

SOURCE PARAMETERS OF THE APRIL, 16, 2013, SARAVAN IRAN GREAT EARTHQUAKE USING SPECTRA OF P AND S WAVES

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At 10:44 UTC (15:14 local time), April 16, 2013, an earthquake struck the Saravan region in South eastern Iran. The M_w was assessed to be 7.8 and a depth of 63km was assigned by IIEES.

Different source parameters, such as seismic moment (M_0), corner frequency (f_0) and stress drop (), can be estimated by fitting an ω^2 model to the P or S wave spectra. In this study we determined source parameters of Saravan earthquake using displacement spectra of P and S waves observed at 16 stations of Iranian National Broad-Band Seismic Network (INSN). The spectra were corrected for attenuation using Zafarani et al. (2008) attenuation relation for Iran. Obtained source parameters include seismic moment, moment magnitude, source radius, corner frequency and stress drop which are presented in Table 1 for all of stations for p wave. Averages of parameters are also showed. The same procedure is performed for S wave spectra and the average of resultant parameters are shown in Table 2. Figure 1 shows the procedure of finding source parameters using ZHSF station located 233 kilometers away from earthquake epicenter.

Table 1. List of source parameters: logarithm of seismic moment (M_0), moment magnitude (M_w), stress drop (), corner frequency (f_0) and radius (a) determined using P wave spectra

Station code	M_0 (N m)	M_w	(bars)	f_0 (Hz)	a (km)
AHRM	19.49	6.9	12.4	0.1	22.3
ASAO	19.80	7.1	232	0.1	10
BJRD	18.94	6.6	5.4	0.1	19.3
BSRN	19.47	6.9	18.1	0.1	19.3
GHVR	19.81	7.2	128.7	0.1	13
KHMZ	19.52	7.0	198.6	0.1	9.0
KRBR	19.28	6.8	225.1	0.2	7.2
MRVT	19.84	7.2	321	0.1	9.8
SHGR	19.50	6.9	139.4	0.1	10
SHRO	19.30	6.8	131.6	0.1	8.8
SHRT	19.82	7.2	30.6	0.1	21.1
TABS	19.57	7	64.2	0.1	13.7
THKV	18.95	6.6	64.1	0.1	10
YZKH	19.49	6.9	104.5	0.1	11.0
ZHSF	19.45	6.9	93.8	0.1	7.7
ZNJK	19.80	7.1	294.5	0.1	7.1
Average	19.52	7.0	131.0	0.1	12.4

Table 2. Average of source parameters: logarithm of seismic moment (M_0), moment magnitude (M_w), stress drop (), corner frequency (f_0) and radius (a) determined using S wave spectra

Parameter	M_0 (N m)	M_w	(bars)	f_0 (Hz)	a (km)
Average	20.05	7.3	149.4	0.1	18.2

The average stress drops obtained here for P and S waves are 131 and 149 bars respectively, which is larger than median stress drop values obtained from previous studies for Iran (Hassani et al., 2011). However as Boore et al. (2010) discussed, the stress parameter and the attenuation model are closely linked together; the value of the stress parameter by itself cannot be meaningfully compared with other stress parameters determined using different attenuation. In addition various studies showed that tectonic setting affect the stress drop estimates so intraplate earthquakes have greater stress drops than interplate earthquakes (Kanamori and Anderson, 1975; Allmann and Shearer, 2009).

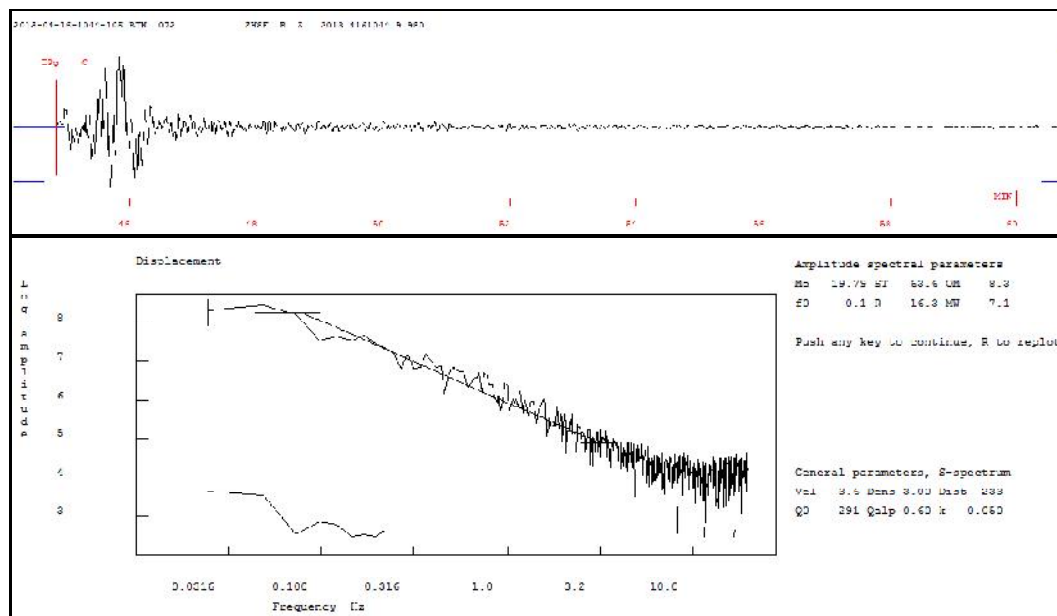


Figure 1. An example from seismic displacement spectra of S wave at ZHSF station. On top is shown the seismogram with the time window used for spectral analysis. The spectrum is corrected for attenuation $Q = 291f^{0.6}$ and near surface attenuation $= 0.06$. The epicentral distance is 233 km

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