Results of the SIV Green's functions validation

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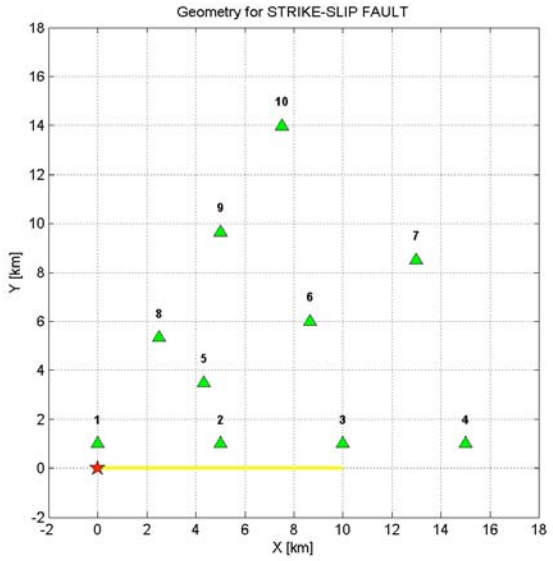
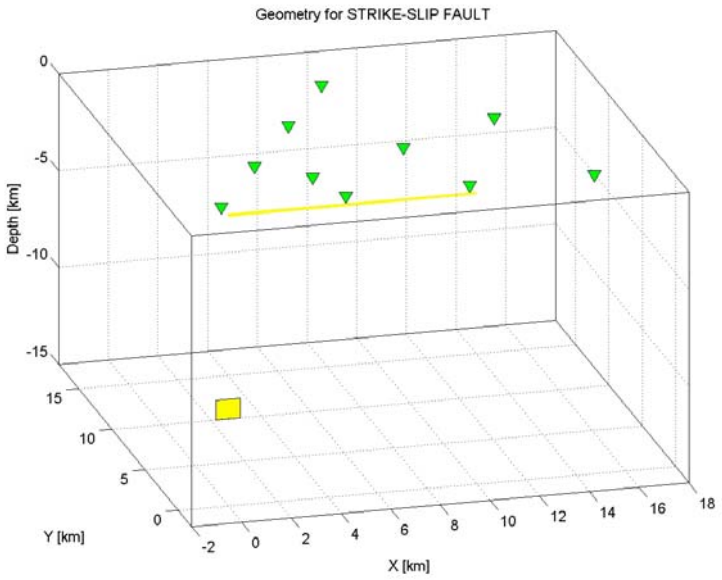
SIV workshop

SIV exercices

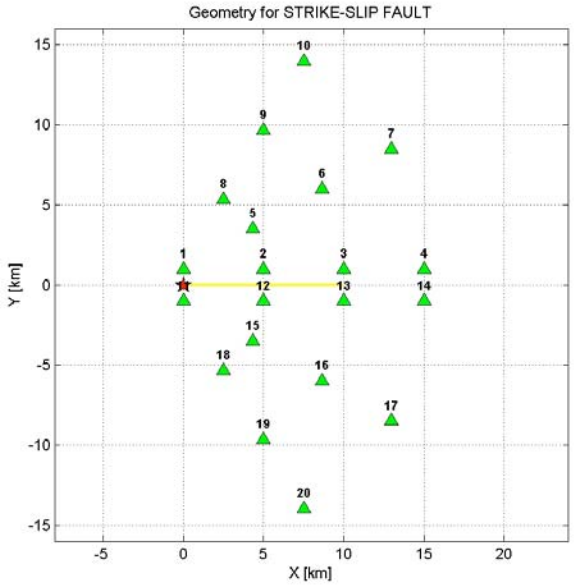
- Strike-slip point source
  - Vertical fault plane
  - Source depth at 10 km
  - Right lateral strike slip
  - Mw=4.996
  - Source time function = boxcar with rise time 0.2 s
  - Frequency range [0-5 Hz]
  - 10 stations (3 lines with azimuth 0, 30, 60 degrees)

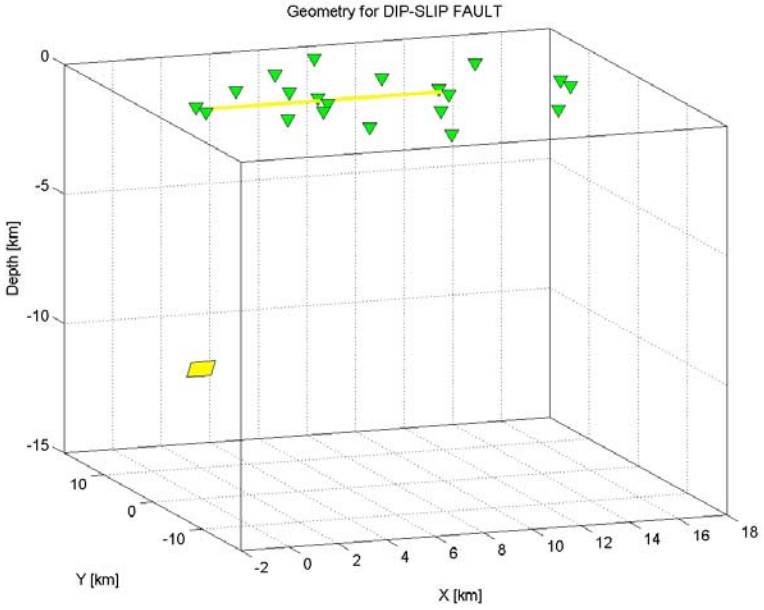




SIV exercices

- Dip-slip point source
  - Fault dip = 40 degrees
  - Source depth at 10 km
  - Rake angle = 90 degrees
  - Mw=4.996
  - Frequency range [0-5 Hz]
  - Source time function = boxcar with rise time 0.2 s
  - 20 stations (hanging and foot walls)





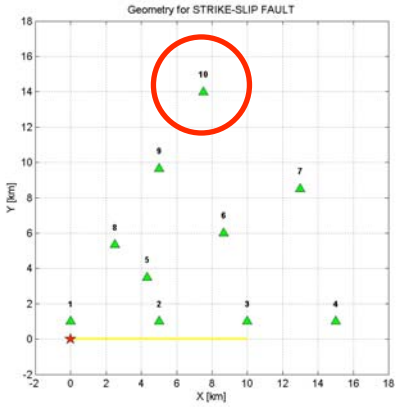
Participants and methods

- 8 participants using 4 different methods

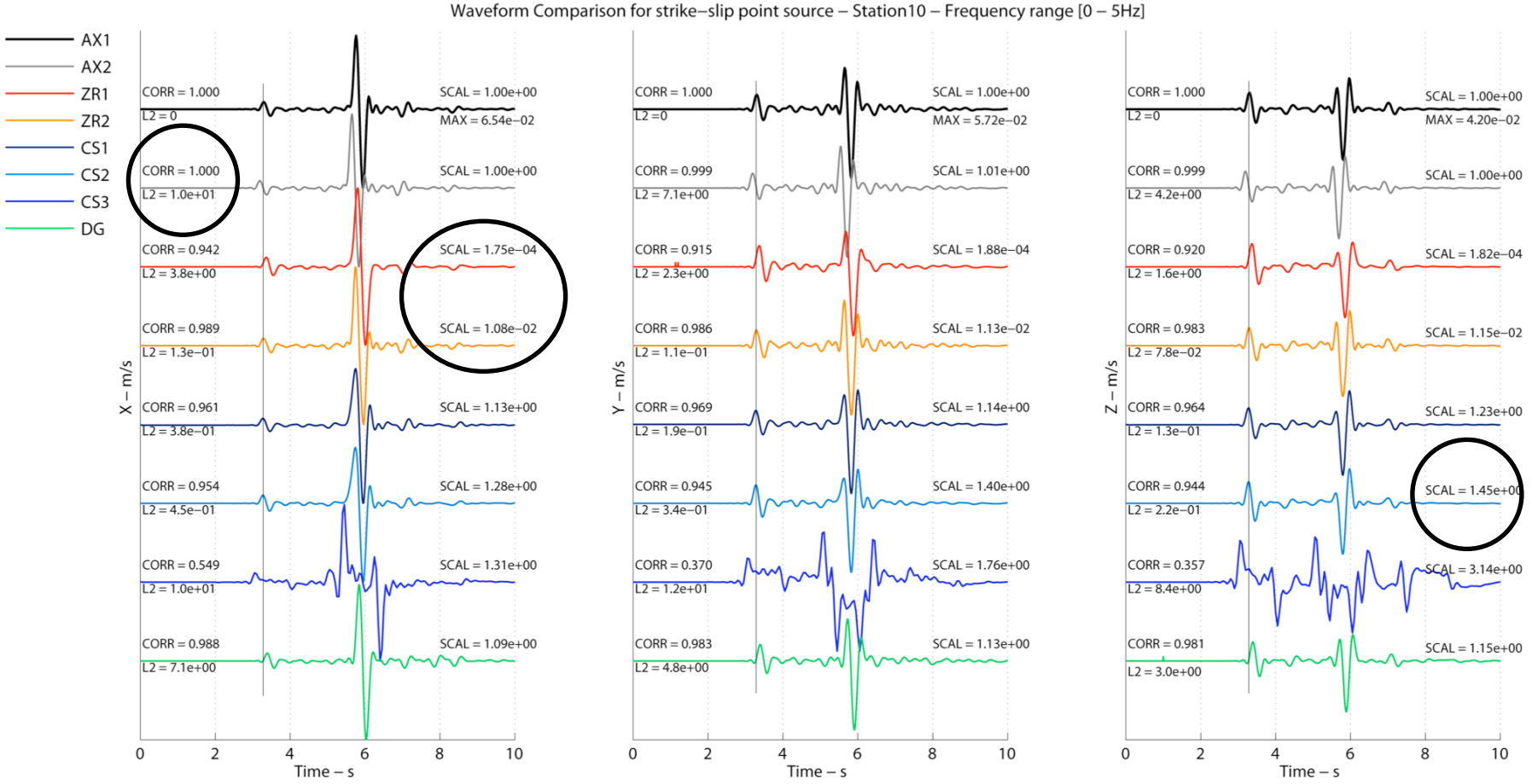
- Simulation techniques
  - AXITRA ➔ **A1, A2**
    - discrete wavenumber method, Bouchon 1981
    - Kennett (1979) propagator matrix technique
  - Zhu and Riveira, 2002 ➔ **ZR1,ZR2**
    - discrete wavenumber method
    - Thompson-Haskell propagator matrix technique
  - COMPSYN ➔ **C1,C2,C3**
    - discrete wavenumber method
    - finite element method (Olson et al., 1984)
  - Discontinuous Galerkin (Martin Kaeser's code) ➔ **DG1**
    - finite-element method
    - combined with the explicit time integration method using arbitrary high-order derivatives (ADER)
    - leads to a high-order accuracy in both space and time

How to compare results

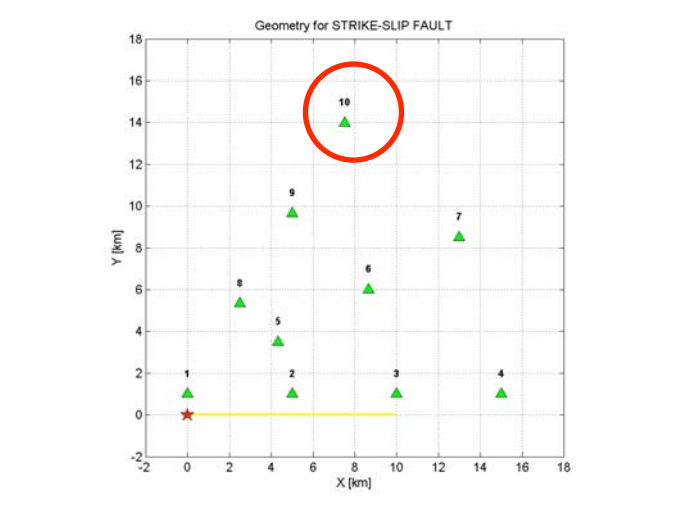
- Reference
  - ➔ AXITRA simulations AX1
- Time domain
  - Normalization to get the reference PGV
  - Maximum of autocorrelation function (global shape)
  - L2 norms (time shift)
- Frequency domain
  - Normalized to get the same amplitude at 0.2 Hz
  - Standard deviation of Fourier spectrum amplitude in various frequency ranges



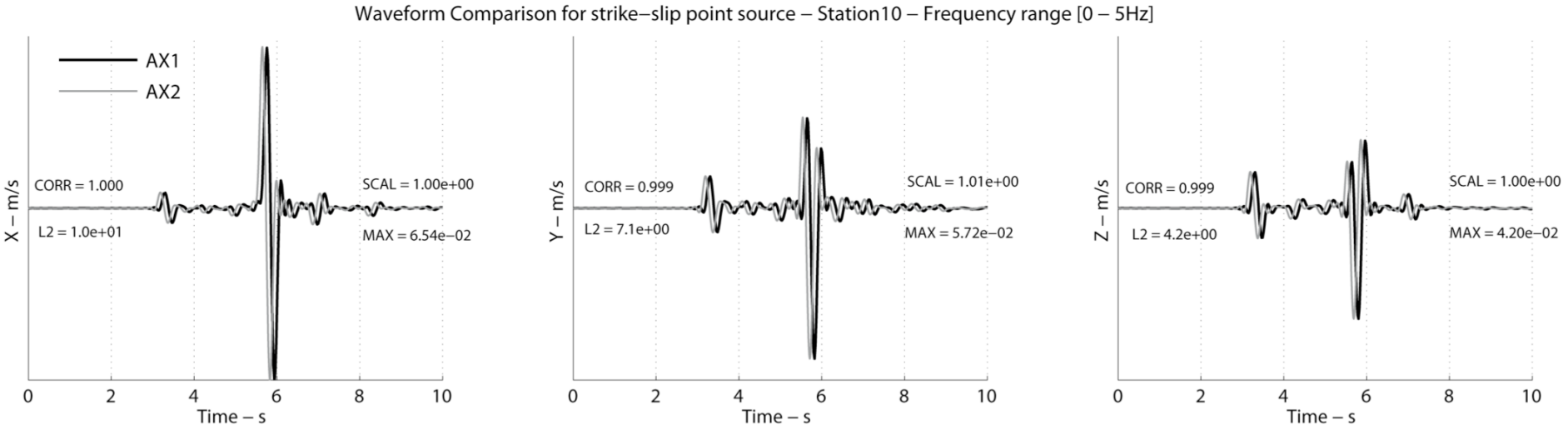
Result for strike-slip point source at a particular station



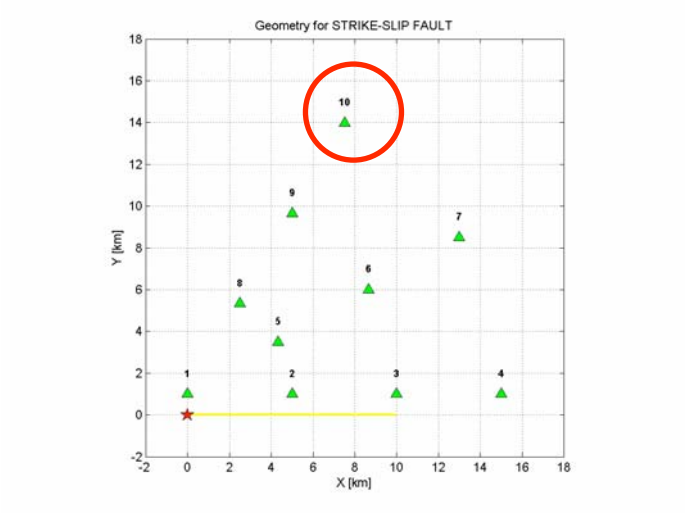
Comparison between synthetics obtained by the same method



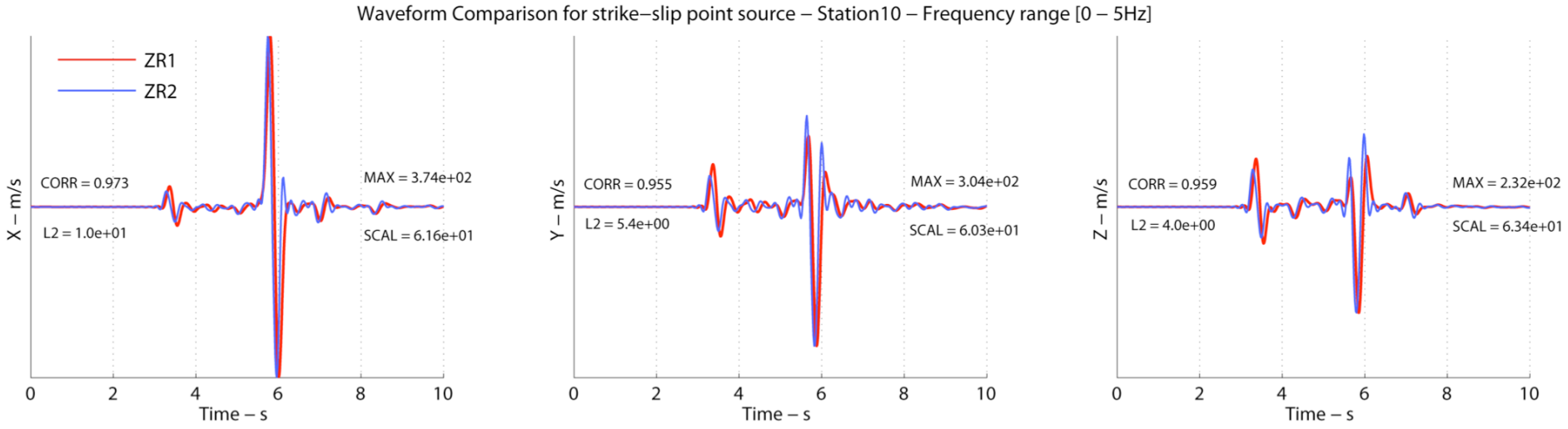
➔ AXITRA



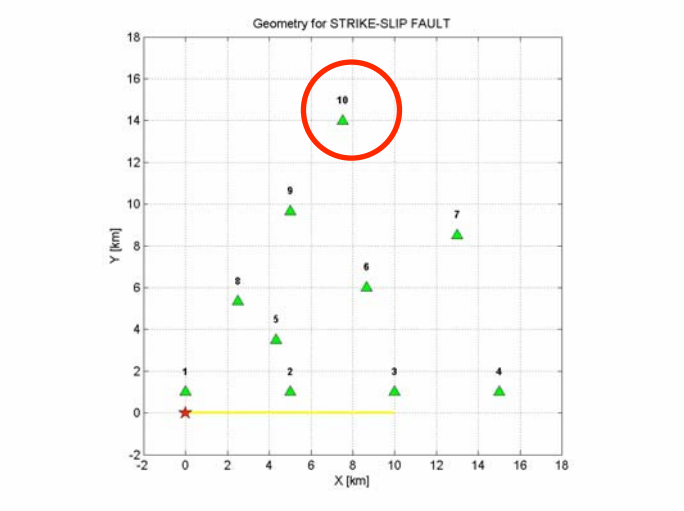
Comparison between synthetics obtained by the same method



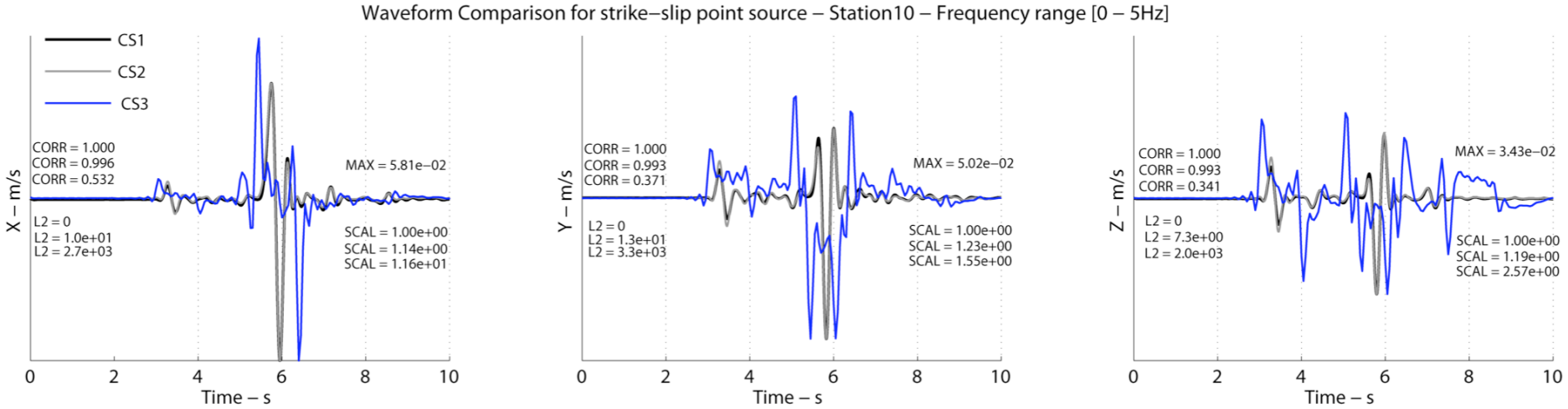
➔ Zhu and Riveira 2002



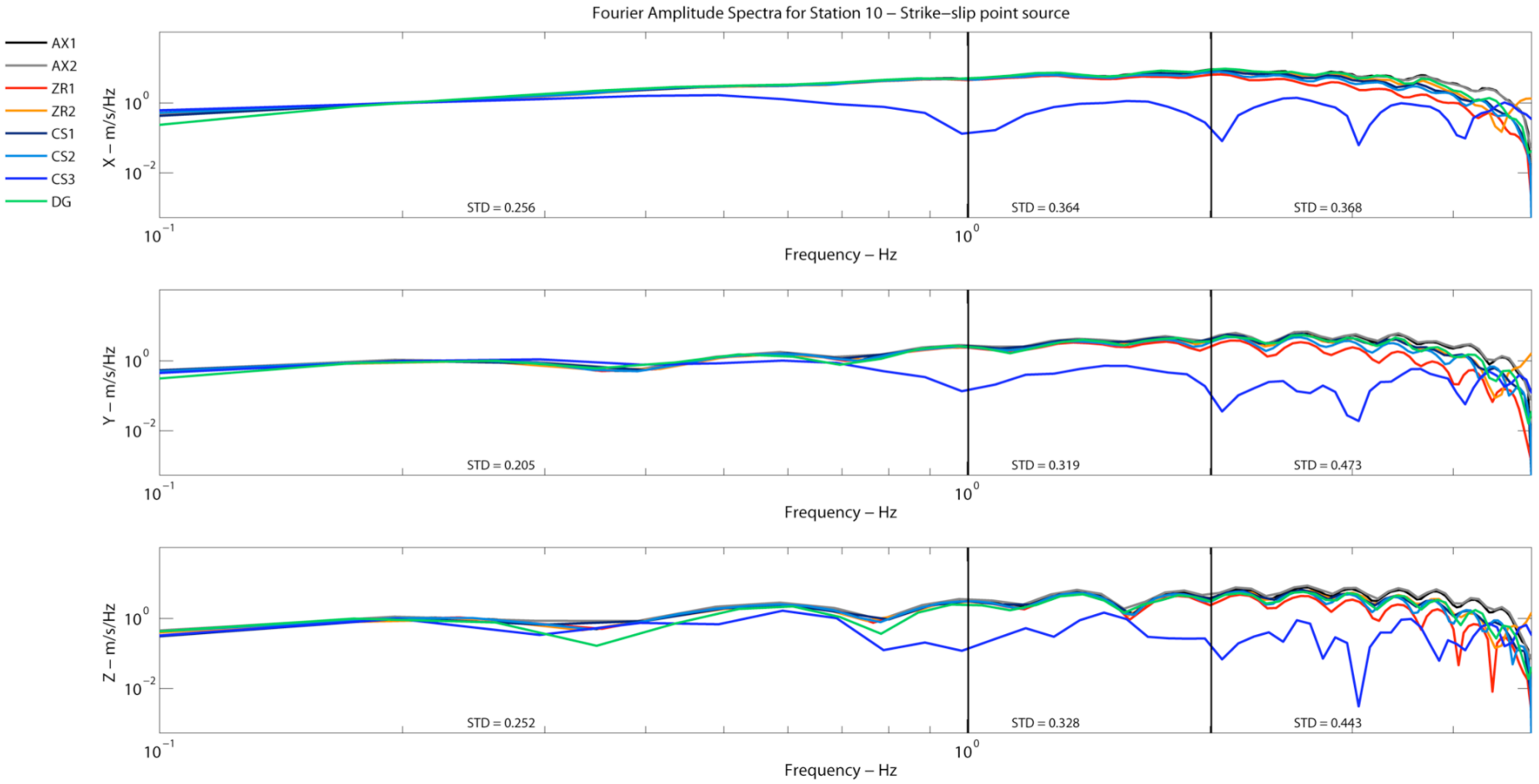
Comparison between synthetics obtained by the same method

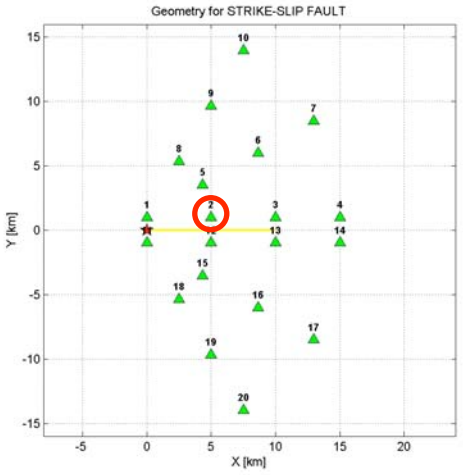


➔ COMPSYN

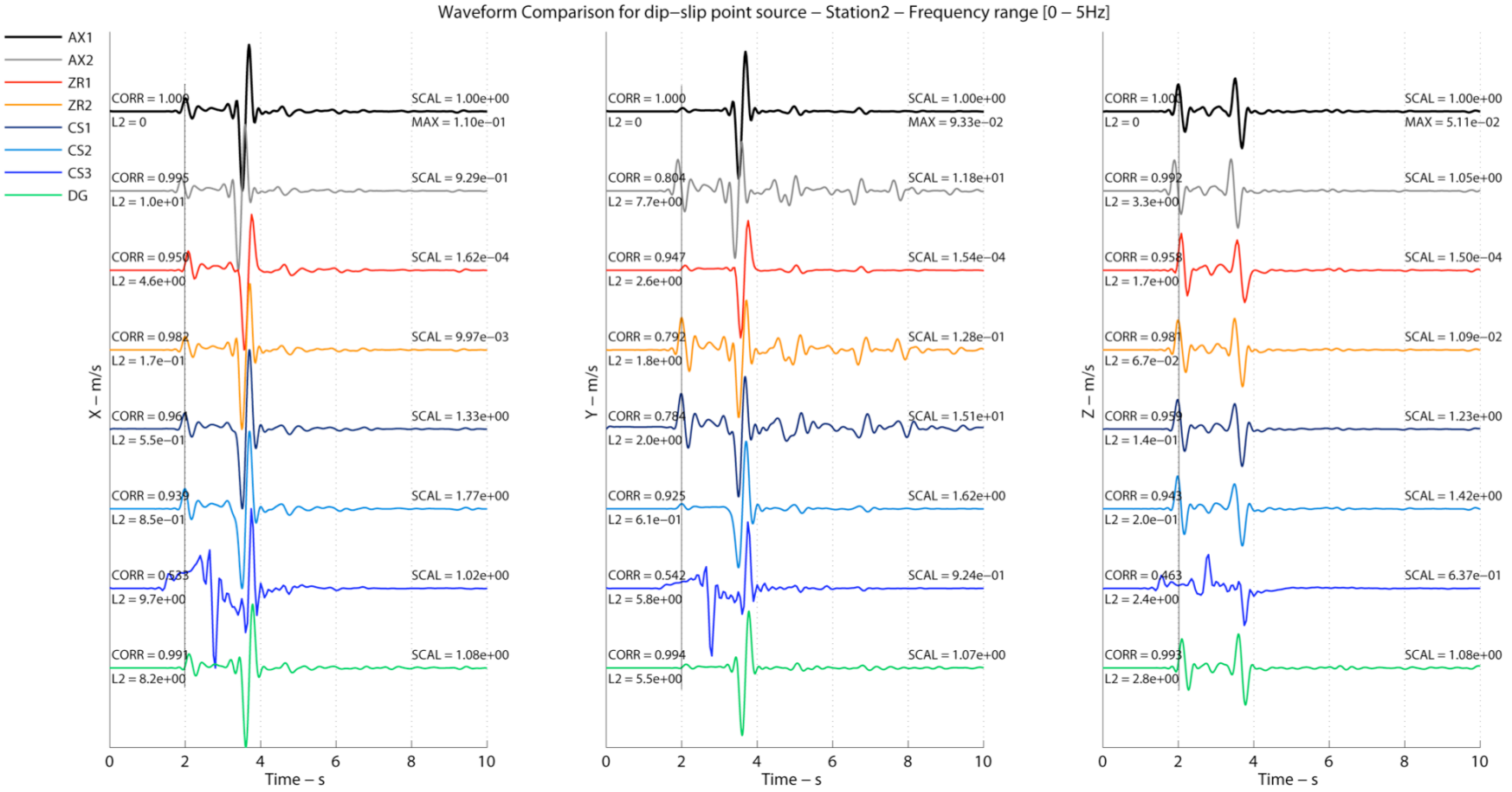


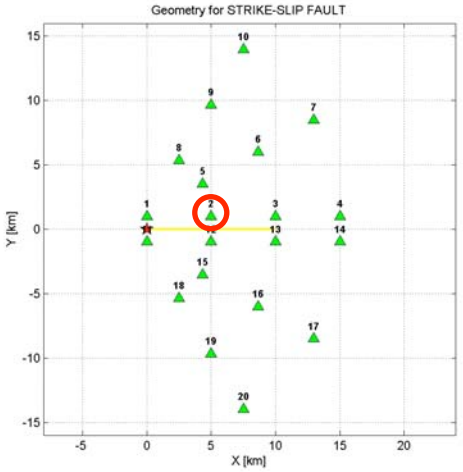
Comparison in the frequency domain



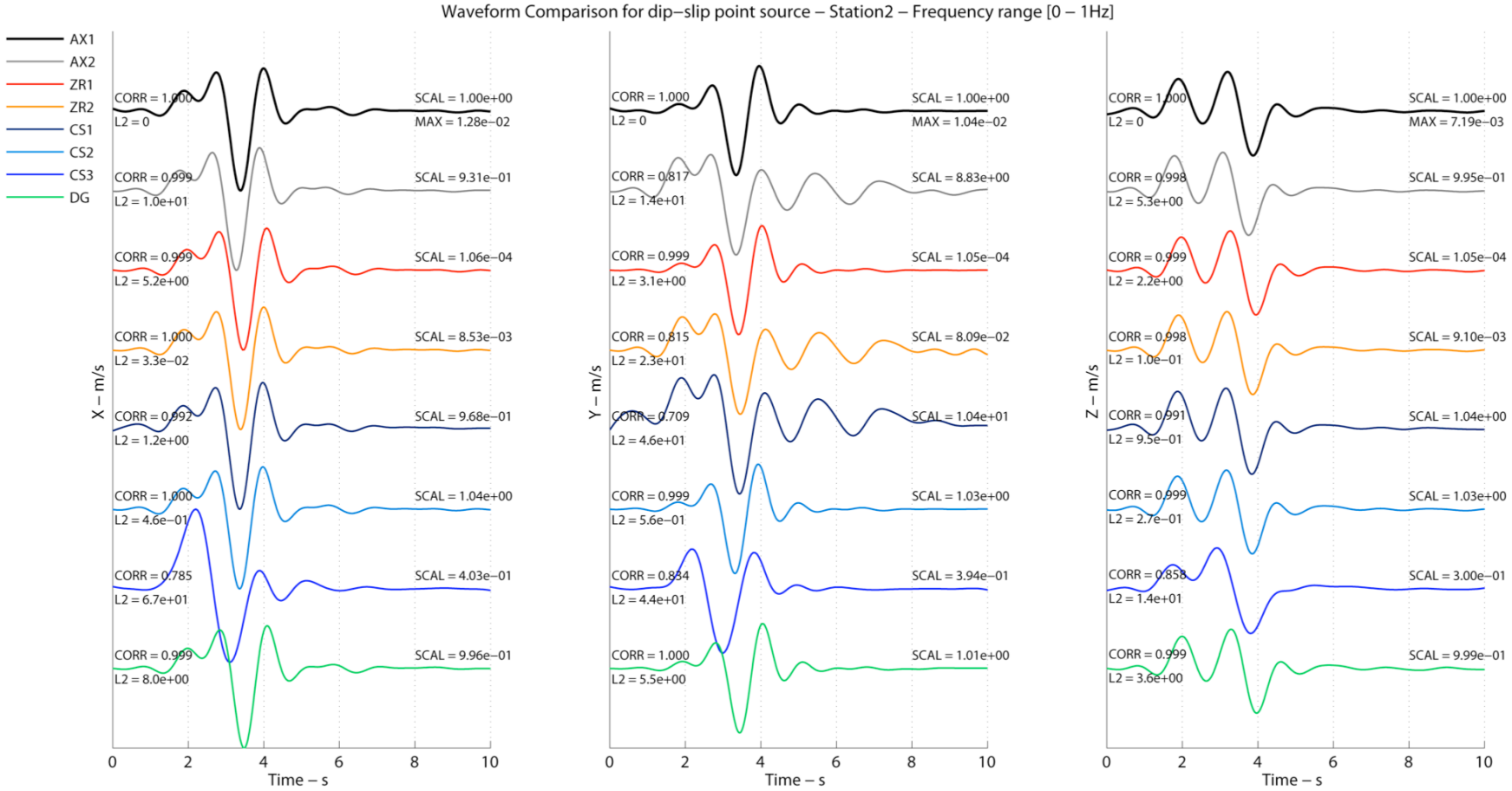


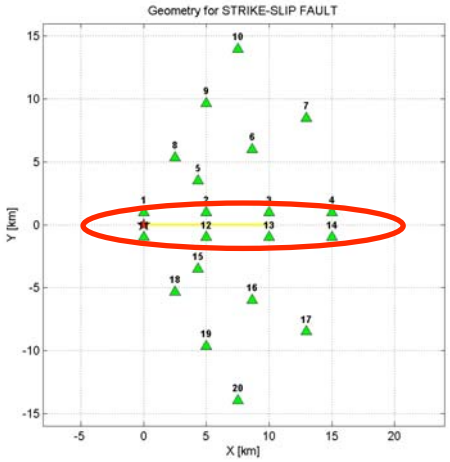
Result for dip-slip point source at a particular station



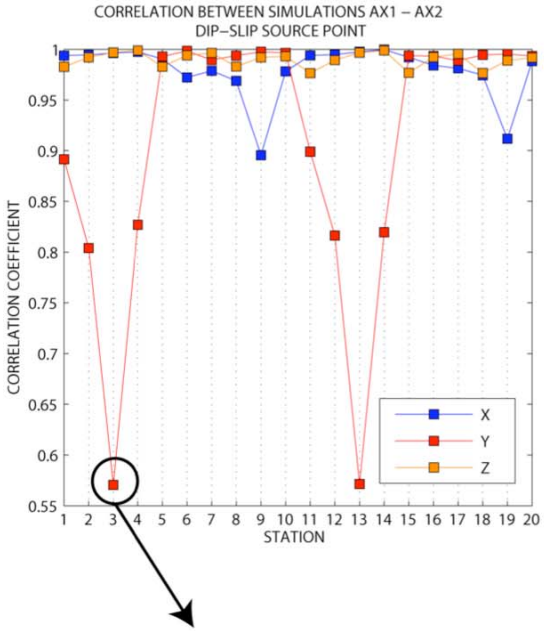


Result for dip-slip point source at a particular station low-pass filtered below 1 Hz



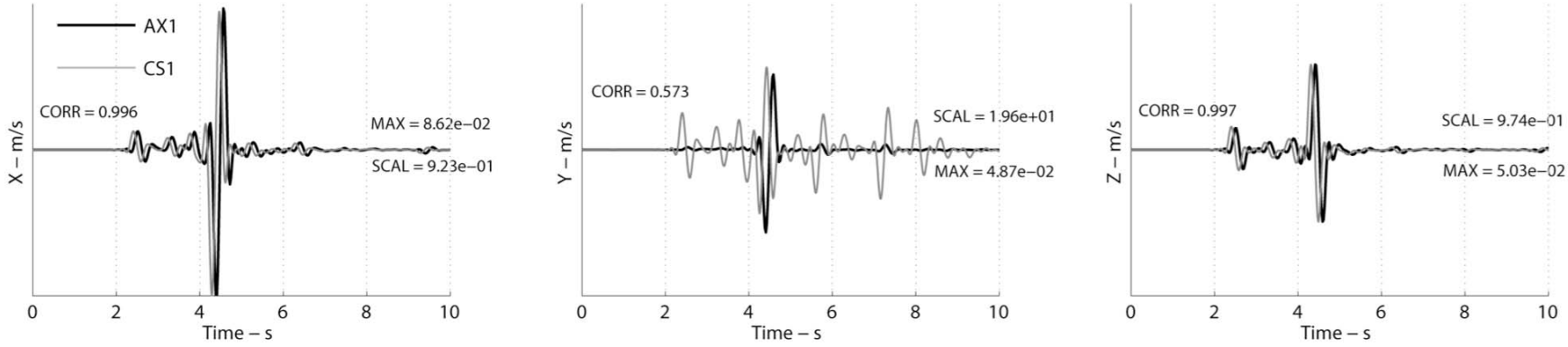


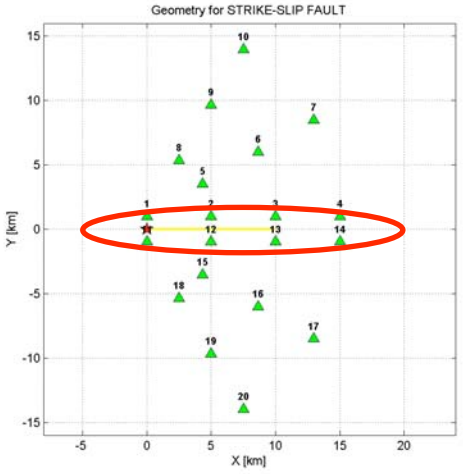
Comparison between 2 different methods for all the stations (dip-slip case)



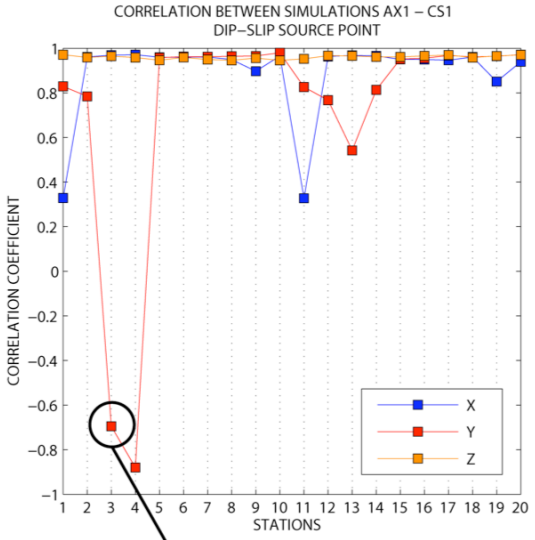
Comparison between AX1 and AX2

Waveform Comparison for dip–slip point source – Station3 – Frequency range [0 – 5Hz]

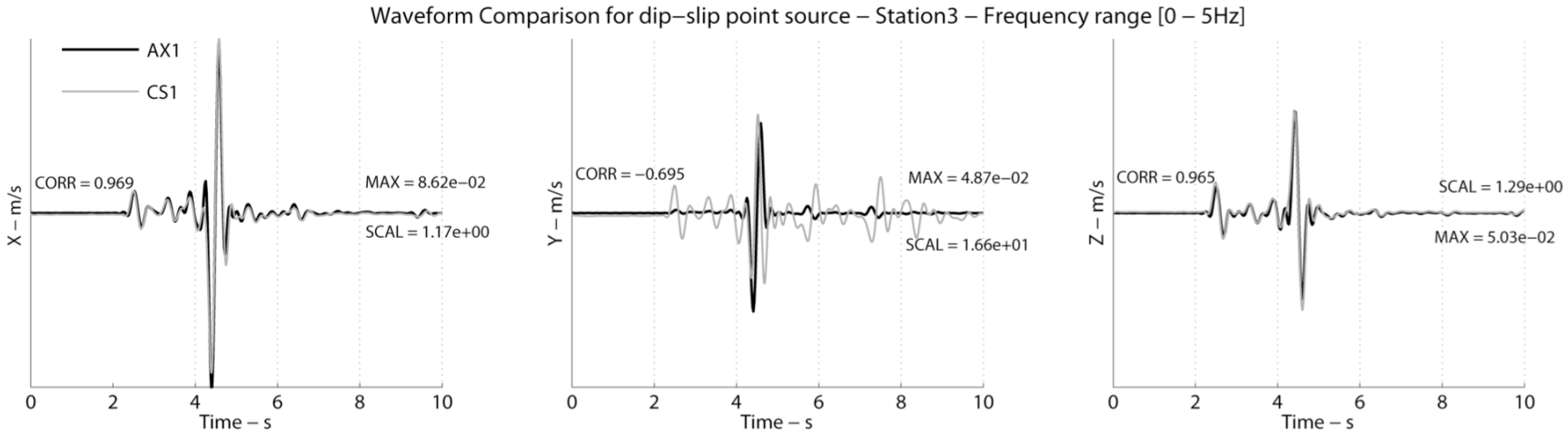




Comparison between 2 different methods for all the stations (dip-slip case)



Comparison between AX1 and CS1



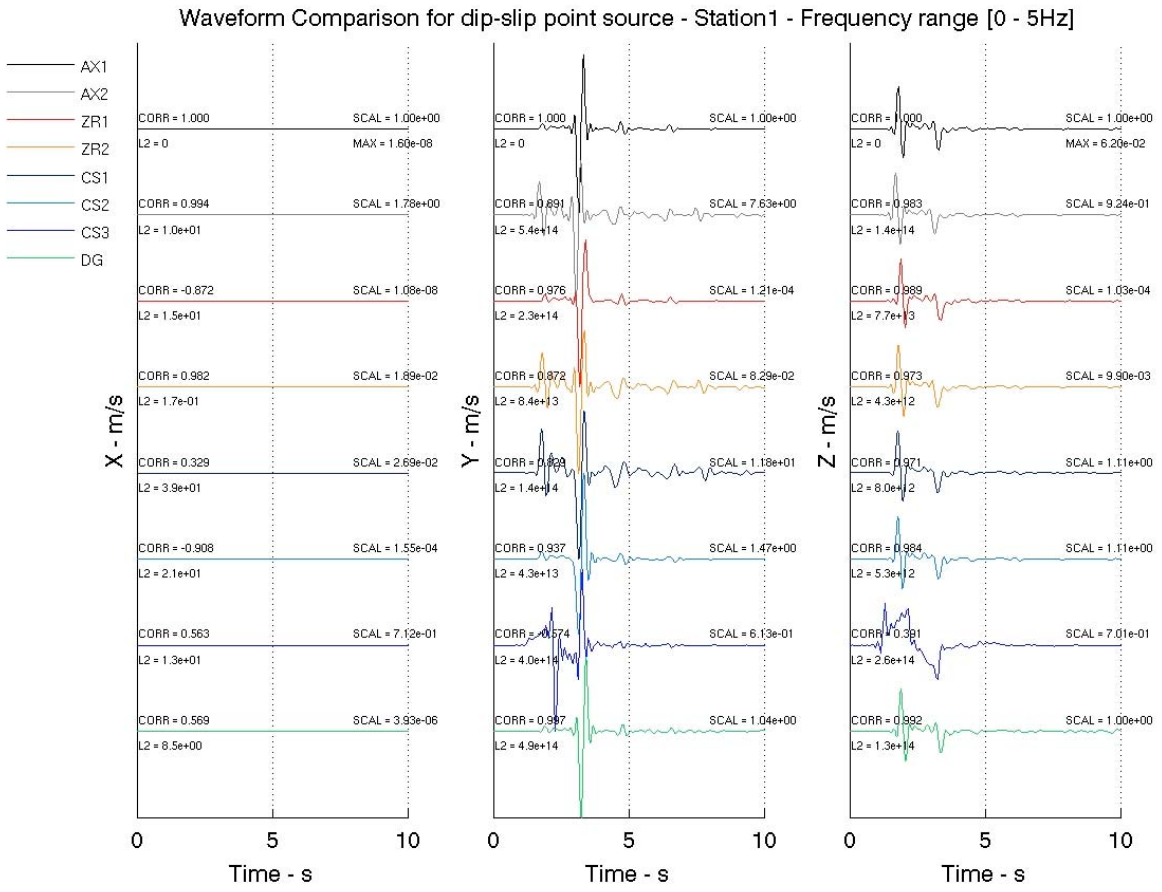
Conclusion

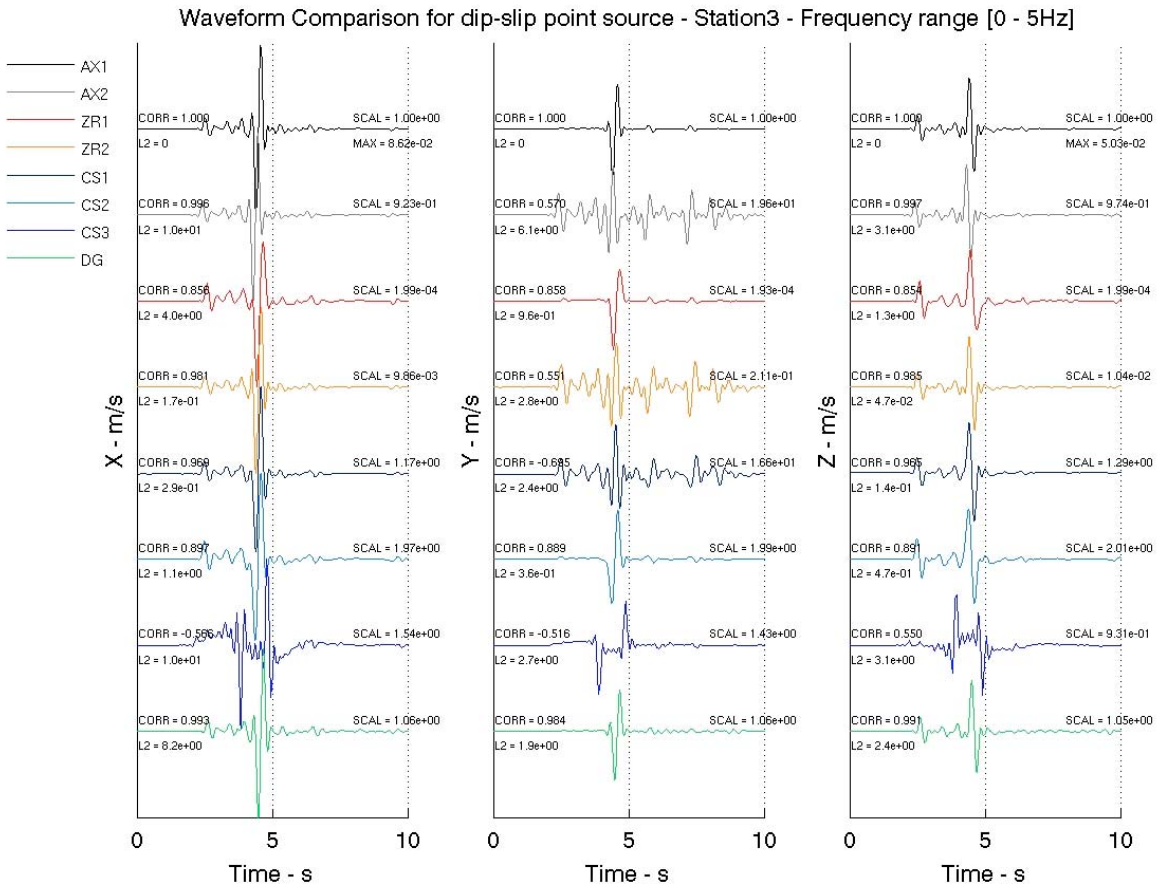
- In such simple cases we still observed significant discrepancies
  - amplitude (rescaling)
  - frequency content
  - time shifts
  - strong artefacts (wavenumber integral convergence)
  - some synthetics looks completely different (boundary reflections?)

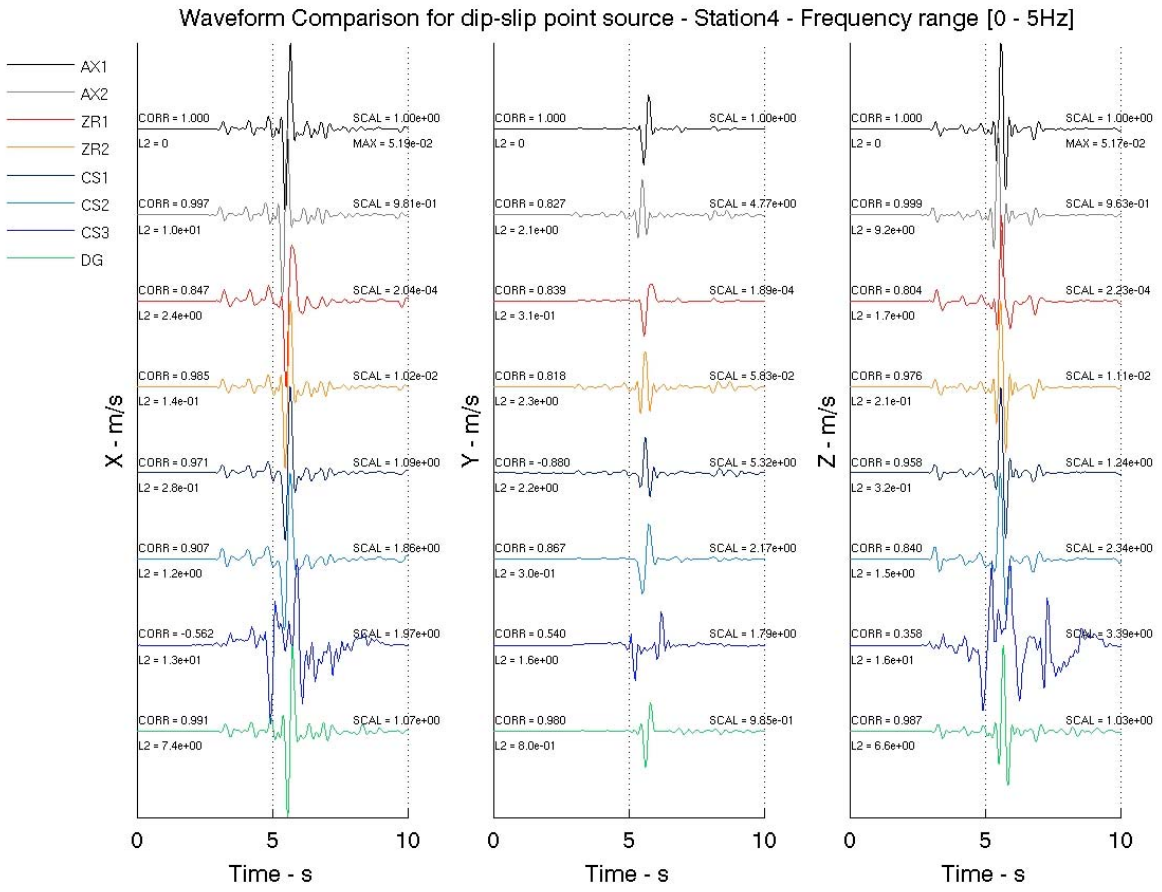
- How to fix it for the SIV database?
  - database of Green's functions?
  - which method should we chosen?

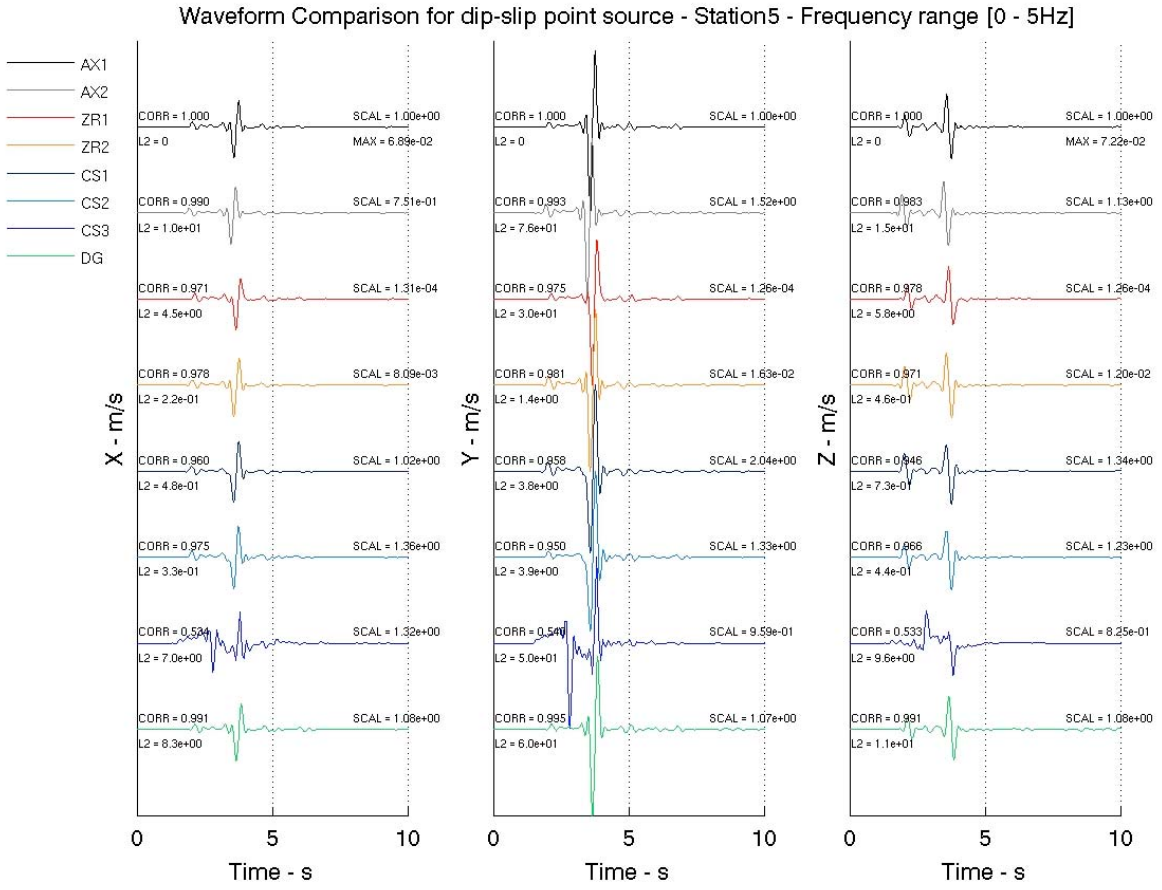
- How to assess epistemic uncertainties?
  - need of more modelers

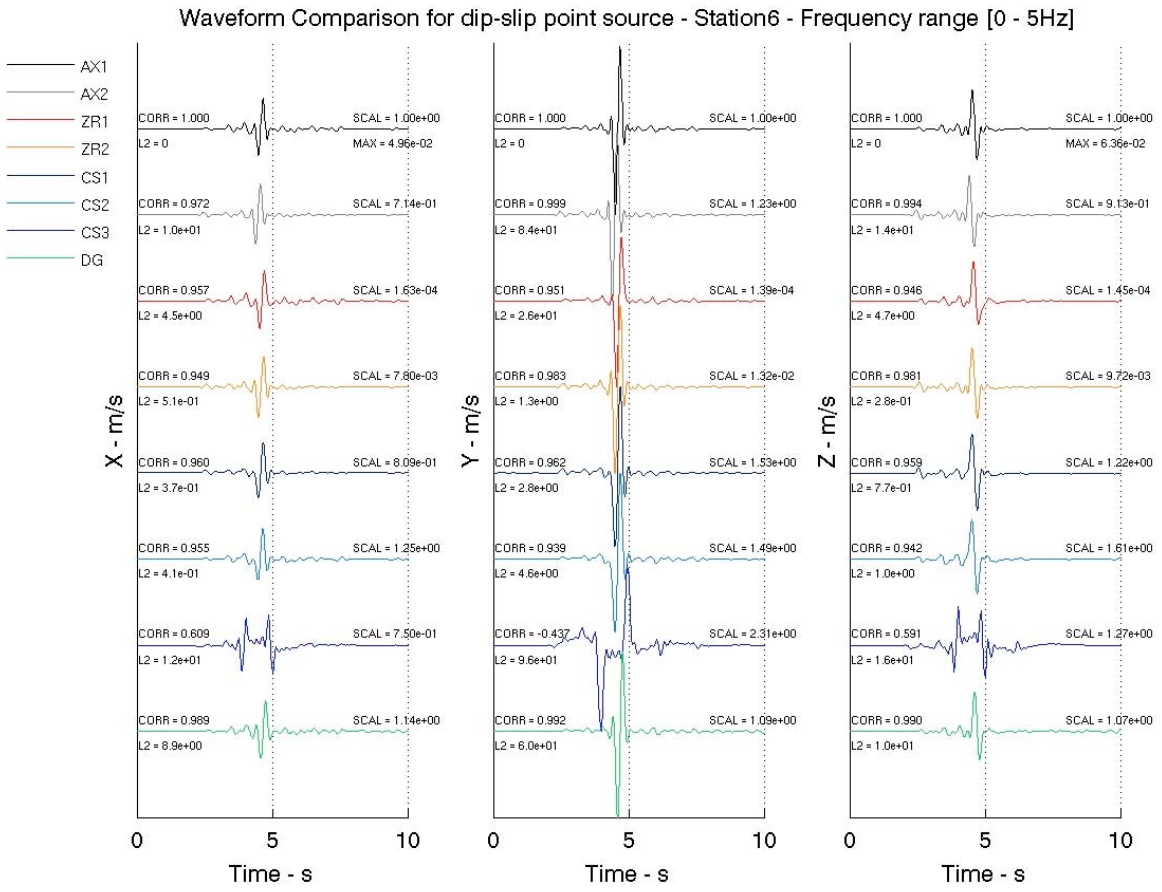
- How to estimate their effects on inverted source models?

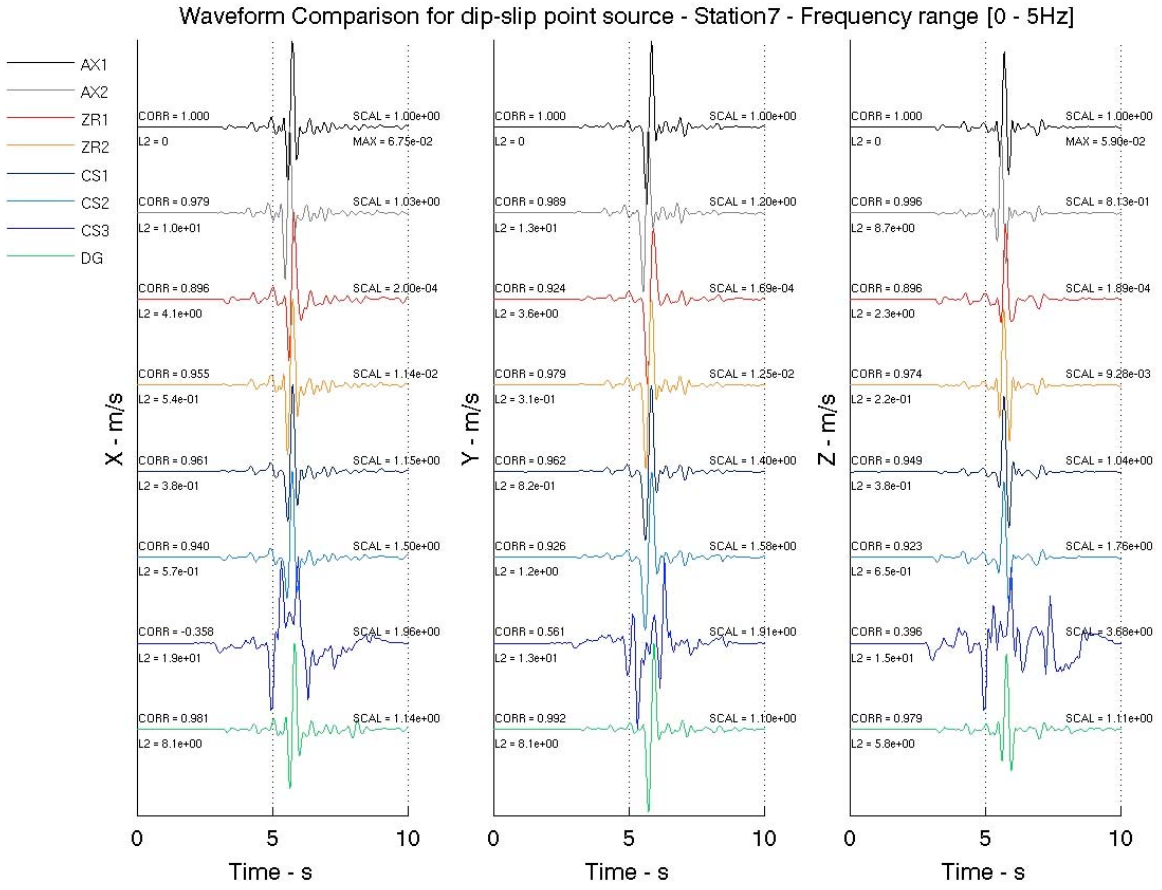

Waveform Comparison for dip-slip point source - Station1 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 1.60e-08
CORR = 0.994
SCAL = 1.78e+00
L2 = 1.0e+01
CORR = -0.872
SCAL = 1.08e-08
L2 = 1.5e+01
CORR = 0.982
SCAL = 1.89e-02
L2 = 1.7e-01
CORR = 0.329
SCAL = 2.69e-02
L2 = 3.9e+01
CORR = -0.908
SCAL = 1.55e-04
L2 = 2.1e+01
CORR = 0.563
SCAL = 7.12e-01
L2 = 1.3e+01
CORR = 0.569
SCAL = 3.93e-06
L2 = 8.5e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.891
SCAL = 7.63e+00
L2 = 5.4e+14
CORR = 0.976
SCAL = 1.21e-04
L2 = 2.3e+14
CORR = 0.872
SCAL = 8.29e-02
L2 = 8.4e+13
CORR = 0.809
SCAL = 1.18e+01
L2 = 1.4e+14
CORR = 0.937
SCAL = 1.47e+00
L2 = 4.3e+13
CORR = 0.574
SCAL = 6.13e-01
L2 = 4.0e+14
CORR = 0.997
SCAL = 1.04e+00
L2 = 4.9e+14
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.20e-02
CORR = 0.983
SCAL = 9.24e-01
L2 = 1.4e+14
CORR = 0.989
SCAL = 1.03e-04
L2 = 7.7e+13
CORR = 0.973
SCAL = 9.90e-03
L2 = 4.3e+12
CORR = 0.971
SCAL = 1.11e+00
L2 = 8.0e+12
CORR = 0.984
SCAL = 1.11e+00
L2 = 5.3e+12
CORR = 0.391
SCAL = 7.01e-01
L2 = 2.6e+14
CORR = 0.992
SCAL = 1.00e+00
L2 = 1.3e+14
Z - m/s
0
5
10
Time - s

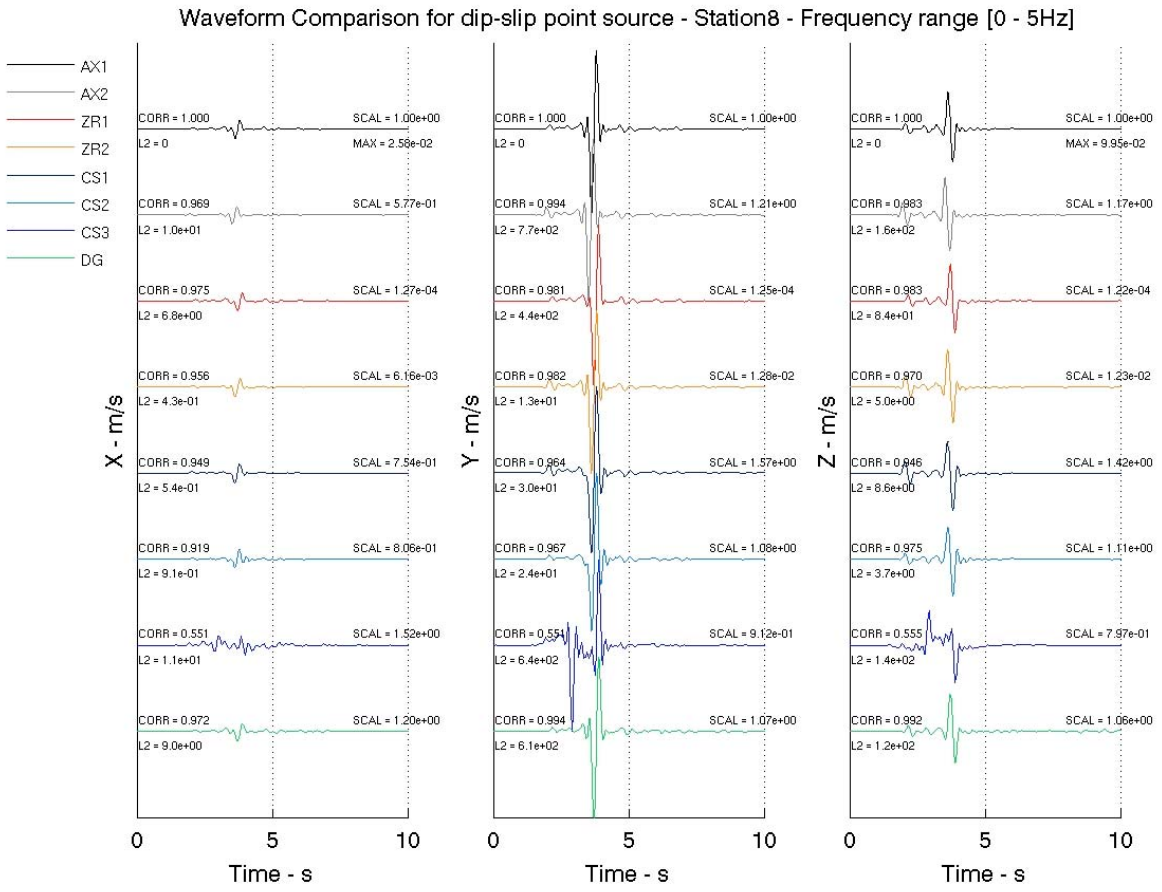

Waveform Comparison for dip-slip point source - Station3 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 8.62e-02
CORR = 0.996
SCAL = 9.23e-01
L2 = 1.0e+01
CORR = 0.856
SCAL = 1.99e-04
L2 = 4.0e+00
CORR = 0.981
SCAL = 9.86e-03
L2 = 1.7e-01
CORR = 0.968
SCAL = 1.17e+00
L2 = 2.9e-01
CORR = 0.897
SCAL = 1.97e+00
L2 = 1.1e+00
CORR = -0.586
SCAL = 1.54e+00
L2 = 1.0e+01
CORR = 0.993
SCAL = 1.06e+00
L2 = 8.2e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.570
SCAL = 1.96e+01
L2 = 6.1e+00
CORR = 0.858
SCAL = 1.93e-04
L2 = 9.6e-01
CORR = 0.551
SCAL = 2.11e-01
L2 = 2.8e+00
CORR = -0.685
SCAL = 1.66e+01
L2 = 2.4e+00
CORR = 0.889
SCAL = 1.99e+00
L2 = 3.6e-01
CORR = -0.516
SCAL = 1.43e+00
L2 = 2.7e+00
CORR = 0.984
SCAL = 1.06e+00
L2 = 1.9e+00
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.03e-02
CORR = 0.997
SCAL = 9.74e-01
L2 = 3.1e+00
CORR = 0.854
SCAL = 1.99e-04
L2 = 1.3e+00
CORR = 0.985
SCAL = 1.04e-02
L2 = 4.7e-02
CORR = 0.965
SCAL = 1.29e+00
L2 = 1.4e-01
CORR = 0.891
SCAL = 2.01e+00
L2 = 4.7e-01
CORR = 0.550
SCAL = 9.31e-01
L2 = 3.1e+00
CORR = 0.991
SCAL = 1.05e+00
L2 = 2.4e+00
Z - m/s
0
5
10
Time - s

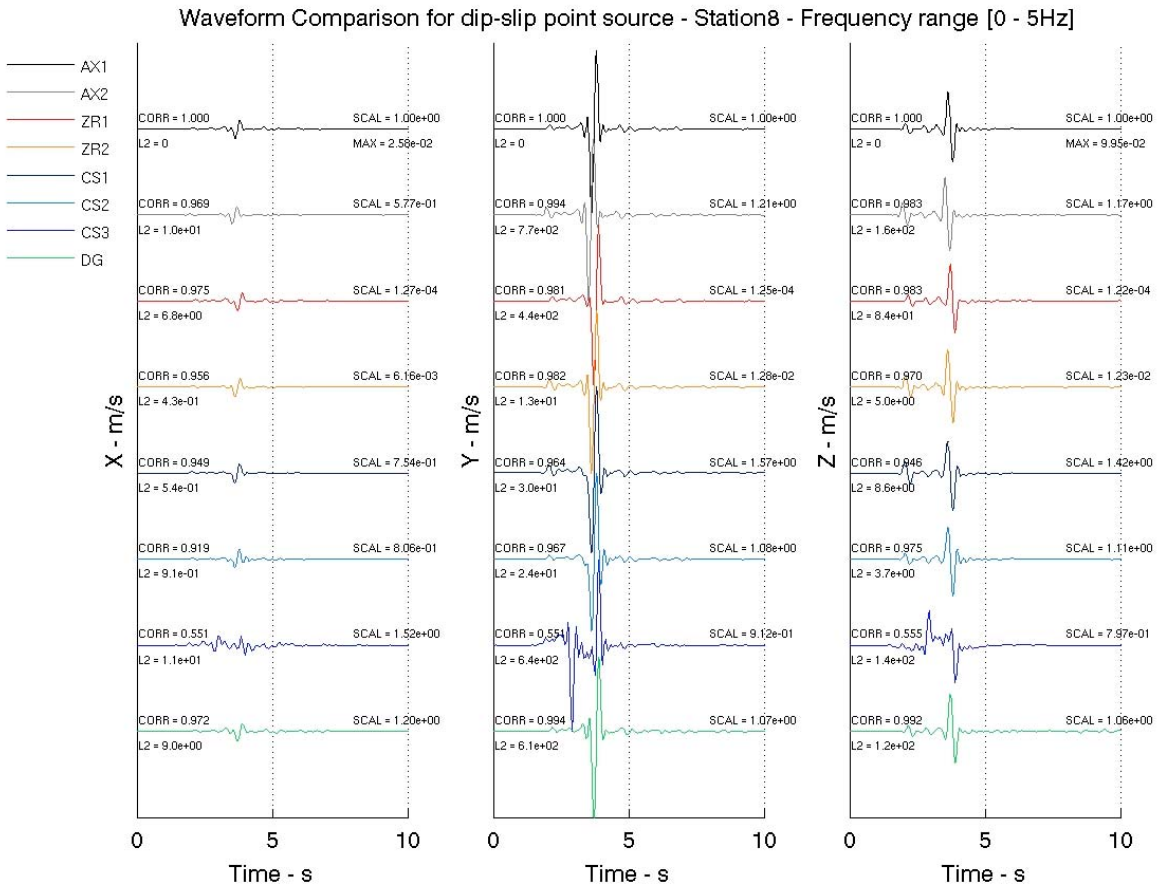

Waveform Comparison for dip-slip point source - Station4 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.19e-02
CORR = 0.997
SCAL = 9.61e-01
L2 = 1.0e+01
CORR = 0.847
SCAL = 2.04e-04
L2 = 2.4e+00
CORR = 0.985
SCAL = 1.02e-02
L2 = 1.4e-01
CORR = 0.971
SCAL = 1.09e+00
L2 = 2.8e-01
CORR = 0.907
SCAL = 1.86e+00
L2 = 1.2e+00
CORR = -0.562
SCAL = 1.97e+00
L2 = 1.3e+01
CORR = 0.991
SCAL = 1.07e+00
L2 = 7.4e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.827
SCAL = 4.77e+00
L2 = 2.1e+00
CORR = 0.839
SCAL = 1.89e-04
L2 = 3.1e-01
CORR = 0.818
SCAL = 5.83e-02
L2 = 2.3e+00
CORR = -0.880
SCAL = 5.32e+00
L2 = 2.2e+00
CORR = 0.867
SCAL = 2.17e+00
L2 = 3.0e-01
CORR = 0.540
SCAL = 1.79e+00
L2 = 1.6e+00
CORR = 0.980
SCAL = 9.85e-01
L2 = 8.0e-01
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.17e-02
CORR = 0.999
SCAL = 9.63e-01
L2 = 9.2e+00
CORR = 0.804
SCAL = 2.23e-04
L2 = 1.7e+00
CORR = 0.976
SCAL = 1.11e-02
L2 = 2.1e-01
CORR = 0.958
SCAL = 1.24e+00
L2 = 3.2e-01
CORR = 0.840
SCAL = 2.34e+00
L2 = 1.5e+00
CORR = 0.358
SCAL = 3.39e+00
L2 = 1.6e+01
CORR = 0.987
SCAL = 1.03e+00
L2 = 6.6e+00
Z - m/s
0
5
10
Time - s

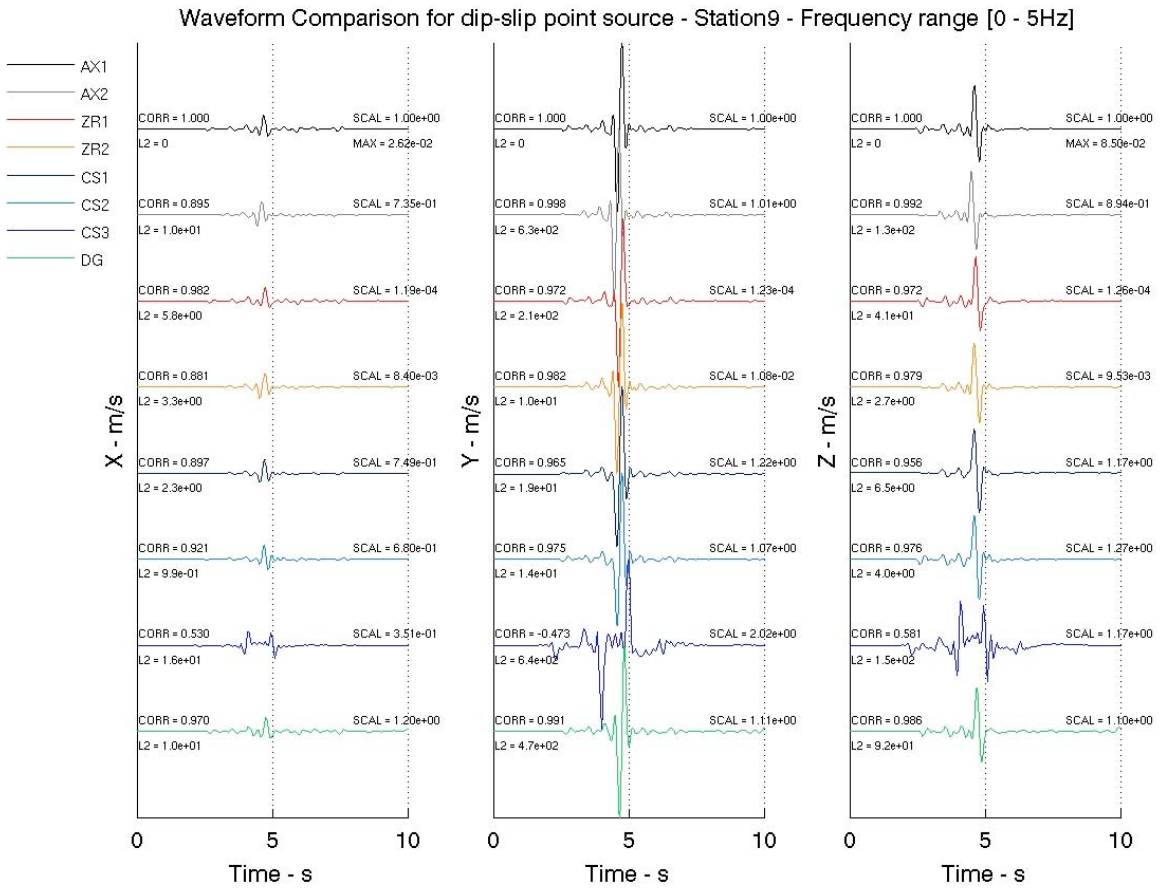

Waveform Comparison for dip-slip point source - Station5 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.89e-02
CORR = 0.990
SCAL = 7.51e-01
L2 = 1.0e+01
CORR = 0.971
SCAL = 1.31e-04
L2 = 4.5e+00
CORR = 0.978
SCAL = 8.09e-03
L2 = 2.2e-01
CORR = 0.960
SCAL = 1.02e+00
L2 = 4.8e-01
CORR = 0.975
SCAL = 1.36e+00
L2 = 3.3e-01
CORR = 0.534
SCAL = 1.32e+00
L2 = 7.0e+00
CORR = 0.991
SCAL = 1.08e+00
L2 = 8.3e+00
X - m/s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.993
SCAL = 1.52e+00
L2 = 7.6e+01
CORR = 0.975
SCAL = 1.26e-04
L2 = 3.0e+01
CORR = 0.981
SCAL = 1.63e-02
L2 = 1.4e+00
CORR = 0.958
SCAL = 2.04e+00
L2 = 3.8e+00
CORR = 0.950
SCAL = 1.33e+00
L2 = 3.9e+00
CORR = 0.540
SCAL = 9.59e-01
L2 = 5.0e+01
CORR = 0.995
SCAL = 1.07e+00
L2 = 6.0e+01
Y - m/s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 7.22e-02
CORR = 0.983
SCAL = 1.13e+00
L2 = 1.5e+01
CORR = 0.978
SCAL = 1.26e-04
L2 = 5.8e+00
CORR = 0.971
SCAL = 1.20e-02
L2 = 4.6e-01
CORR = 0.946
SCAL = 1.34e+00
L2 = 7.3e-01
CORR = 0.966
SCAL = 1.23e+00
L2 = 4.4e-01
CORR = 0.533
SCAL = 8.25e-01
L2 = 9.6e+00
CORR = 0.991
SCAL = 1.08e+00
L2 = 1.1e+01
Z - m/s
0
5
10
Time - s

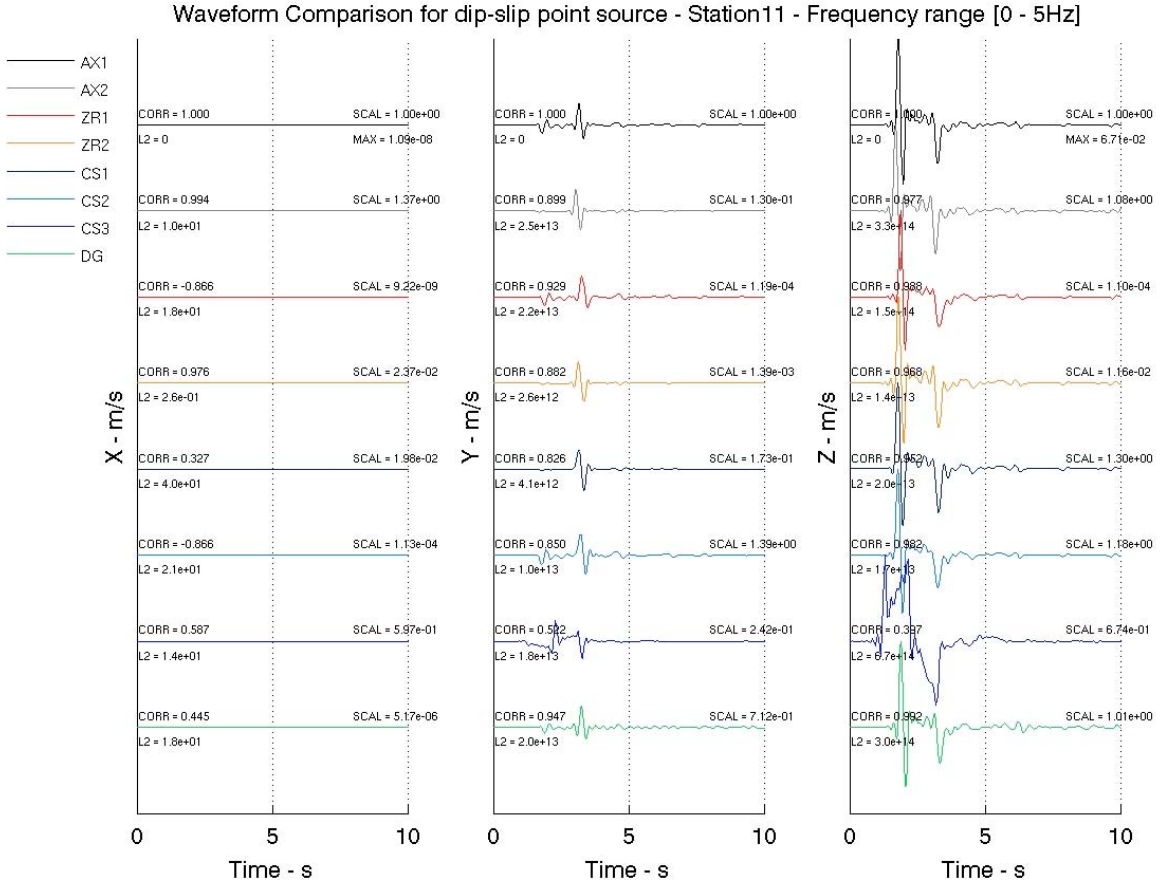

Waveform Comparison for dip-slip point source - Station6 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 4.96e-02
CORR = 0.972
SCAL = 7.14e-01
L2 = 1.0e+01
CORR = 0.957
SCAL = 1.63e-04
L2 = 4.5e+00
CORR = 0.949
SCAL = 7.80e-03
L2 = 5.1e-01
CORR = 0.960
SCAL = 8.09e-01
L2 = 3.7e-01
CORR = 0.955
SCAL = 1.25e+00
L2 = 4.1e-01
CORR = 0.609
SCAL = 7.50e-01
L2 = 1.2e+01
CORR = 0.989
SCAL = 1.14e+00
L2 = 8.9e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.999
SCAL = 1.23e+00
L2 = 8.4e+01
CORR = 0.951
SCAL = 1.39e-04
L2 = 2.6e+01
CORR = 0.983
SCAL = 1.32e-02
L2 = 1.3e+00
CORR = 0.962
SCAL = 1.53e+00
L2 = 2.8e+00
CORR = 0.939
SCAL = 1.49e+00
L2 = 4.6e+00
CORR = -0.437
SCAL = 2.31e+00
L2 = 9.6e+01
CORR = 0.992
SCAL = 1.09e+00
L2 = 6.0e+01
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.36e-02
CORR = 0.994
SCAL = 9.13e-01
L2 = 1.4e+01
CORR = 0.946
SCAL = 1.45e-04
L2 = 4.7e+00
CORR = 0.981
SCAL = 9.72e-03
L2 = 2.8e-01
CORR = 0.959
SCAL = 1.22e+00
L2 = 7.7e-01
CORR = 0.942
SCAL = 1.61e+00
L2 = 1.0e+00
CORR = 0.591
SCAL = 1.27e+00
L2 = 1.6e+01
CORR = 0.990
SCAL = 1.07e+00
L2 = 1.0e+01
Z - m/s
0
5
10
Time - s

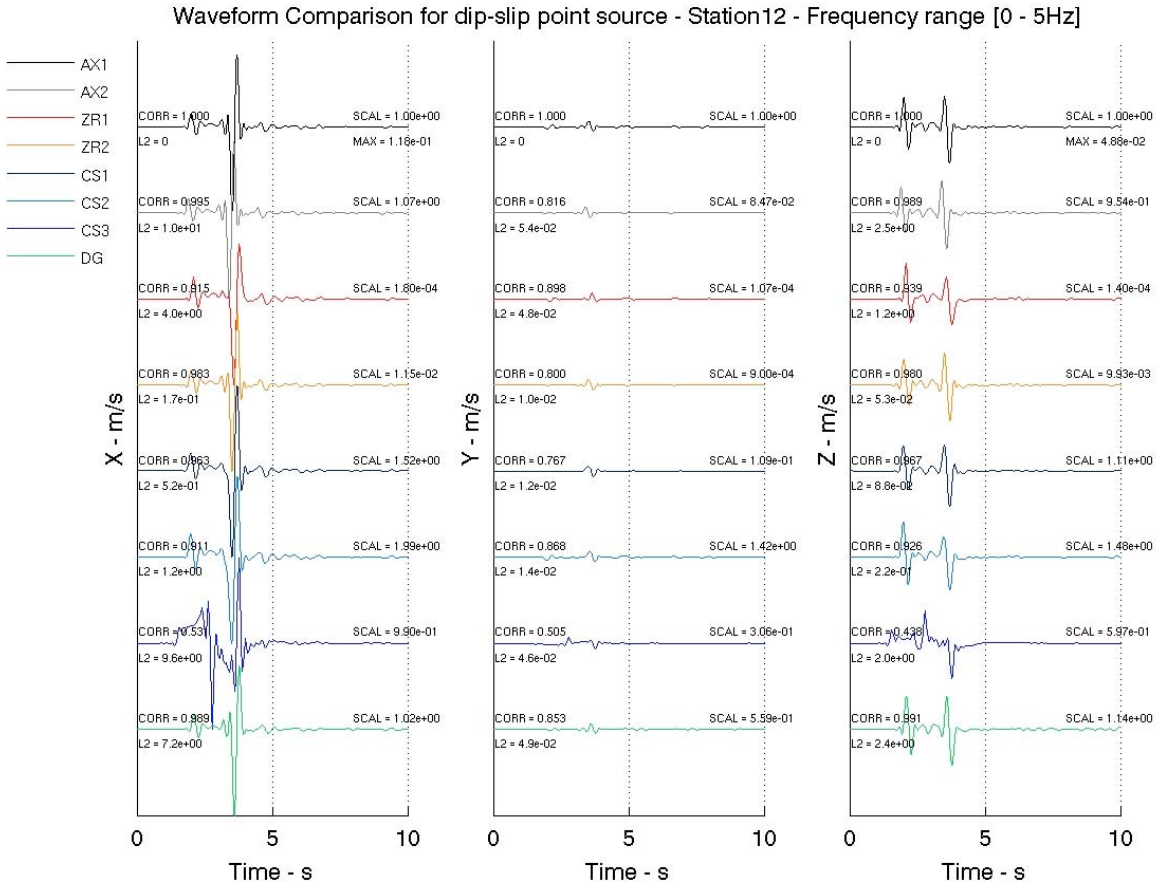

Waveform Comparison for dip-slip point source - Station7 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.75e-02
CORR = 0.979
SCAL = 1.03e+00
L2 = 1.0e+01
CORR = 0.896
SCAL = 2.00e-04
L2 = 4.1e+00
CORR = 0.955
SCAL = 1.14e-02
L2 = 5.4e-01
CORR = 0.961
SCAL = 1.15e+00
L2 = 3.8e-01
CORR = 0.940
SCAL = 1.50e+00
L2 = 5.7e-01
CORR = -0.358
SCAL = 1.96e+00
L2 = 1.9e+01
CORR = 0.981
SCAL = 1.14e+00
L2 = 8.1e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.989
SCAL = 1.20e+00
L2 = 1.3e+01
CORR = 0.924
SCAL = 1.69e-04
L2 = 3.6e+00
CORR = 0.979
SCAL = 1.25e-02
L2 = 3.1e-01
CORR = 0.962
SCAL = 1.40e+00
L2 = 8.2e-01
CORR = 0.926
SCAL = 1.58e+00
L2 = 1.2e+00
CORR = 0.561
SCAL = 1.91e+00
L2 = 1.3e+01
CORR = 0.992
SCAL = 1.10e+00
L2 = 8.1e+00
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.90e-02
CORR = 0.996
SCAL = 8.13e-01
L2 = 8.7e+00
CORR = 0.896
SCAL = 1.89e-04
L2 = 2.3e+00
CORR = 0.974
SCAL = 9.28e-03
L2 = 2.2e-01
CORR = 0.949
SCAL = 1.04e+00
L2 = 3.8e-01
CORR = 0.923
SCAL = 1.76e+00
L2 = 6.5e-01
CORR = 0.396
SCAL = 3.68e+00
L2 = 1.5e+01
CORR = 0.979
SCAL = 1.11e+00
L2 = 5.8e+00
Z - m/s
0
5
10
Time - s

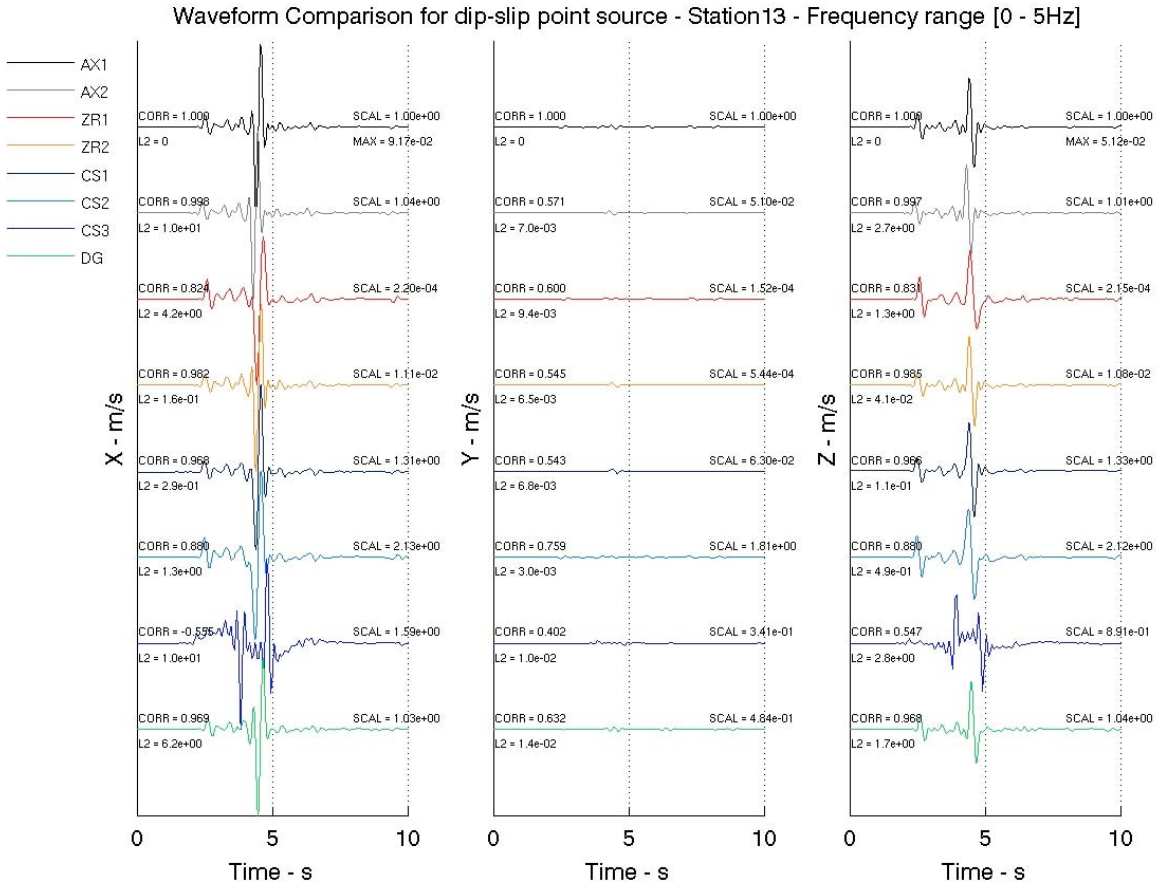

Waveform Comparison for dip-slip point source - Station8 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 2.58e-02
CORR = 0.969
SCAL = 5.77e-01
L2 = 1.0e+01
CORR = 0.975
SCAL = 1.27e-04
L2 = 6.8e+00
CORR = 0.956
SCAL = 6.16e-03
L2 = 4.3e-01
CORR = 0.949
SCAL = 7.54e-01
L2 = 5.4e-01
CORR = 0.919
SCAL = 8.06e-01
L2 = 9.1e-01
CORR = 0.551
SCAL = 1.52e+00
L2 = 1.1e+01
CORR = 0.972
SCAL = 1.20e+00
L2 = 9.0e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.994
SCAL = 1.21e+00
L2 = 7.7e+02
CORR = 0.981
SCAL = 1.25e-04
L2 = 4.4e+02
CORR = 0.982
SCAL = 1.28e-02
L2 = 1.3e+01
CORR = 0.964
SCAL = 1.57e+00
L2 = 3.0e+01
CORR = 0.967
SCAL = 1.08e+00
L2 = 2.4e+01
CORR = 0.554
SCAL = 9.12e-01
L2 = 6.4e+02
CORR = 0.994
SCAL = 1.07e+00
L2 = 6.1e+02
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 9.95e-02
CORR = 0.983
SCAL = 1.17e+00
L2 = 1.6e+02
CORR = 0.983
SCAL = 1.22e-04
L2 = 8.4e+01
CORR = 0.970
SCAL = 1.23e-02
L2 = 5.0e+00
CORR = 0.946
SCAL = 1.42e+00
L2 = 8.6e+00
CORR = 0.975
SCAL = 1.11e+00
L2 = 3.7e+00
CORR = 0.555
SCAL = 7.97e-01
L2 = 1.4e+02
CORR = 0.992
SCAL = 1.06e+00
L2 = 1.2e+02
Z - m/s
0
5
10
Time - s

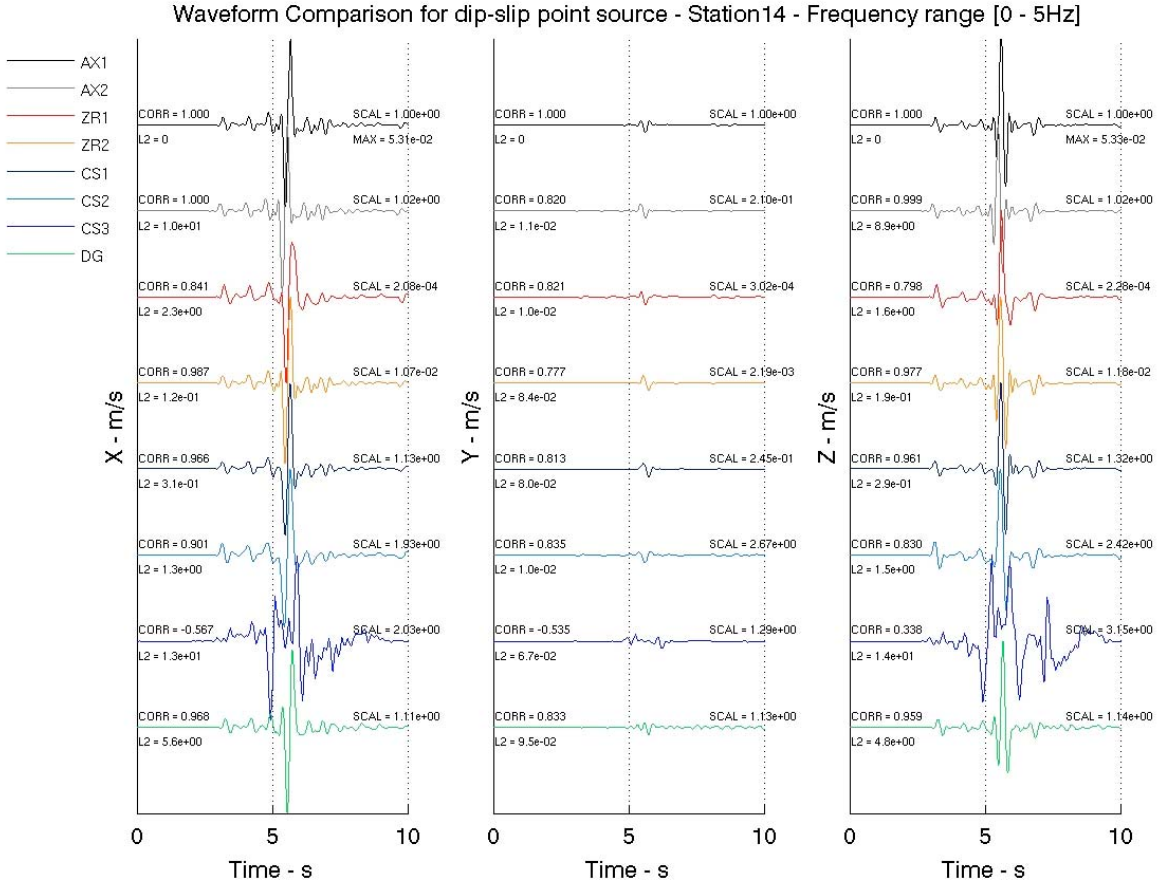

Waveform Comparison for dip-slip point source - Station8 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 2.58e-02
CORR = 0.969
SCAL = 5.77e-01
L2 = 1.0e+01
CORR = 0.975
SCAL = 1.27e-04
L2 = 6.8e+00
CORR = 0.956
SCAL = 6.16e-03
L2 = 4.3e-01
CORR = 0.949
SCAL = 7.54e-01
L2 = 5.4e-01
CORR = 0.919
SCAL = 8.06e-01
L2 = 9.1e-01
CORR = 0.551
SCAL = 1.52e+00
L2 = 1.1e+01
CORR = 0.972
SCAL = 1.20e+00
L2 = 9.0e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.994
SCAL = 1.21e+00
L2 = 7.7e+02
CORR = 0.981
SCAL = 1.25e-04
L2 = 4.4e+02
CORR = 0.982
SCAL = 1.28e-02
L2 = 1.3e+01
CORR = 0.964
SCAL = 1.57e+00
L2 = 3.0e+01
CORR = 0.967
SCAL = 1.08e+00
L2 = 2.4e+01
CORR = 0.554
SCAL = 9.12e-01
L2 = 6.4e+02
CORR = 0.994
SCAL = 1.07e+00
L2 = 6.1e+02
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 9.95e-02
CORR = 0.983
SCAL = 1.17e+00
L2 = 1.6e+02
CORR = 0.983
SCAL = 1.22e-04
L2 = 8.4e+01
CORR = 0.970
SCAL = 1.23e-02
L2 = 5.0e+00
CORR = 0.946
SCAL = 1.42e+00
L2 = 8.6e+00
CORR = 0.975
SCAL = 1.11e+00
L2 = 3.7e+00
CORR = 0.555
SCAL = 7.97e-01
L2 = 1.4e+02
CORR = 0.992
SCAL = 1.06e+00
L2 = 1.2e+02
Z - m/s
0
5
10
Time - s

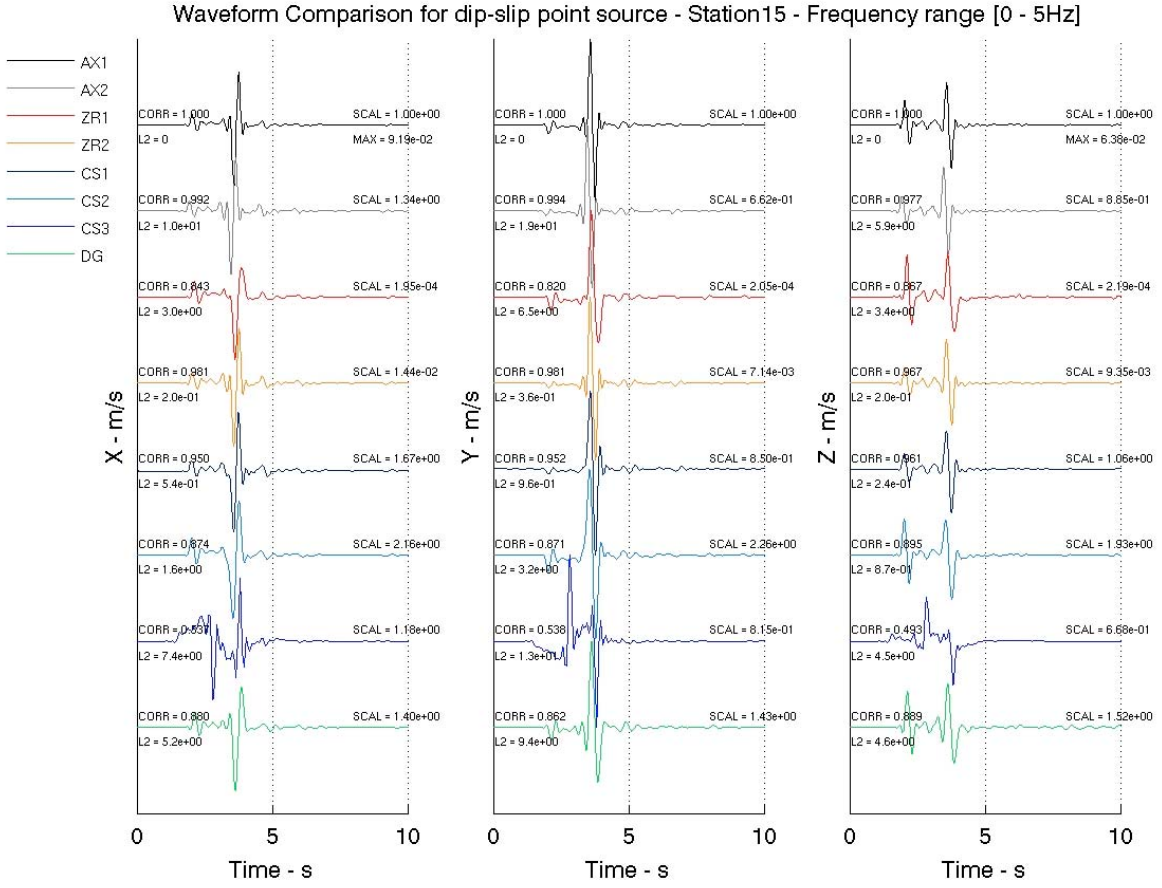

Waveform Comparison for dip-slip point source - Station9 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 2.62e-02
CORR = 0.895
SCAL = 7.35e-01
L2 = 1.0e+01
CORR = 0.982
SCAL = 1.19e-04
L2 = 5.8e+00
CORR = 0.881
SCAL = 8.40e-03
L2 = 3.3e+00
CORR = 0.897
SCAL = 7.49e-01
L2 = 2.3e+00
CORR = 0.921
SCAL = 6.80e-01
L2 = 9.9e-01
CORR = 0.530
SCAL = 3.51e-01
L2 = 1.6e+01
CORR = 0.970
SCAL = 1.20e+00
L2 = 1.0e+01
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.998
SCAL = 1.01e+00
L2 = 6.3e+02
CORR = 0.972
SCAL = 1.23e-04
L2 = 2.1e+02
CORR = 0.982
SCAL = 1.08e-02
L2 = 1.0e+01
CORR = 0.965
SCAL = 1.22e+00
L2 = 1.9e+01
CORR = 0.975
SCAL = 1.07e+00
L2 = 1.4e+01
CORR = -0.473
SCAL = 2.02e+00
L2 = 6.4e+02
CORR = 0.991
SCAL = 1.11e+00
L2 = 4.7e+02
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 8.50e-02
CORR = 0.992
SCAL = 8.94e-01
L2 = 1.3e+02
CORR = 0.972
SCAL = 1.26e-04
L2 = 4.1e+01
CORR = 0.979
SCAL = 9.53e-03
L2 = 2.7e+00
CORR = 0.956
SCAL = 1.17e+00
L2 = 6.5e+00
CORR = 0.976
SCAL = 1.27e+00
L2 = 4.0e+00
CORR = 0.581
SCAL = 1.17e+00
L2 = 1.5e+02
CORR = 0.986
SCAL = 1.10e+00
L2 = 9.2e+01
Z - m/s
0
5
10
Time - s

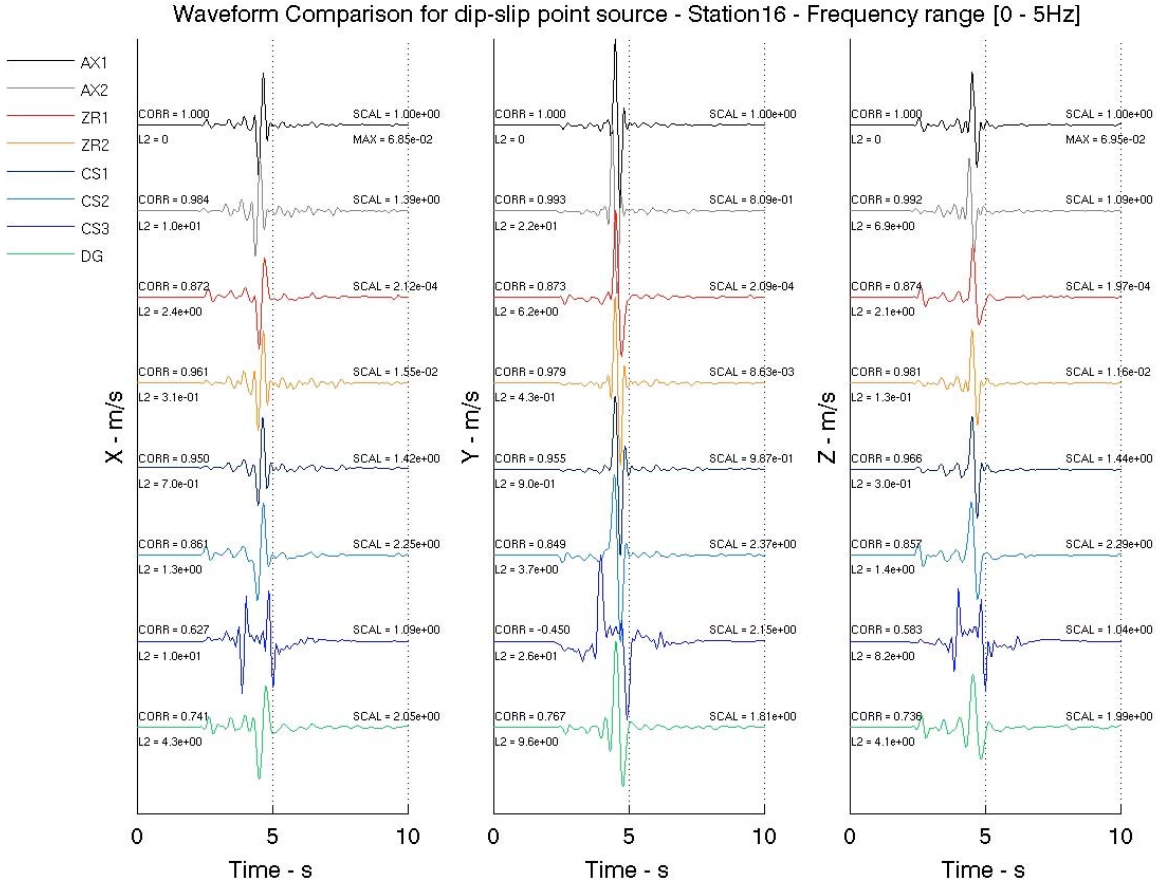

Waveform Comparison for dip-slip point source - Station11 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 1.09e-08
CORR = 0.994
SCAL = 1.37e+00
L2 = 1.0e+01
CORR = -0.866
SCAL = 9.22e-09
L2 = 1.8e+01
CORR = 0.976
SCAL = 2.37e-02
L2 = 2.6e-01
CORR = 0.327
SCAL = 1.98e-02
L2 = 4.0e+01
CORR = -0.866
SCAL = 1.13e-04
L2 = 2.1e+01
CORR = 0.587
SCAL = 5.97e-01
L2 = 1.4e+01
CORR = 0.445
SCAL = 5.17e-06
L2 = 1.8e+01
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.899
SCAL = 1.30e-01
L2 = 2.5e+13
CORR = 0.929
SCAL = 1.19e-04
L2 = 2.2e+13
CORR = 0.882
SCAL = 1.39e-03
L2 = 2.6e+12
CORR = 0.826
SCAL = 1.73e-01
L2 = 4.1e+12
CORR = 0.850
SCAL = 1.39e+00
L2 = 1.0e+13
CORR = 0.522
SCAL = 2.42e-01
L2 = 1.8e+13
CORR = 0.947
SCAL = 7.12e-01
L2 = 2.0e+13
Y - m/s
0
5
10
Time - s
SCAL = 1.00e+00
MAX = 6.71e-02
SCAL = 1.08e+00
SCAL = 1.10e-04
SCAL = 1.16e-02
SCAL = 1.30e+00
SCAL = 1.18e+00
SCAL = 6.74e-01
SCAL = 1.01e+00
Z - m/s
0
5
10
Time - s

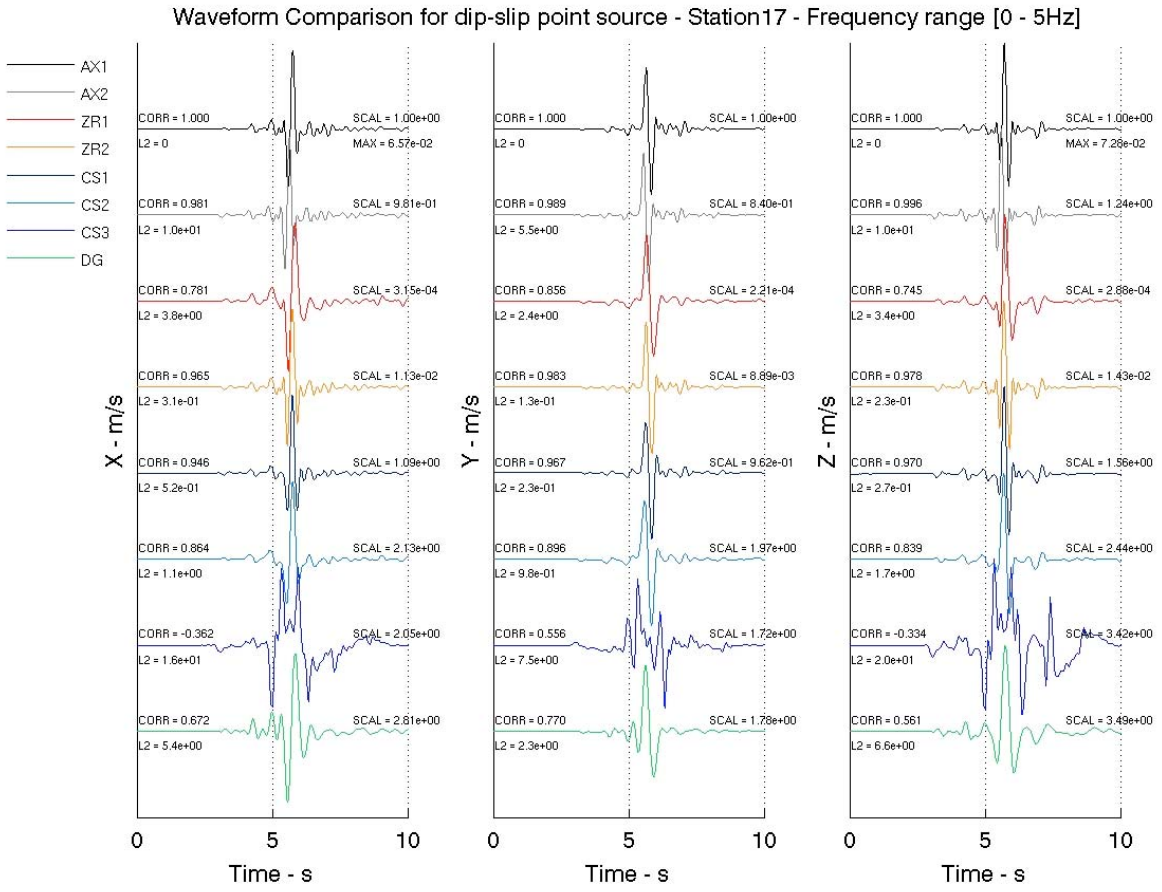

Waveform Comparison for dip-slip point source - Station12 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 1.18e-01
CORR = 0.995
SCAL = 1.07e+00
L2 = 1.0e+01
CORR = 0.815
SCAL = 1.80e-04
L2 = 4.0e+00
CORR = 0.983
SCAL = 1.15e-02
L2 = 1.7e-01
CORR = 0.963
SCAL = 1.52e+00
L2 = 5.2e-01
CORR = 0.911
SCAL = 1.99e+00
L2 = 1.2e+00
CORR = 0.531
SCAL = 9.90e-01
L2 = 9.6e+00
CORR = 0.989
SCAL = 1.02e+00
L2 = 7.2e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.816
SCAL = 8.47e-02
L2 = 5.4e-02
CORR = 0.898
SCAL = 1.07e-04
L2 = 4.8e-02
CORR = 0.800
SCAL = 9.00e-04
L2 = 1.0e-02
CORR = 0.767
SCAL = 1.09e-01
L2 = 1.2e-02
CORR = 0.868
SCAL = 1.42e+00
L2 = 1.4e-02
CORR = 0.505
SCAL = 3.06e-01
L2 = 4.6e-02
CORR = 0.853
SCAL = 5.59e-01
L2 = 4.9e-02
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 4.86e-02
CORR = 0.989
SCAL = 9.54e-01
L2 = 2.5e+00
CORR = 0.839
SCAL = 1.40e-04
L2 = 1.2e+00
CORR = 0.980
SCAL = 9.93e-03
L2 = 5.3e-02
CORR = 0.967
SCAL = 1.11e+00
L2 = 8.8e-02
CORR = 0.926
SCAL = 1.48e+00
L2 = 2.2e-01
CORR = 0.438
SCAL = 5.97e-01
L2 = 2.0e+00
CORR = 0.991
SCAL = 1.14e+00
L2 = 2.4e+00
Z - m/s
0
5
10
Time - s

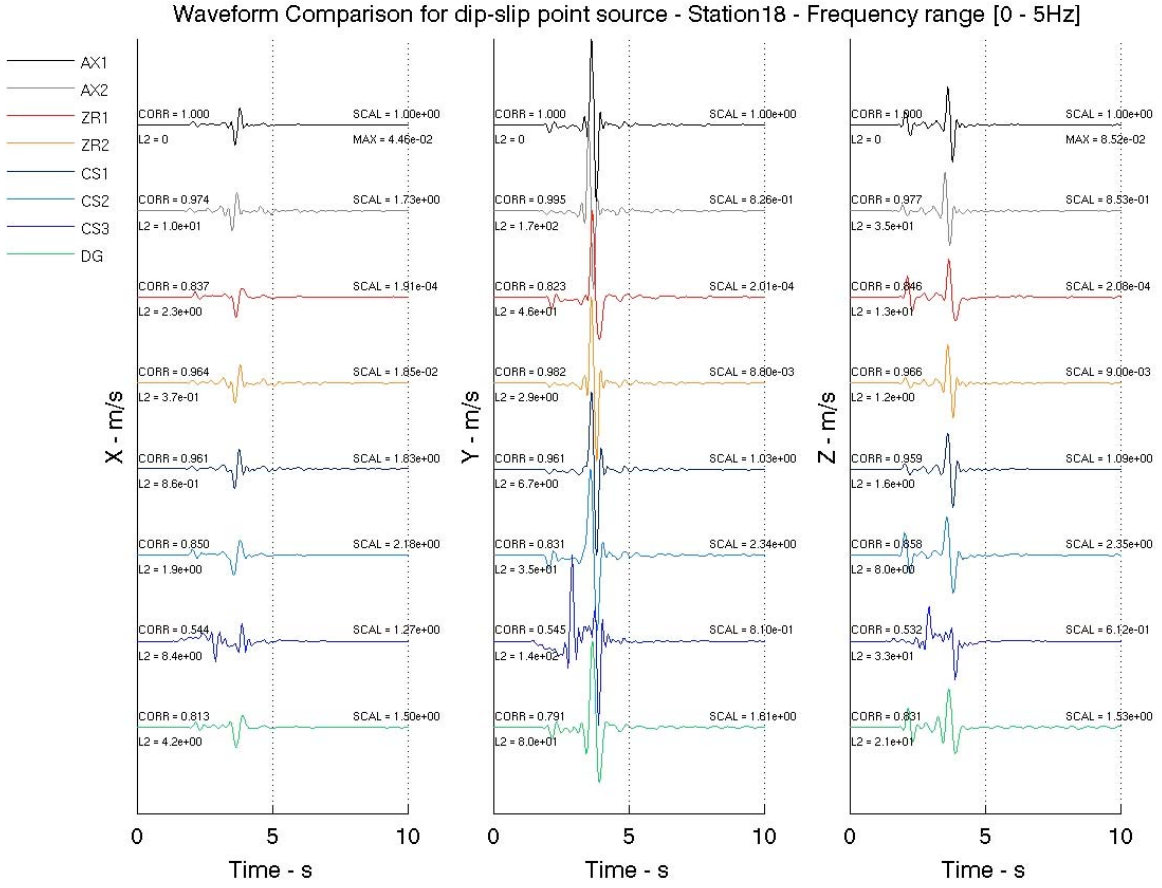

Waveform Comparison for dip-slip point source - Station13 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
X - m/s
Y - m/s
Z - m/s
Time - s
Time - s
Time - s
0
5
10
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 9.17e-02
CORR = 0.998
SCAL = 1.04e+00
L2 = 1.0e+01
CORR = 0.824
SCAL = 2.20e-04
L2 = 4.2e+00
CORR = 0.982
SCAL = 1.11e-02
L2 = 1.6e-01
CORR = 0.968
SCAL = 1.31e+00
L2 = 2.9e-01
CORR = 0.880
SCAL = 2.13e+00
L2 = 1.3e+00
CORR = -0.556
SCAL = 1.59e+00
L2 = 1.0e+01
CORR = 0.969
SCAL = 1.03e+00
L2 = 6.2e+00
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.571
SCAL = 5.10e-02
L2 = 7.0e-03
CORR = 0.600
SCAL = 1.52e-04
L2 = 9.4e-03
CORR = 0.545
SCAL = 5.44e-04
L2 = 6.5e-03
CORR = 0.543
SCAL = 6.30e-02
L2 = 6.8e-03
CORR = 0.759
SCAL = 1.81e+00
L2 = 3.0e-03
CORR = 0.402
SCAL = 3.41e-01
L2 = 1.0e-02
CORR = 0.632
SCAL = 4.84e-01
L2 = 1.4e-02
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.12e-02
CORR = 0.997
SCAL = 1.01e+00
L2 = 2.7e+00
CORR = 0.831
SCAL = 2.15e-04
L2 = 1.3e+00
CORR = 0.985
SCAL = 1.08e-02
L2 = 4.1e-02
CORR = 0.966
SCAL = 1.33e+00
L2 = 1.1e-01
CORR = 0.880
SCAL = 2.12e+00
L2 = 4.9e-01
CORR = 0.547
SCAL = 8.91e-01
L2 = 2.8e+00
CORR = 0.968
SCAL = 1.04e+00
L2 = 1.7e+00

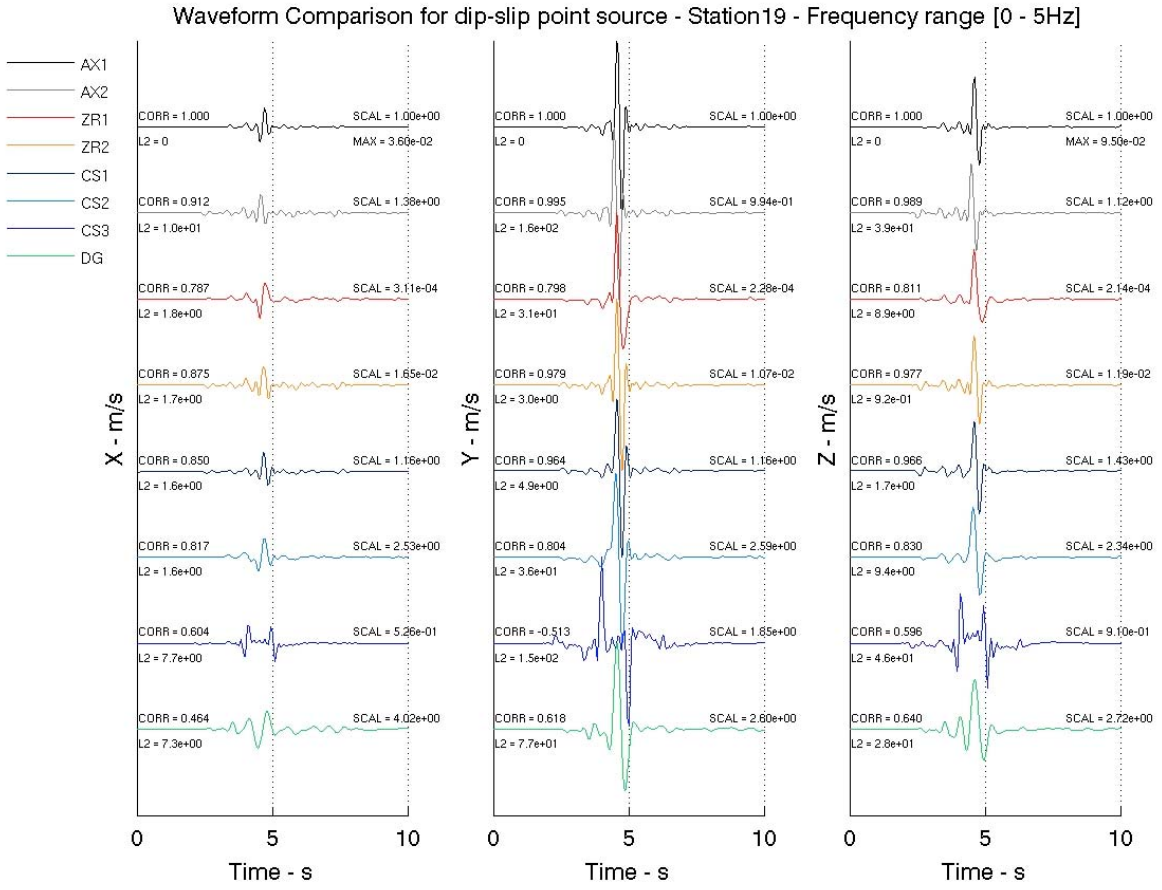

Waveform Comparison for dip-slip point source - Station14 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.31e-02
CORR = 1.000
SCAL = 1.02e+00
L2 = 1.0e+01
CORR = 0.841
SCAL = 2.08e-04
L2 = 2.3e+00
CORR = 0.987
SCAL = 1.07e-02
L2 = 1.2e-01
CORR = 0.966
SCAL = 1.13e+00
L2 = 3.1e-01
CORR = 0.901
SCAL = 1.93e+00
L2 = 1.3e+00
CORR = -0.567
SCAL = 2.03e+00
L2 = 1.3e+01
CORR = 0.968
SCAL = 1.11e+00
L2 = 5.6e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.820
SCAL = 2.10e-01
L2 = 1.1e-02
CORR = 0.821
SCAL = 3.02e-04
L2 = 1.0e-02
CORR = 0.777
SCAL = 2.19e-03
L2 = 8.4e-02
CORR = 0.813
SCAL = 2.45e-01
L2 = 8.0e-02
CORR = 0.835
SCAL = 2.67e+00
L2 = 1.0e-02
CORR = -0.535
SCAL = 1.29e+00
L2 = 6.7e-02
CORR = 0.833
SCAL = 1.13e+00
L2 = 9.5e-02
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 5.33e-02
CORR = 0.999
SCAL = 1.02e+00
L2 = 8.9e+00
CORR = 0.798
SCAL = 2.28e-04
L2 = 1.6e+00
CORR = 0.977
SCAL = 1.18e-02
L2 = 1.9e-01
CORR = 0.961
SCAL = 1.32e+00
L2 = 2.9e-01
CORR = 0.830
SCAL = 2.42e+00
L2 = 1.5e+00
CORR = 0.338
SCAL = 3.15e+00
L2 = 1.4e+01
CORR = 0.959
SCAL = 1.14e+00
L2 = 4.8e+00
Z - m/s
0
5
10
Time - s

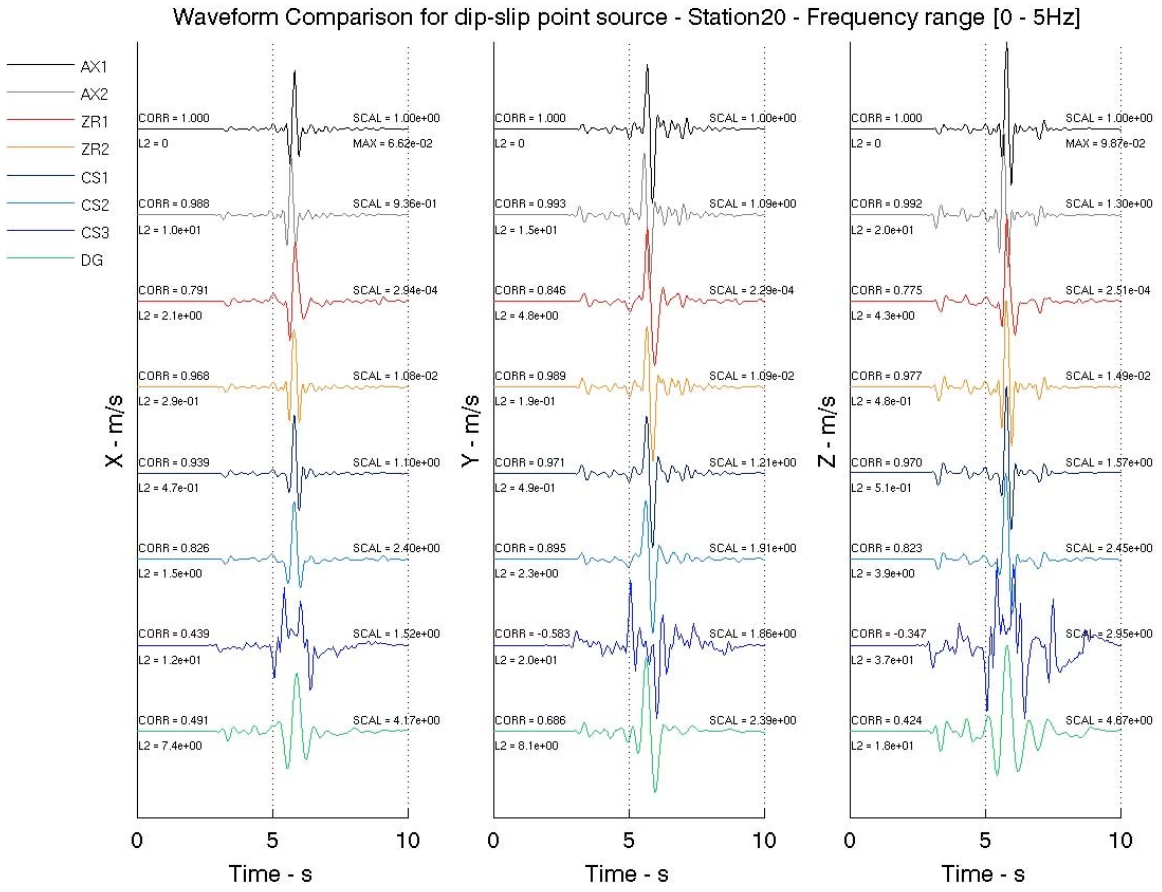

Waveform Comparison for dip-slip point source - Station15 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
X - m/s
Y - m/s
Z - m/s
Time - s
Time - s
Time - s
0
5
10
CORR = 1.000
L2 = 0
SCAL = 1.00e+00
MAX = 9.19e-02
CORR = 0.992
L2 = 1.0e+01
SCAL = 1.34e+00
CORR = 0.843
L2 = 3.0e+00
SCAL = 1.95e-04
CORR = 0.981
L2 = 2.0e-01
SCAL = 1.44e-02
CORR = 0.950
L2 = 5.4e-01
SCAL = 1.67e+00
CORR = 0.874
L2 = 1.6e+00
SCAL = 2.16e+00
CORR = 0.557
L2 = 7.4e+00
SCAL = 1.18e+00
CORR = 0.880
L2 = 5.2e+00
SCAL = 1.40e+00
CORR = 1.000
L2 = 0
SCAL = 1.00e+00
CORR = 0.994
L2 = 1.9e+01
SCAL = 6.62e-01
CORR = 0.820
L2 = 6.5e+00
SCAL = 2.05e-04
CORR = 0.981
L2 = 3.6e-01
SCAL = 7.14e-03
CORR = 0.952
L2 = 9.6e-01
SCAL = 8.50e-01
CORR = 0.871
L2 = 3.2e+00
SCAL = 2.26e+00
CORR = 0.538
L2 = 1.3e+01
SCAL = 8.15e-01
CORR = 0.862
L2 = 9.4e+00
SCAL = 1.43e+00
CORR = 1.000
L2 = 0
SCAL = 1.00e+00
MAX = 6.36e-02
CORR = 0.977
L2 = 5.9e+00
SCAL = 8.85e-01
CORR = 0.867
L2 = 3.4e+00
SCAL = 2.19e-04
CORR = 0.967
L2 = 2.0e-01
SCAL = 9.35e-03
CORR = 0.961
L2 = 2.4e-01
SCAL = 1.06e+00
CORR = 0.895
L2 = 8.7e-01
SCAL = 1.93e+00
CORR = 0.493
L2 = 4.5e+00
SCAL = 6.68e-01
CORR = 0.889
L2 = 4.6e+00
SCAL = 1.52e+00


Waveform Comparison for dip-slip point source - Station16 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
X - m/s
Y - m/s
Z - m/s
Time - s
Time - s
Time - s
0
5
10
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.85e-02
CORR = 0.984
SCAL = 1.39e+00
L2 = 1.0e+01
CORR = 0.873
SCAL = 2.12e-04
L2 = 2.4e+00
CORR = 0.961
SCAL = 1.55e-02
L2 = 3.1e-01
CORR = 0.950
SCAL = 1.42e+00
L2 = 7.0e-01
CORR = 0.861
SCAL = 2.25e+00
L2 = 1.3e+00
CORR = 0.627
SCAL = 1.09e+00
L2 = 1.0e+01
CORR = 0.741
SCAL = 2.05e+00
L2 = 4.3e+00
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.993
SCAL = 8.09e-01
L2 = 2.2e+01
CORR = 0.873
SCAL = 2.09e-04
L2 = 6.2e+00
CORR = 0.979
SCAL = 8.63e-03
L2 = 4.3e-01
CORR = 0.955
SCAL = 9.87e-01
L2 = 9.0e-01
CORR = 0.849
SCAL = 2.37e+00
L2 = 3.7e+00
CORR = -0.450
SCAL = 2.15e+00
L2 = 2.6e+01
CORR = 0.767
SCAL = 1.61e+00
L2 = 9.6e+00
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.95e-02
CORR = 0.992
SCAL = 1.09e+00
L2 = 6.9e+00
CORR = 0.874
SCAL = 1.97e-04
L2 = 2.1e+00
CORR = 0.981
SCAL = 1.16e-02
L2 = 1.3e-01
CORR = 0.966
SCAL = 1.44e+00
L2 = 3.0e-01
CORR = 0.857
SCAL = 2.29e+00
L2 = 1.4e+00
CORR = 0.583
SCAL = 1.04e+00
L2 = 8.2e+00
CORR = 0.736
SCAL = 1.99e+00
L2 = 4.1e+00


Waveform Comparison for dip-slip point source - Station17 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.57e-02
CORR = 0.981
SCAL = 9.61e-01
L2 = 1.0e+01
CORR = 0.781
SCAL = 3.15e-04
L2 = 3.8e+00
CORR = 0.965
SCAL = 1.13e-02
L2 = 3.1e-01
CORR = 0.946
SCAL = 1.09e+00
L2 = 5.2e-01
CORR = 0.864
SCAL = 2.13e+00
L2 = 1.1e+00
CORR = -0.362
SCAL = 2.05e+00
L2 = 1.6e+01
CORR = 0.672
SCAL = 2.81e+00
L2 = 5.4e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.989
SCAL = 8.40e-01
L2 = 5.5e+00
CORR = 0.856
SCAL = 2.21e-04
L2 = 2.4e+00
CORR = 0.983
SCAL = 8.89e-03
L2 = 1.3e-01
CORR = 0.967
SCAL = 9.62e-01
L2 = 2.3e-01
CORR = 0.896
SCAL = 1.97e+00
L2 = 9.8e-01
CORR = 0.556
SCAL = 1.72e+00
L2 = 7.5e+00
CORR = 0.770
SCAL = 1.78e+00
L2 = 2.3e+00
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 7.26e-02
CORR = 0.996
SCAL = 1.24e+00
L2 = 1.0e+01
CORR = 0.745
SCAL = 2.88e-04
L2 = 3.4e+00
CORR = 0.978
SCAL = 1.43e-02
L2 = 2.3e-01
CORR = 0.970
SCAL = 1.56e+00
L2 = 2.7e-01
CORR = 0.839
SCAL = 2.44e+00
L2 = 1.7e+00
CORR = -0.334
SCAL = 3.42e+00
L2 = 2.0e+01
CORR = 0.561
SCAL = 3.49e+00
L2 = 6.6e+00
Z - m/s
0
5
10
Time - s


Waveform Comparison for dip-slip point source - Station18 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
X - m/s
Y - m/s
Z - m/s
Time - s
Time - s
Time - s
0
5
10
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 4.46e-02
CORR = 0.974
SCAL = 1.73e+00
L2 = 1.0e+01
CORR = 0.837
SCAL = 1.91e-04
L2 = 2.3e+00
CORR = 0.964
SCAL = 1.85e-02
L2 = 3.7e-01
CORR = 0.961
SCAL = 1.83e+00
L2 = 8.6e-01
CORR = 0.850
SCAL = 2.18e+00
L2 = 1.9e+00
CORR = 0.544
SCAL = 1.27e+00
L2 = 8.4e+00
CORR = 0.813
SCAL = 1.50e+00
L2 = 4.2e+00
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.995
SCAL = 8.26e-01
L2 = 1.7e+02
CORR = 0.823
SCAL = 2.01e-04
L2 = 4.6e+01
CORR = 0.982
SCAL = 8.80e-03
L2 = 2.9e+00
CORR = 0.961
SCAL = 1.03e+00
L2 = 6.7e+00
CORR = 0.831
SCAL = 2.34e+00
L2 = 3.5e+01
CORR = 0.545
SCAL = 8.10e-01
L2 = 1.4e+02
CORR = 0.791
SCAL = 1.61e+00
L2 = 8.0e+01
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 8.52e-02
CORR = 0.977
SCAL = 8.53e-01
L2 = 3.5e+01
CORR = 0.846
SCAL = 2.08e-04
L2 = 1.3e+01
CORR = 0.966
SCAL = 9.00e-03
L2 = 1.2e+00
CORR = 0.959
SCAL = 1.09e+00
L2 = 1.6e+00
CORR = 0.858
SCAL = 2.35e+00
L2 = 8.0e+00
CORR = 0.532
SCAL = 6.12e-01
L2 = 3.3e+01
CORR = 0.831
SCAL = 1.53e+00
L2 = 2.1e+01


Waveform Comparison for dip-slip point source - Station19 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
X - m/s
Y - m/s
Z - m/s
Time - s
Time - s
Time - s
0
5
10
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 3.60e-02
CORR = 0.912
SCAL = 1.38e+00
L2 = 1.0e+01
CORR = 0.787
SCAL = 3.11e-04
L2 = 1.8e+00
CORR = 0.875
SCAL = 1.65e-02
L2 = 1.7e+00
CORR = 0.850
SCAL = 1.16e+00
L2 = 1.6e+00
CORR = 0.817
SCAL = 2.53e+00
L2 = 1.6e+00
CORR = 0.604
SCAL = 5.26e-01
L2 = 7.7e+00
CORR = 0.464
SCAL = 4.02e+00
L2 = 7.3e+00
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.995
SCAL = 9.94e-01
L2 = 1.6e+02
CORR = 0.798
SCAL = 2.28e-04
L2 = 3.1e+01
CORR = 0.979
SCAL = 1.07e-02
L2 = 3.0e+00
CORR = 0.964
SCAL = 1.16e+00
L2 = 4.9e+00
CORR = 0.804
SCAL = 2.59e+00
L2 = 3.6e+01
CORR = -0.513
SCAL = 1.85e+00
L2 = 1.5e+02
CORR = 0.618
SCAL = 2.60e+00
L2 = 7.7e+01
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 9.50e-02
CORR = 0.989
SCAL = 1.12e+00
L2 = 3.9e+01
CORR = 0.811
SCAL = 2.14e-04
L2 = 8.9e+00
CORR = 0.977
SCAL = 1.19e-02
L2 = 9.2e-01
CORR = 0.966
SCAL = 1.43e+00
L2 = 1.7e+00
CORR = 0.830
SCAL = 2.34e+00
L2 = 9.4e+00
CORR = 0.596
SCAL = 9.10e-01
L2 = 4.6e+01
CORR = 0.640
SCAL = 2.72e+00
L2 = 2.8e+01


Waveform Comparison for dip-slip point source - Station20 - Frequency range [0 - 5Hz]
AX1
AX2
ZR1
ZR2
CS1
CS2
CS3
DG
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 6.62e-02
CORR = 0.988
SCAL = 9.36e-01
L2 = 1.0e+01
CORR = 0.791
SCAL = 2.94e-04
L2 = 2.1e+00
CORR = 0.968
SCAL = 1.08e-02
L2 = 2.9e-01
CORR = 0.939
SCAL = 1.10e+00
L2 = 4.7e-01
CORR = 0.826
SCAL = 2.40e+00
L2 = 1.5e+00
CORR = 0.439
SCAL = 1.52e+00
L2 = 1.2e+01
CORR = 0.491
SCAL = 4.17e+00
L2 = 7.4e+00
X - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
CORR = 0.993
SCAL = 1.09e+00
L2 = 1.5e+01
CORR = 0.846
SCAL = 2.29e-04
L2 = 4.8e+00
CORR = 0.989
SCAL = 1.09e-02
L2 = 1.9e-01
CORR = 0.971
SCAL = 1.21e+00
L2 = 4.9e-01
CORR = 0.895
SCAL = 1.91e+00
L2 = 2.3e+00
CORR = -0.583
SCAL = 1.86e+00
L2 = 2.0e+01
CORR = 0.686
SCAL = 2.39e+00
L2 = 8.1e+00
Y - m/s
0
5
10
Time - s
CORR = 1.000
SCAL = 1.00e+00
L2 = 0
MAX = 9.87e-02
CORR = 0.992
SCAL = 1.30e+00
L2 = 2.0e+01
CORR = 0.775
SCAL = 2.51e-04
L2 = 4.3e+00
CORR = 0.977
SCAL = 1.49e-02
L2 = 4.8e-01
CORR = 0.970
SCAL = 1.57e+00
L2 = 5.1e-01
CORR = 0.823
SCAL = 2.45e+00
L2 = 3.9e+00
CORR = -0.347
SCAL = 2.95e+00
L2 = 3.7e+01
CORR = 0.424
SCAL = 4.67e+00
L2 = 1.8e+01
Z - m/s
0
5
10
Time - s