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SOURCE CHARACTERISTICS OF THE 2005 ZARAND EARTHQUAKE IN KERMAN PROVINCE, SOUTH-EAST IRAN

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On February 22, 2005, at 2h 25m 22.6s (GMT), a shallow destructive earthquake with a magnitude 6.4 occurred in Zarand, Kerman province. The epicenter was calculated 30.78N and 56.90E. This earthquake was felt in Kerman province. The main shock was recorded by 27 stations. Furthermore, 30 aftershocks were recorded with a maximum magnitude of 4.2. There are several methods for finding source characteristics. The basis of stochastic finite fault method has the ability to combine models derived for spectra amplitude of ground motion with respect to the randomness of high-frequency motions. Source parameters as initial data in stochastic finite fault method are stress reduction, corner frequency, quality factor, a rate of tectonic. We estimated the size of the main fault about 15 km in length and 9 km in width. The rupture started at depth of 12 km. The best value for strike and dip were 276 and 45 degrees, respectively. The stress drop, corner frequency, quality factor and rate of tectonic were estimated as 33bar, 1.25Hz, 120 and 0.84. Rupture was initiated at (i,j)=(1,3) element. In addition, the estimated fault plane solution shows the mechanism as reverse and the northern block acted as a hanging wall.

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The dimensions of the fault were obtained using Walls and Cooper's Equality of 15 km along the length and 9 km in width and dimensions of the element 1 × 1 were considered. After obtaining information about the fault plane, we need to extend the fault slope to enter the simulation program. Considering the values reported by different seismological centers, the optimal amount of 71 degrees and the 44 degree gradient was ultimately estimated. Table 1 shows the comparison of the results of this study with the reported results from others studies. Based on the comparison of observed and simulated real-time simulations, the values obtained for the fault in this study are consistent with real topography, and in Table 2, the best input parameters for the simulation of Zarand earthquake in Kerman are indicated. The results are presented as comparative observable and simulated topography in the time domain. In the time domain, observed, simulated acceleration, velocity and displacement figures are plotted and compared.

Table 1. The site boost factor.

Freq (Hz)	0.01	0.09	0.16	0.51	0.84	1.25	2.26	3.17	6.05	16.6	61.2
$V_3 = 520 m/s$	1	1.21	1.32	1.59	1.77	1.96	2.25	2.42	2.7	3.2	4.1

The results are presented as comparative and simulated topography in time and frequency domain. In the time domain, observed, simulated acceleration, velocity and displacement figures are plotted and compared in the frequency domain, February spectrum, and observation and simulated response spectrum. The stress drop is estimated as 70 bars. The centroid moment tensor solution for a best double couple point source shows two nodal planes striking N56E (dipping 89 SE) and N146E (dipping 58) indicating predominantly reverse mechanisms and are in agreement with the activated fault system and the mechanism of other earthquakes in this region. From the engineering point of view, Zarand earthquake, which provided ground-motion characteristics of a rare large event in the affected area, was the controlling event for the design of structures with high safety requirements.

Table 2. Application input parameters.

Amounts	Application input parameters Exsim
279 46	stretch slope
15	Fault length
9	Fault width
30.750 56.801	Main coordinates of the earthquake
12	Focal depth of the earthquake
6.3	(M_w) great
15	Number of elements in length
9	Number of elements in width
3.2 km/s	Shear wave velocity
2.56 km/s	Propagation speed
43	Loss of tension
130 0.94	Quality factor tectonic coefficient
32.14 56.25	Fault corner coordinates

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