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PRELIMINARY ANALYSIS OF DATA FROM THE AFTERSHOCK DEPLOYMENT IN VAN AND ERCİŞ , TURKEY

M=5.6 VAN EARTHQUAKE ON 09/11/2011

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SUMMARY

Following the destructive M=7.2 Van Earthquake of 23 October 2011 in Eastern Turkey, we have deployed eight strong motion monitoring equipment to the region to record aftershocks.

Four of the stations were installed in the city of Van, and the remaining four in the city of Ercis, which suffered the most damage and loss of life. The stations in each city are arranged such that one of the stations is located on a stiff soil or a rock site to be used as the reference station, and the remaining three in the flat urban area forming a triangle.

The eight-station network has recorded a large number of aftershocks, including the destructive one with M=5.6 on 9 November 2011 epicentered near the town of Edremit south of Van. Figure 1 shows the location of this earthquake, as well as the deployment regions. For the background information on this earthquake please see the link http://www.koeri.boun.edu.tr/News/%2009%20November%202011,%20M=5.6,%20Van,%20Turkey%20Earthquake_16_206.depmuh. The locations of the eight stations in Van and Erciş can be seen Figures 2 and 3 respectively. Descriptive information on the stations is summarized in Table 1.

This report presents preliminary analysis of the data recorded by the network during the M=5.6 Edremit-Van earthquake. All four stations in Ercis recorded the earthquake. In Van only two stations recorded the event, the rock- site station and one of the soil-site stations. These records can be downloaded through links in Table 1. Processed records from the Van network can be seen in Figure 4 through Figure 10. Records from Erciş are presented in Figure 11 through Figure 19.

We think that the records from the rock-site station in Van may have some calibration problems. So, although they are presented in the report, we do not recommend using them until further tests are done in the instruments. The other Van station that recorded the earthquake was very near the Bayram Hotel that was destroyed completely during this earthquake causing the deaths, among others, of several newspersons and a Japanese aid worker.

Following observations can be made:

- Although they are from the same earthquake, the Van record shows a very distinct impulsive displacement and a velocity pulse (Figure 7), whereas Erciş records are

dominated by long-duration surface velocities and displacements (Figure 13 through Figure 16), suggesting basin effects.

- The velocity and displacement pulses seen in the Van records can also be observed in the Erciş records (Compare Figure 7 with the arrivals at around 10 sec in Erciş records in Figures 13-16).

- There is a strong directionality in the particle motions of the Van records (Figure 8). It appears that the fault normal component is at about 120° N and the fault parallel component is at 30° N. This finding is in line with the fault mechanism solutions for this earthquake.

- Observed accelerations, velocities and displacements are very large for an earthquake of M5.6 magnitude.

- The response spectra in Van are very monochromatic with a single peak around 0.4 s in the EW direction. The same peak can clearly be seen in Erciş response spectra as well (Figure 18).

- There are no distinct dominant frequencies in the spectral ratios (Figure 10) in Van that can suggest site effects. Yet in two frequency ranges, between 0.8-1.4 Hz and 2.6-3.8 Hz average amplifications reach 5 and 8 respectively.

- In Erciş at 1.4 Hz and 2.5 Hz in the EW direction and an uninterrupted, average 4 times amplification between 0.5 and 1.8 Hz in the NS direction are evident (Figure 19).

More detailed investigations on this and other aftershock data are in progress.

Figure 1. Epicentre of M5.6 Edremit-Van earthquake and locations of aftershock monitoring cities, Van and Erciş

Figure 2. Locations of aftershock monitoring stations in Van

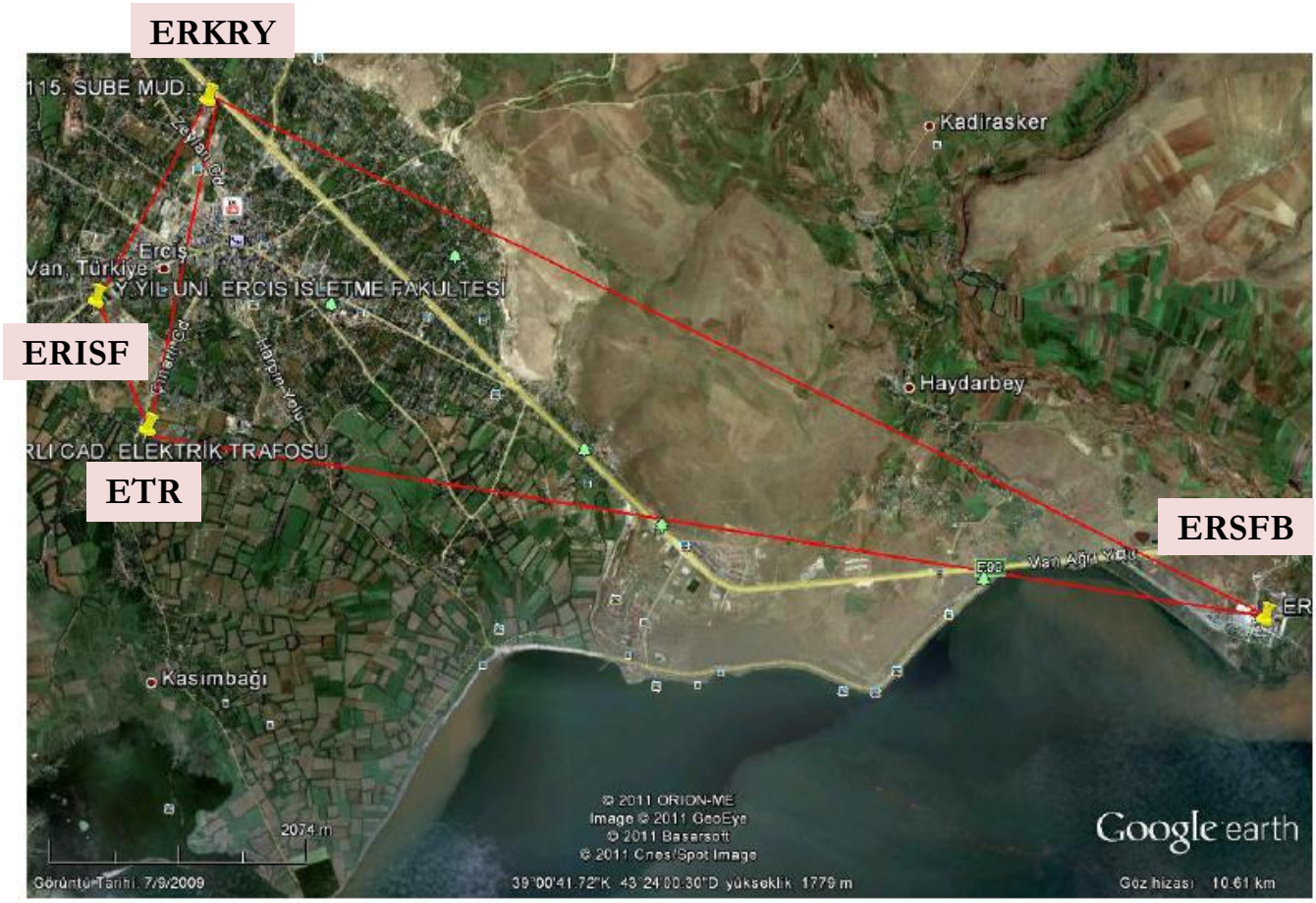

Figure 3. Locations of aftershock monıioring stations in Erciş

Table 1. Station information for the Van and Erciş deployments. Use links at VNS, VNKEA and four Erciş stations to download data

VAN

STATION CODE	STATION COORDINATES	STATION LOCATION
VNS (rock site)	38.33455N 43.19533E	Şemsibey İlkokulu
VNKOI (soil site)	38.33455N 43.19533E	Koç İlköğretim Okulu
VNTGM (soil site)	38.33455N 43.19533E	TEDAŞ Genel Müdürlüğü (Havaalanı kavsağı)
VNKEA (soil site)	38.33455N 43.19533E	TEDAŞ Köy Elektrik Arıza (Valilik yanı, Santral Sok.)

ERCİŞ

STATION CODE	STATION COORDINATES	STATION LOCATION
ERSFB (stiff soil site)	38.59996N 43.27304E	Erciş Şeker Fabrikası
ETR (soil site)	39.00880N 43.21097E	TEDAŞ Trafo Binası (Çınarlı Caddesi sonu)
ERKRY (soil site)	39.02264N 43.21426E	Erciş Karayolları 115. Şube Müdürlüğü
ERISF (soil site)	39.01398N 43.20798E	Yüzüncü Yıl Üniversitesi Erciş İşletme Fakültesi

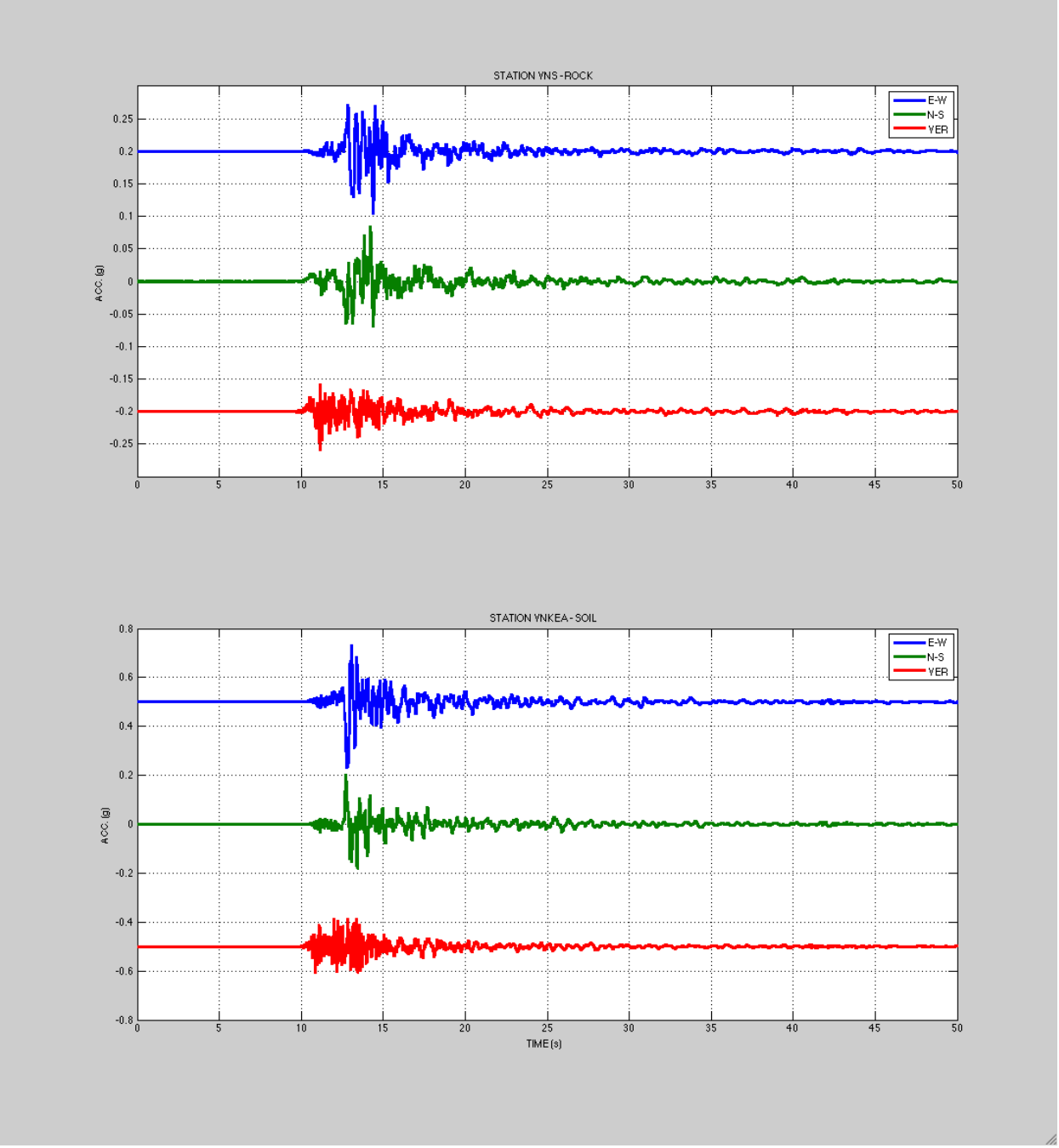

Figure 4. Accelerations recorded at stations VNS (rock) and VNKEA (soil)

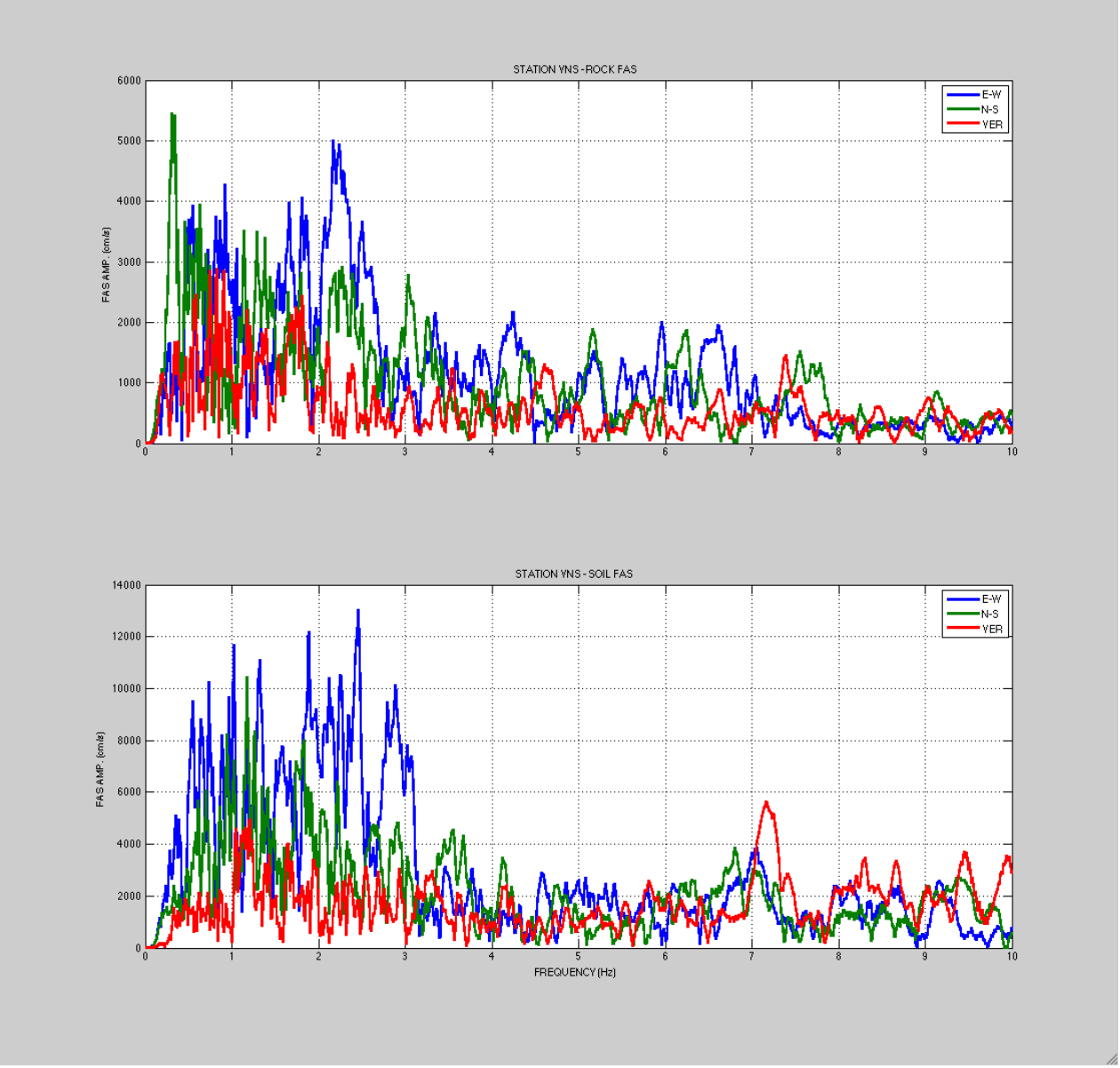

Figure 5. Fourier Amplitude Spectra of accelerations recorded at station VNS (rock) and VNKEA (soil)

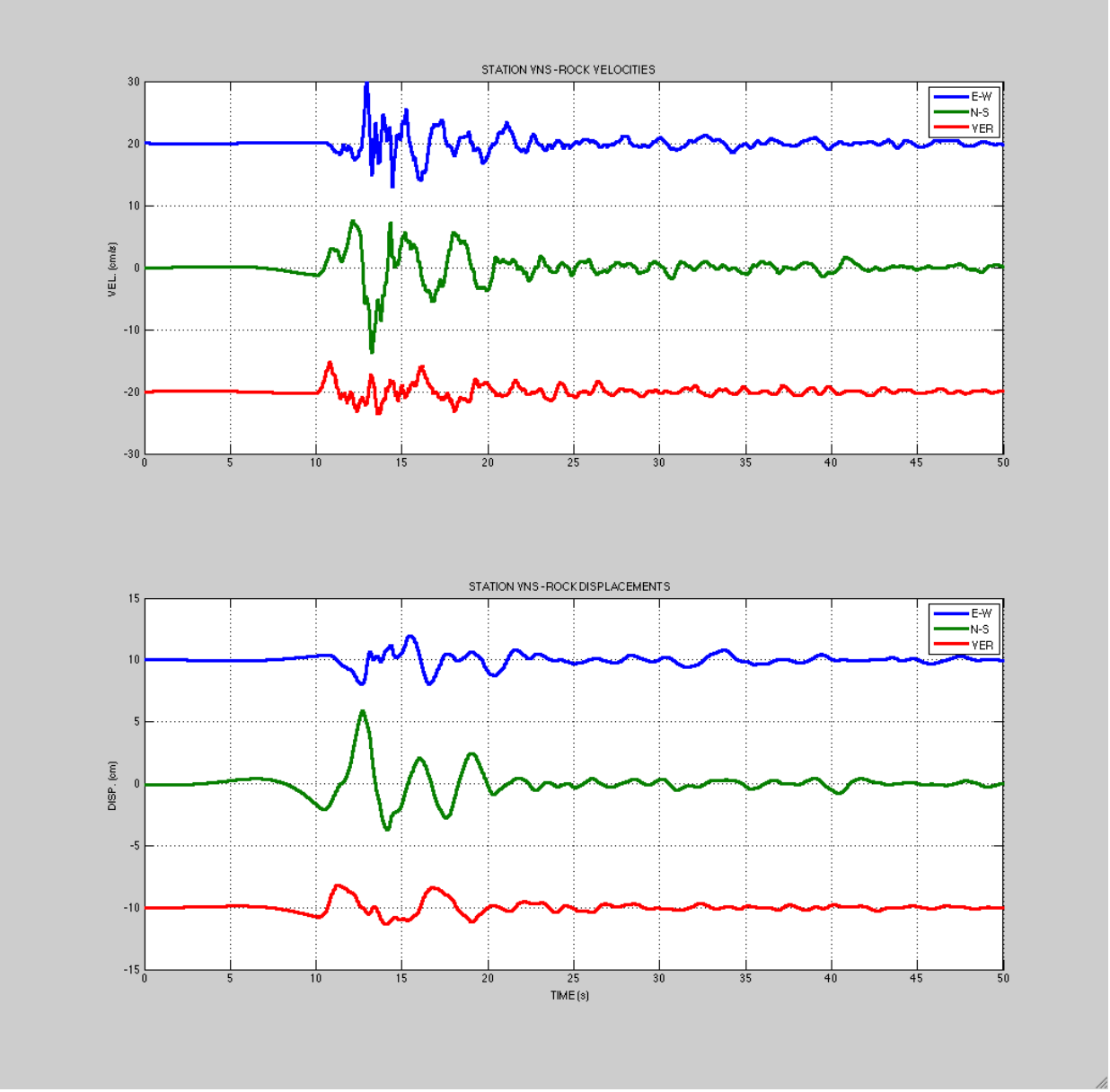

Figure 6. Velocities and displacements at station VNS (rock)
(*Note: Rock site records need to be re-checked for accuracy*)

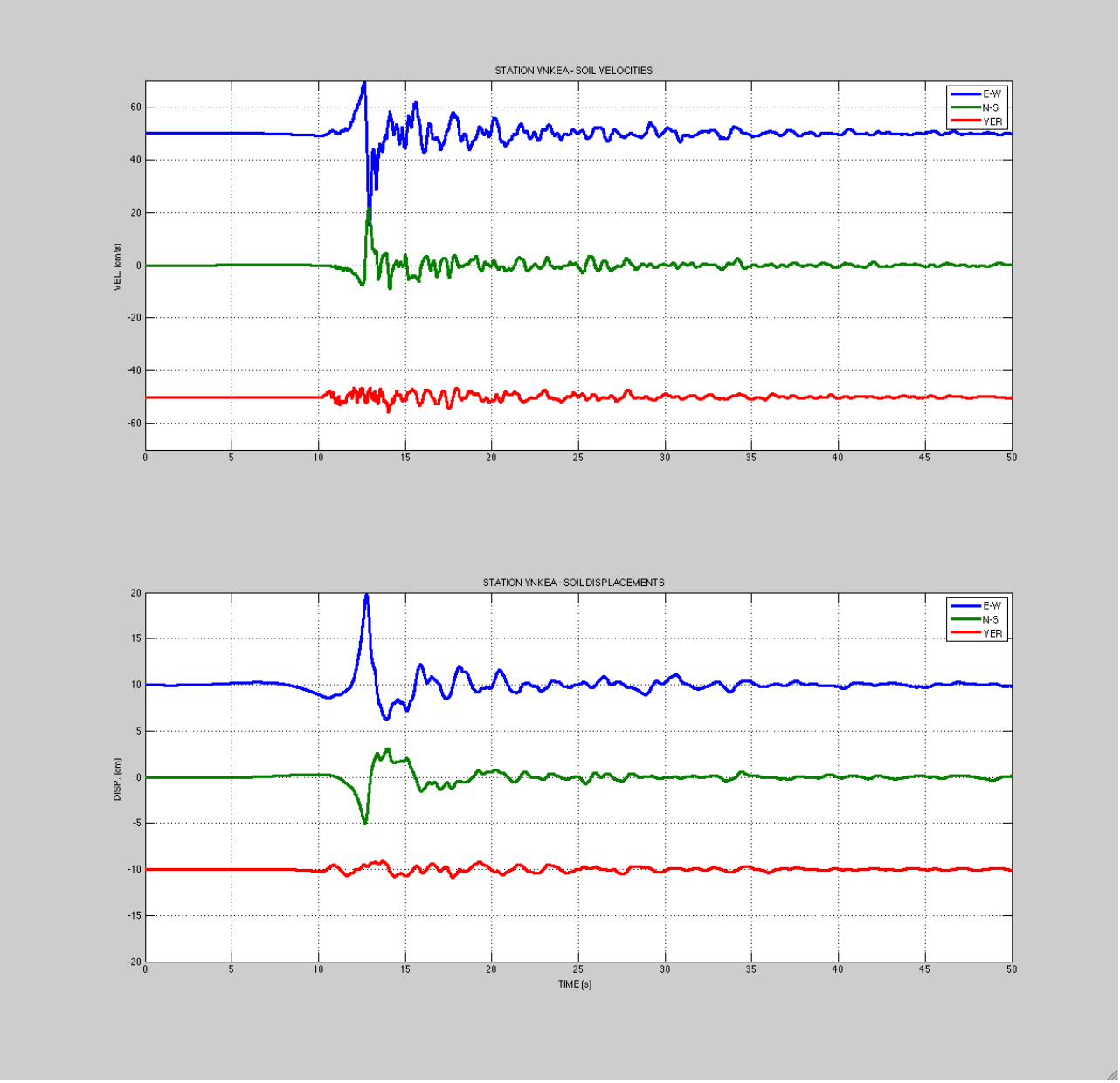

Figure 7. Velocities and displacements at station VNKEA (soil)

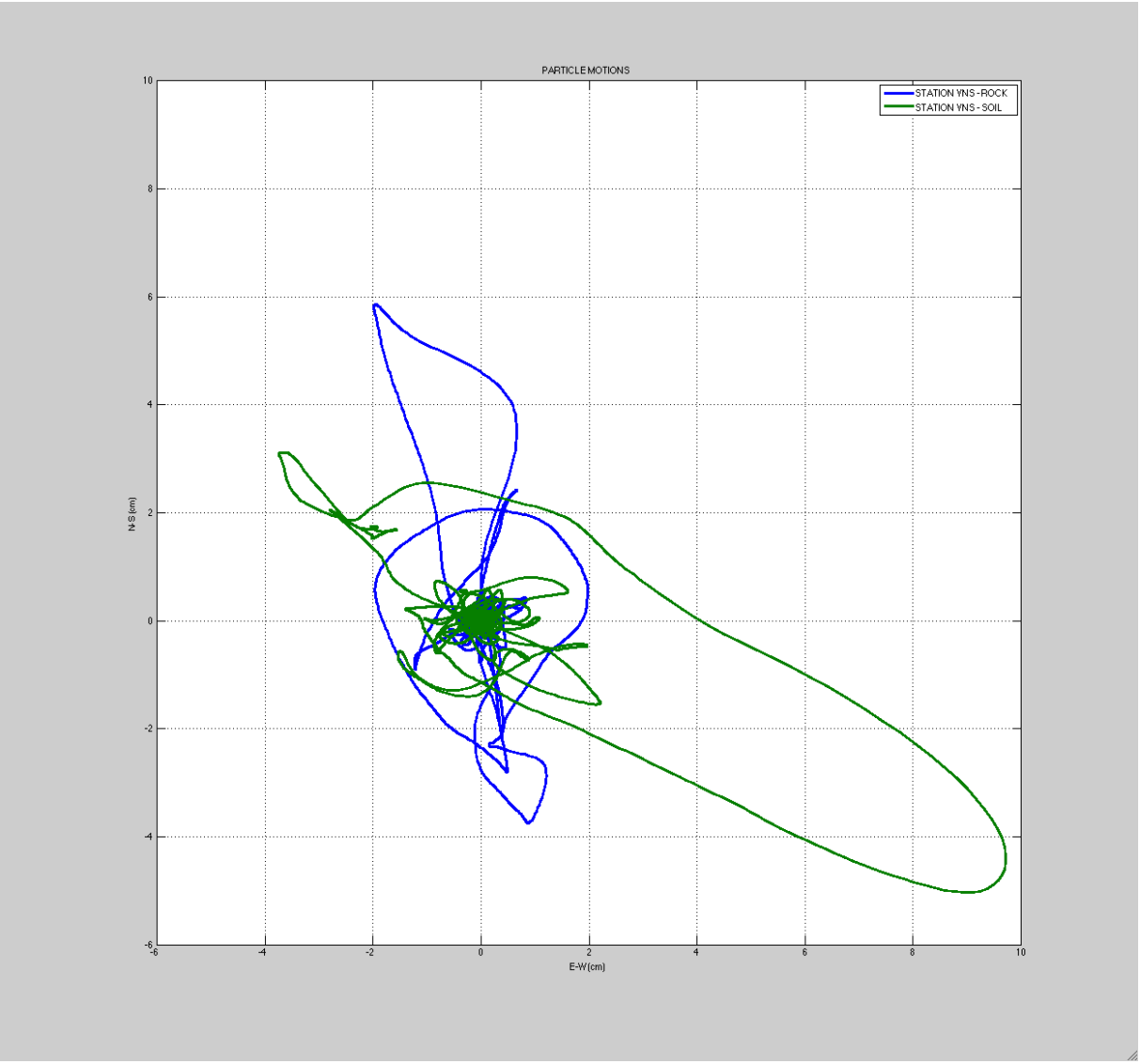

Figure 8. Particle motions at stations VNS (rock) AND VNKEA (soil)
(*Note: Rock site records need to be re-checked for accuracy*)

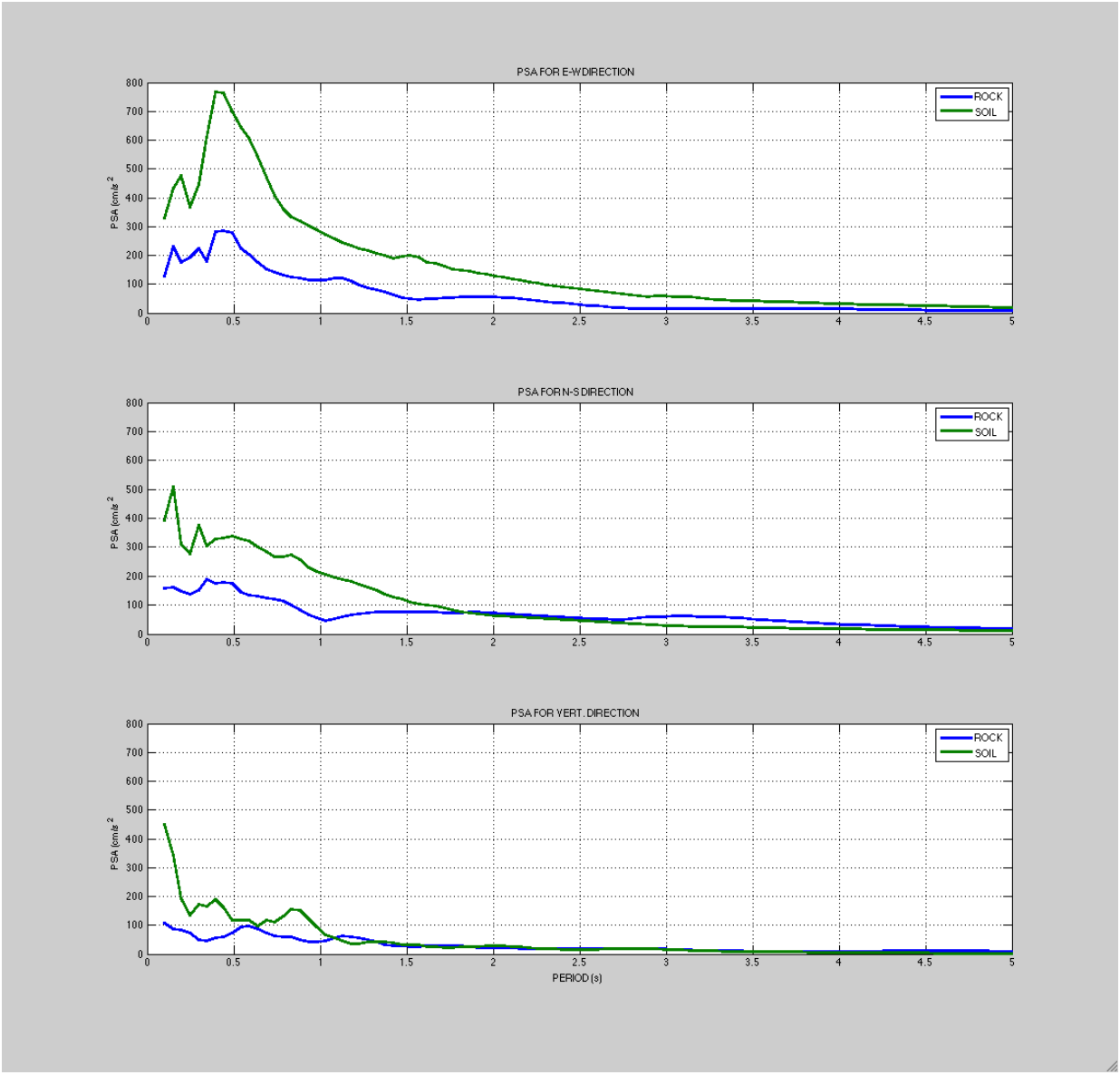

Figure 9. Response spectra (SA) at stations VNS (rock) and VNKEA (soil)
(*Note: Rock site records need to be re-checked for accuracy*

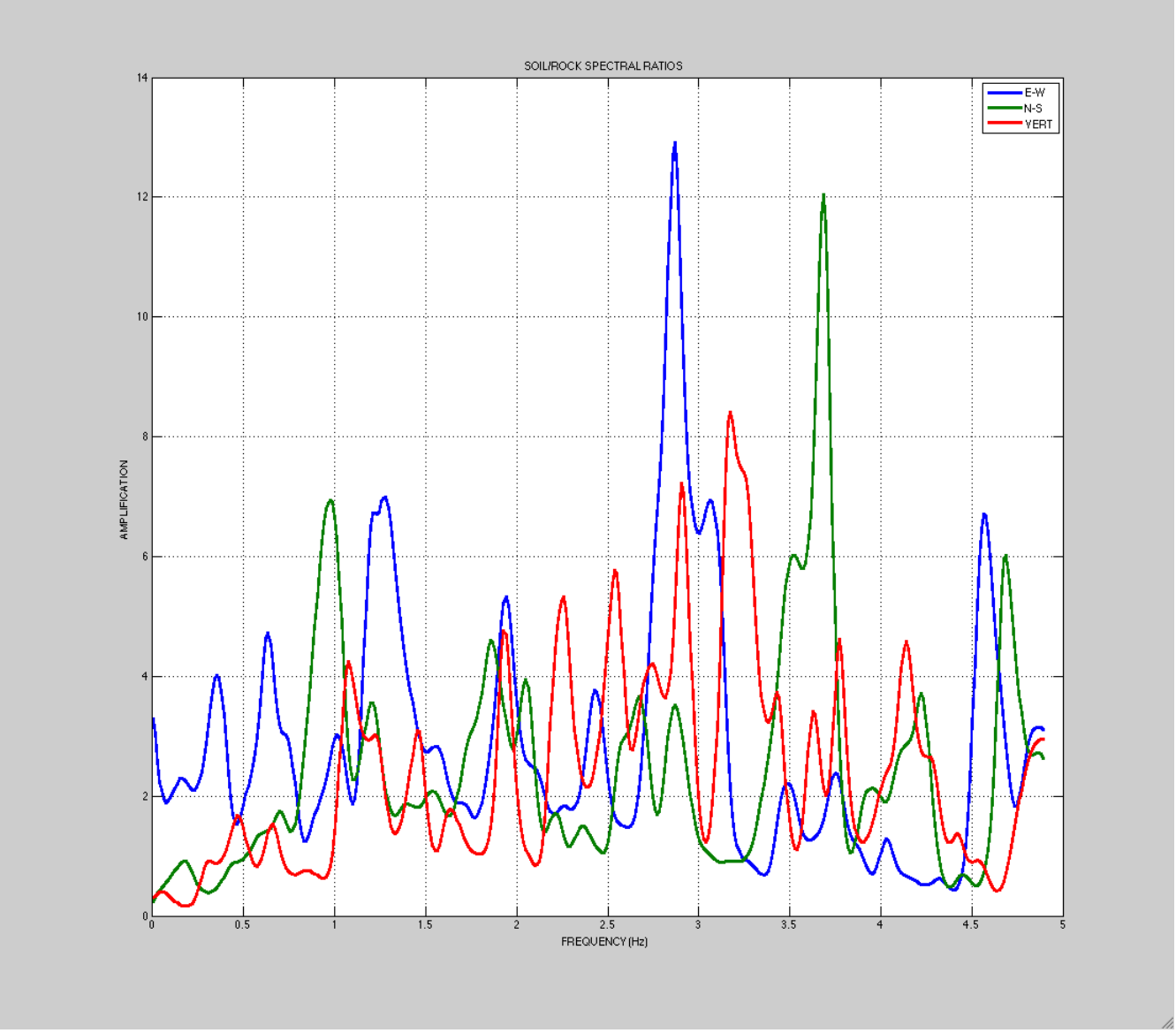

Figure 10. Soil (St. VNKEA) / Rock (St. VNS) spectral ratios
(*Note: Rock site records need to be re-checked for accuracy*)

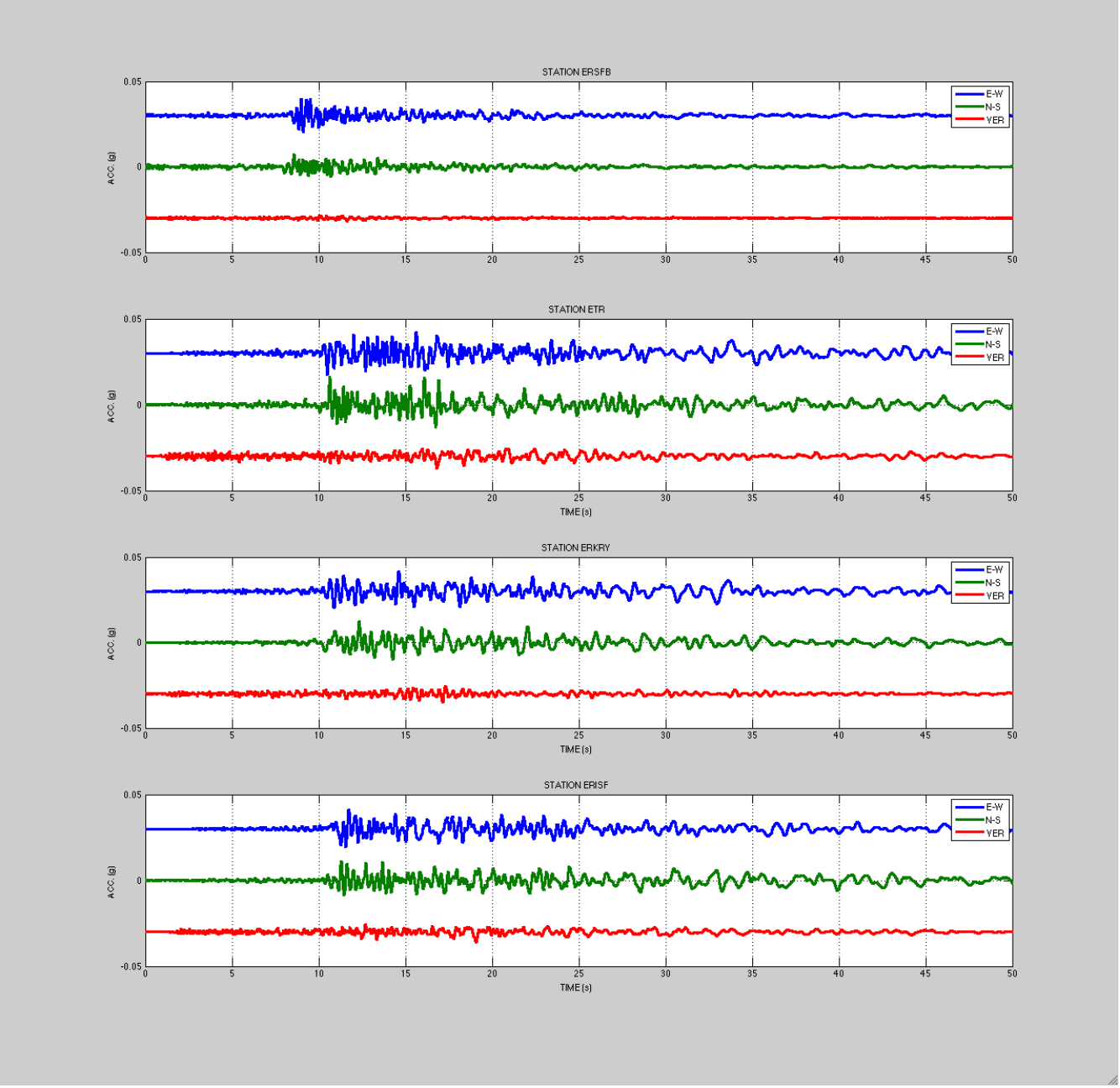

Figure 11. Accelerations recorded at stations ERSFB, ETR, ERKRY, ERISF in Erciş

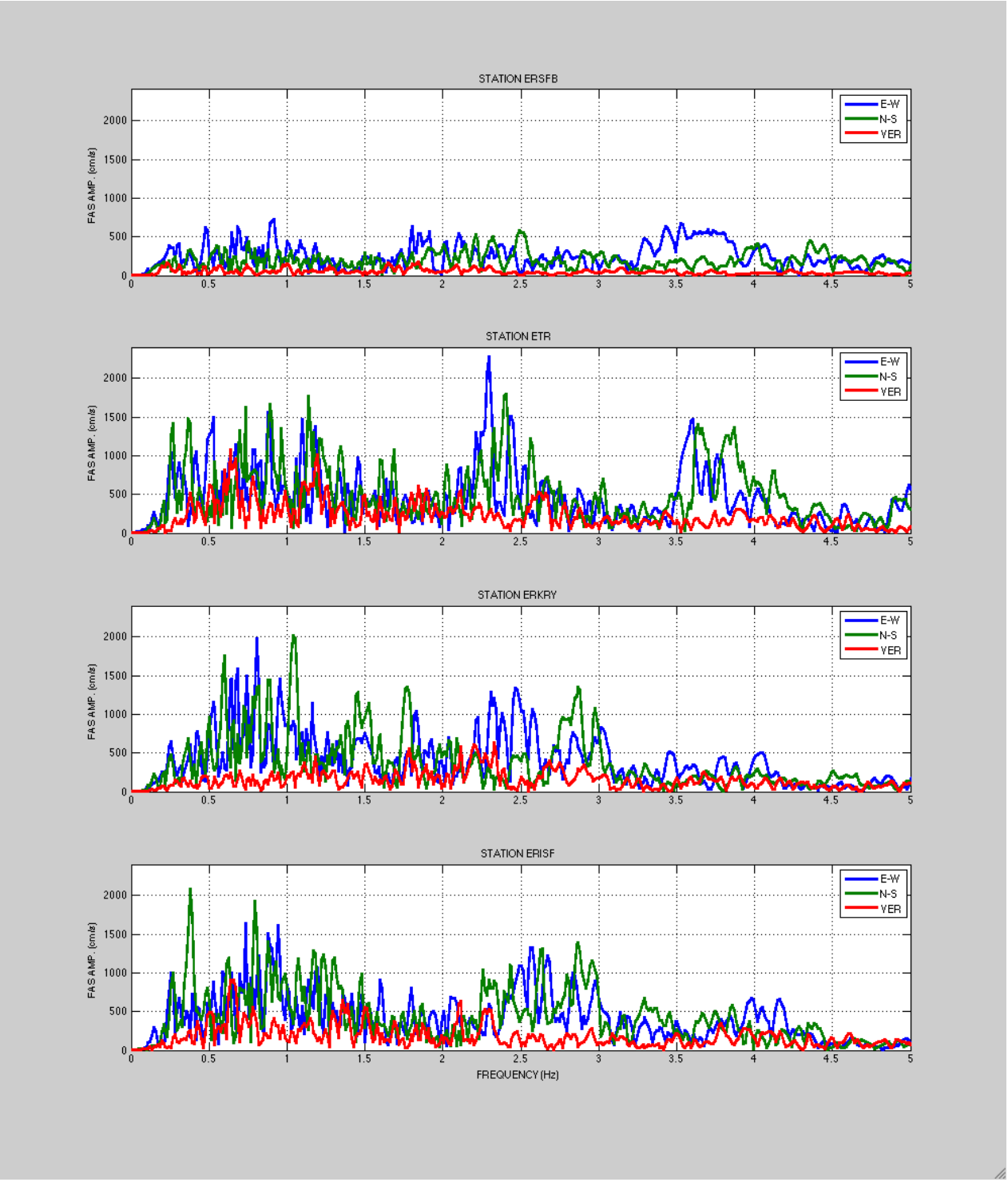

Figure 12. Fourier Amplitude Spectra of accelerations recorded at stations ERSFB, ETR, ERKRY, ERISF in Erciş

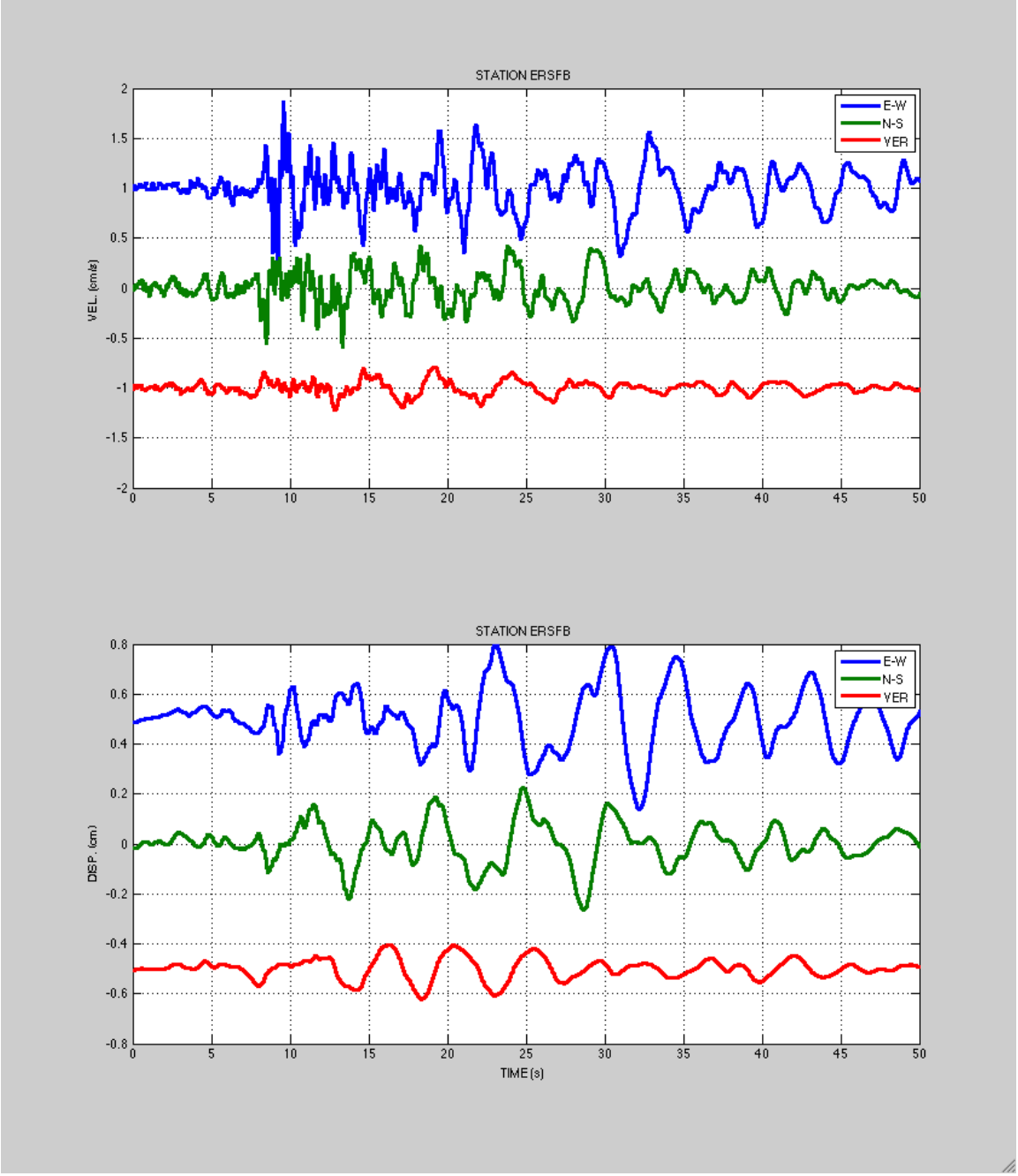

Figure 13. Displacements and velocities at station ERSFB in Erciş

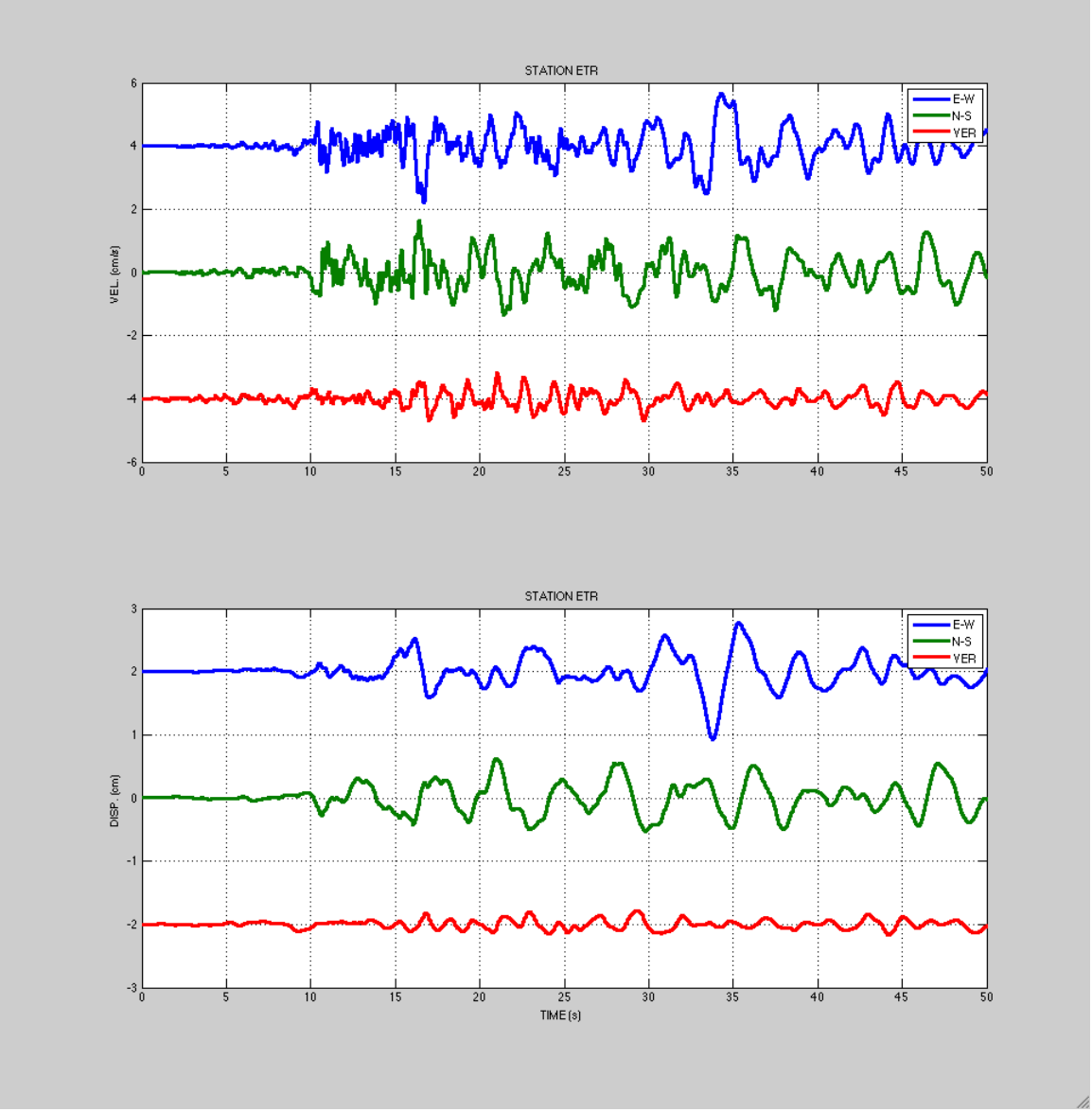

Figure 14. Displacements and velocities at station ETR in Erciş

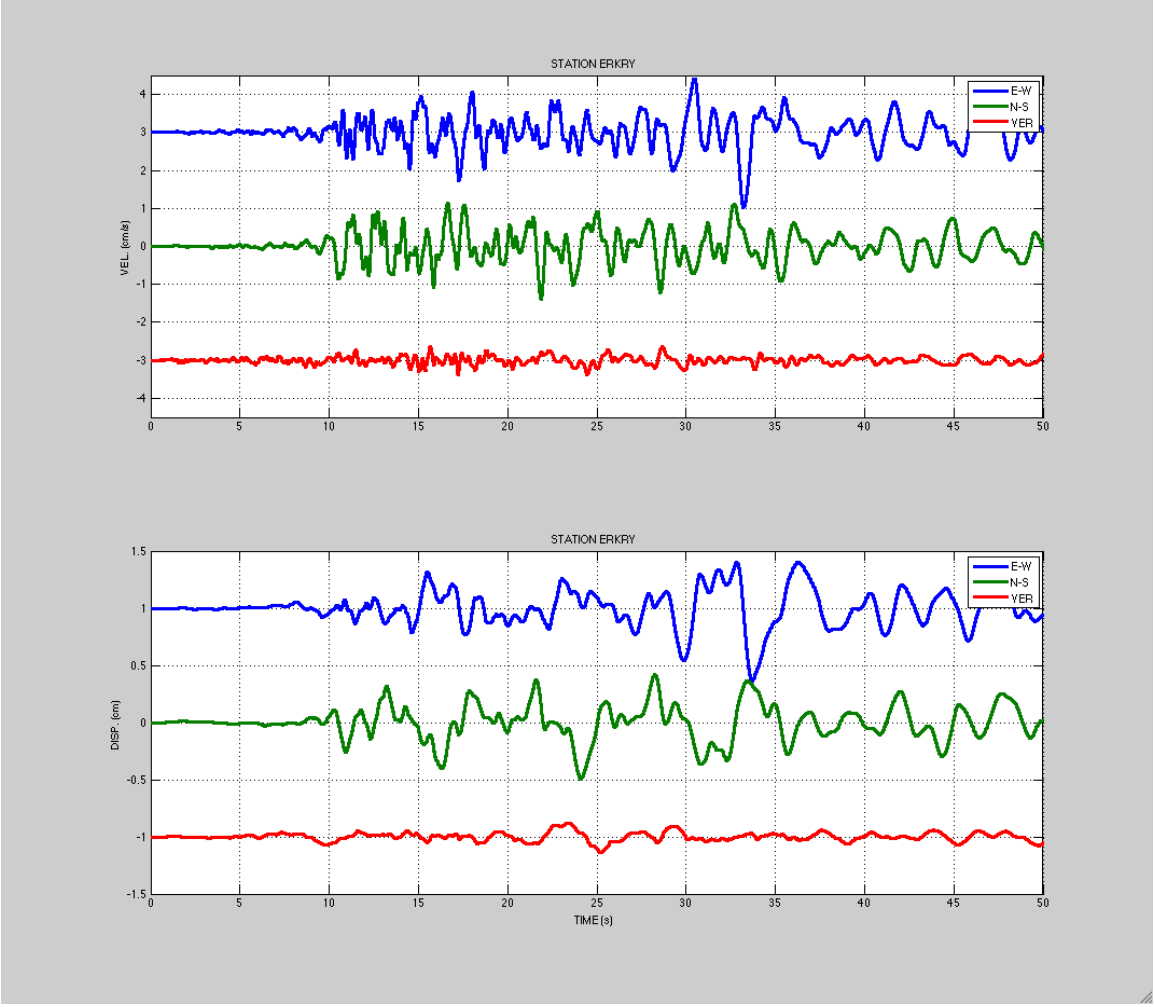

Figure 15. Displacements and velocities at station ERKRY in Erciş

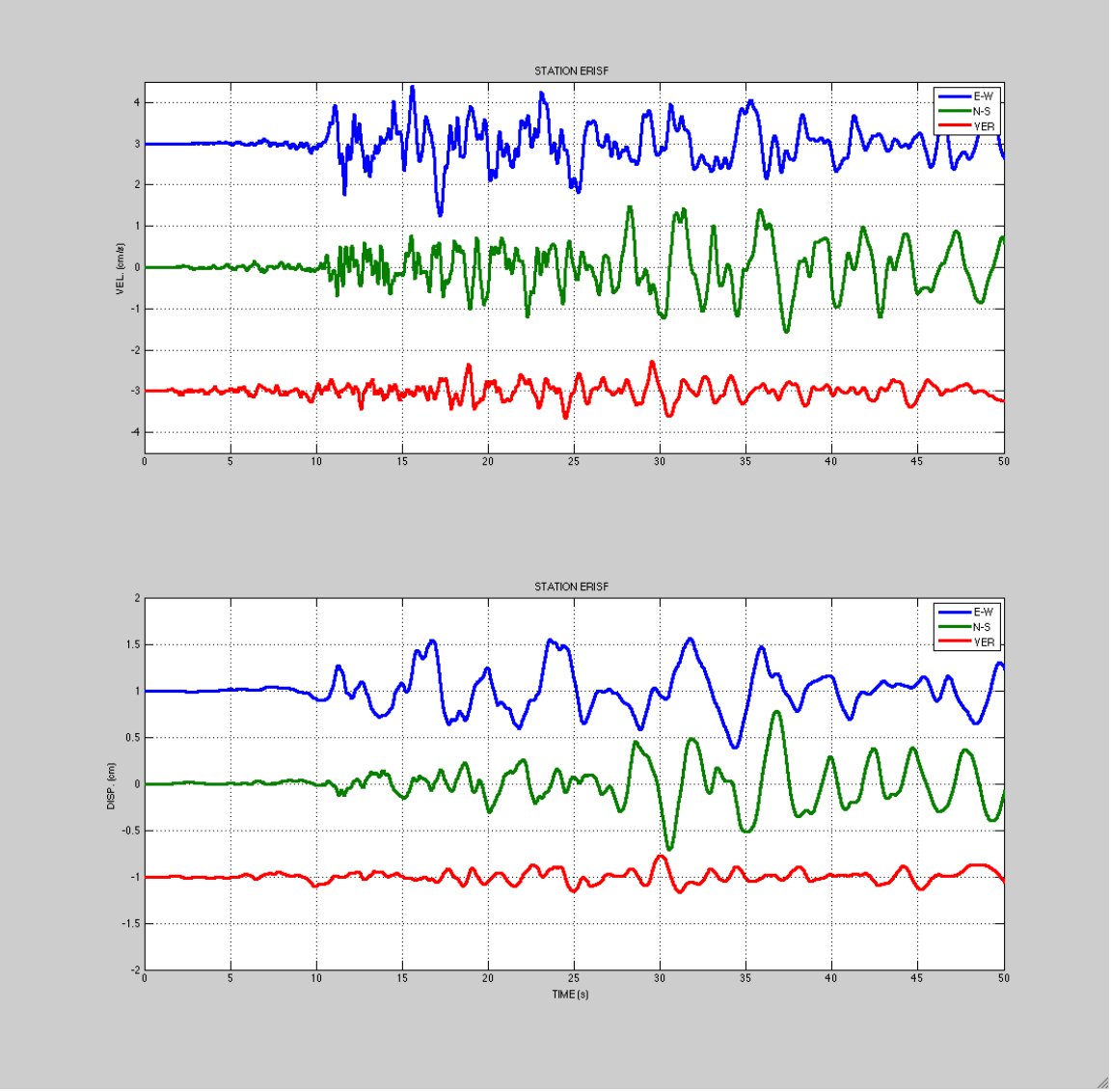

Figure 16. Displacements and velocities at station ERISF in Erciş

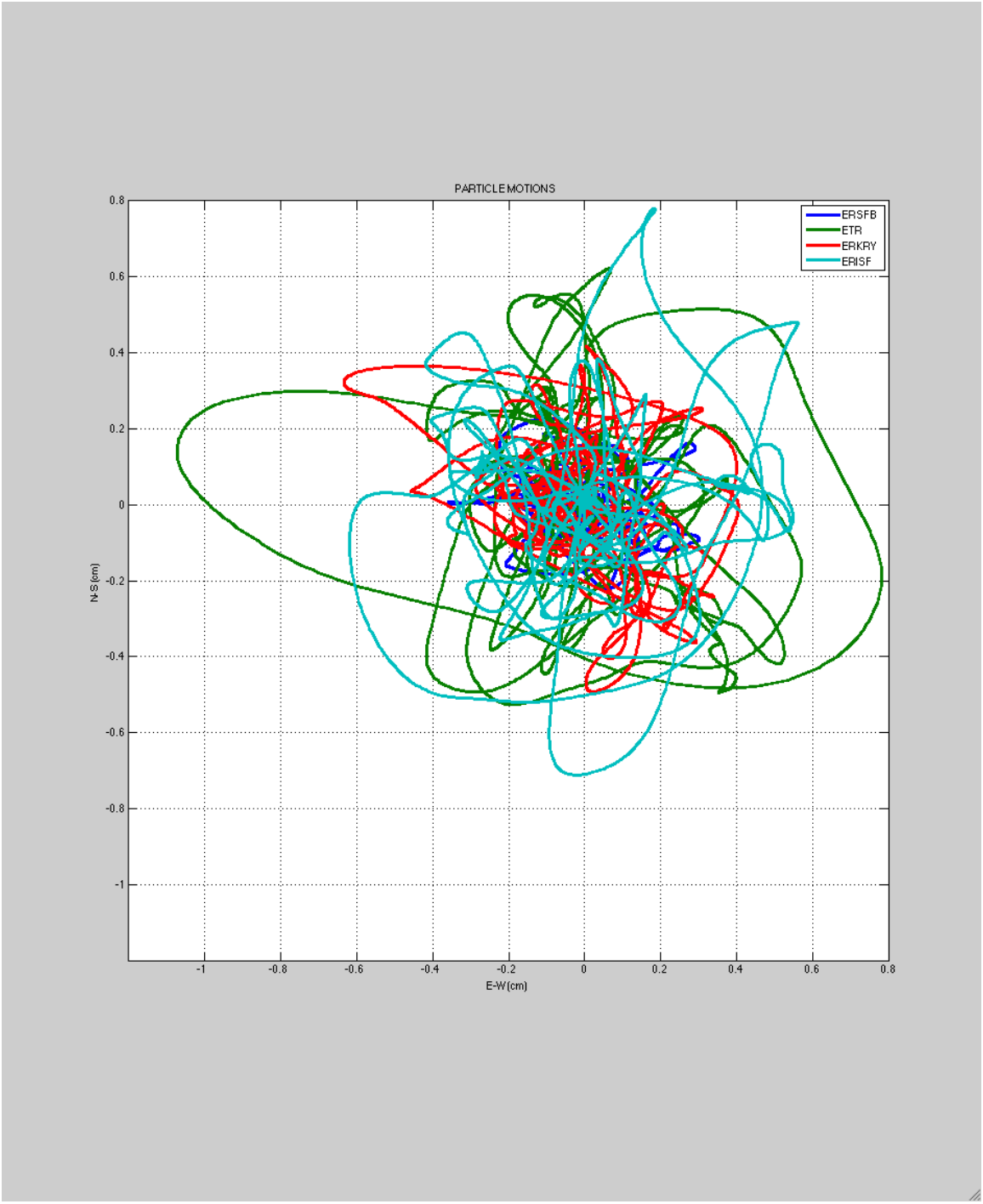

Figure 17.Particle motions at stations ERSFB, ETR, ERKRY, ERISF in Erciş

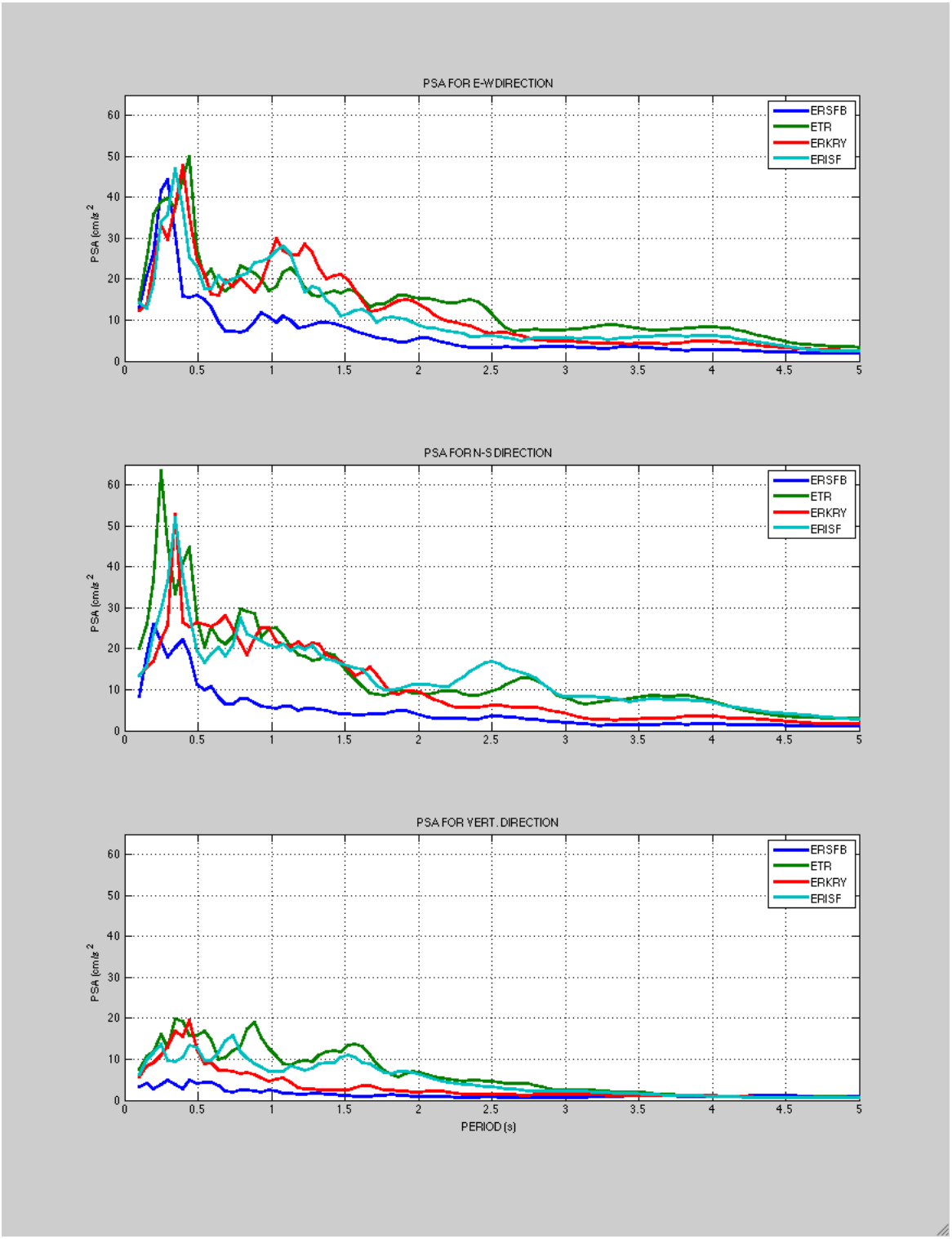

Figure 18.Response spectra (SA) at stations ERSFB, ETR, ERKRY, ERISF in Erciş

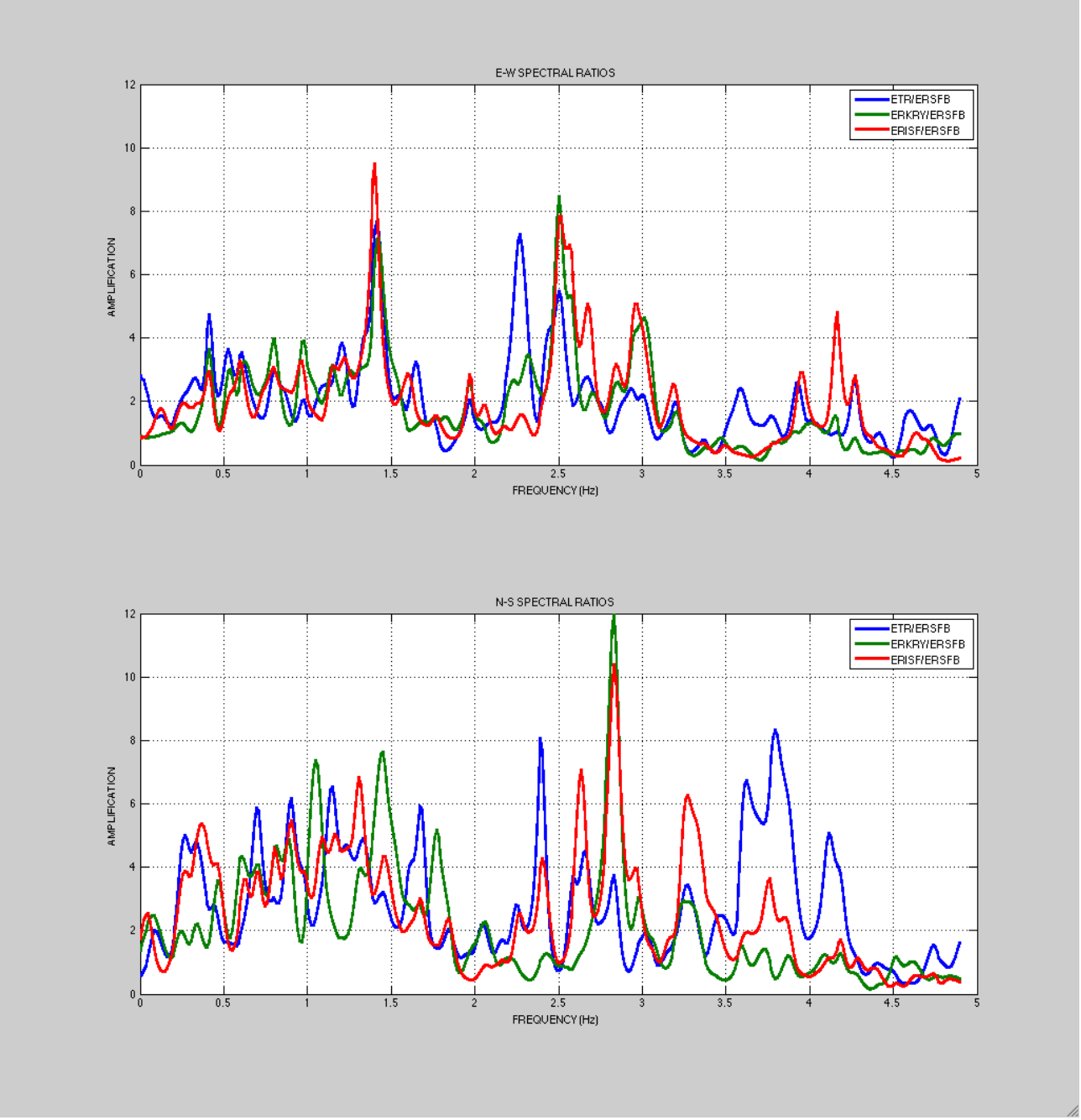

Figure 19. Spectral ratios with respect to ERSFB for stations ETR, ERKRY, ERISF in Erciş

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