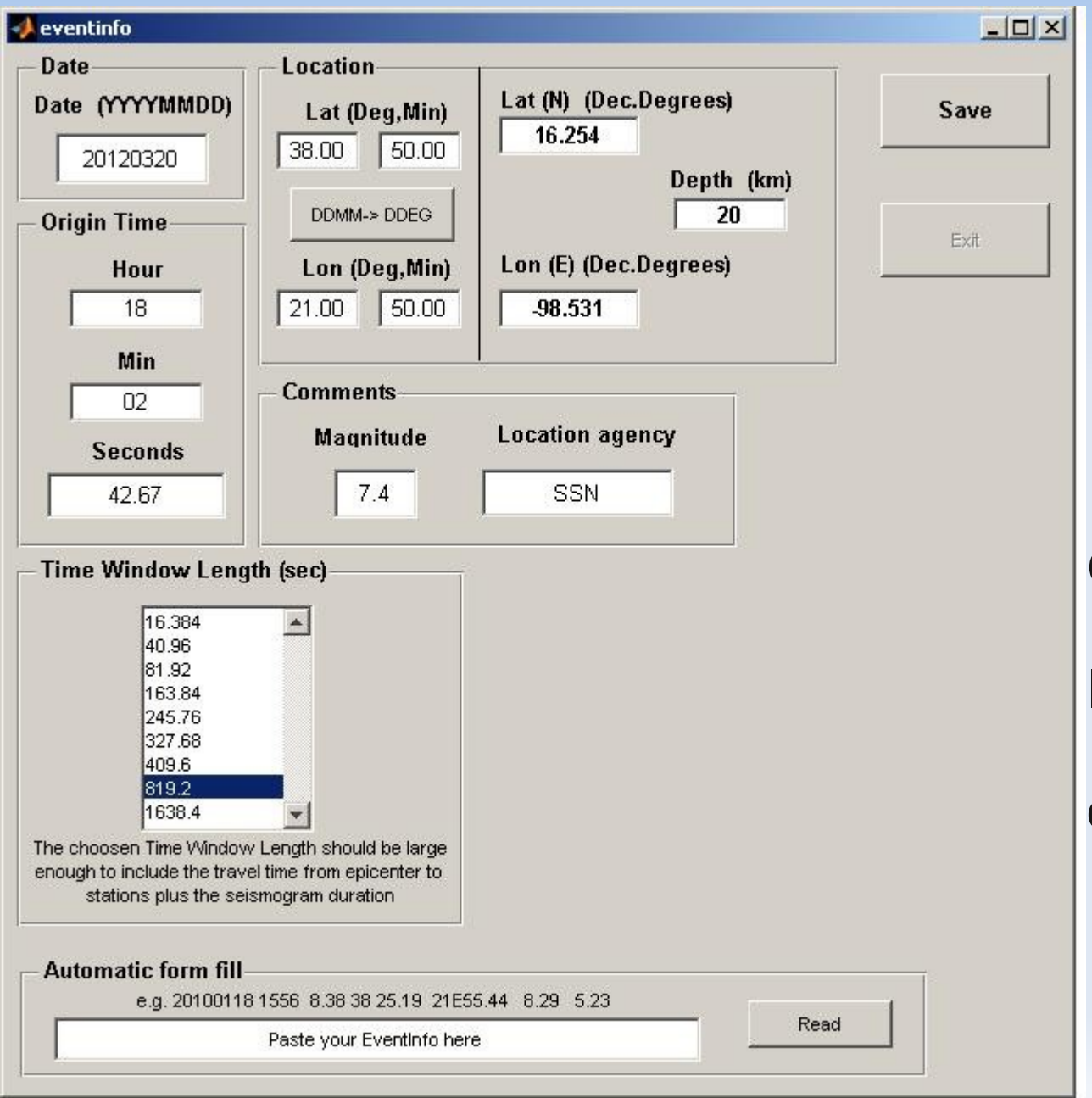
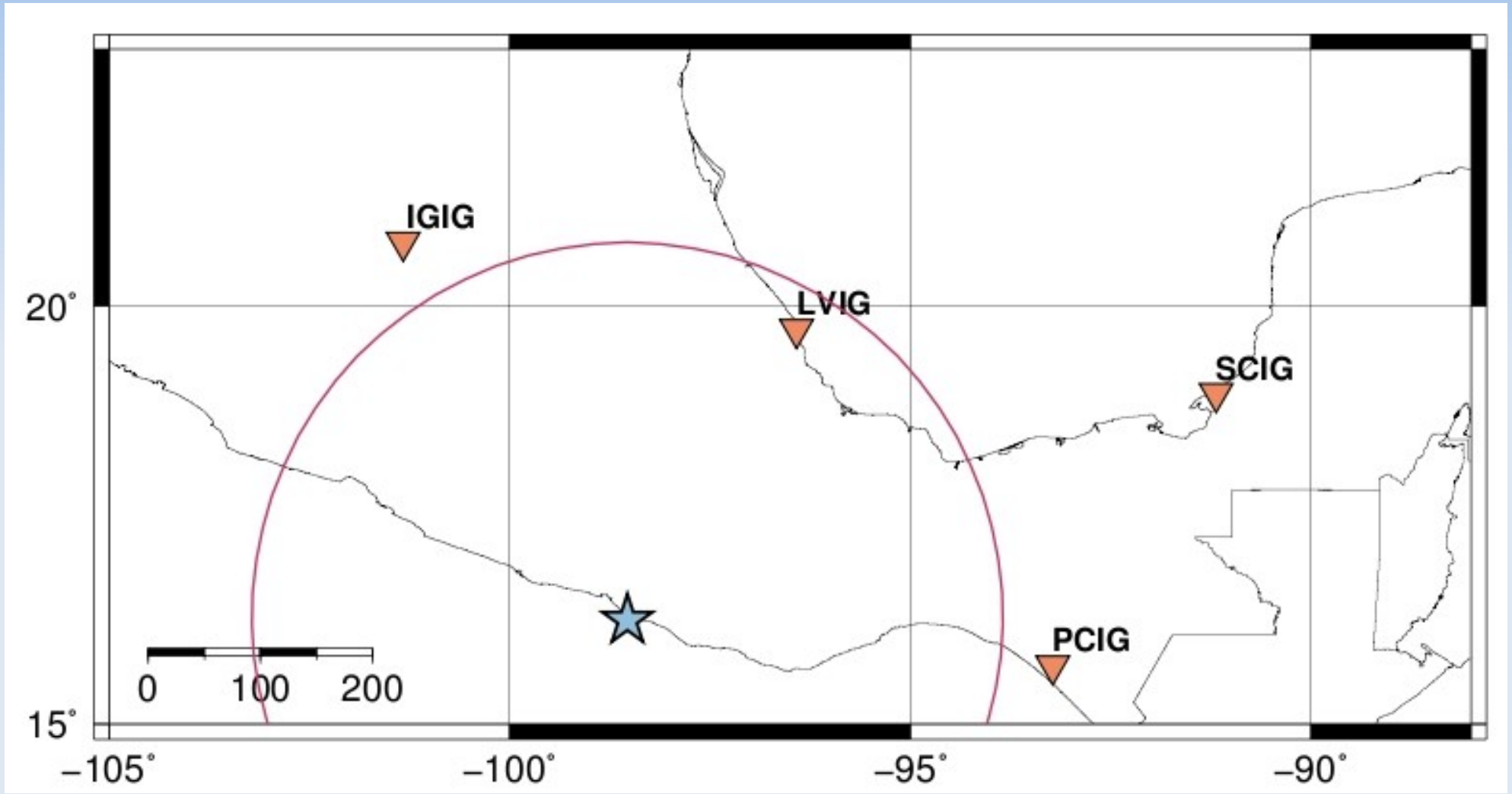


Oscar Alberto Castro Artola

Instituto de Geofísica, UNAM.

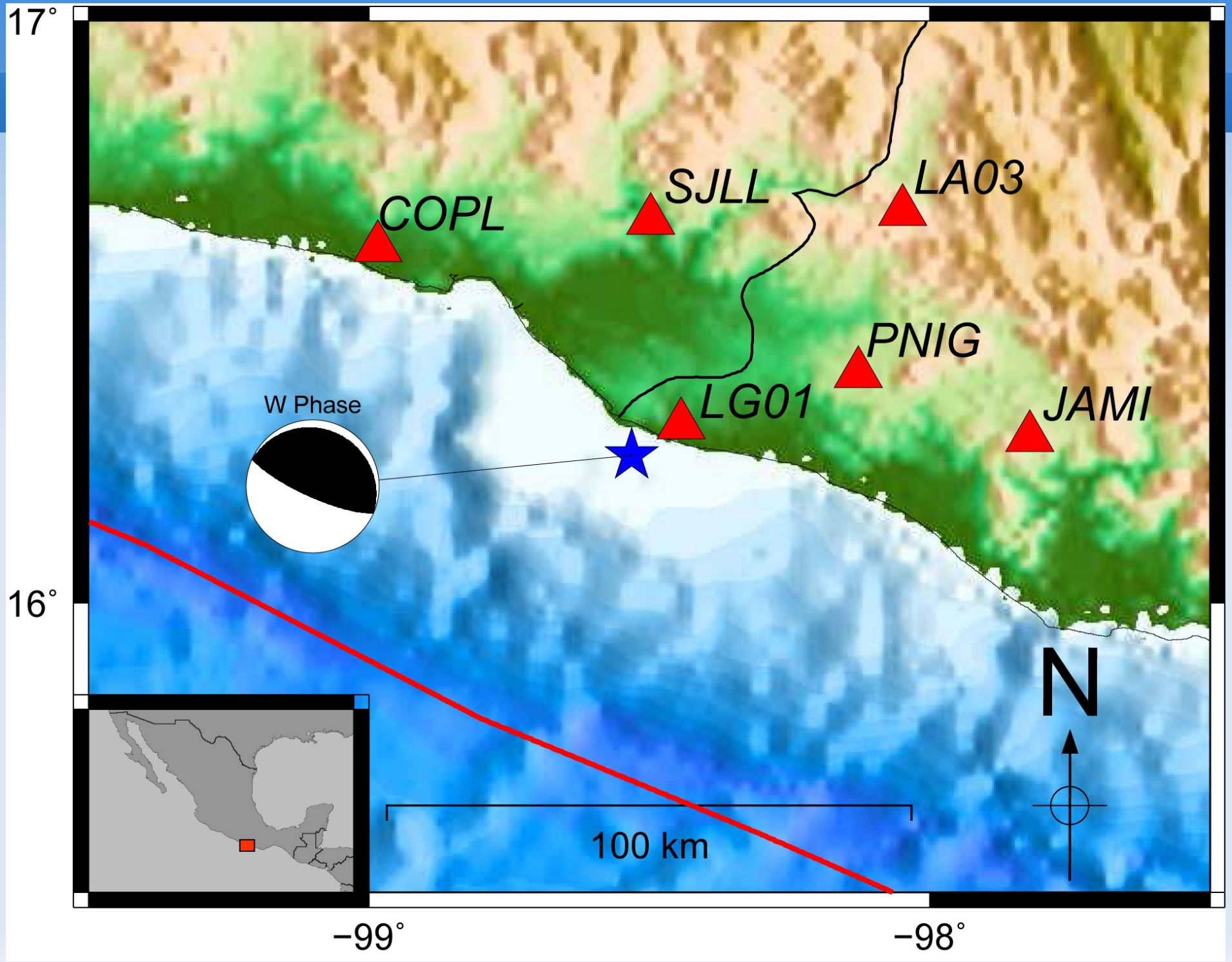
oscar.cas.art@gmail.com

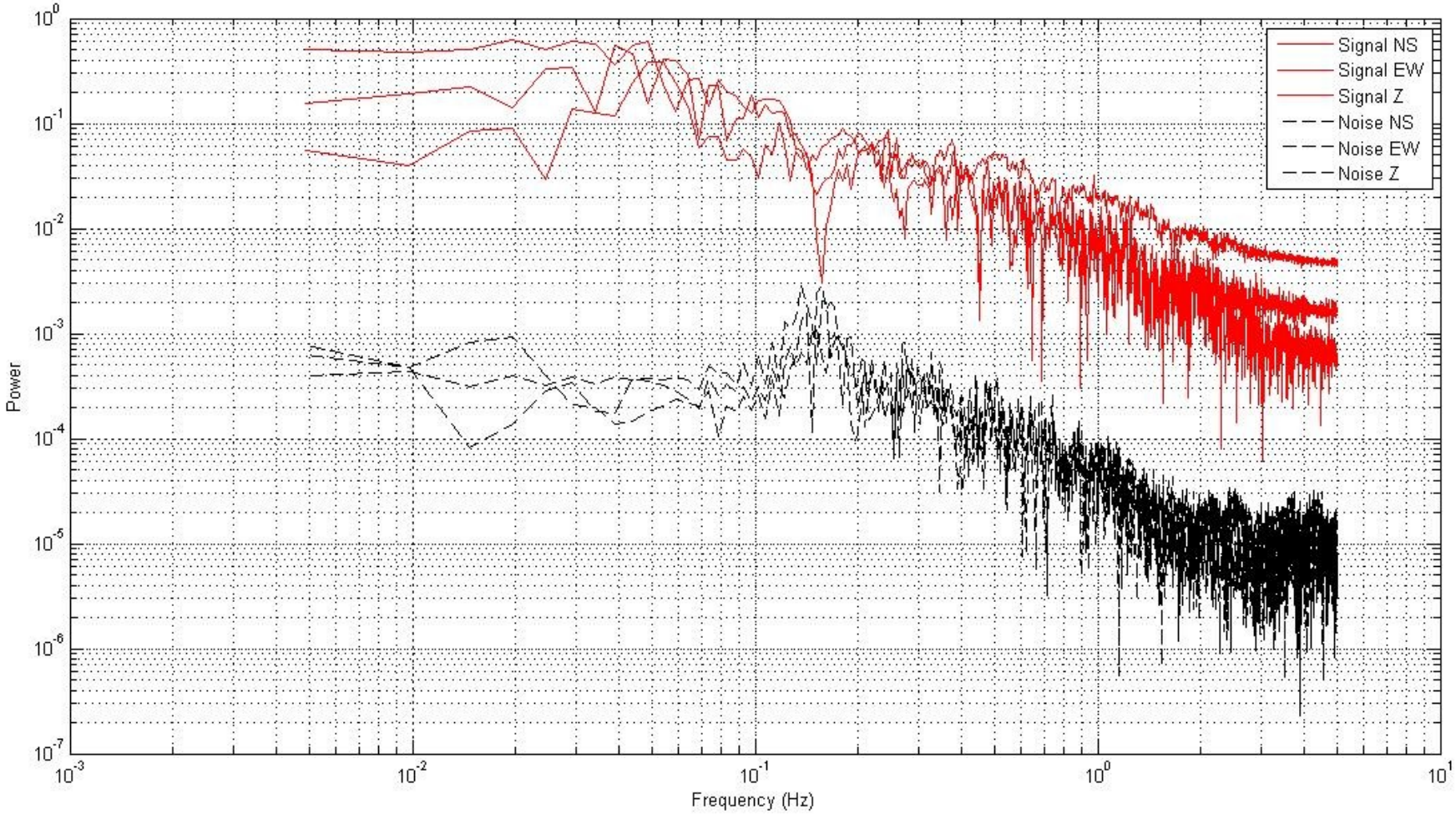
March 20th 2012, Guerrero-Oaxaca, Mexico. Mw=7.5

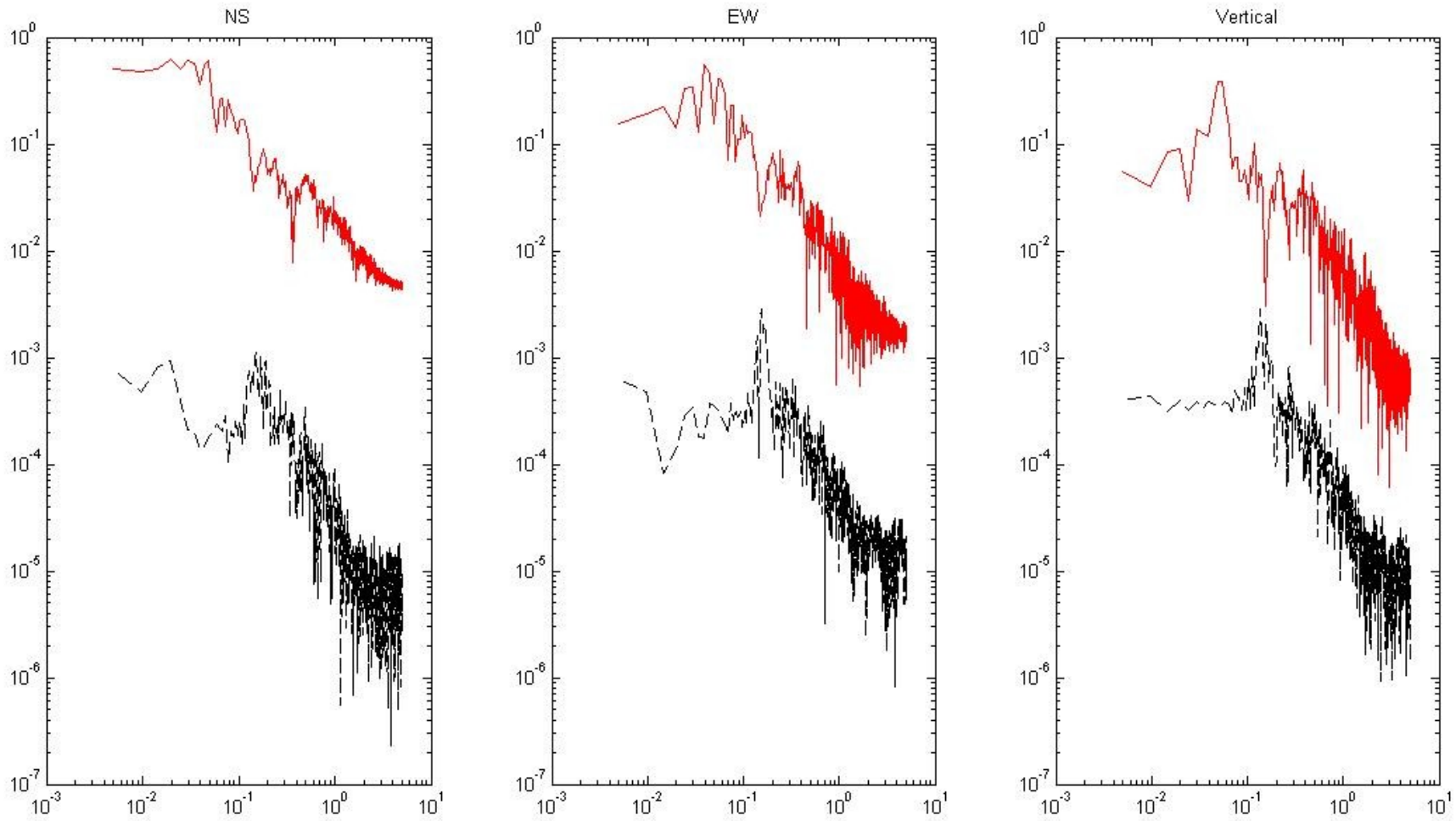


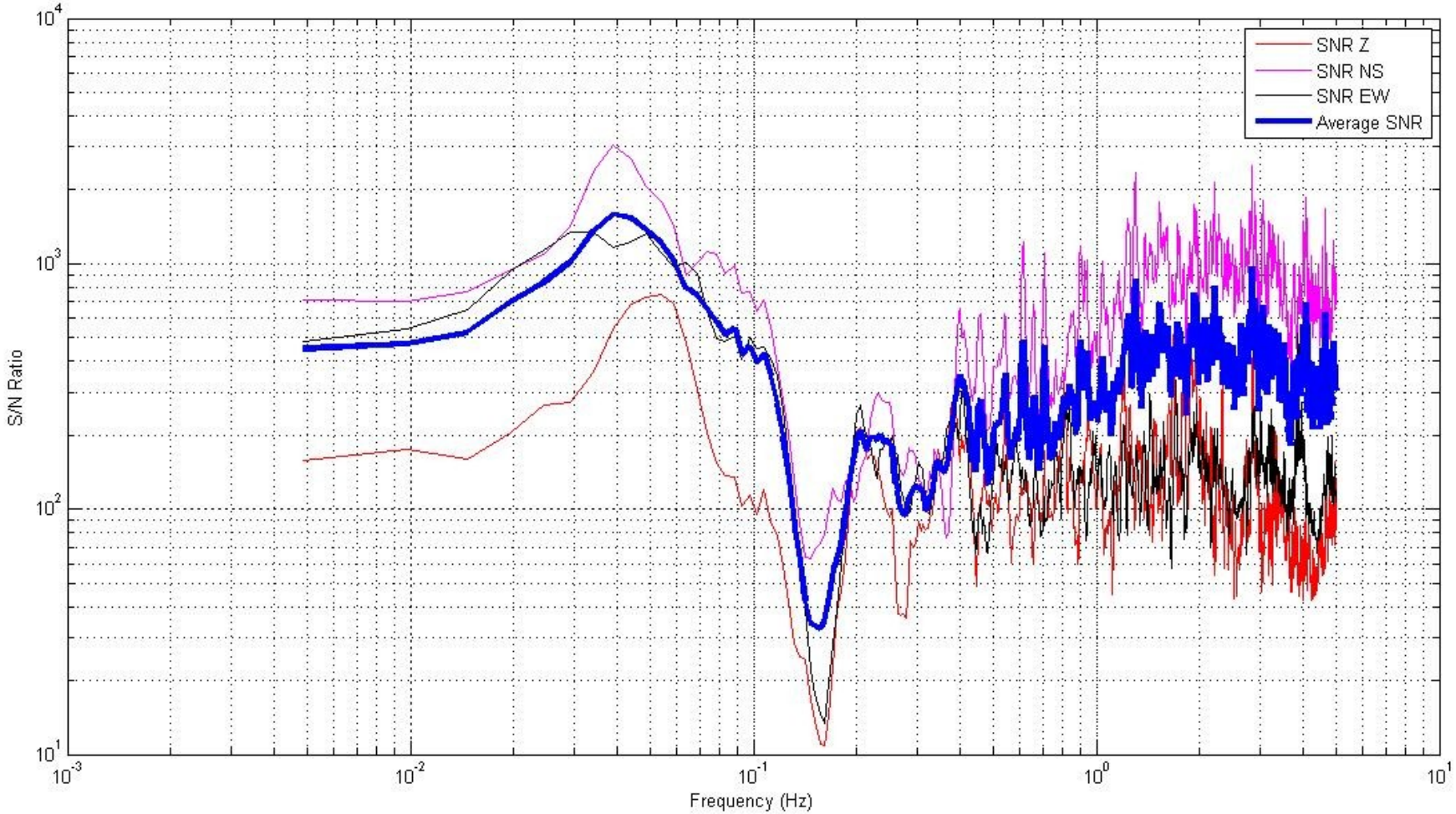
Problems:

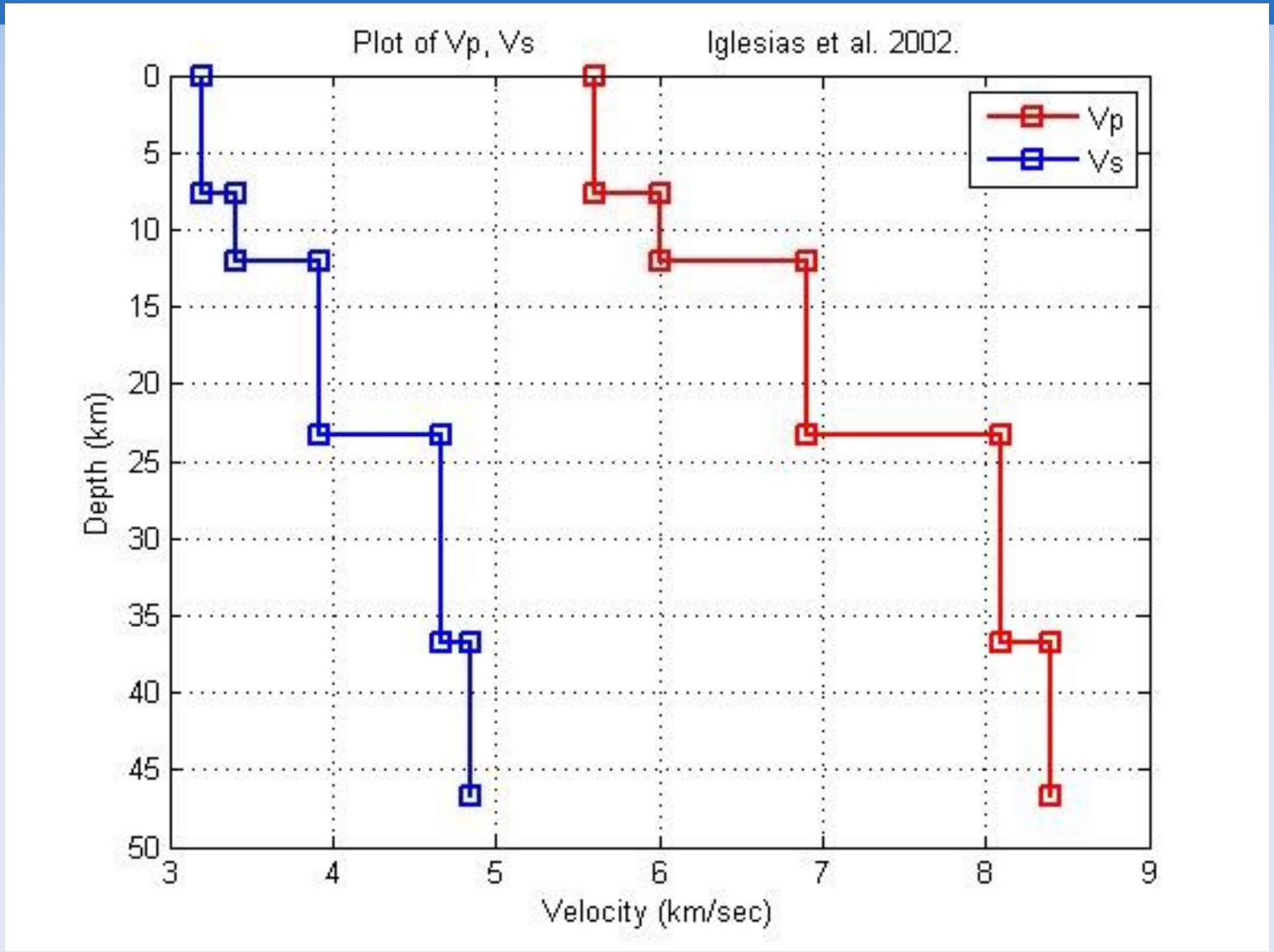
- Filter difference
- Parameter xl
- Taper application (10%)
- Higher frequencies.

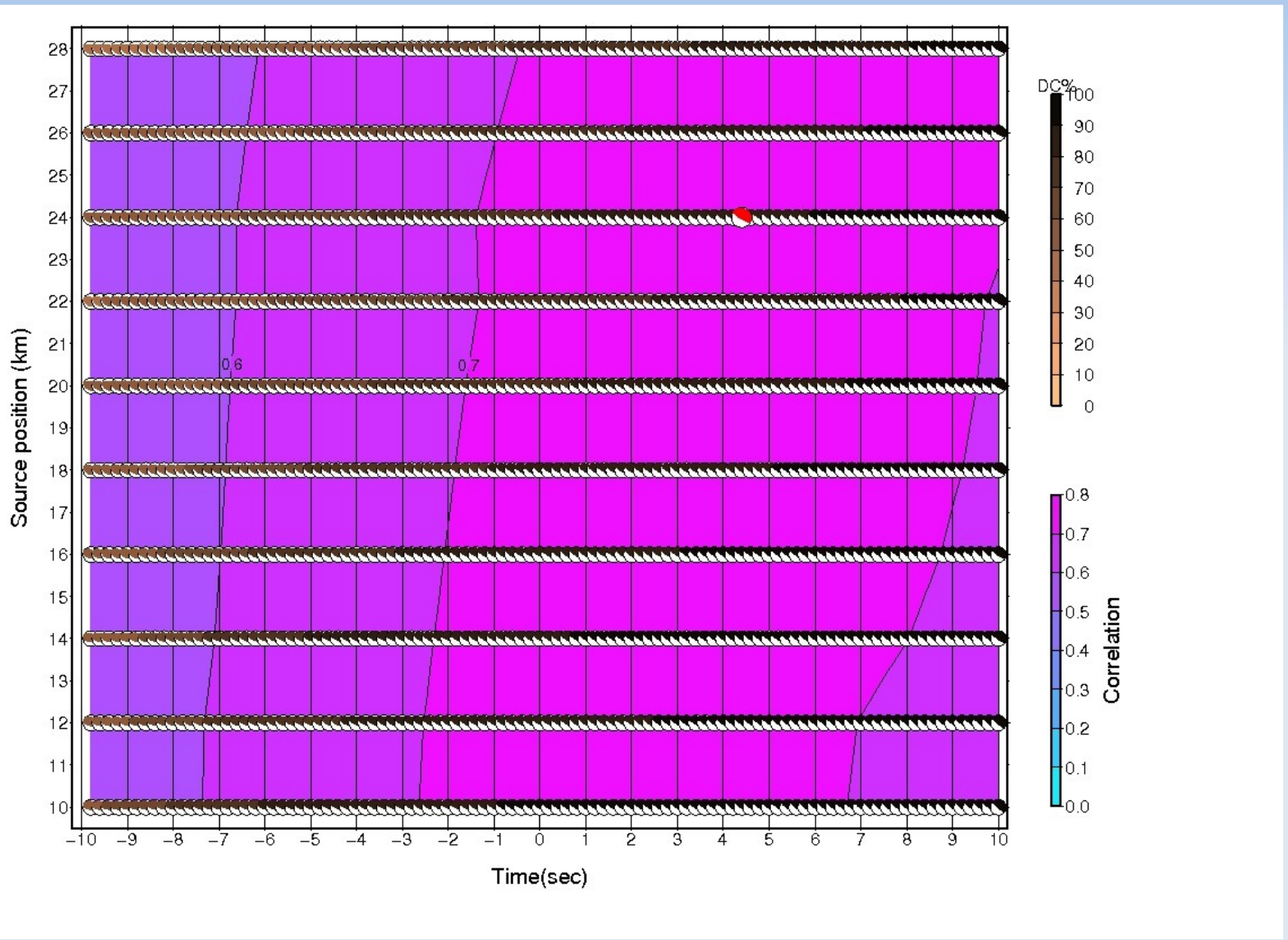

17°
16°
−99°
−98°
COPL
SJLL
LA03
PNIG
LG01
JAMI
W Phase
N
100 km

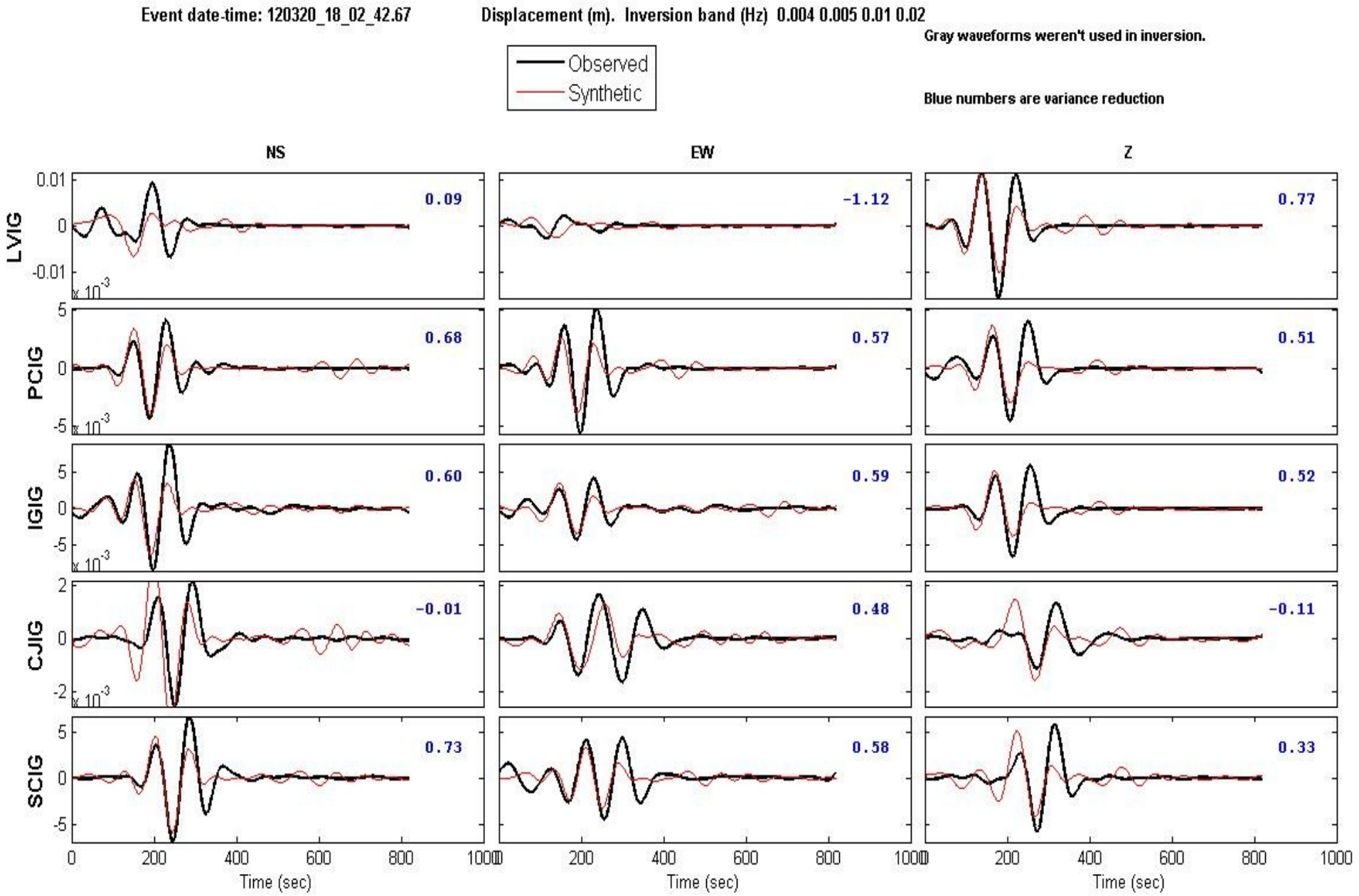

Signal NS
Signal EW
Signal Z
Noise NS
Noise EW
Noise Z
Power
Frequency (Hz)
10^{0}
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-3}
10^{-2}
10^{-1}
10^{0}
10^{1}

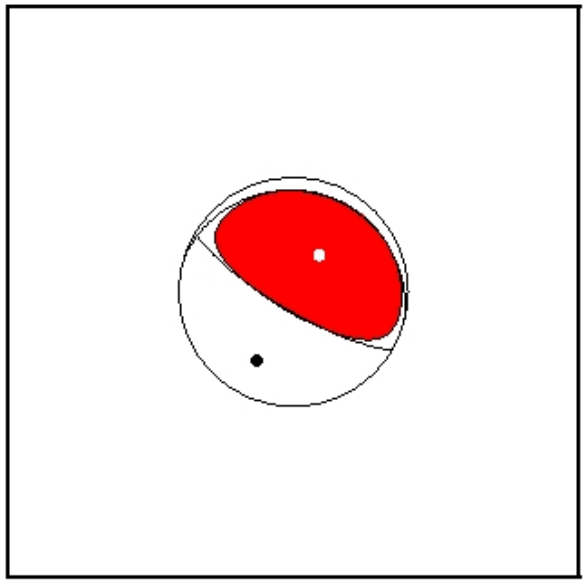

NS
EW
Vertical


SNR Z
SNR NS
SNR EW
Average SNR
S/N Ratio
Frequency (Hz)
10^4
10^3
10^2
10^1
10^{-3}
10^{-2}
10^{-1}
10^0
10^1


Plot of Vp, Vs
Iglesias et al. 2002.
Vp
Vs
Depth (km)
Velocity (km/sec)
0
5
10
15
20
25
30
35
40
45
50
3
4
5
6
7
8
9


Source position (km)
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
0.6
0.7
−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10
Time(sec)
DC%
100
90
80
70
60
50
40
30
20
10
0
Correlation
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0


Event date-time: 120320_18_02_42.67
Displacement (m). Inversion band (Hz) 0.004 0.005 0.01 0.02
Gray waveforms weren't used in inversion.
Observed
Synthetic
Blue numbers are variance reduction
NS
EW
Z
LVIG
PCIG
IGIG
CJIG
SCIG
0.09
-1.12
0.77
0.68
0.57
0.51
0.60
0.59
0.52
-0.01
0.48
-0.11
0.73
0.58
0.33
x 10^-3
Time (sec)



MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (SSN)

Origin time 20120320 18:02:42.67
Lat 16.254 Lon -98.531 Depth 20

CENTROID

Trial source number : 9 (Fixed Epicenter inversion)
Centroid Lat (N)16.254 Lon (E)-98.531
Centroid Depth (km) : 26
Centroid time : +5.2 (sec) relative to origin time

Moment (Nm) : 1.389e+021
Mw : 8
VOL% :0
DC% :86.7
CLVD% :13.3

	SNR	CN	FMVAR	STVAR
Var.red.:(for stations used in inversion):0.56	NaN	4.1	5±3	0.66
Var.red.(for all stations) :0.56				

Strike	Dip	Rake
121	77	93
Strike	Dip	Rake
287	14	77

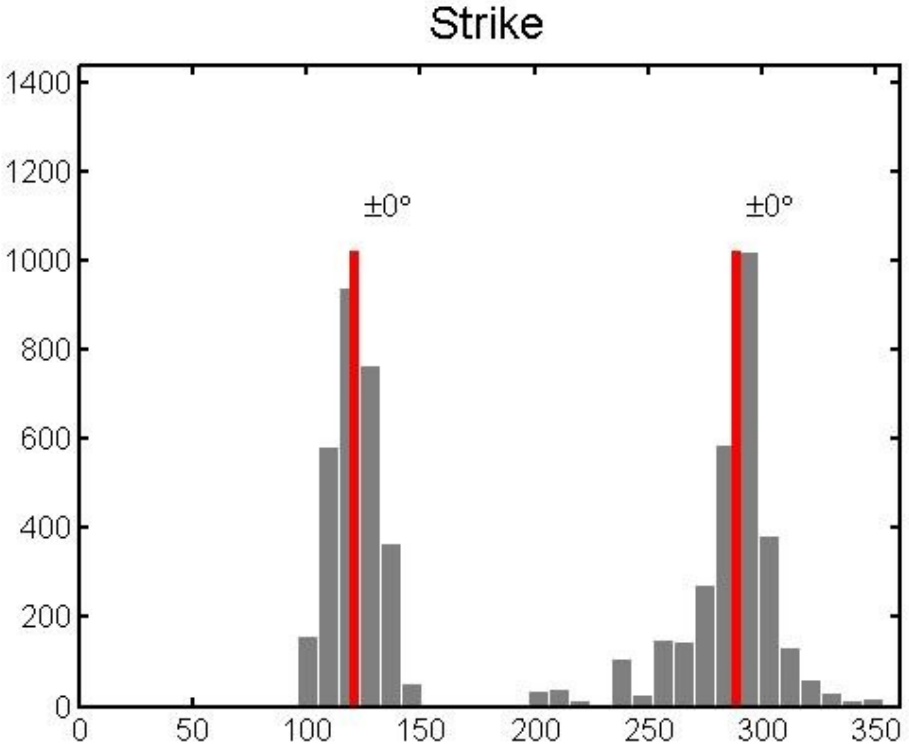
P-axis	Azimuth	Plunge
	208	32
T-axis	Azimuth	Plunge
	35	58

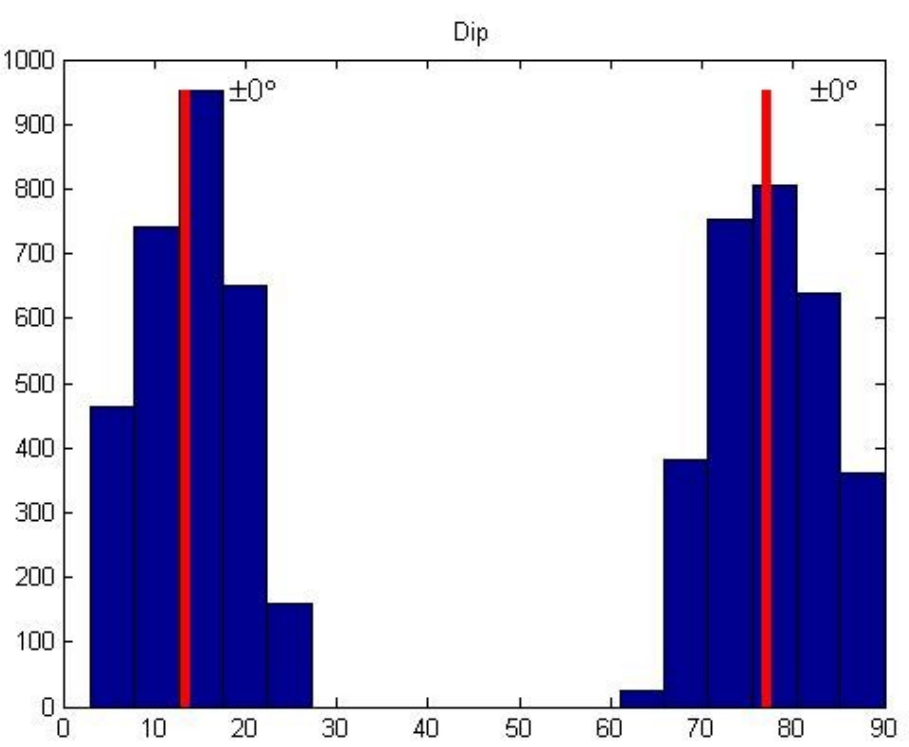
Mrr	Mtt	Mpp
0.664	-0.509	-0.155
Mrt	Mrp	Mtp
1.053	-0.653	0.174

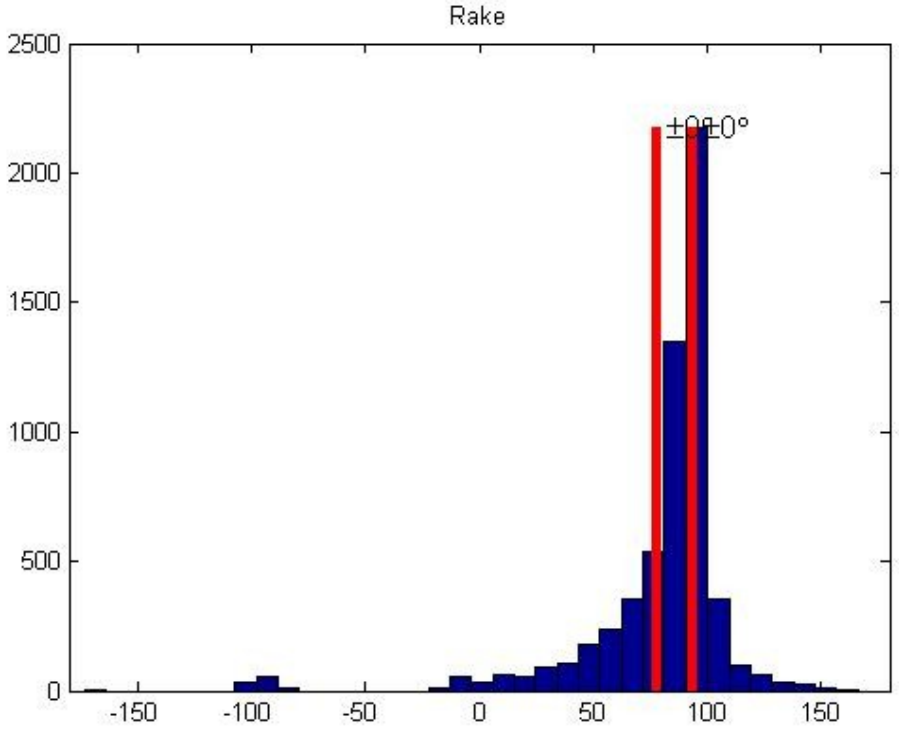
Exponent (Nm): 21

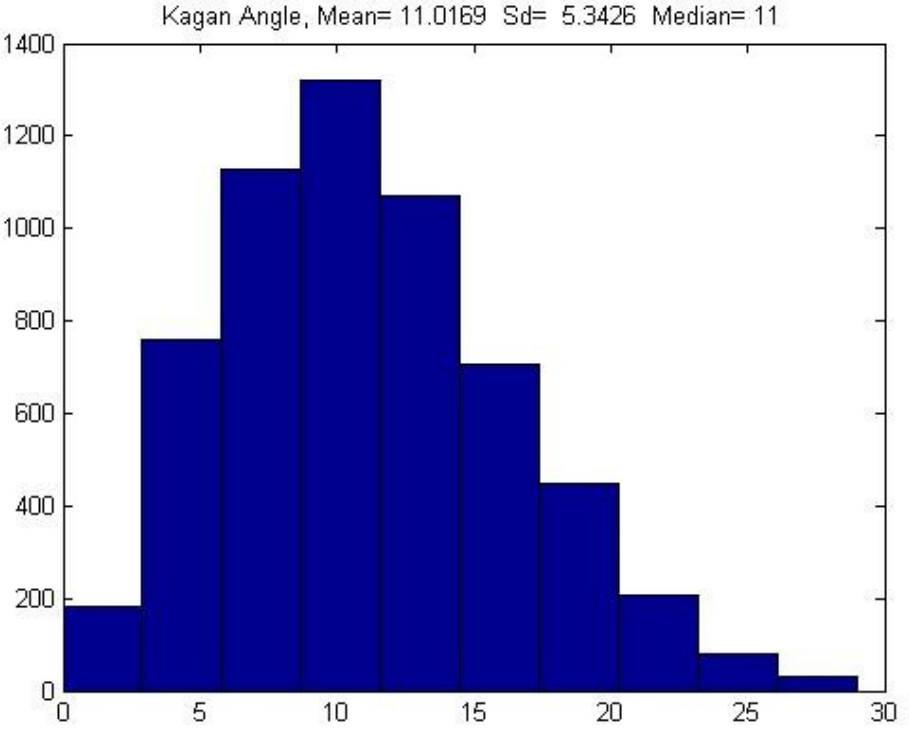
Frequency band used in inversion (Hz)
0.004 - 0.005 -- 0.01 - 0.02

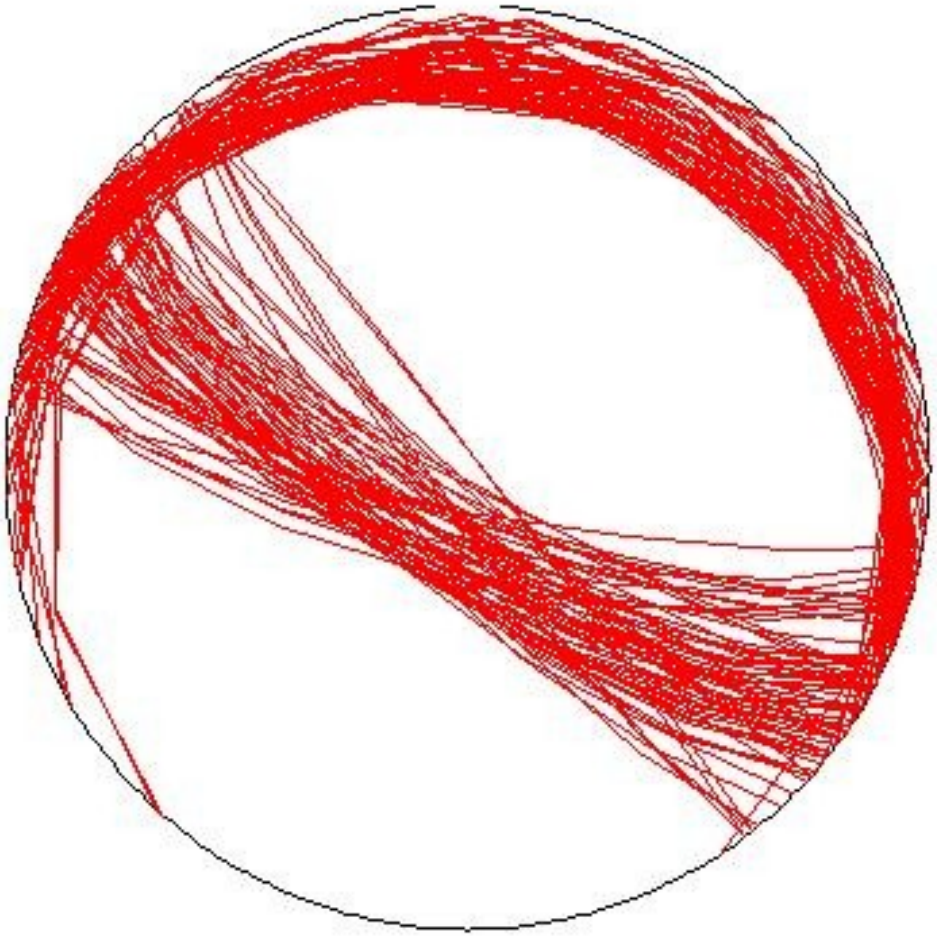
Stations-Components Used-Distance	NS	EW	Z	D(km)
LVIG	+	+	+	445
PCIG	+	+	+	572
IGIG	+	+	+	579
CJIG	+	+	+	778
SCIG	+	+	+	835

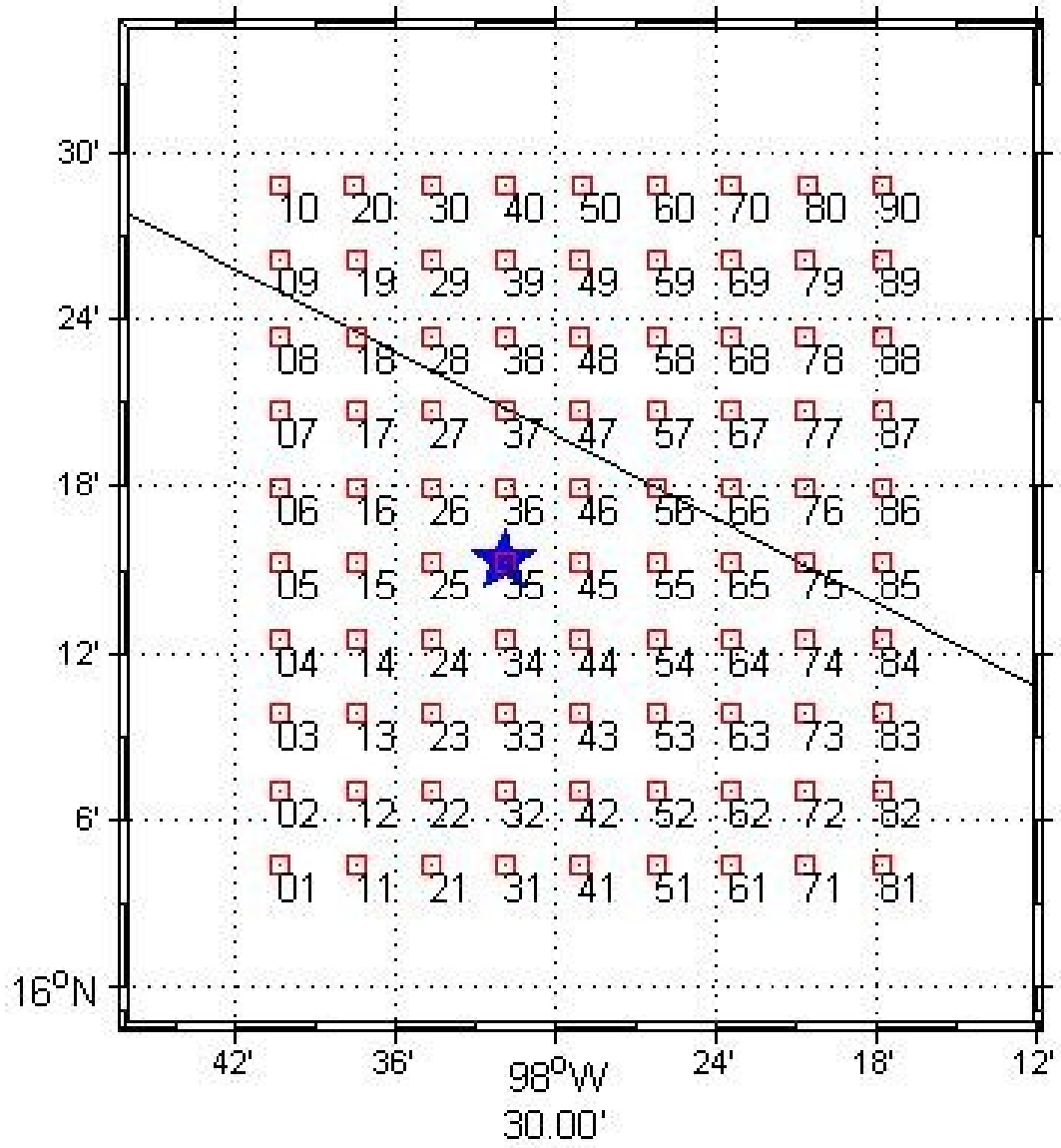

Strike
±0°
±0°
0
200
400
600
800
1000
1200
1400
0
50
100
150
200
250
300
350

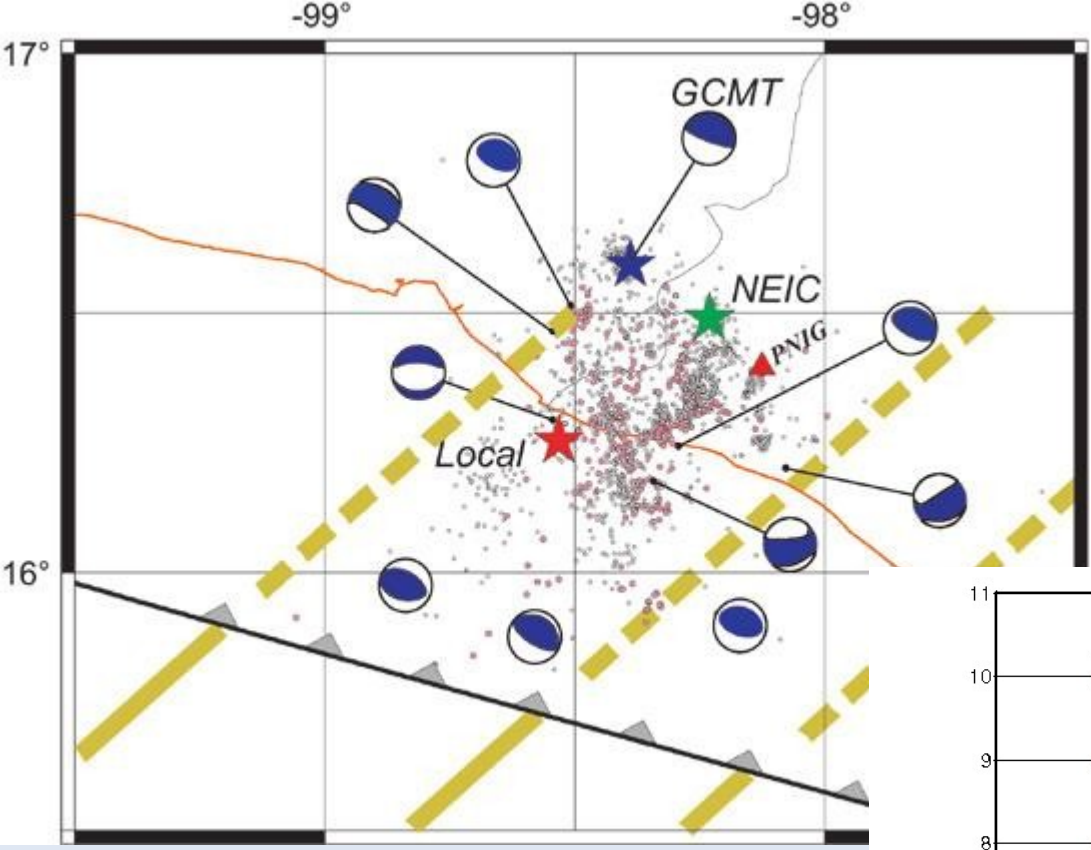

Dip
±0°
±0°
0
100
200
300
400
500
600
700
800
900
1000
0
10
20
30
40
50
60
70
80
90

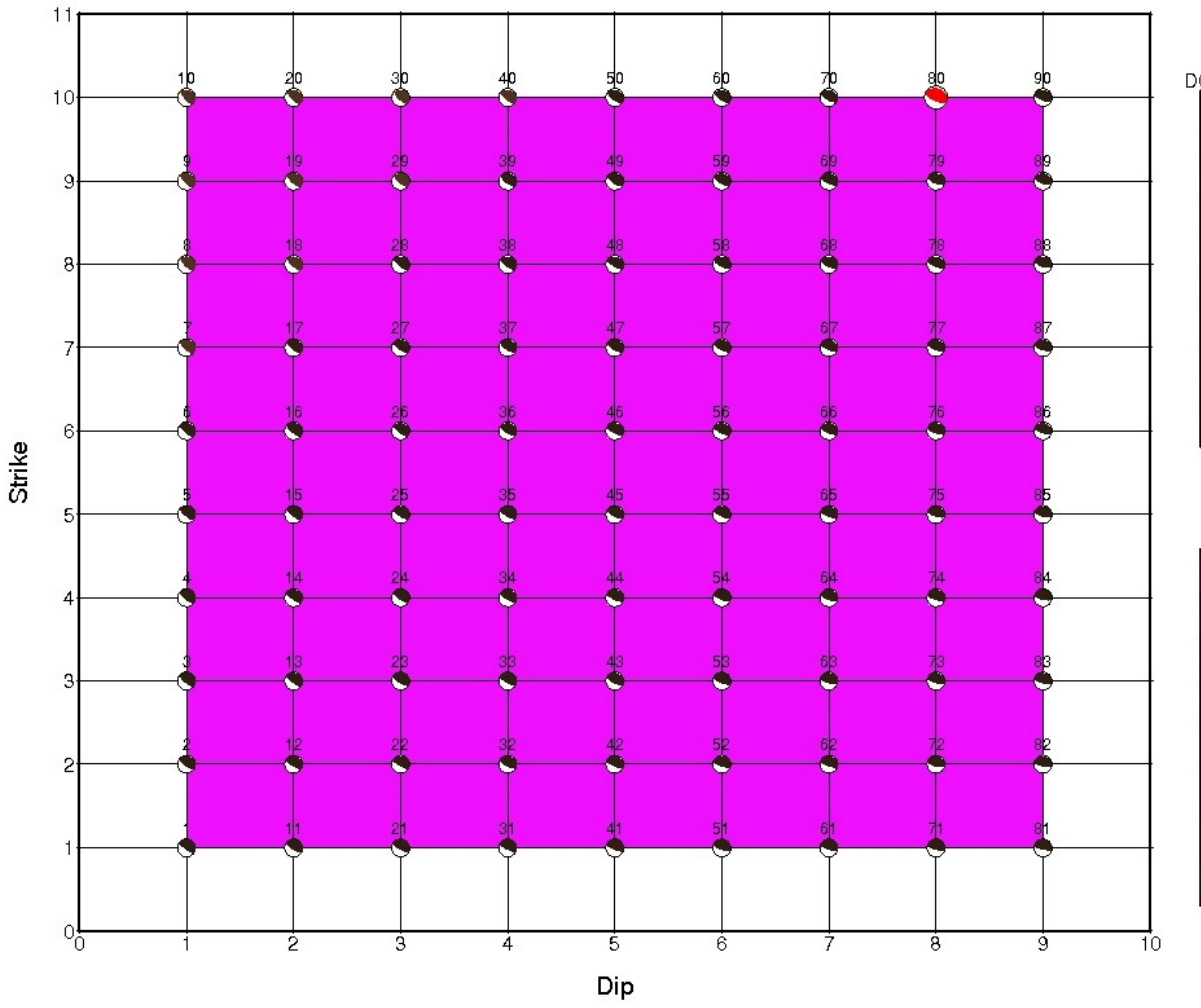

Rake
±0°±0°
0
500
1000
1500
2000
2500
-150
-100
-50
0
50
100
150

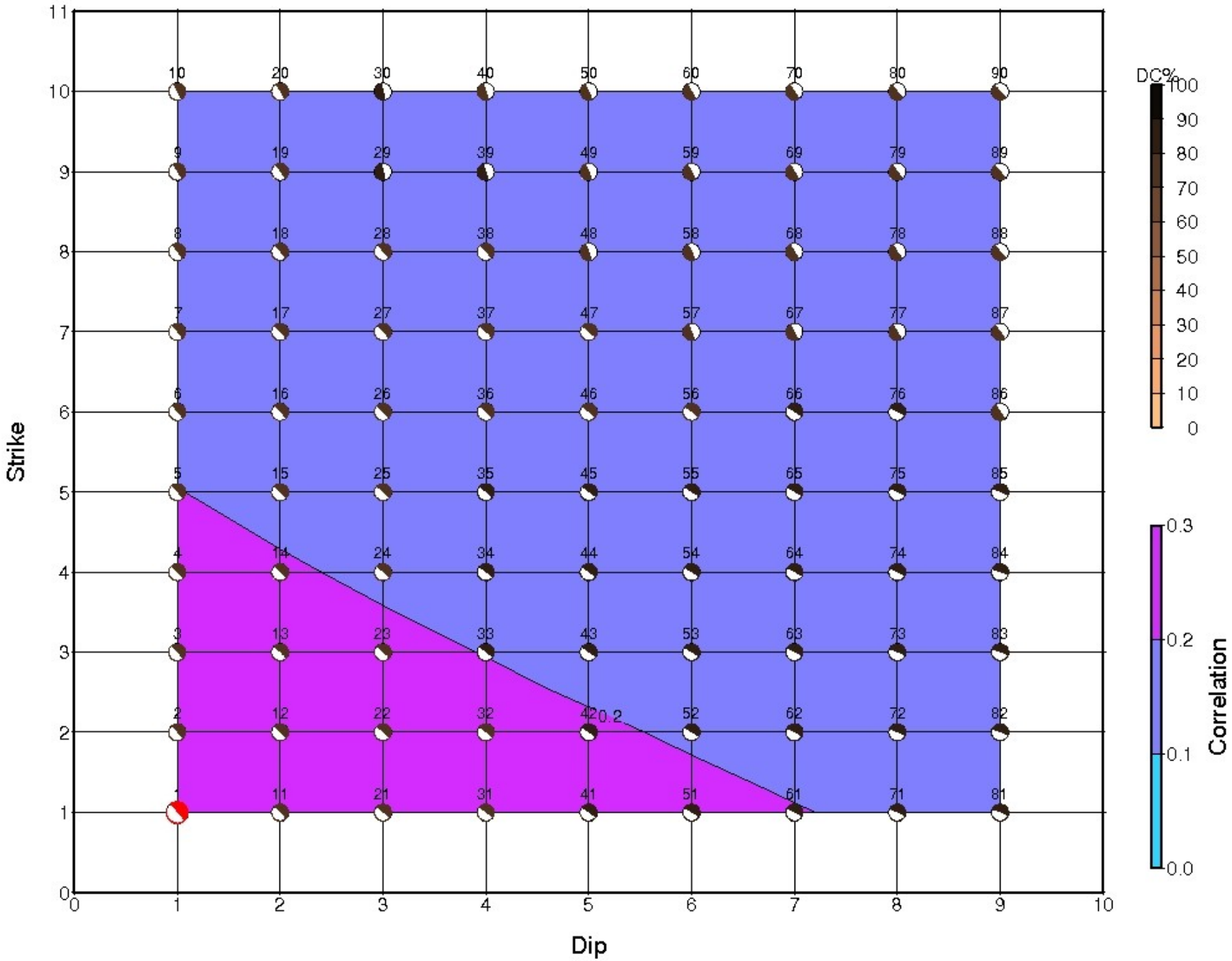

Kagan Angle, Mean= 11.0169 Sd= 5.3426 Median= 11
0
200
400
600
800
1000
1200
1400
0
5
10
15
20
25
30

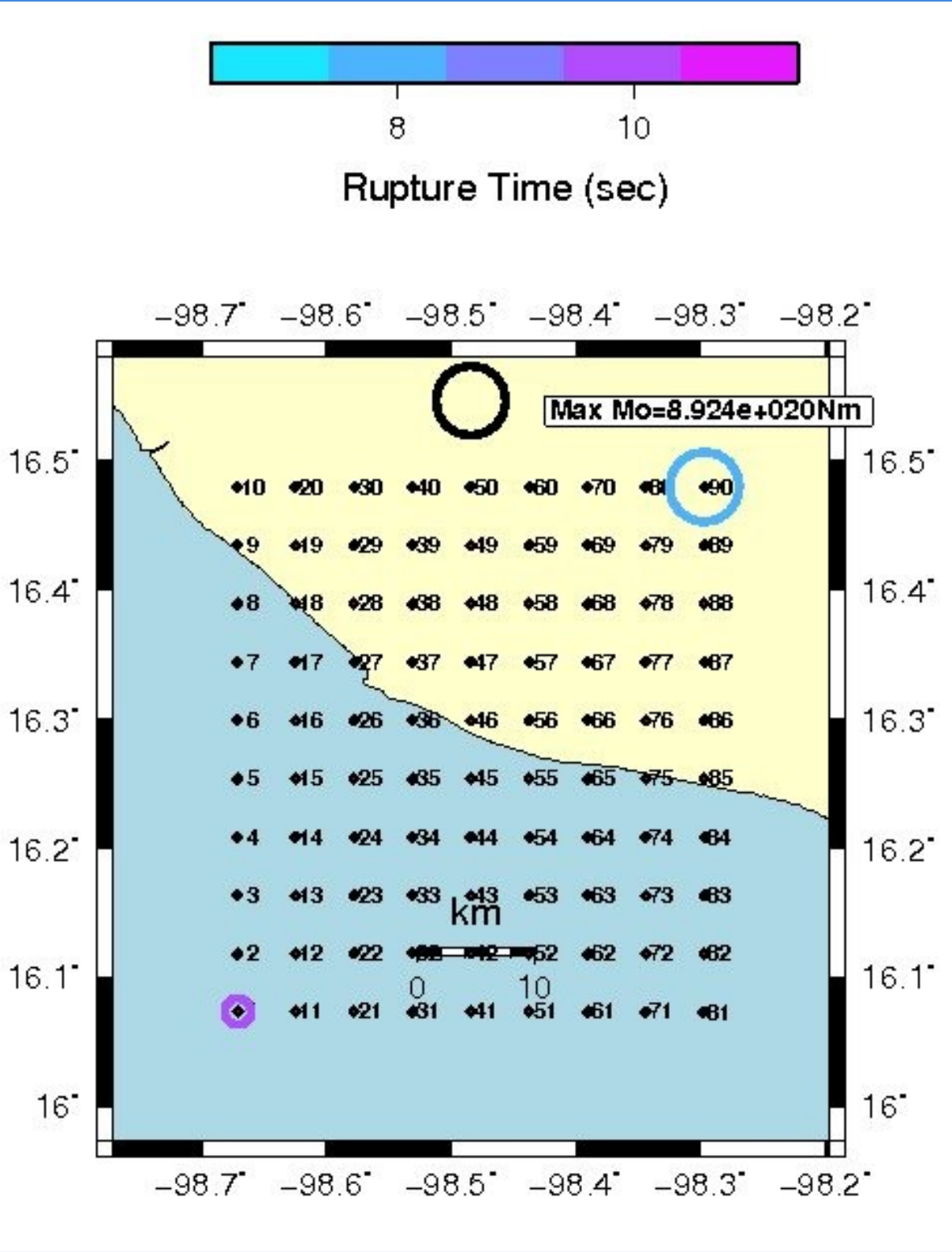


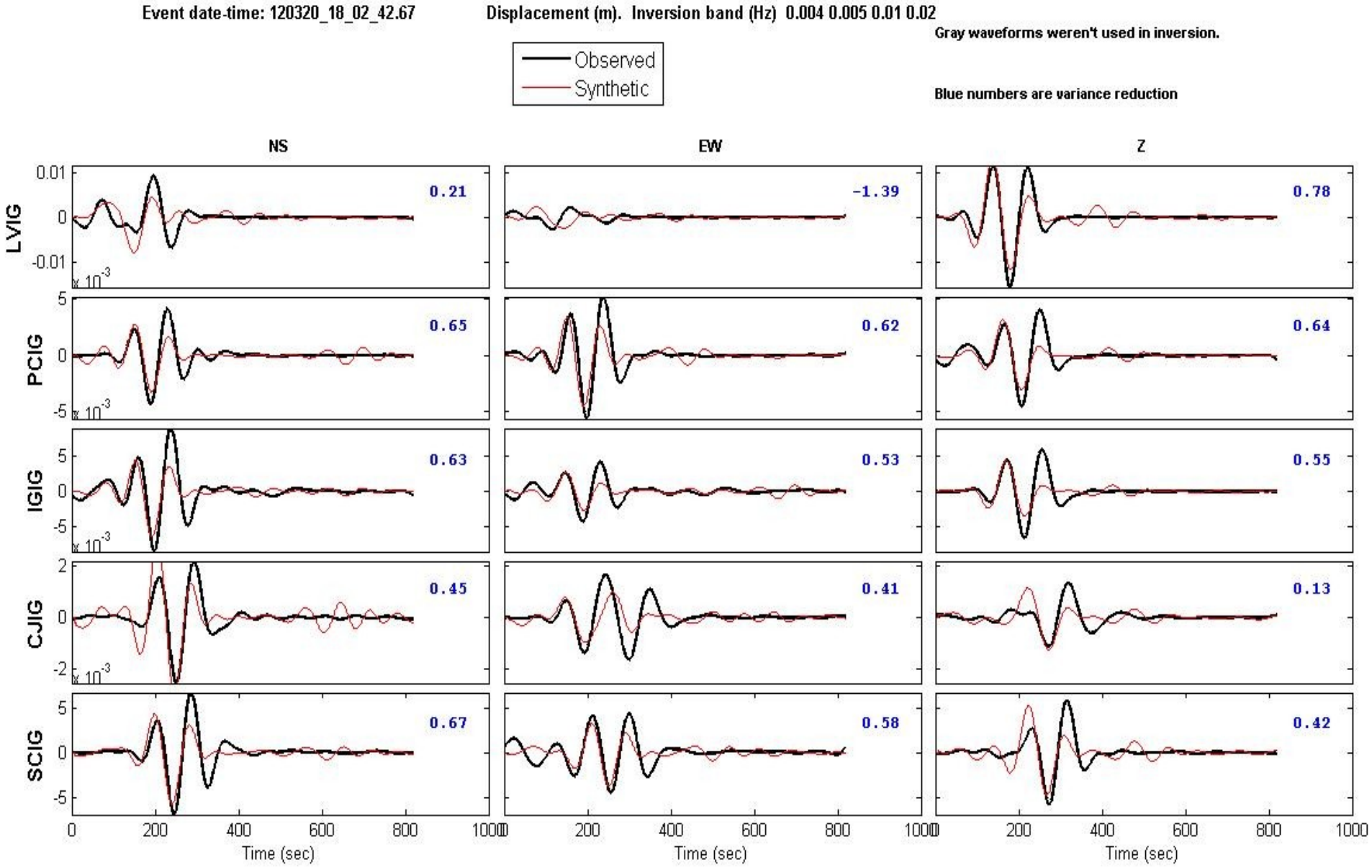

30'
24'
18'
12'
6'
16°N
10 20 30 40 50 60 70 80 90
09 19 29 39 49 59 69 79 89
08 18 28 38 48 58 68 78 88
07 17 27 37 47 57 67 77 87
06 16 26 36 46 56 66 76 86
05 15 25 35 45 55 65 75 85
04 14 24 34 44 54 64 74 84
03 13 23 33 43 53 63 73 83
02 12 22 32 42 52 62 72 82
01 11 21 31 41 51 61 71 81
42'
36'
98°W
30.00'
24'
18'
12'

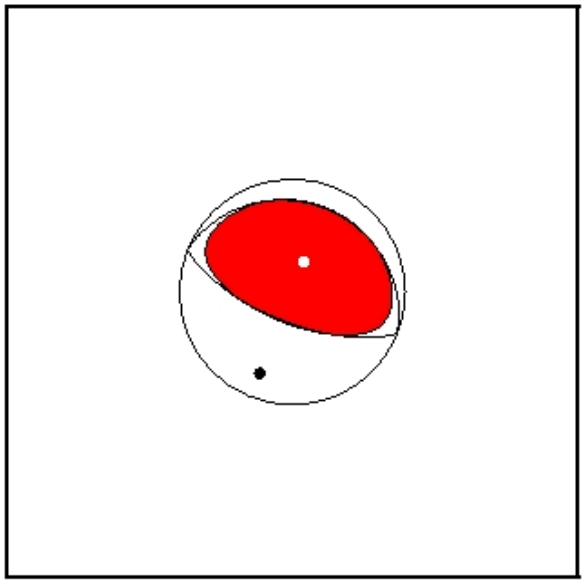

-99°
-98°
17°
16°
GCMT
NEIC
PNJG
Local


Strike
Dip


Strike
Dip
DC%
100
90
80
70
60
50
40
30
20
10
0
Correlation
0.3
0.2
0.1
0.0
0.2


8
10
Rupture Time (sec)
-98.7°
-98.6°
-98.5°
-98.4°
-98.3°
-98.2°
Max Mo=8.924e+020Nm
16.5°
16.4°
16.3°
16.2°
16.1°
16°
km
0
10


Event date-time: 120320_18_02_42.67
Displacement (m). Inversion band (Hz) 0.004 0.005 0.01 0.02
Gray waveforms weren't used in inversion.
Observed
Synthetic
Blue numbers are variance reduction
NS
EW
Z
LVIG
PCIG
IGIG
CJIG
SCIG
0.21
-1.39
0.78
0.65
0.62
0.64
0.63
0.53
0.55
0.45
0.41
0.13
0.67
0.58
0.42
x 10^-3
Time (sec)



MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (SSN)

Origin time 20120320 18:02:42.67
Lat 16.254 Lon -98.531 Depth 20

CENTROID

Trial source number : 90 (Multiple Source line or plane inversion)
Centroid Lat (N)16.4798 Lon (E)-98.2969
Centroid Depth (km) : 20
Centroid time : +7.4 (sec) relative to origin time

Moment (Nm) : 8.924e+020
Mw : 7.9
VOL% :0
DC% :84.8
CLVD% :15.2

	SNR	CN	FMVAR	STVAR
Var.red.:(for stations used in inversion):0.56	NaN	3.7	12±6	0.63
Var.red.(for all stations) :0.59				

Strike	Dip	Rake
112	68	90
Strike	Dip	Rake
292	22	91

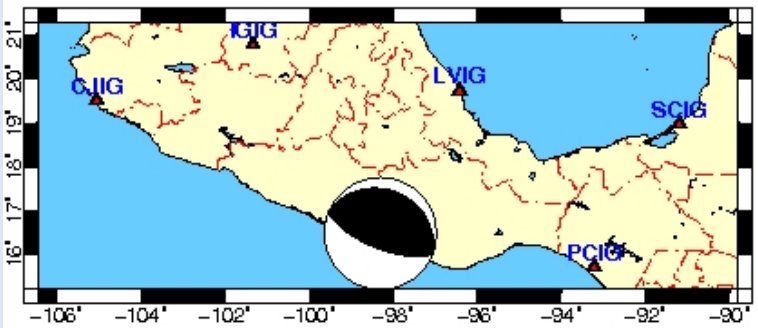
P-axis	Azimuth	Plunge
	202	23
T-axis	Azimuth	Plunge
	21	67

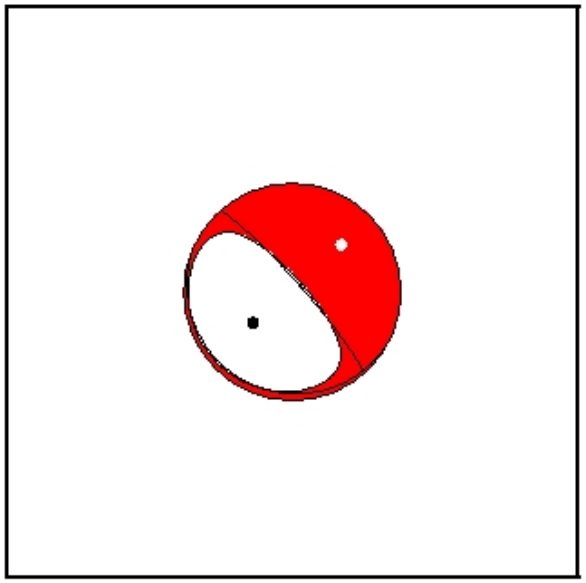
Frequency band used in inversion (Hz)
0.004 - 0.005 -- 0.01 - 0.02

Stations-Components Used-Distance	NS	EW	Z	D(km)
LVIG	+	+	+	445
PCIG	+	+	+	572
IGIG	+	+	+	579
CJIG	+	+	+	778
SCIG	+	+	+	835

Mrr	Mtt	Mpp
6.643	-5.215	-1.429
Mrt	Mrp	Mtp
5.866	-2.294	1.812

Exponent (Nm): 20





MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (SSN)

Origin time 20120320 18:02:42.67
Lat 16.254 Lon -98.531 Depth 20

CENTROID

Trial source number : 1 (Multiple Source line or plane inversion)
Centroid Lat (N)16.0732 Lon (E)-98.6712
Centroid Depth (km) : 20
Centroid time : +10 (sec) relative to origin time

Moment (Nm) : 3.341e+020
Mw : 7.6
VOL% :0
DC% :74.2
CLVD% :25.8

		SNR	CN	FMVAR	STVAR
Var.red.:	(for stations used in inversion):0.59	NaN	3.8	12±6	0.63
Var.red.	(for all stations) :0.59				

Strike	Dip	Rake
319	83	-87
Strike	Dip	Rake
115	3	-113

P-axis	Azimuth	Plunge
	232	52
T-axis	Azimuth	Plunge
	46	38

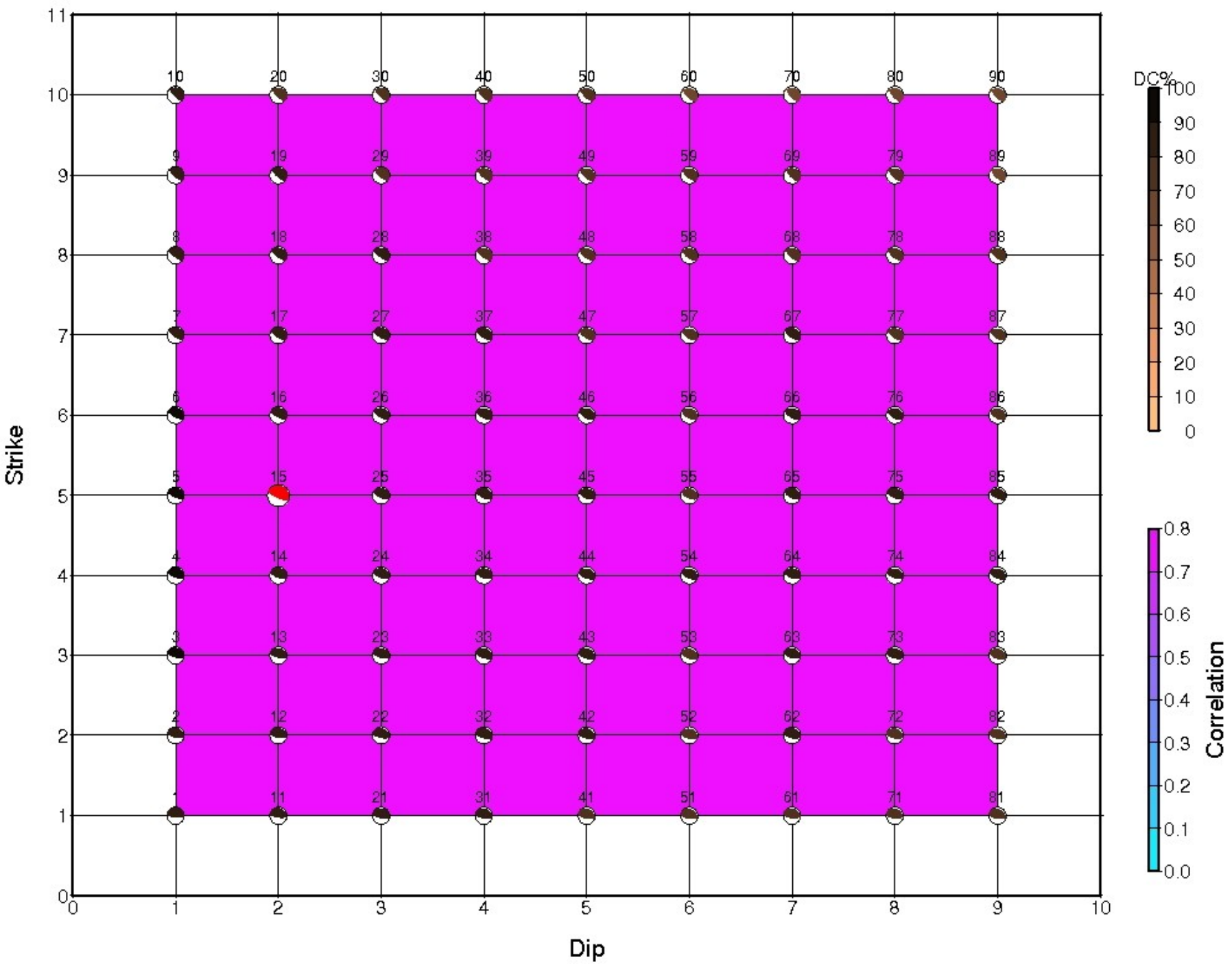
Mrr	Mtt	Mpp
-1.031	0.675	0.356
Mrt	Mrp	Mtp
2.079	-2.451	-0.081

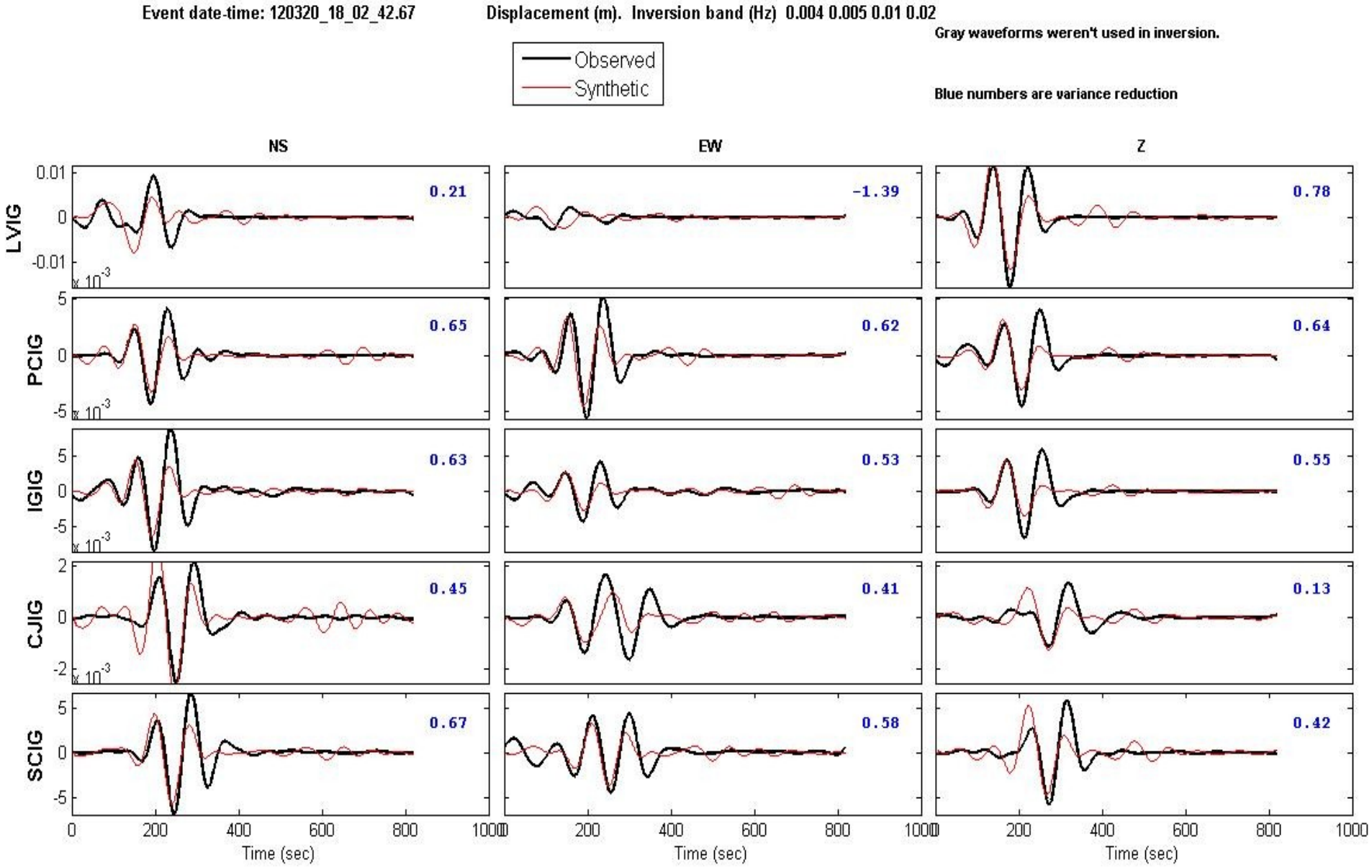
Exponent (Nm): 20

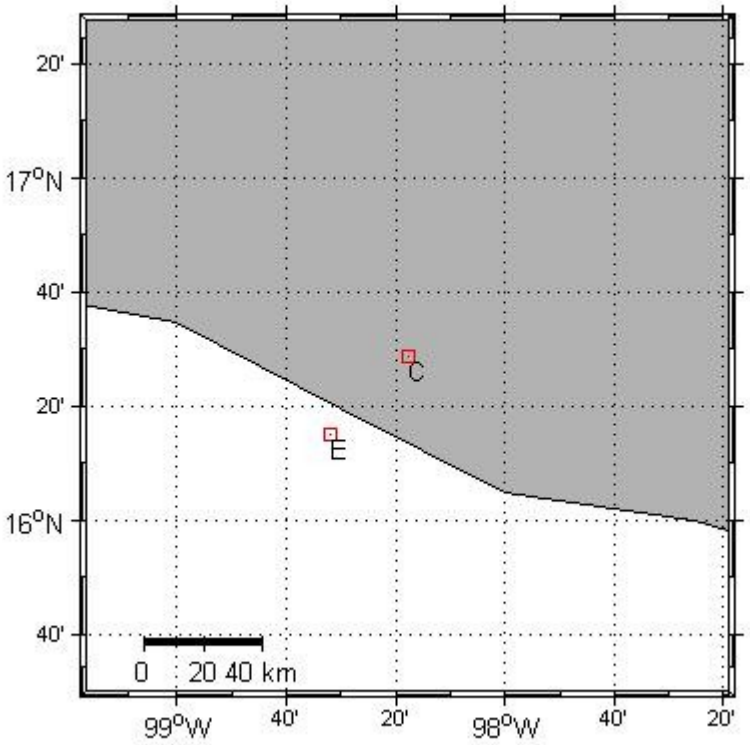
Frequency band used in inversion (Hz)
0.004 - 0.005 -- 0.01 - 0.02

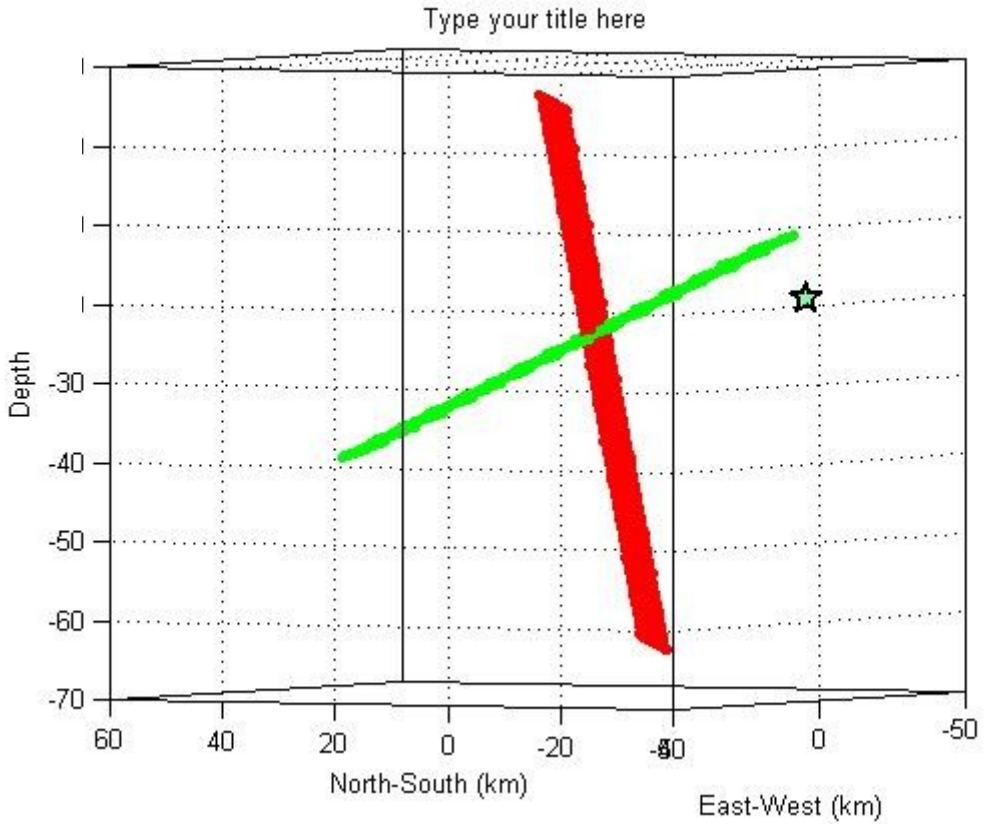
Stations-Components Used-Distance

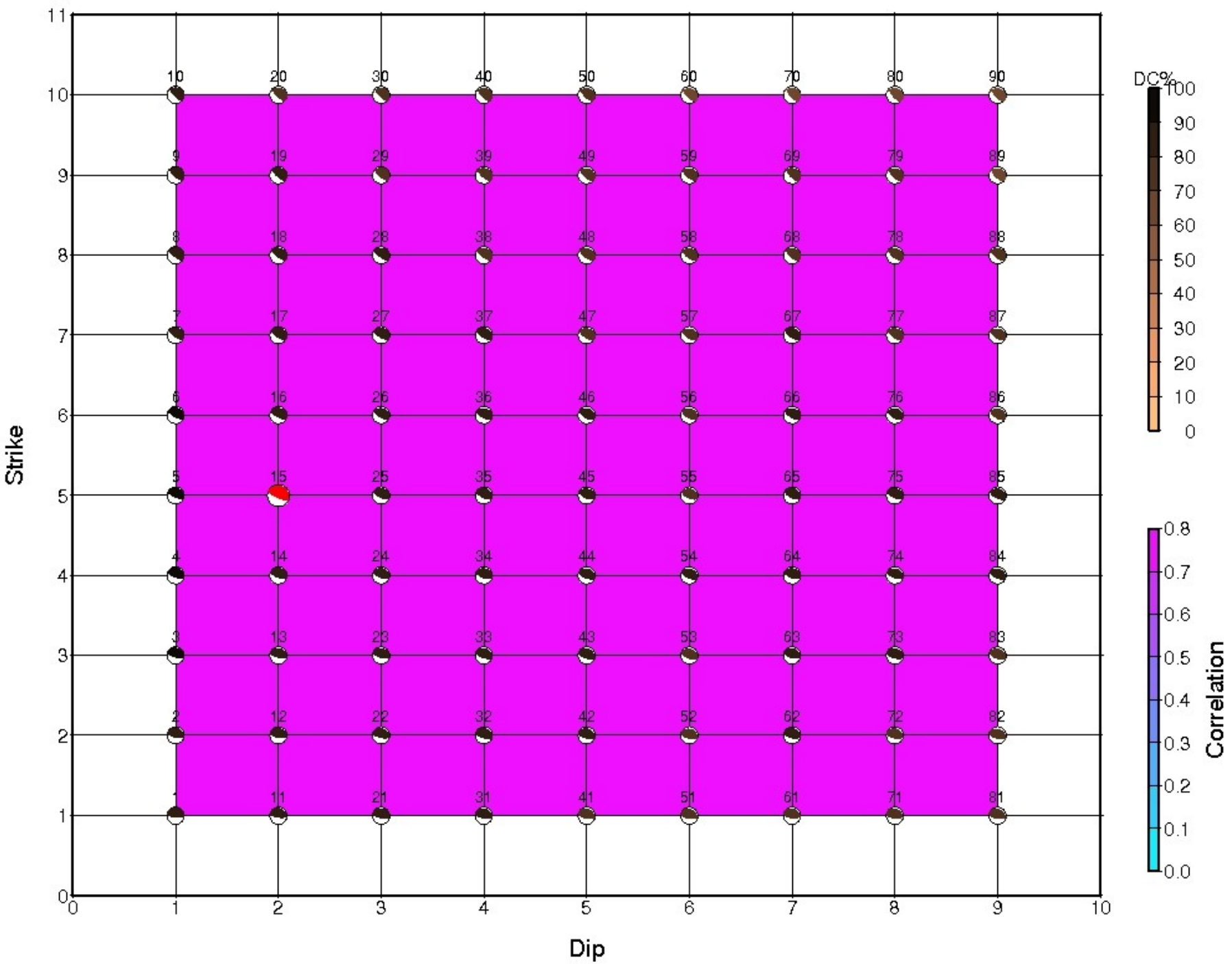
	NS	EW	Z	D(km)
LVIG	+	+	+	445
PCIG	+	+	+	572
IGIG	+	+	+	579
CJIG	+	+	+	778
SCIG	+	+	+	835

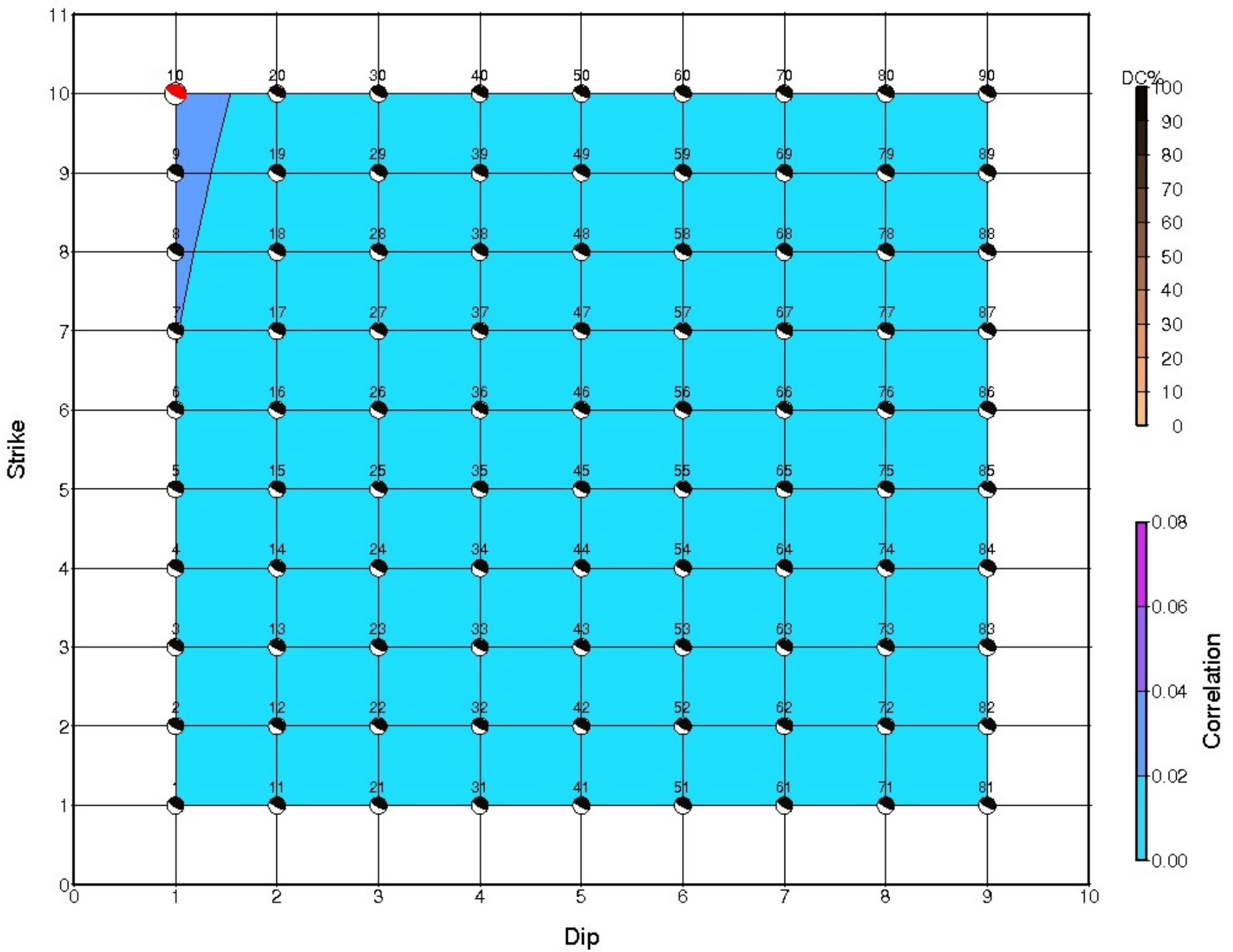

Strike
Dip
DC%
100
90
80
70
60
50
40
30
20
10
0
Correlation
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0

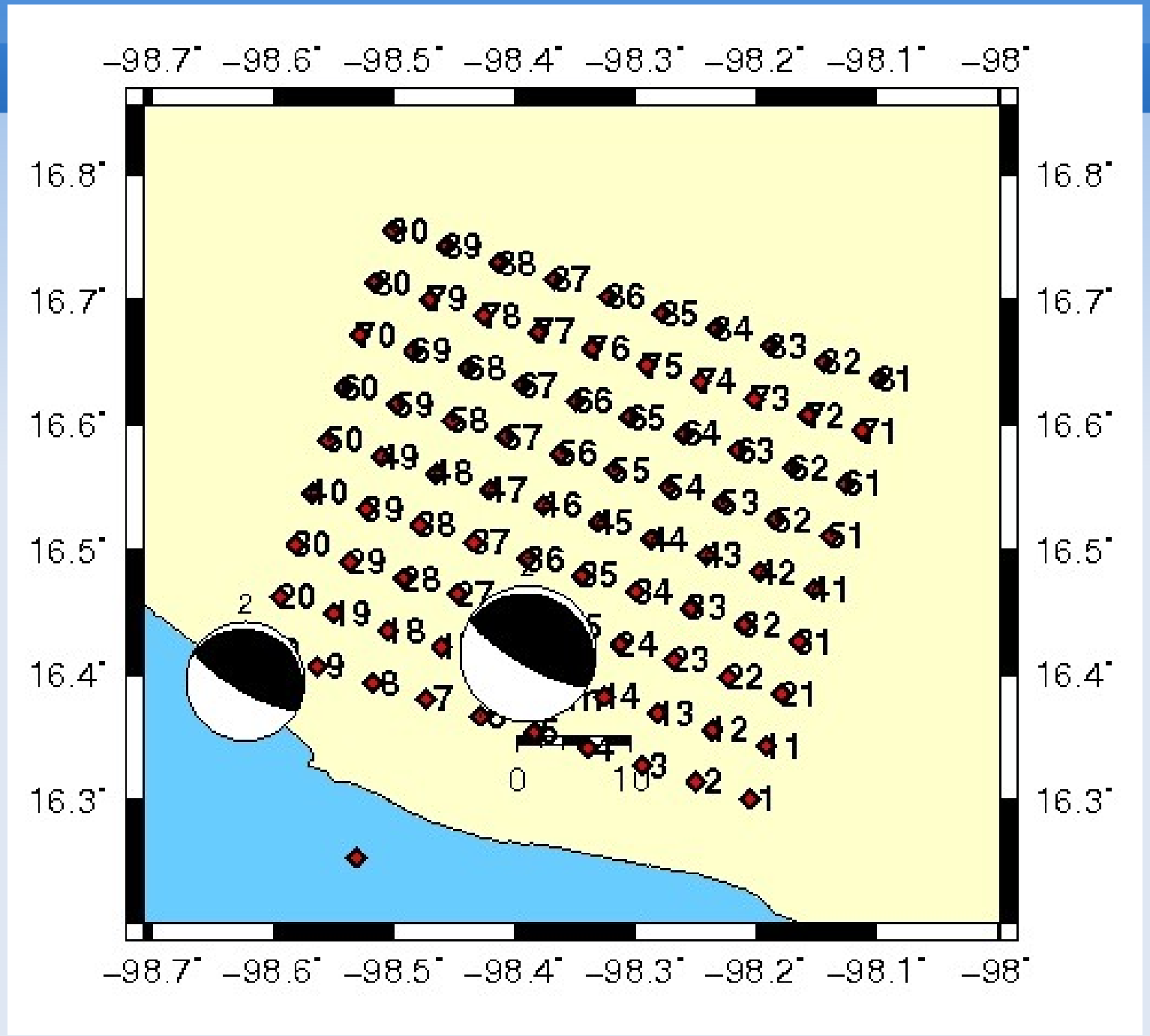

Event date-time: 120320_18_02_42.67
Displacement (m). Inversion band (Hz) 0.004 0.005 0.01 0.02
Gray waveforms weren't used in inversion.
Observed
Synthetic
Blue numbers are variance reduction
NS
EW
Z
LVIG
PCIG
IGIG
CJIG
SCIG
0.21
-1.39
0.78
0.65
0.62
0.64
0.63
0.53
0.55
0.45
0.41
0.13
0.67
0.58
0.42
x 10^-3
Time (sec)

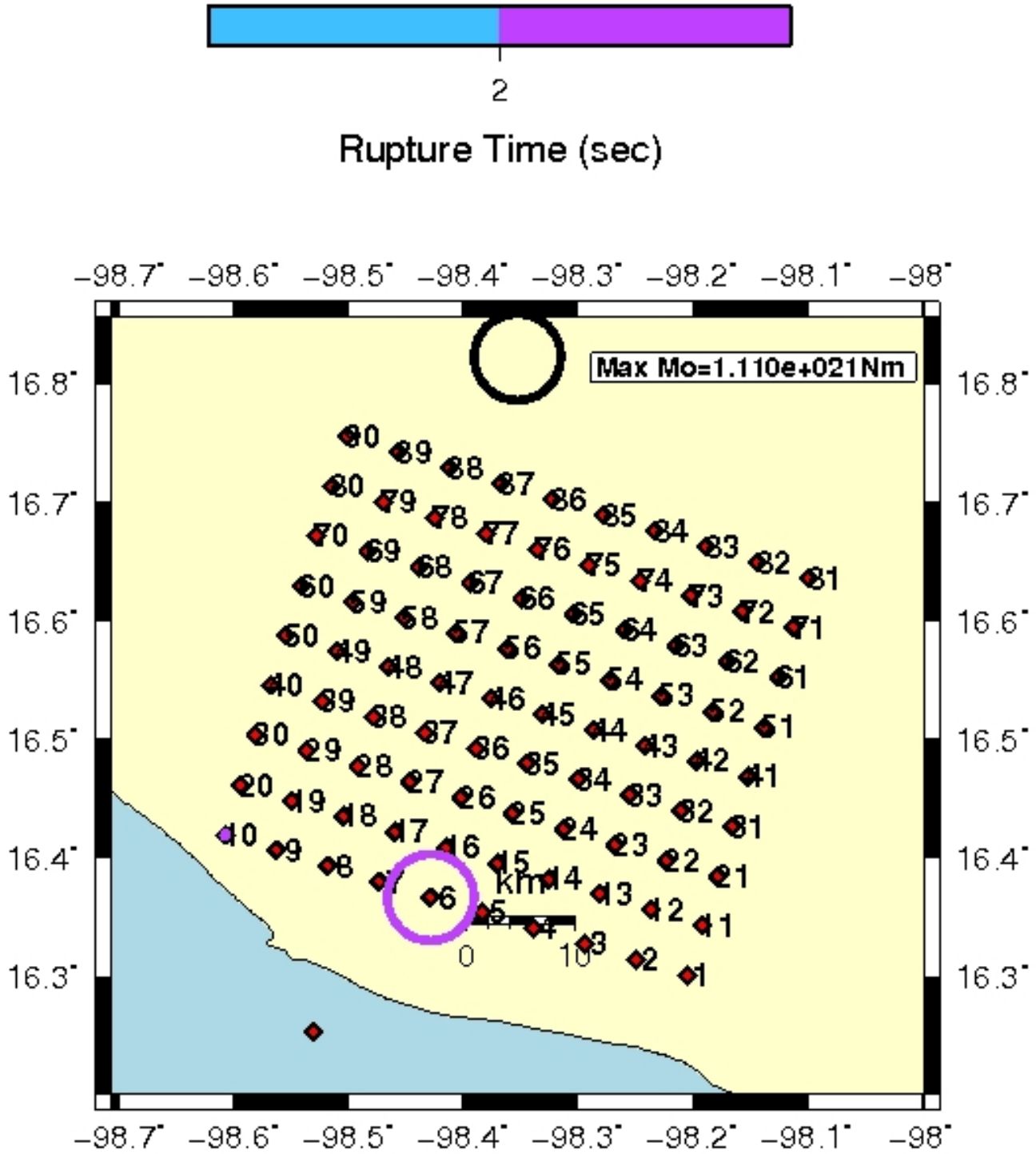

20'
17°N
40'
20'
16°N
40'
C
E
0 20 40 km
99°W
40'
20'
98°W
40'
20'

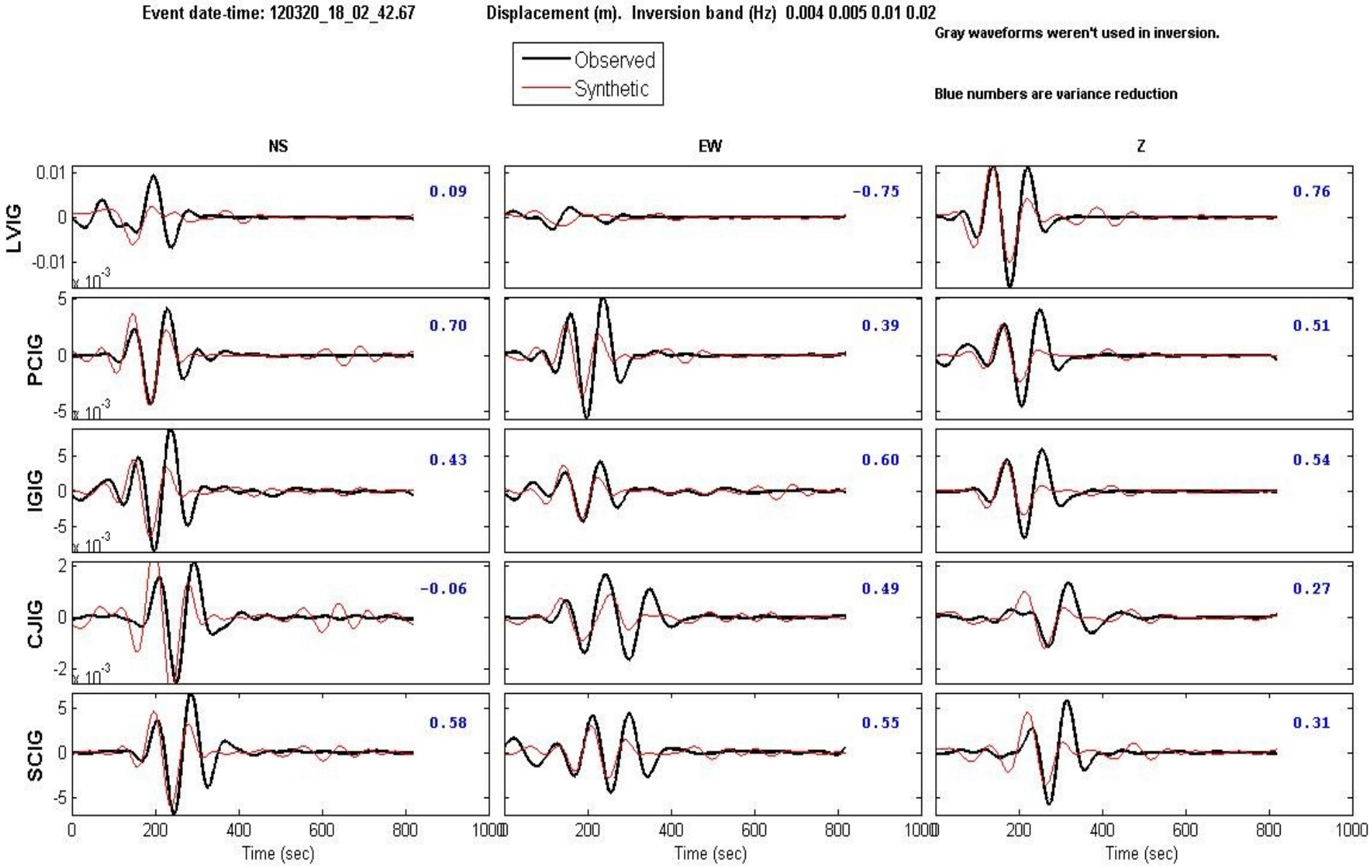

Type your title here
Depth
-30
-40
-50
-60
-70
60
40
20
0
-20
-40
0
-50
North-South (km)
East-West (km)

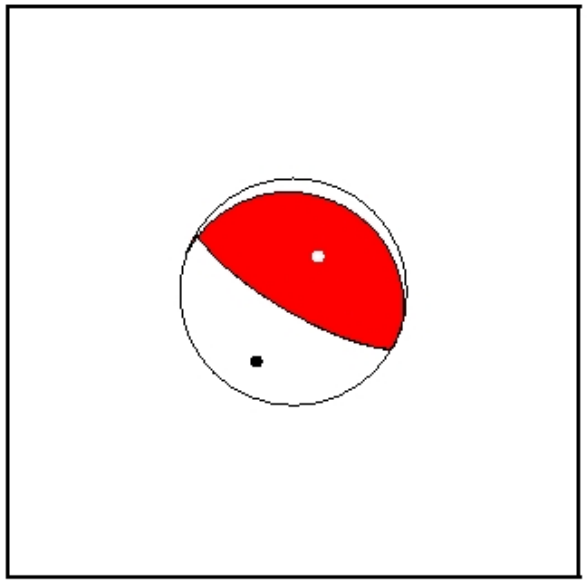

Strike
Dip
DC%
100
90
80
70
60
50
40
30
20
10
0
Correlation
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0


Strike
Dip
DC%
100
90
80
70
60
50
40
30
20
10
0
Correlation
0.08
0.06
0.04
0.02
0.00


-98.7°
-98.6°
-98.5°
-98.4°
-98.3°
-98.2°
-98.1°
-98°
16.8°
16.7°
16.6°
16.5°
16.4°
16.3°
0
10


2
Rupture Time (sec)
−98.7° −98.6° −98.5° −98.4° −98.3° −98.2° −98.1° −98°
16.8°
16.7°
16.6°
16.5°
16.4°
16.3°
Max Mo=1.110e+021Nm
km
0
10


Event date-time: 120320_18_02_42.67
Displacement (m). Inversion band (Hz) 0.004 0.005 0.01 0.02
Gray waveforms weren't used in inversion.
Observed
Synthetic
Blue numbers are variance reduction
NS
EW
Z
LVIG
PCIG
IGIG
CJIG
SCIG
0.09
-0.75
0.76
0.70
0.39
0.51
0.43
0.60
0.54
-0.06
0.49
0.27
0.58
0.55
0.31
x 10^-3
Time (sec)



MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (SSN)

Origin time 20120320 18:02:42.67
Lat 16.254 Lon -98.531 Depth 20

CENTROID

Trial source number : 6 (Multiple Source line or plane inversion)
Centroid Lat (N)16.3672 Lon (E)-98.4283
Centroid Depth (km) : 16.3712
Centroid time : +2 (sec) relative to origin time

Moment (Nm) : 1.110e+021
Mw : 8
VOL% :0
DC% :100
CLVD% :0

		SNR	CN	FMVAR	STVAR
Var.red.:	(for stations used in inversion):0.52	NaN	5.0	NaN±NaN	NaN
Var.red.	(for all stations) :0.52				

Strike	Dip	Rake
120	76	93
Strike	**Dip**	**Rake**
287	14	77

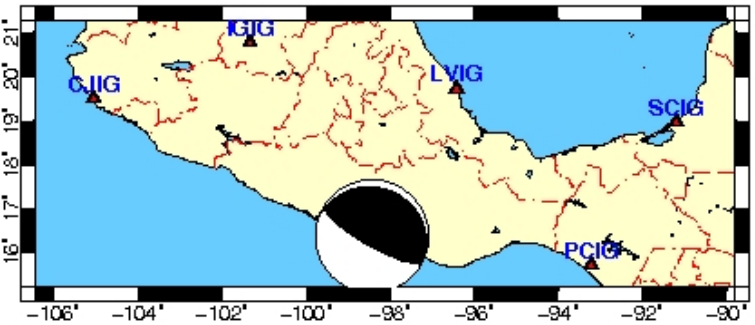
P-axis	Azimuth	Plunge
	208	31
T-axis	**Azimuth**	**Plunge**
	35	59

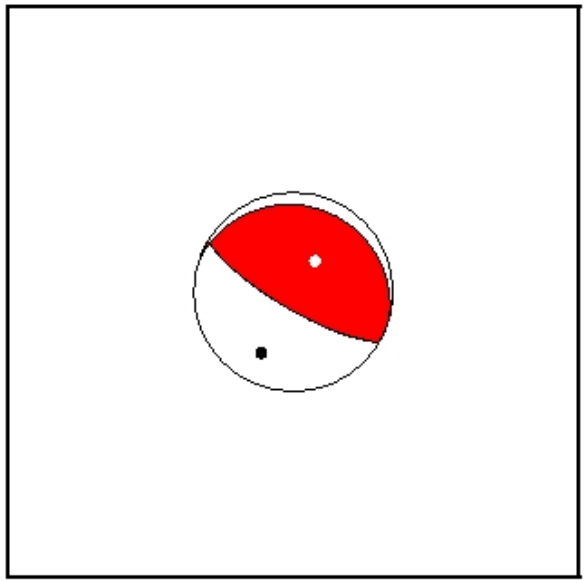
Mrr	Mtt	Mpp
5.078	-4.306	-0.772
Mrt	**Mrp**	**Mtp**
8.425	-5.109	1.921

Exponent (Nm): 20

Frequency band used in inversion (Hz)
0.004 - 0.005 -- 0.01 - 0.02

Stations-Components Used-Distance	NS	EW	Z	D(km)
LVIG	+	+	+	445
PCIG	+	+	+	572
IGIG	+	+	+	579
CJIG	+	+	+	778
SCIG	+	+	+	835





MOMENT TENSOR SOLUTION

HYPOCENTER LOCATION (SSN)

Origin time 20120320 18:02:42.67
Lat 16.254 Lon -98.531 Depth 20

CENTROID

Trial source number : 10 (Multiple Source line or plane inversion)
Centroid Lat (N)16.4199 Lon (E)-98.6074
Centroid Depth (km) : 16.3712
Centroid time : +2 (sec) relative to origin time

Moment (Nm) : 3.528e+019
Mw : 7
VOL% :0
DC% :100
CLVD% :0

		SNR	CN	FMVAR	STVAR
Var.red.:	(for stations used in inversion) :0.52	NaN	5.0	NaN±NaN	NaN
Var.red.	(for all stations) :0.52				

file

Strike	Dip	Rake
120	76	93
Strike	Dip	Rake
287	14	77

P-axis	Azimuth	Plunge
	208	31
T-axis	Azimuth	Plunge
	35	59

Mrr	Mtt	Mpp
1.614	-1.369	-0.245
Mrt	Mrp	Mtp
2.678	-1.624	0.611

Exponent (Nm): 19

Frequency band used in inversion (Hz)
0.004 - 0.005 -- 0.01 - 0.02

Stations-Components Used-Distance

	NS	EW	Z	D(km)
LVIG	+	+	+	445
PCIG	+	+	+	572
IGIG	+	+	+	579
CJIG	+	+	+	778
SCIG	+	+	+	835