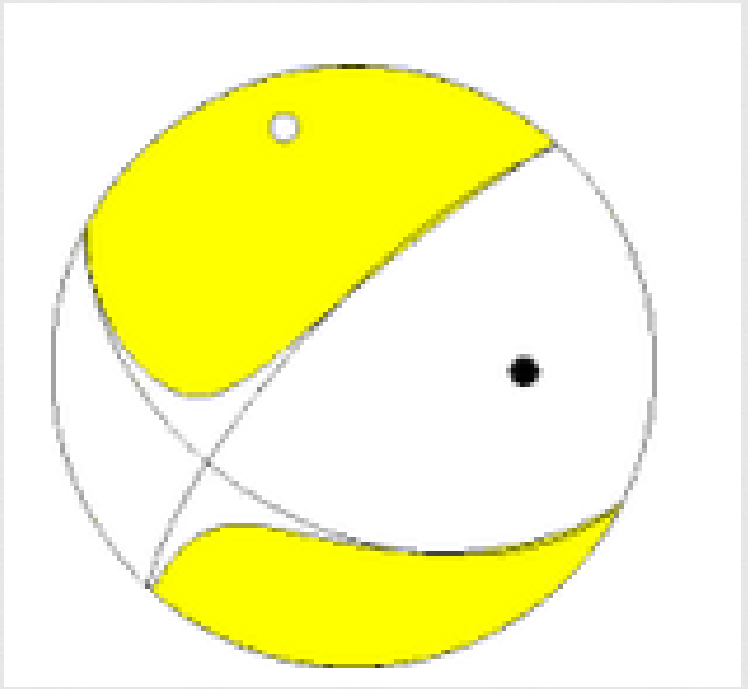

Outcome

- The inversion show up a good correlation between the real data and the synthetic data for the Colombian stations.
- The best depth centroid location is at 14 km using the frequency range described before and with this the variance obtained is 0.61.
- After doing a lot of test using different frequency ranges, it was achieve to the best solution.
- The search through the planes in depth is in standby and it is going to be reported in future presentations.

We are so grateful for all your patient and your dedication to achieve the goal of the course.
Thank you very much.