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Technical Report

THE MOST IMPORTANT CHARACTERISTICS OF STRONG GROUND MOTION DATA IN IRAN IN 2011

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ABSTRACT

During January–December 2011 more than 311 records were recovered from permanent Iran strong motion stations operated by the Road, Housing and Urban Development Research Center. Accelerograms were recovered from ISMN triggered by 199 earthquakes in the magnitude 2.0 to 7.2 ranges.

Peak ground acceleration was recorded in Baba Monir station about 299 cm/s2 on March 5th, 2011 earthquake.

Keywords: Accelerogram; accelerograph; earthquake; strong motion; peak ground acceleration.

1. INTRODUCTION

The Iranian plateau is one of the seismically active areas of the world and frequently suffers destructive earthquakes that cause heavy loss of human life and widespread damage. Safeguarding life and property from destructive effects of earthquakes is a major national as well as world-wide problem. Earthquake strong motion data provide the basis for design of engineered buildings, bridges, dams and other critical structures as well as the basis for research on fundamental problems related to earthquake processes, and internal structure of the earth. Strong motion instrumentation program in Iran is operated by ISMN.

Iran Strong Motion Network (ISMN) started its activities in 1973 at the former Planning and Budget Organization. In 1981, the ISMN was transferred to BHRC and a new phase of its activities began. Until 1992, the ISMN had 274 analog accelerographs. At the present time (August 2013) ISMN has 1149 digital accelerographs. More than 9770 three component accelerograms have been recorded by these instruments.

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2. STRONG MITION DATA IN 2011

During January – December 2011, 199 earthquake triggered 175 accelerographs, among them 165 earthquakes had magnitude greater than 4 (Figures 1 and 2). In addition, more than 311 accelerograms were recovered from the permanent Iran Strong Motion Network, operated by the Building & Housing Research Center (Figure 3). Amongst these the South-West Pakistan Earthquake of the 18 January 2011, with Mw7.2 was the greatest one. The main shock of this earthquake triggered 10 accelerographs. Its maximum PGA was about 78 gals that was registered by Saravan station, but the highest acceleration in this period recorded at Baba Monir station in the event of March 5th, 2011. The strong motion and seismological data of important accelerograms are listed in the appendix table.

- In appendix table we classify the information collected for each entry in the database under three headings: (1) Earthquake information (date, epicentral coordinates, magnitude, and depth), (2) Station information (coordinates, location, ID, altitude,) and (3) record information (trigger times, peak ground motion amplitudes of each waveform). The earthquake information was obtained from both national and international seismic agencies. We processed all records with $M \geq 4$, and only for these records PGV, PGD and spectral quantities were computed because ground motion records of events with smaller magnitudes are unlikely to be significant for engineering use. The most important earthquakes in 2011 are listed in below.

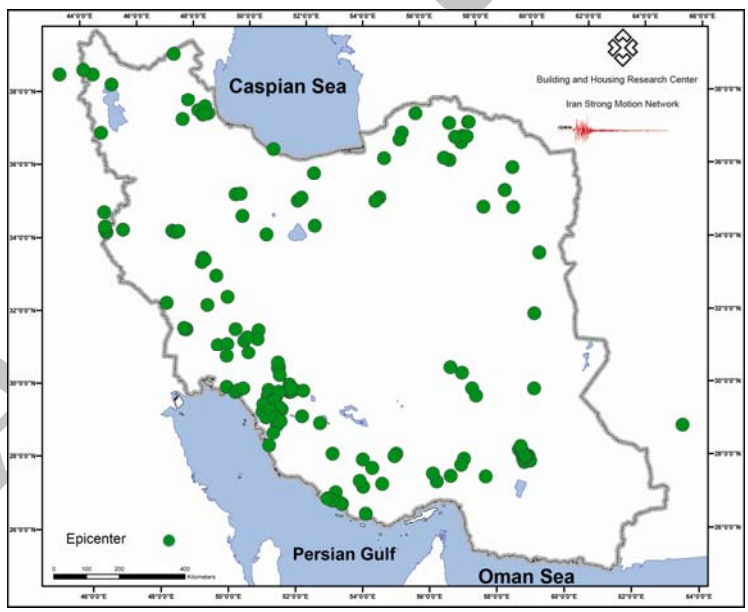

Figure 1: The epicentres of the earthquakes occurred in Iran and neighbouring countries that recorded by ISMN in 2011

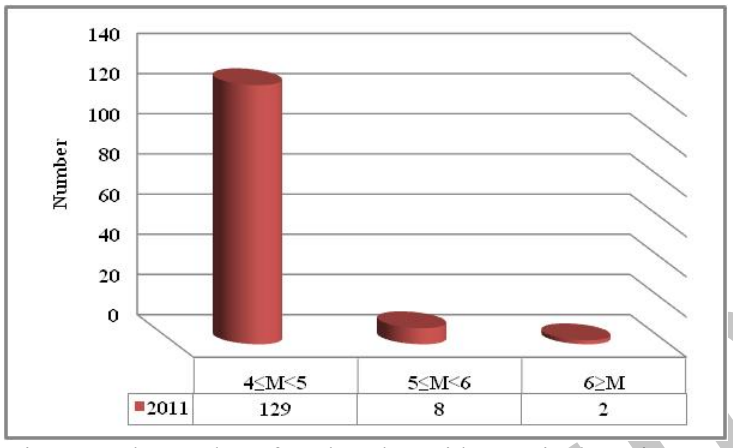

Figure 2. The number of earthquakes with magnitude >4 in 2011

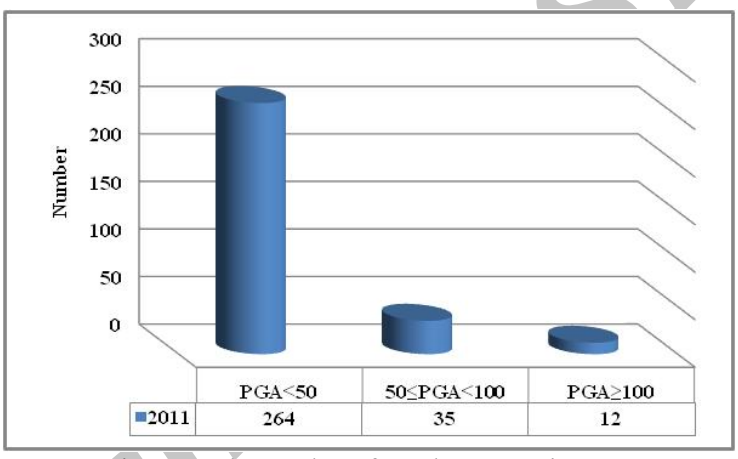

Figure 3. The number of accelerograms in 2011

2.1 Sepidan Earthquake of January 5th, 2011

On January 5th, 2011 at 05:55:47 (UTC), an earthquake with Mw5.4 (BHRC), Mn5.3 (IGTU), Ml5.2 (IIEES) and mb5.4 (NEIC), occurred in the west of Sepidan town (Fars Province) in South of Iran. This event was recorded by 7 sets of digital accelerographs of Iran Strong Motion Network (ISMN) (Figure 4). The uncorrected peak acceleration of about 135 cm/s^2 was recorded in Sepidan station. The epicenter of this event was located in 30.16N, 51.70E (BHRC), 30.20N, 51.79E (IGTU), 30.20N, 51.99E (IIEES) and 30.13N, 51.76E (NEIC). Many aftershocks occurred in the region, some of them are discussed below.

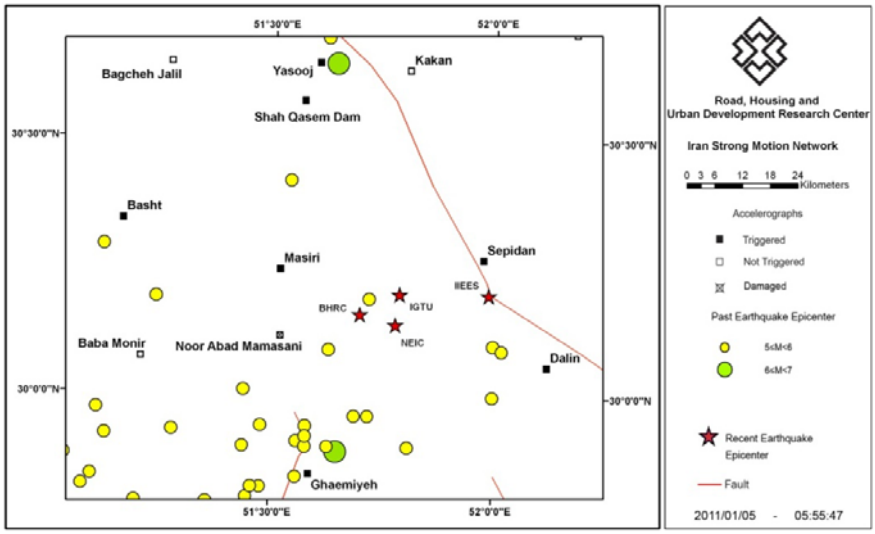

Figure 4. The Location map of January 5th, 2011 Sepidan Earthquake and triggered stations

Date	*Record No.*	*Strong Motion Parameters*	*Components*		
			L	*V*	*T*
2011/01/5	*5151/01*	*Corrected Acceleration (cm/s²)*	*132*	*34*	*116*
		Velocity (cm/s)	*2.6*	*0.7*	*4.3*
05:55:47		*Displacement (cm)*	*0.26*	*0.15*	*0.27*
		Duration (sec)	*7.5*	*11.1*	*4.5*

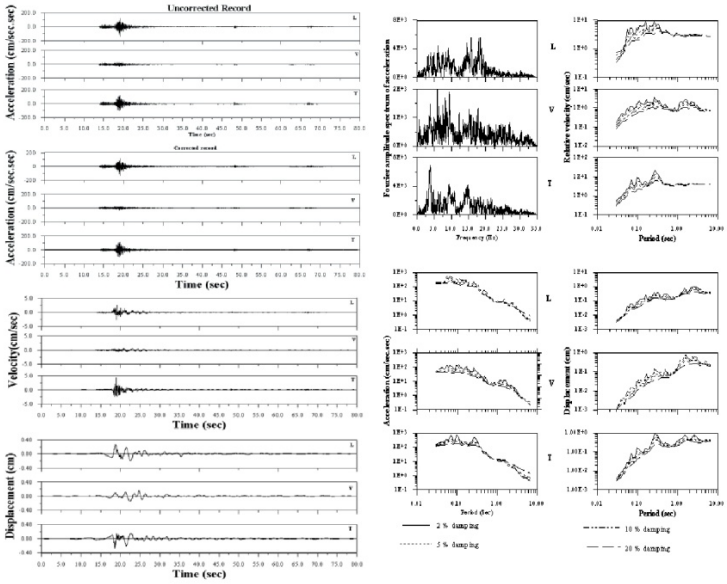

Figure 5. Uncorrected & corrected time-histories, Response and Fourier spectrums of Sepidan accelerogram

2.2 Sepidan Earthquake Aftershock of January 7th, 2011

On January 7th 2011 at 23:52:59 (UTC), an earthquake with Mw5.1 (BHRC), Mn5.1 (IGTU), Ml5.2 (IIEES) and mb5.1 (NEIC), occurred in the West of Sepidan city (Fars province). This event was recorded by 5 sets of digital accelerographs (Figure 6) of Iran Strong Motion Network (ISMN) (Sepidan, Baba Monir, Shah Qasem Dam1, Ghaemiyeh and Basht). The uncorrected peak acceleration was recorded in Sepidan station (66 cm/s^2). The epicenter of this event has been located at 30.17N, 51.74E (BHRC), 30.17N, 51.76E (IGTU), 30.20N, 51.68E (IIEES) and 30.15N, 51.59E (NEIC).

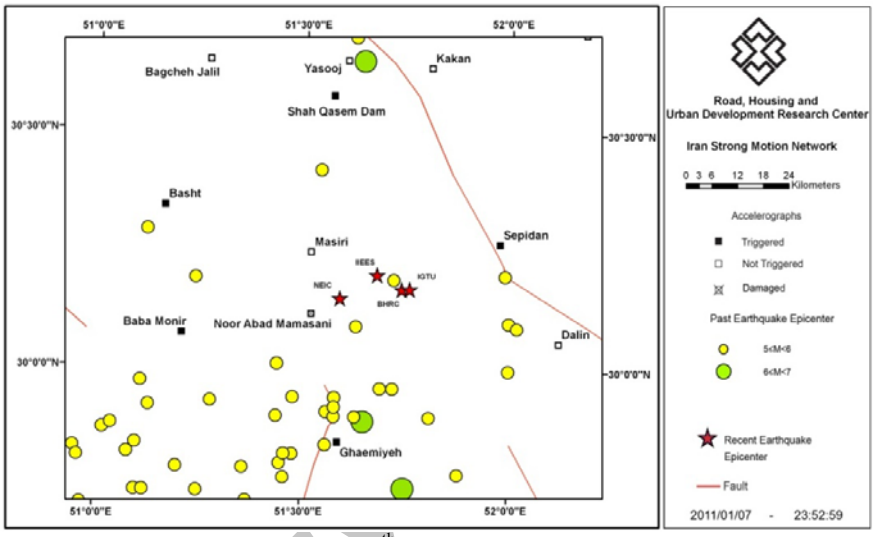

Figure 6. The location map of January 7th, 2011 Sepidan earthquake and triggered stations

Date	Record No.	Strong Motion Parameters	Components		
			L	V	T
2011/01/07	5157/07	Corrected Acceleration (cm/s^2)	58	23	65
		Velocity (cm/s)	1.3	0.5	1.2
23:52:59		Displacement (cm)	0.07	0.04	0.09
		Duration (sec)	7.8	8.1	8.0

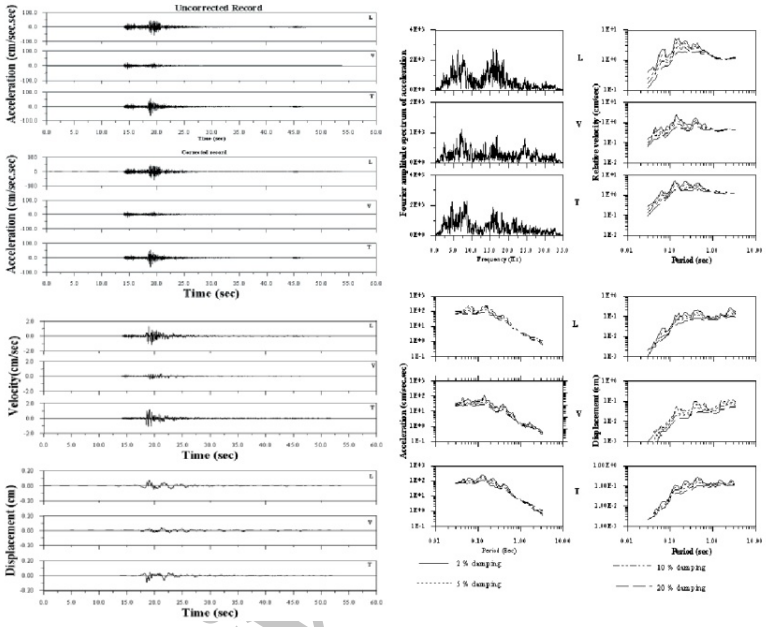

Figure 7. Uncorrected and corrected time-histories, Response and Fourier spectrums of Sepidan accelerogram

2.3 South-West Pakistan Earthquake of January 18th, 2011

A massive earthquake with the Magnitude of 7.2 (NEIC) struck a remote area in south-west of Pakistan on early Wednesday, January 18th at 20:23:26. The epicenter of this event has reported in 310 Km ESE of Zahedan with Mn7.2 (IGUT), Ml7.0 (IIEES) and Mw7.2 (NEIC). This event was recorded by 10 sets of digital accelerographs of Iran Strong Ground Motion Network in Saravan, Jaleq, Pishin Dam1, 2 and 3, Gosht, Sib Sooran, Sabz Gaz, Sarbaz and Zabol stations (Figure 8). The maximum uncorrected peak acceleration of 78 cm/s^2 was recorded in Saravan station. The epicenter of this event has been located at 28.87N, 63.97 (IGUT), 28.04N, 63.85E (IIEES) and 28.84N, 63.95E (NEIC).

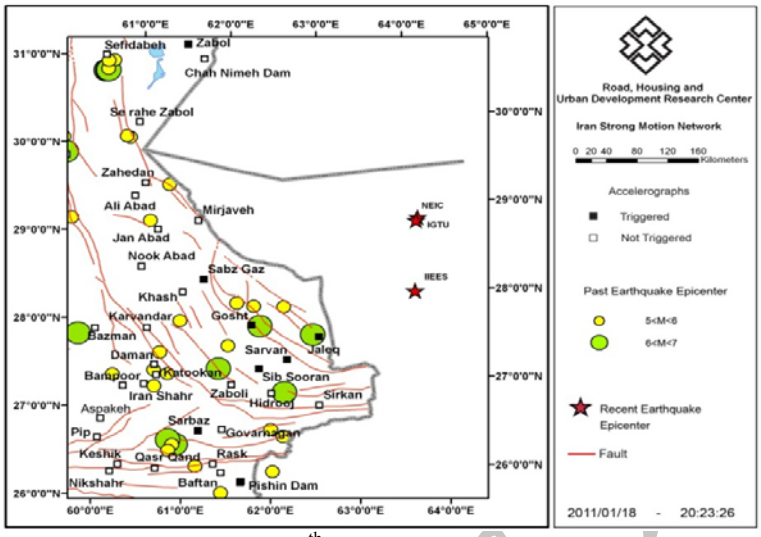

Figure 8. The location map of January 18th, 2011 South-West Pakistan earthquake and triggered stations

Date	*Record No.*	*Strong Motion Parameters*	*Components*		
			L	*V*	*T*
2011/01/18	*5163*	*Corrected Acceleration (cm/s²)*	*24*	*11*	*77*
		Velocity (cm/s)	*1.4*	*0.6*	*3.5*
20:23:26		*Displacement (cm)*	*0.20*	*0.16*	*0.21*
		Duration (sec)	*30.7*	*42.6*	*12.8*

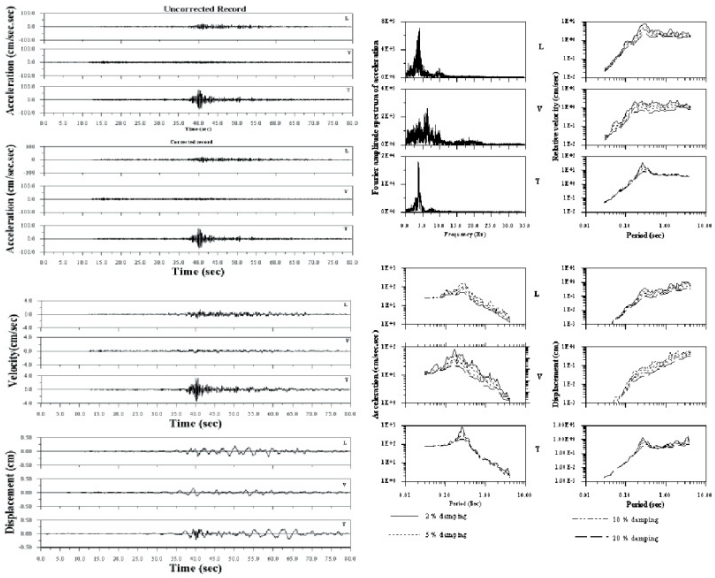

Figure 9. Uncorrected and corrected time-histories, Response and Fourier spectrums of Saravan accelerogram

2.4 Rigan Earthquake of January 27th, 2011 (Main shock)

On the 27th of January, 2011 at 08:38:28 (UTC), a relatively strong earthquake with the magnitude of Mw6.1 (BHRC), Mn6.0 (IGUT), mb6.2 (IIEES) and Mw6.2 (NEIC), occurred South of Rigan city in Kerman province in South-East of Iran. This event was recorded by 12 sets of digital accelerographs of Iran Strong Motion Network (ISMN) (Figure 10). The maximum uncorrected peak acceleration of about 192 cm/s^2 was recorded in Sarzeh station. The epicenter of this event has been located at 28.15N, 59.00E (BHRC), 28.25N, 59.07E (IGUT), 28.15N, 59.09E (IIEES) and 28.19 N, 58.97E (NEIC).

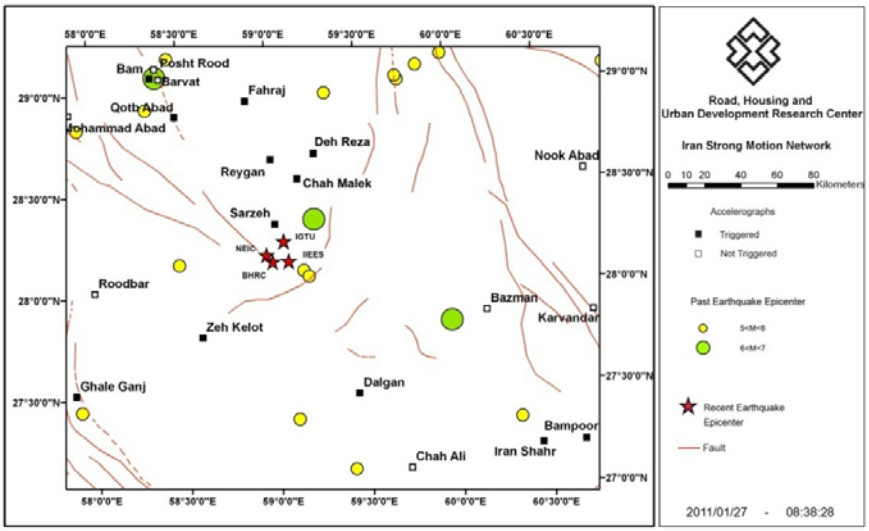

Figure 10. The location map of January 27th, 2011 Rigan earthquake and triggered stations

Date	Record No.	Strong Motion Parameters	Components		
			L	V	T
2011/01/27	5179/04	Corrected Acceleration (cm/s^2)	187	76	155
		Velocity (cm/s)	9.2	3.1	8.2
08:38:28		Displacement (cm)	1.12	0.37	1.66
		Duration (sec)	5.8	9.1	6.0

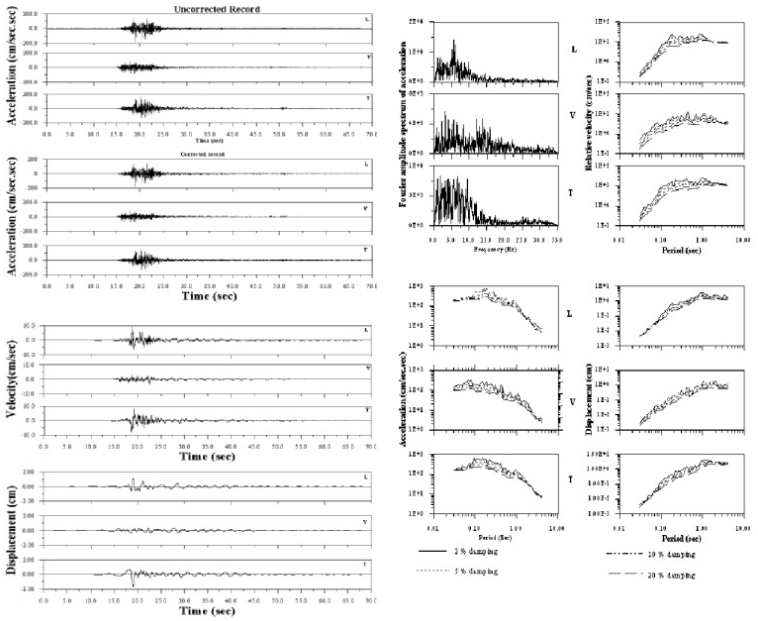

Figure 11. Uncorrected and corrected time-histories, Response and Fourier spectrums of the Sarzeh earthquake

2.5 Baba Monir Earthquake of March 5th, 2011

On March 5th, 2011 at 11:24:41 (UTC), an earthquake with Mw5.2 (BHRC), Mn5.2 (IGTU), Ml5.1 (IIEES) and mb5.1 (NEIC), occurred near Baba Monir town (Fars Province), South-West of Iran. This event was recorded by 7 sets of digital accelerograph of Iran Strong Ground Motion Network (ISMN) (Figure 12). The maximum peak acceleration was recorded in Baba Monir station (299 cm/s^2). The epicenter of this event has been located at 30.00N, 51.19E (BHRC), 30.04N, 51.11E (IGTU), 30.02N, 51.19E (IIEES) and 30.021N, 51.15E (NEIC).

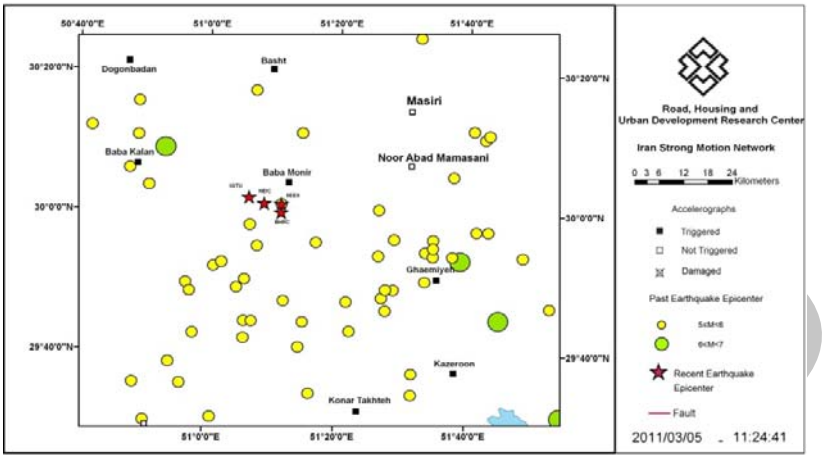

Figure 12. The location map of March 5th, 2011 Baba Monir earthquake and triggered stations

Date	*Record No.*	*Strong Motion Parameters*	*Components*		
			L	*V*	*T*
2011/03/05	*5194/01*	*Corrected Acceleration (cm/s²)*	*291*	*142*	*222*
		Velocity (cm/s)	*14.6*	*5.2*	*8.9*
11:24:41		*Displacement (cm)*	*1.91*	*1.11*	*0.94*
		Duration (sec)	*8.1*	*9.3*	*10.1*

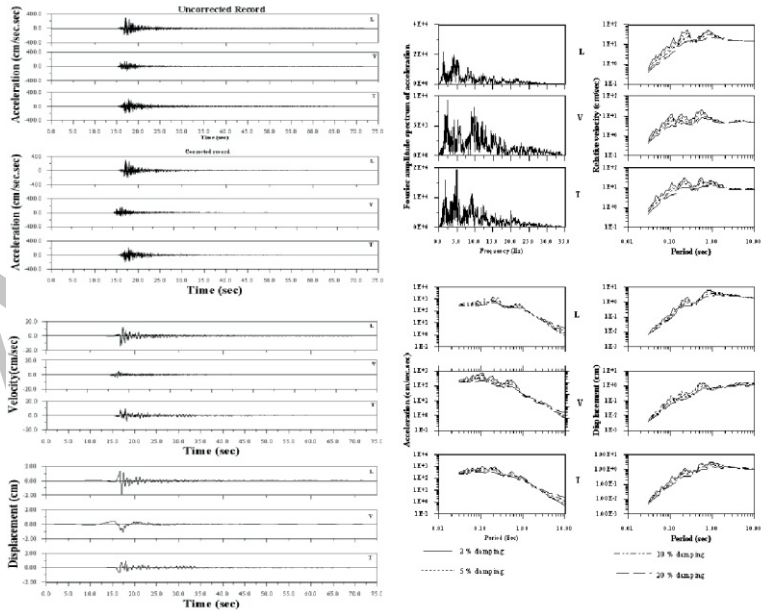

Figure 13. Uncorrected and corrected time-histories, Response and Fourier spectrums of Baba Monir accelerogram

2.6 Rudbar Earthquake of June 15th, 2011

On June 15th, 2011 at 01:05:30 UTC an earthquake with magnitude of Mw5.6(BHRC), Mn5.3 (IGTU), Ml5.7 (IIEES) and mb5.3 (NEIC) occurred in South of Kerman Province. This event was recorded by 5 sets of accelerograph (Figure 14) stations of ISMN and the maximum peak acceleration of about 48 cm/s^2 has been recorded in Rudbar station. BHRC estimated the epicenter on 27.80N, 57.79E and the magnitude of this event to be Mw5.6 using the recorded strong motion data. This event was also located to be at the coordinates of 27.78N, 57.77E (IGTU), 27.94N, 57.75E (IIEES) and 28.00N, 57.65E (NEIC).

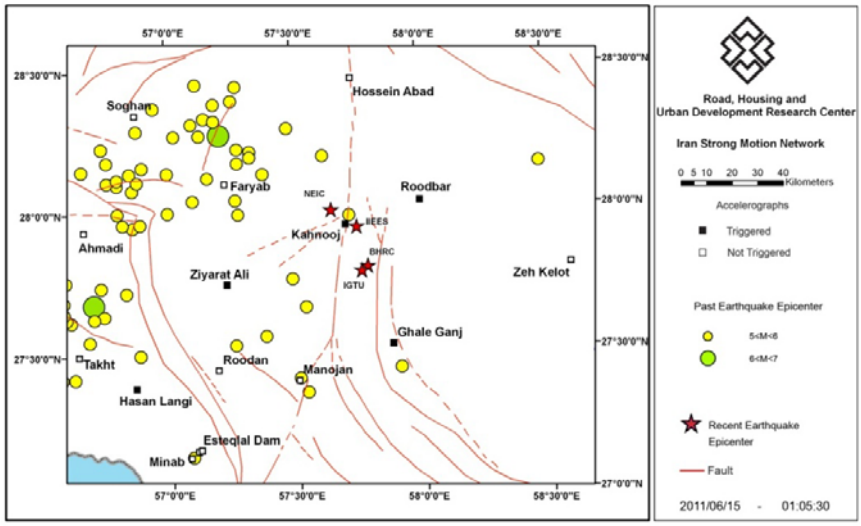

Figure 14. The location map of June 15th, 2011 Rudbar earthquake and triggered stations

Date	Record No.	Strong Motion Parameters	Components		
			L	V	T
2011/06/15	5254	Corrected Acceleration (cm/s^2)	47	23	33
		Velocity (cm/s)	3.4	0.7	1.5
01:05:30		Displacement (cm)	0.44	0.08	0.16
		Duration (sec)	8.4	15.0	13.9

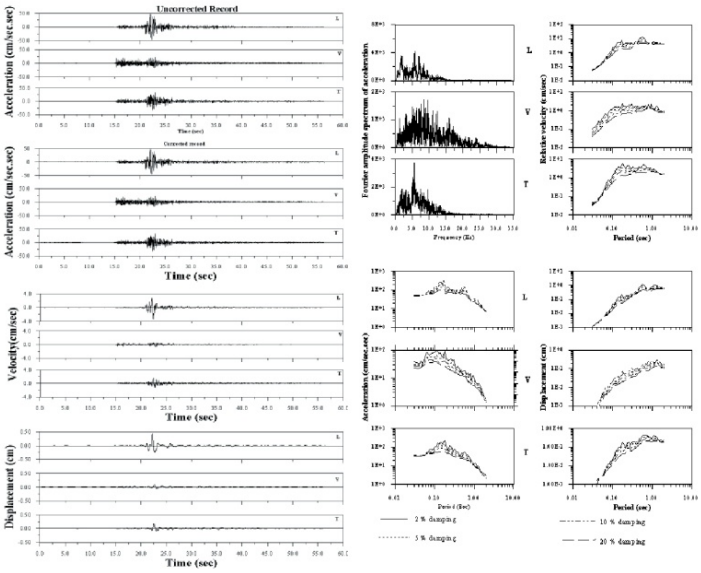

Figure 15. Uncorrected and corrected time-histories, response and Fourier spectrums of Roodbar accelerogram

2.7 Turkey-Iran Border Region Earthquake of October 23rd, 2011

On October 23rd, 2011 at 10:41:21 (UTC), an earthquake with Mw7.0 (BHRC), Mn7.1 (IGUT), and Mw7.1 (NEIC), occurred in Turkey near Iran border line. This event was recorded by 11 sets of digital accelerographs (Figure 16) of Iran Strong Ground Motion Network (Siah-Cheshmeh, Makoo, Avagiq, Salmas1, Qotoor, Hadi Shahr, Qareziaodin, Pol Dasht, Kelvans, Khoy and Seylab). The maximum uncorrected peak acceleration of about 72 cm/s^2 was recorded in Siah-Cheshmeh station (ISMN stations). The epicenter of this event has been located at 38.51N, 43.46E (BHRC), 38.67N, 43.71E (IGUT) and 38.63N, 43.49E (NEIC).

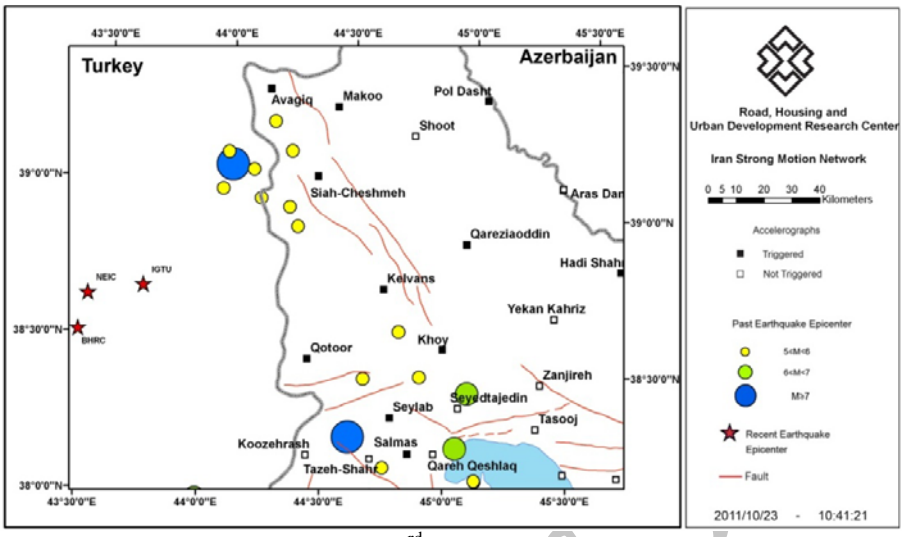

Figure 16. The location map of October 23rd, 2011 Turkey-Iran Border region earthquake and triggered stations

Date	*Record No.*	*Strong Motion Parameters*	*Components*		
			L	*V*	*T*
2011/10/23	*5325*	*Corrected Acceleration (cm/s²)*	*67*	*30*	*72*
		Velocity (cm/s)	*21.5*	*7.6*	*19.2*
10:41:21		*Displacement (cm)*	*7.67*	*2.15*	*7.28*
		Duration (sec)	*32.4*	*39.3*	*36.6*

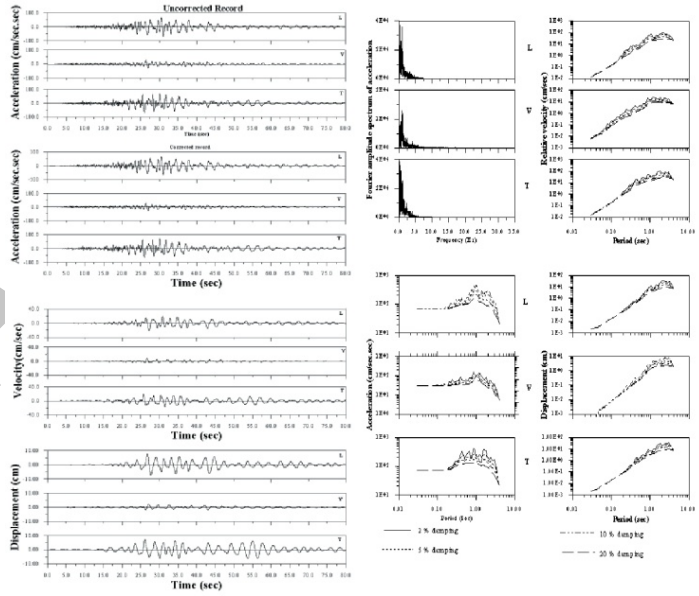

Figure 17. Uncorrected and corrected time-histories, Response and Fourier spectrums of Siah-Cheshme accelerogram

Strong Motion Data (BHRC)								Seismological Data					
No.	Station	Record No.	Coordinate N	Coordinate E	U.P.G.A (cm/s/s)	ts-tp (sec)	Vs30 (m/s)	Origin Time Y/M/D	Origin Time h:m:s	Epicenter N	Epicenter E	Magnitude	Ref.
1	Hendijan	5204	30.23	49.71	16	4.0		2011/01/03	13:37:57	30.25 30.30 30.22	49.71 49.80 49.78	Mn4.4 MI4.2 mb4.2	IGTU IIEES NEIC
2	Sepidan	5151/01	30.27	51.98	135	4.0		2011/01/05	05:55:47	30.16 30.20 30.20 30.13	51.70 51.79 51.99 51.76	Mw5.4 MI5.8 Mn5.3 MI5.2 mb5.4	BHRC IGTU IIEES NEIC
	Masiri	5154/02	30.25	51.52	81	2.8	1262						
	Shah Qasem Dam1	5311/02	30.58	51.57	54	6.2							
	Ghaemiyeh	5150	29.85	51.59	28	4.9	617						
	Basht	5152	30.34	51.16	28	7.1							
	Dalin	5170	30.06	52.12	20	7.6	1230						
	Yasooj	5318/02	30.65	51.60	14	7.4							
3	Masiri	5154/03	30.25	51.52	35	2.7	1262	2011/01/05	16:32:21	30.18	51.66	Mw4.6	BHRC
	Sepidan	5157/04	30.27	51.98	24	4.4				30.14	51.58	Mn4.3	IGTU
	Shah Qasem Dam1	5311/03	30.58	51.57	21	5.9				30.22	51.65	MI4.4	IIEES
4	Masiri	5154/04	30.25	51.52	30	2.7	1262	2011/01/05	17:50:53	30.19	51.66	Mw4.5	BHRC
	Shah Qasem Dam1	5311/04	30.58	51.57	14	5.7				30.19	51.63	Mn4.2	IGTU
	Sepidan	5157/05	30.27	51.98	14	4.3				30.24	51.75	MI4.1	IIEES
5	Sepidan	5157/07	30.27	51.98	66	2.4		2011/01/07	23:52:59	30.17	51.74	Mw5.0	BHRC
	Baba Monir	5155/01	30.07	51.21	23	7.7	832						
	Shah Qasem Dam1	5311/06	30.58	51.57	18	6.4				30.17	51.76	Mn5.0	IGTU
	Ghaemiyeh	5156/01	29.85	51.59	15	5.6	617			30.20	51.68	MI5.0	IIEES
	Basht	5164/01	30.34	51.16	15	7.4				30.15	51.59	mb4.9	NEIC
6	Sepidan	5157/08	30.27	51.98	68	4.3		2011/01/08	00:24:24	30.23	51.68	Mw5.2	BHRC
	Masiri	5154/06	30.25	51.52	39	3.0	1262						
	Ghaemiyeh	5156/02	29.85	51.59	28	5.6	617			30.19	51.75	Mn5.1	IGTU
	Baba Monir	5155/02	30.07	51.21	22	6.2	832						
	Basht	5164/02	30.34	51.16	19	6.9				30.18	51.71	MI5.2	IIEES
	Shah Qasem Dam1	5311/07	30.58	51.57	17	6.7				30.18	51.71	mb5.0	NEIC
7	Evaz	5191	27.76	54.01	42	3.4	757	2011/01/09	13:13:04	27.59	54.02	Mn4.1	IGTU
	Kooreh	5167	27.92	53.80	14	5.0	386			27.51	54.26	MI4.2	IIEES
										27.78	54.08	mb4.3	NEIC
8	Sirch	5239	30.20	57.56	29	2.4	398	2011/01/09	18:11:04	30.23	57.46	Mn4.3	IGTU
	Joshan	5233	30.12	57.61	15	3.4	776			30.33	57.33	MI4.5	IIEES
9	Saravan	5163	27.37	62.32	78	25.9		2011/01/18	20:23:26	28.87 28.04 28.84	63.97 63.85 63.95	Mn7.2 MI7.0 Mw7.2	IGTU IIEES NEIC
	Jaleq	5161	27.60	62.71	74	-							
	Pishin Dam	5184	26.03	61.69	72	-							
	Gosht	5160	27.79	61.96	28	-							
	Sib Sooran	5186	27.29	62.00	26	-							
	Pishin Dam	5185	26.02	61.68	24	-							
	Sabz Gaz	5162	28.34	61.46	24	-							
	Sarbaz	5208	26.63	61.26	14	-							
	Pishin Dam	5183	26.03	61.69	13	-							
	Zabol	5231	31.03	61.50	11	-							

Strong Motion Data (BHRC)								Seismological Data					
No.	Station	Record No.	Coordinate N	Coordinate E	U.P.G.A (cm/s/s)	ts-tp (sec)	Vs30 (m/s)	Origin Time Y/M/D	Origin Time h:m:s	Epicenter N	Epicenter E	Magnitude	Ref.
10	Sarzeh	5179/02	28.33	59.02	59	2.7		2011/01/27	07:02:06	28.17	58.99	Mw4.7	BHRC
	Chah Malek	5176/02	28.55	59.16	32	5.7				28.26	58.99	Mn5.1	IGTU
	Deh Reza	5177/02	28.67	59.26	13	8.0				28.12	59.07	Ml4.9	IIEES
	Zeh Kelot	5180/01	27.79	58.59	11	-				28.30	58.90	mb5.0	NEIC
11	Sarzeh	5179/04	28.33	59.02	192	3.0		2011/01/27	08:38:28				
	Chah Malek	5176/03	28.55	59.16	43	6.3				28.15	59.00	Mw6.1 Ml6.2	BHRC
	Ghale Ganj	5172	27.52	57.88	42	-	683						
	Reygan	5173	28.65	59.01	30	6.2	437						
	Deh Reza	5177/03	28.67	59.26	25	8.2				28.25	59.07	Mn6.0	IGTU
	Bam1	5171	29.08	58.35	23	14.0							
	Zeh Kelot	5180/02	27.79	58.59	20	8.9							
	Qotb Abad	5174	28.88	58.48	20	11.4	648			28.15	59.09	mb6.2	IIEES
	Fahraj	5178	28.95	58.89	19	11.1	280						
	Bampoor	5187	27.20	60.45	18	-							
	Iran Shahr	5182	27.20	60.69	11	-				28.19	58.97	Mw6.2	NEIC
	Dalgan	5188	27.48	59.45	11	-							
12	Sarzeh	5179/05	28.33	59.02	58	3.0		2011/01/27	08:43:30	28.31	59.14	Mn4.8	IGTU
										28.10	59.17	Ml5.3	IIEES
13	Sarzeh	5179/06	28.33	59.02	14	2.5		2011/01/27	09:05:21	28.18	59.18	Mn4.2	IGTU
14	Sarzeh	5179/08	28.33	59.02	41	2.2		2011/01/27	09:07:54	28.24	58.96	Mn4.8	IGTU
										28.07	59.20	Ml5.0	IIEES
15	Sarzeh	5179/09	28.33	59.02	56	2.6		2011/01/27	15:01:47	28.42	58.92	Mn4.6	IGTU
										28.18	59.09	Ml4.6	IIEES
										27.84	58.87	mb4.3	NEIC
16	Sarzeh	5179/11	28.33	59.02	83	2.4		2011/01/28	04:20:42	28.37	58.96	Mn5.3	IGTU
	Chah Malek	5176/04	28.55	59.16	25	5.8				28.15	59.07	Ml5.3	IIEES
	Bam1	5175	29.08	58.35	12	14.0				28.15	59.07	mb5.0	NEIC
17	Sarzeh	5179/12	28.33	59.02	43	2.3		2011/01/28	05:06:49	28.42	58.93	Mn4.9	IGTU
	Chah Malek	5176/05	28.55	59.16	12	5.7				28.19	59.11	Ml4.8	IIEES
										28.42	58.93	mb4.5	NEIC
18	Sarzeh	5179/13	28.33	59.02	14	2.4		2011/01/28	06:34:04	28.44	58.96	Mn4.3	IGTU
										28.30	59.06	Ml4.2	IIEES
										28.44	58.96	mb4.0	NEIC

Strong Motion Data (BHRC)								Seismological Data					
No.	Station	Record No.	Coordinate N	Coordinate E	U.P.G.A (cm/s/s)	ts-tp (sec)	Vs30 (m/s)	Origin Time Y/M/D	Origin Time h:m:s	Epicenter N	Epicenter E	Magnitude	Ref.
19	Sarzeh	5179/17	28.33	59.02	63	2.3		2011/01/29	04:43:19	28.33	59.02	Mn5.0	IGTU
	Chah Malek	5176/06	28.55	59.16	14	5.7				28.16	59.07	Ml4.7	IIEES
										28.33	59.02	mb4.6	NEIC
20	Beyram	5190	27.44	53.51	17	2.9	377	2011/01/30	18:58:13	27.12	53.37	Mn4.4	IGTU
										27.01	53.47	Ml4.4	IIEES
										27.34	53.42	mb4.7	NEIC
21	Khalkhal1	5197/03	37.61	48.54	227	1.3	485	2011/03/04	09:46:30	37.82	48.34	Mn4.3	IGTU
	Firoozabad	5215/02	37.59	48.24	19	3.7	459			37.73	48.61	Ml4.3	IIEES
										37.83	48.69	mb4.6	NEIC
22	Baba Monir	5194/01	30.07	51.21	299	1.4	832	2011/03/05	11:24:41	30.00	51.19	Mw5.2	BHRC
	Ghaemiyeh	5210/01	29.85	51.59	95	6.5	617						
	Basht	5195/02	30.34	51.16	51	5.0				30.04	51.11	Mn5.2	IGTU
	Dogonbadan	5196	30.35	50.79	32	6.9							
	Baba Kalan	5209	30.11	50.82	30	5.7				30.02	51.19	Ml5.1	IIEES
	Konar Takhteh	5198	29.53	51.39	17	5.9	450						
	Kazeroon	5199	29.63	51.64	13	6.9				30.02	51.15	mb5.1	NEIC
23	Baba Monir	5194/02	30.07	51.21	84	1.3	832	2011/03/05	11:28:39	30.04	51.02	Mn4.0	IGTU
	Ghaemiyeh	5210/02	29.85	51.59	16	7.4	617						
24	Soghan	5212/02	28.35	56.88	14	6.0		2011/03/05	20:42:53	28.30	57.14	Mn5.1	IGTU
	Faryab	5216	28.10	57.23	14		641			28.42	56.95	Ml4.9	IIEES
										28.28	57.13	mb5.1	NEIC
25	Siyahoo	5245	27.76	56.34	26	6.8	627	2011/03/14	07:55:08	27.84	56.71	Mn4.7	IGTU
	Ahmadi	5243	27.94	56.67	10	4.4	528			27.70	56.79	Ml4.8	IIEES
										27.84	56.71	mb4.8	NEIC
26	Qasreshirin	5217/01	34.51	45.59	16	2.7		2011/04/06	19:17:17	34.31	45.53	Mn4.4	IGTU
	Sar Pol-e-Zahab	5219/01	34.46	45.87	15	4.5				34.32	45.49	Ml4.4	IIEES
27	Qasreshirin	5217/02	34.51	45.59	20	2.5		2011/04/07	04:47:35	34.38	45.48	Mn4.6	IGTU
	Sar Pol-e-Zahab	5219/02	34.46	45.87	12	4.5				34.36	45.57	Ml4.4	IIEES
										34.36	45.57	mb4.6	NEIC
28	Goorsefid	5225	34.22	45.85	12	5.1		2011/04/08	04:27:44	34.46	45.46	Mn4.3	IGTU
										34.37	45.37	Ml4.3	IIEES
29	Ghaemiyeh	5229/02	29.85	51.59	12	8.4	617	2011/05/08	22:17:32	29.81	50.88	Mn4.8	IGTU
	Shabankareh	5230	29.47	50.99	10	-	368			29.84	51.00	Ml4.9	IIEES
										29.79	50.96	mb4.9	NEIC
30	Meymand	5317	31.10	51.27	102	2.5		2011/05/12	14:25:59	30.96	51.31	Mw4.9	BHRC
	Pataveh	5252	30.96	51.26	35	2.6				30.94	51.30	Mn4.8	IGTU
	Khafr	5250/02	31.00	51.48	21	3.0				31.04	51.40	Ml4.6	IIEES
	Komeh	5463	31.07	51.59	15	4.2				30.94	51.30	mb4.8	NEIC

Strong Motion Data (BHRC)								Seismological Data					
No.	Station	Record No.	Coordinate N	Coordinate E	U.P.G.A (cm/s/s)	ts-tp (sec)	Vs30 (m/s)	Origin Time Y/M/D	Origin Time h:m:s	Epicenter N	Epicenter E	Magnitude	Ref.
31	Kadkan	5251	35.59	58.87	20	4.9	571	2011/05/24	20:30:11	35.65	58.77	Mn4.5	IGTU
	Rivash	5255	35.48	58.47	17	5.6	428			35.68	58.63	MI4.5	IIEES
										35.72	58.67	mb4.6	NEIC
32	Roodbar	5254	28.03	58.00	48	6.0		2011/06/15	01:05:30	27.80	57.79	Mw5.6	BHRC
	Ghale Ganj	5248	27.52	57.88	37	7.0	683						
	Kahnooj	5249	27.95	57.71	28	4.4	1564			27.78	57.77	Mn5.3	IGTU
	Ziyarat Ali	5257	27.75	57.23	16	7.7	1334			27.94	57.75	MI5.7	IIEES
	Hasan Langi	5416	27.39	56.86	10	-	251			28.00	57.65	mb5.3	NEIC
33	Joshan	5260	30.12	57.61	81	2.3	776	2011/06/26	19:47:00	30.03	57.58	Mw4.9 MI5.6	BHRC
	Sirch	5261	30.20	57.56	79	3.2	398						
	Golbaf1	5262	29.89	57.73	38	3.3	365			30.21	57.63	Mn5.2	IGTU
	Andoohjerd	5259	30.23	57.75	22	3.9	566			30.12	57.54	MI5.1	IIEES
	Mahan	5265	30.07	57.29	15	4.0	1085			30.18	57.56	Mw5.1	NEIC
34	Foroomad	5277/02	36.50	56.76	109	3.0		2011/07/26	04:04:12	36.61	56.76	Mw5.2	BHRC
	Davarzan	5276	36.35	56.88	24	4.6	604			36.58	56.93	Mn4.9	IGTU
										36.52	56.89	MI4.7	IIEES
	Joqata	5278	36.63	57.07	19	4.4	964			36.63	56.79	mb5.0	NEIC
35	Mojen	5280	36.48	54.65	45	2.6	876	2011/08/11	22:32:18	36.62	54.73	MI5.2	BHRC
	Abarsej	5279	36.58	54.92	13	2.6							
	Shahrood	5281	36.41	54.97	13	4.4				36.56	54.81	MI4.7	IIEES
	Chahar Bagh	5289	36.60	54.50	13	3.0				36.53	54.73	Mn4.9	IGTU
	Tazareh	5282	36.40	54.48	11	4.3				36.63	54.75	mb5.0	NEIC
36	Konar Takhteh	5297/02	29.53	51.39	27	1.6	450	2011/08/27	02:55:59	29.45	51.28	Mn4.2	IGTU
	Dalaki	5294	29.43	51.29	20	3.2	971			29.54	51.39	MI4.1	IIEES
										29.55	51.13	mb4.4	NEIC
37	Bardeskan	5292	35.27	57.97	60	1.6	993	2011/09/05	00:52:16	35.23	58.04	Mn4.1	IGTU
	Azim Abad	5291	35.15	58.07	20		237			35.24	58.00	MI4.1	IIEES
										35.57	58.16	mb4.2	NEIC
38	Haji Abad1	5321	28.36	54.43	23	4.3	561	2011/10/19	02:52:34	28.09	54.30	Mn5.3	IGTU
										28.84	54.84	MI5.1	IIEES
										28.15	54.30	mb5.5	NEIC
39	Siyahoo	5337	27.76	56.34	13	2.7	627	2011/10/20	06:57:26	27.70	56.29	Mn4.1	IGTU
										27.51	56.47	MI4.3	IIEES
										27.54	56.22	mb4.5	NEIC

Strong Motion Data (BHRC)								Seismological Data					
No.	Station	Record No.	Coordinate N	Coordinate E	U.P.G.A (cm/s/s)	ts-tp (sec)	Vs30 (m/s)	Origin Time Y/M/D	Origin Time h:m:s	Epicenter N	Epicenter E	Magnitude	Ref.
40	Siah-Cheshmeh	5325	39.07	44.39	72	14.9		2011/10/23	10:41:21	38.51	43.46	Mw7.0	BHRC
	Makoo	5323	39.29	44.45	29	14.5							
	Avagiq	5322	39.33	44.16	26	12.7							
	Salmas1	5327	38.20	44.85	25	-							
	Qotoor	5329	38.48	44.41	21	14.5							
	Hadi Shahr	5331	38.84	45.66	15	-				38.67	43.71	Mn7.1	IGTU
	Qareziaoddin	5326	38.89	45.02	14	-							
	Pol Dasht	5330	39.35	45.06	14	-							
	Kelvans	5332	38.72	44.70	14	-							
	Khoy	5324	38.55	44.96	13	-				38.63	43.49	Mw7.1	NEIC
	Seylab	5328	38.31	44.76	12	-							
41	Gotvand Dam1	5352	32.27	48.92	36	5.3		2011/10/28	22:48:01	32.49	48.97	Mn4.6	IGTU
	Lali	5336	32.34	49.09	17	4.2				32.46	49.02	Ml4.7	IIEES
										32.46	49.02	mb4.7	NEIC
42	Faryab	5415	28.10	57.23	20	3.4	641	2011/11/13	14:11:06	28.14	57.05	Mn4.5	IGTU
										28.26	57.04	Ml4.4	IIEES
43	Golestan Dam1	5458	37.32	55.28	100	2.1		2011/12/04	08:48:41	37.32	55.35	Mn4.0	IGTU
	Minoodasht	5342	37.23	55.37	78	2.2	449			37.41	55.28	Ml3.5	IIEES
	Golestan Dam2	5459	37.33	55.29	48	1.6							
44	Esfarayen	5343	37.06	57.50	28	2.4		2011/12/08	20:04:33	37.18	57.56	Mn4.5	IGTU
	Esfarayen Dam2	5618/01	37.08	57.64	18	3.9				37.13	57.45	Ml4.3	IIEES
45	Parsian	5340/02	27.21	53.04	152	2.3	549	2011/12/09	03:23:33	27.21	53.08	Mn4.9	IGTU
										27.09	53.21	Ml4.7	IIEES
										27.20	53.15	mb4.9	NEIC
46	Nosrat Abad	5350	29.86	59.98	22	6.3		2011/12/19	01:52:56	30.16	59.41	Mn4.6	IGTU
										30.04	59.47	Ml4.5	IIEES
47	Garmkhan	5348/01	37.51	57.49	66	1.3		2011/12/26	01:49:12	37.57	57.63	Mn4.2	IGTU
	Naveh	5349/01	37.67	57.42	44	2.8				37.63	57.57	Ml4.1	IIEES
										37.63	57.57	mb4.5	NEIC

REFERENCES

1. Road, Housing and Urban Development Research Center. www.bhrc.ac.ir
2. Institute of Geophysics Tehran University, Iran Seismological Center. www.irsc.ut.ac.ir
3. International Institute of Earthquake Engineering and Seismology. http://www.iiees.ac.ir
4. National Earthquake Information Center. http://earthquake.usgs.gov/regional/neic/