

New catalogue of felt Indian earthquakes during 1901-1971

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सार — तीन समाचार पत्रों, मुख्यतः टाइम्स ऑफ इंडिया, हिन्दू तथा स्टेट्समैन में प्रकाशित रिपोर्टों के आधार पर 1901-1971 की अवधि के लिए भारत में अनुभव किए गए भूकम्पों की नई सूची तैयार की गई है।

ABSTRACT. A new catalogue of felt earthquakes in India has been prepared for the period 1901-1971 based on the reports published in three newspapers namely, *Times of India*, *Hindu* and *Statesman*.

Key words — Epicentre, earthquake.

1. Introduction

Quantification of earthquake risk in the Peninsular India is more difficult due to its relatively less seismic status and larger recurrence interval of earthquakes compared to the Himalayan region. The rapid growth of industrial installations, nuclear and thermal power plants, dams and multistoreyed buildings, however, require more representative design parameters for which reliable seismological data is needed. Since the epicentral parameters of earthquakes of magnitude 4 or less cannot be reliably determined in the Indian region and often remain undetected due to sparse network of seismological stations except close to a few dams, the only alternative is to collect information for the felt earthquakes through the newspaper records. For this purpose, a project was undertaken by India Meteorological Department to scan the microfilms of the three newspapers namely, *Statesman*, *Hindu* and *Times of India*. Based on this, Srivastava and Ramachandran (1985) have published a new catalogue for peninsular earthquakes which brought out a large number of earthquakes of slight to moderate intensity for the pre-instrumental period (1831-1900).

The object of this paper is to prepare a catalogue of felt earthquakes in the Indian region for the period 1901-1970 based upon the newspaper reports in *Statesman*, *Hindu* and *Times of India*. This also includes earthquakes whose parameters determined by IMD/ISC/USG were reported by Tandon and Srivastava (1974) but felt reports were not included. Thus the additional information now available is supplementary to the IMD catalogue for earthquakes of magnitude 5 and more.

2. Previous earthquake catalogues

Earthquake catalogues for the Indian region have been prepared by :

- (i) Oldham (1883) giving the list of significant earthquakes upto 1869,
- (ii) Gubin (1968) — Significant earthquakes of Peninsular India up to 1966,
- (iii) Tandon and Srivastava (1974) — Earthquakes of magnitude 5 or more during the last 200 years; epicentre of earthquakes up to 1900 based on felt reports and after 1901 based on instrumental data,
- (iv) Chandra (1977) — Earthquakes up to 1975 from different sources for Peninsular India,
- (v) Srivastava and Das (1982),
- (vi) Srivastava and Ramachandran (1985) and
- (vii) Bapat *et al.* (1983).

In addition, seismological notes prepared by India Meteorological Department also provide valuable information for Indian earthquakes which were being published in *Mausam* earlier and are now published in *Bulletin Indian Society of Earthquake Technology*. A number of earthquakes have also been detected through the BARC Array at Gauribidnaur, NGRI observatory, Hyderabad and the network of IMD/NGRI/RRL stations in northeast India. A few earthquakes reported in *Indian Express* have also been added.

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TABLE 1
Felt earthquakes over India (1901-1970)

Date	Place	Intensity (M. M.)	Source	Remarks	Date	Place	Intensity (M. M.)	Source	Remarks
(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
6-8-1901	Darjeeling	III	Sta/8-8-01		4-9-1925	Gopalpore	III	Sta/5-9-25	
	Jiagunj	III	10-8-01 11-8-01			Cuttack	III	8-9-25	
3-2-1902	Cooch Behar	III	Sta/12-2-02		15-3-1927	Calcutta	IV	Sta/16-3-27, 17-3-27	Epicentre 24.5°N, 95.0°E, Mag. 6.5, Origin time 16 h 50 m 32 sec.
29-3-1902	Darjeeling	II	—			Jalpaiguri	II	TOI/17-3-27	
15-8-1902	Cooch Behar	III	Sta/22-8-02			Darjeeling	II	Hin/17-3-27	
4-5-1904	Colombo	II-III	Sta/13-5-04		2-6-1927	Calcutta	II	Sta/3-6-27	Epicentre 24.5°N, 82.0°E, Mag. 6.5, Origin time 16 h 37 m 24 sec
24-6-1904	Calcutta	II	Sta/26-6-04			Asansol	II	TOI/4-6-27, 6-6-27	
21-7-1904	Junagadh	III	Sta/28-7-04			Jubbulpore	II		
24-11-1904	Balaso	III	Sta/26-11-04			Chindware	II		
18-12-1904	Darjeeling	III	Sta/20-12-04			Nagpur	II		
2-4-1905	Ongole	V	Sta/4-4-05		29-7-1927	Madras	II	Sta/30-7-27	
	Madras	III	TOI/4-4-05, 5-4-05		25-12-1927	Jamshedpur	II		
26-3-1906	Bombay	VI	Sta/27-3-06, TOI/27-3-06		9-3-1928	Colombo	III	TOI/12-3-28	
3-5-1906	Darjeeling	IV	Sta/5-5-06		27-5-1928	Darjeeling	III	TOI/29-5-28	
10-10-1906	Darjeeling	III-IV	Sta/11-10-06, 13-10-06		5-11-1928	Bombay	III	Sta/8-11-28	
6-12-1906	Calcutta	III	Sta/7-12-06, TOI/7-12-06		8-12-1928	Nagapatam	III	Hin/11-12-28	
4-4-1908	Calcutta	II	Sta/5-4-08		9-1-1928	Midnapur	III	Sta/12-1-29	
5-7-1908	Darjeeling	III	Sta/7-7-08		30-12-1929	Alipore	II	Sta/31-12-29	
	Kurseang	III			5-5-1930	Alipore	III	Sta/6-5-30, TOI/7-5-30	
23-9-1908	Darjeeling	III	Sta/25-9-08		11-7-1930	Calcutta	VI	Sta/12-7-30	
July 1909	Calcutta	III	TOI/30-8-09		21-7-1930	Kandi	III	Sta/24-7-30	
14-7-1909	Darjeeling	II	Hin/15-7-09		13-8-1930	Jamshedpur	IV	Sta/15-8-30, TOI/15-8-30	
28-8-1909	Calcutta	II	Sta/29-8-09, 31-8-09		17-4-1933	Marcara	III	Sta/22-4-33	
	Serampore	II			16-7-1933	Bombay	II	Sta/18-7-33	
	Dinajpore	II			17-7-1933	Bombay	V	TOI/18-7-33, 17-9-33	
Sept. 1909	Ongole	III	TOI/29-9-09			Lonavla	III		
1-9-1910	Kalyan	III	Sta/3-9-10, TOI/3-9-10			Poona	III		
7-9-1910	Balasure	III	Sta/8-9-10			Nasik	III		
25-9-1910	Jodhpur	III	TOI/28-9-10			Kalyan	III		
27-9-1910	Jodhpur	II	Hin/28-9-10		4-12-1933	Cooch Behar	III	Sta/8-12-33	
5-10-1911	Calcutta	II	Hin/6-10-11		11-1-1934	Sivakasi	V	Sta/13-1-34	
8-12-1911	Calcutta	III	Hin/8-12-11			Virudhunagar	III		
22-5-1912	Calcutta	II	Sta/24-5-12			Sattur	III		
5-6-1912	Kolar Goldfield	III	Sta/9-6-12			Srivilliputtur	III		
12-6-1912	Kalimpong	III	Sta/13-6-12		20-2-1934	Bobbili	III	Sta/22-2-34	
	Darjeeling	II			13-4-1934	Darjeeling	II	Sta/16-4-34	
13-11-1912	Manikganj	II	Sta/14-11-12		23-8-1934	Darjeeling	II	Sta/24-8-34	
14-11-1912	Manikganj	II	Sta/19-11-12		15-10-1934	Sholapur	III	TOI/16-10-34	
22-1-1913	Ceylon	III	Sta/22-1-13		21-10-1934	Sholapur	II	TOI/24-10-34	
1-11-1913	Darjeeling	III	Sta/4-11-13		4-12-1934	Periapatna	II	Sta/6-12-34	
14-12-1913	Narayanavaram	II-III	Sta/8-7-15		9-1-1935	Chinsurah	II	Sta/11-1-35	
7-1-1916	Ootacamund	III	Sta/8-1-16		15-1-1935	Jaipur	V	Hin/16-1-35, Sta/17-1-35	
18-5-1917	Vizianagaram	III	Hin/18-5-17		20-5-1935	Malda	III	TOI/22-3-35	
	Gaya	II	Sta/22-5-17, 24-5-17			Satkhira	III		
8-7-1918	Calcutta	VI	Sta/9-7-18			Calcutta	III		
	Krishnagar	V	10-7-18, 12-7-18, 13-7-18, 14-7-18, 17-7-18, 19-1-19	Epicentre 24.5°N, 91°E, Mag. 7.6, Origin time 10 h 22 m 07 sec (GMT)		Chinsurah	III		
	Asansol	III				Chandenagore	III		
30-7-1918	Ranchi	IV	Sta/2-8-18		21-3-1935	Calcutta	V	TOI/22-3-35	
9-9-1923	Calcutta	VI	Sta/11-9-23		24-3-1935	Siliguri	III	Sta/27-5-35	
	Darjeeling	III	TOI/11-9-23, 12-9-23	Epicentre 25.25°N, 91°E, Mag. 7.1, Origin time 22 h 03 m 42 sec (GMT)	23-4-1935	Siliguri	III	Sta/25-4-35, 26-4-35	
16-1-1924	Bombay	IV	TOI/17-1-24			Berhampore	III		
	Surat	IV	19-1-24			Faridpore	III	Hin/26-4-35	Epicentre 25.1°N, 94.7°E, Mag. 6, Origin time 16 h 45 m 41 sec
24-3-1925	Darjeeling	III	Sta/24-3-25			Krishnagar	III		
21-6-1925	Gaganbavda	IV	TOI/1-7-25			Chinsurah	III		
	Rajapur	IV				Satkhira	III		
						Bally	III		
						Cooch Behar	III		
						Dumka	III		

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TABLE 1 (Contd.)

(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
4-7-1935	Siliguri	II	Hin/6-7-35		31-10-1940	Rajkot	V	Hin/1-11-40, TOI/1-11-40	
	Kalimpong	II				Junagadh	IV	2-11-40	
	Jalpaiguri	II				Amreli	IV	4-11-40	
16-7-1935	Jaipur	IV	TOI/18-7-35			Dharangdhara	IV		
15-8-1935	Dhanbad	III	TOI/16-8-35			Morvi State	III		
15-9-1935	Kalyan	IV	Hin/17-9-35, 18-9-35			Cutch-Mandvi	III		Epicentre 23.7°N, 69.9°E, Magnitude 6.0, Origin time 10 h 43 m 50 sec
15-9-1935	Bombay	II	TOI/17-9-35						
5-11-1935	Mettur	II	Hin/9-11-35		November 1940	Cutch-Mandvi	III	TOI/16-11-40	
Nov 1935	Kottakkal	III	TOI/15-11-35						
21-11-1935	Mettur	IV	Sta/27-11-35		28-5-1941	Ratnagiri	V	Hin/30-5-41	
8-12-1935	Siliguri	III	Hin/11-12-35, Sta/12-12-35			Bombay	III	TOI/30-5-41	
8-4-1936	Pachmarhi	IV	Hin/8-4-36		26-6-1941	Madras	VI	Hin/27-6-41, 28-6-41	
27-5-1936	Siwan	IV	TOI/28-5-36			Visakhapatnam	V	29-6-41	
	Patna	IV				Chandernagaon	IV	TOI/27-6-41	
9-6-1936	Siliguri	IV	Hin/9-6-36			Cuttack	III		Epicentre 12.4°N, 92.5°E, Magnitude 8.1, Origin time 15 h 52 m 00 sec
	Patna	III	TOI/10-6-36			Calcutta	III		
	Gaya	III				Ceylon	III		
	Siwan	III			18-7-1941	Purnea	II	Hin/20-7-41	
26-10-1936	Siliguri	III	Hin/27-10-36		21-2-1942	Malda	III	Hin/23-2-41	
11-1-1937	Bombay	III	Hin/14-1-37			Serajunje	III	TOI/24-2-42	
16-5-1937	Salem	IV	Hin/17-3-37		23-10-1943	Burdwan	III	Hin/25-10-43	
22-8-1937	Batamcherla	IV	Hin/24-8-37			Hazaribagh	III	TOI/25-10-43, 26-10-43	
	Malliyala R.S.	II				Dhanbad	III	27-10-43	
8-1-1938	Chittoor	IV	Hin/11-1-38			Muzaffarpur	III		Epicentre 26.4°N, 94.0°E, Mag. 7.2, Origin time 17 h 23 m 17 sec (GMT)
18-1-1938	Darbhanga	III	Hin/19-1-38			Patna	III		
29-1-1938	Muzaffarpur	III	Hin/29-1-38						
	Darbhanga	III	TOI/31-1-38						
14-4-1938	Purnea	V	TOI/15-4-38	Epicentre 22.5°N, 94.5°E, Mag. 5.2	31-1-1944	Darjeeling	III	Hin/4-2-44	
	Calcutta	III			6-2-1944	Chittoor	III	Hin/11-2-44	
	Malda	III			18-2-1944	Muzaffarpur	IV	Hin/19-2-44	
	Barhampore	III				Patnai	III	TOI/19-2-44	
	Krishnagar	III			29-2-1944	Madurai	V	TOI/2-3-44	
	Siliguri	III				Coonoor	IV	Hin/3-3-44	
5-7-1938	Paliad (Gujarat)	II	TOI/11-7-38			Colombo	III		
	Vinchja	II							
July 1938	Nagar	III	TOI/11-7-38		2-10-1944	Jaipur	III	TOI/6-10-44	
	Shankarnarayan	III			6-6-1945	Visakhapatnam	V	Hin/10-6-45, 11-6-45	
	Hosangali	III			29-12-1945	Monghyr	IV	Hin/3-1-46	
12-7-38	Bhavnagar	IV	Hin/12-7-38		19-1-1946	Jubbulpore	III	TOI/21-1-46	
	Paliad	IV	Hin/14-7-38		12-5-1946	Baudhraj	VI	TOI/28-5-46, Hin/28-5-46	
23-7-1938	Virangam	III	Hin/24-7-38		2-11-1946	Muzaffarpur	III	TOI/4-11-46, Hin/5-11-46	
13-8-1938	Paliad	IV	TOI/17-8-38		29-7-1947		III	Hin/31-7-47, 2-8-47	
26-8-1938	Behrampore	III	Hin/27-8-38			Balurghat	III	5-8-47	
10-9-1938	Dindigil	V	Hin/11-9-38, 12-9-38			Calcutta	III	TOI/1-8-47, 5-8-47	
	Tirumavali	IV	13-9-38, 14-9-38		6-2-1948	Rayadurg	IV		
	Tuticorin	III	TOI/12-9-38		25-5-1948	Jaipur	II	TOI/28-5-48	
	Srivilliputtur	III			16-6-1948	Gobichetti- Palayam	III	TOI/17-6-48	
	Nagercoil	III			9-7-1948	Chicacole	III	Hin/14-7-48	
	Tirvillia	III			15-9-1948	Chittoor	III	Hin/17-9-48	
	Pudukkottai	III			28-9-1948	Calcutta	III	Hin/30-9-48, 1-10-48	
	Madura Town	III			7-12-1948	Calcutta	III	Hin/9-12-48, 10-12-48, TOI/9-12-48	
	Kottayam	III			19-1-1950	Pudukkottah	III	Hin/22-1-50	
17-1-1939	Jaipur	IV	Hin/18-1-39 TOI/19-1-39		23-1-1950	Tirunelveli	III	Hin/25-1-50	
22-1-1939	Purnea	III	Hin/22-1-39			Vikramasinga- puram	III		
	Darjeeling	III	TOI/23-1-39			Mannarkoil	III		
19-4-1939	Hyderabad	IV	Hin/20-4-39			Ambur	III		
	Secunderabad	IV	TOI/20-4-39			Kadayam	III		
29-4-1939	Darbhanga	VI	Hin/30-4-39 TOI/1-5-39			Tenkasi	III		
20-8-1939	Tirvottur	V	Hin/24-8-39		14-2-1950	Berhampore	III	TOI/16-2-50	
1-10-1939	Muzaffarpur	IV	Hin/2-10-39						
	Patna	III	TOI/3-10-39						
	Kishanganj	III							
	Darbhanga	III							
5-11-1939	Amraoti	III	TOI/11-11-39						
6-4-1940	Salem District	III	TOI/17-4-40						

TABLE 1 (Contd.)

(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	
2-8-1951	Mattur	III	Hin/6-8-51		16-8-1956	Sehore	III	TOI/18-8-56		
	Meeteri	III			17-8-1956	Ramseen village	III	TOI/21-8-56		
20-8-1951	Midnapore	III	Hin/22-8-51		18-8-1956	Ramseen village	III	Do.		
20-9-1951	Dadvel	III	Hin/24-9-51		31-8-1956	Sehore	III	TOI/2-9-1956		
9-5-1952	Rangamalai	VI	Hin/12-5-52, 14-5-52, 17-5-52		10-10-1956	Jaipur	III	TOI/11-10-56, Hin/16-10-56		
29-5-1952	Rangamalai	V	Hin/1-6-52		5-11-1956	Gulbarga	III	Hin/13-11-56		
3-6-1952	Rangamalai	VI	Hin/8-6-52		15-18 Dec. 1956	Ramseen village	III	TOI/26-12-56		
6-6-1952	Rangamalai	IV	Hin/13-6-52, 21-6-52, 29-6-52		1-1-1957	Kalimpong	IV	TOI/2-1-57, Hin/3-1-57		
20-10-1952	Krishnagiri	III	Hin/25-10-52		28-2-1957	Jabalpur	III	TOI/2-3-57		
	Kaveripatnam	II	TOI/23-10-52		20-4-1957	Ongole	III	Hin/23-4-57		
	Bairanathan	II			1-7-1957	Calcutta	III	TOI/3-7-57		
	Dowlatabad	II				Cooch Behar	II			
	Dharmapuri	II				Berhampur	II			
	Poosaripath	II			10-7-1957	Anjar	III	Hin/11-7-57, TOI/11-7-57		
17-12-1952	Kolar Town	III	Hin/21-12-52		20-7-1957	Gaganbavda	III	TOI/22-7-57		
25-2-1953	Tirumalvai	IV	Hin/27-2-53			Talkanka (near Kolhapur)	III			
	Therava & Eloghat Islands (near Ernakulam)	IV	TOI/27-5-53		25-8-1957	Jabalpur	IV	TOI/27-8-57		
	Madurai	III				Nagpur	II	Hin/27-8-57		
	Trivandrum	III				Chindwara	II			
	Peeramade hills	III			4-10-1957	Tiruchirapalli	IV	Hin/5-10-57		
22-5-1953	Jamshedpur	III	TOI/23-5-53			Thiraiyur	IV	TOI/5-10-57, 6-10-57		
2-4-1953	Valley east of Kottayam	VII	Hin/10-4-55			Salem	III			
						Tirchengodu	III			
29-8-1953	Gorakhpur	V	TOI/30-8-53	Epicentre Lat 27.9° N, Long. 82.2° E, Mag. 6.0		Rasipuram	III			
	Patna	V	Hin/30-8-53				Kulittalai	II		
	Muzaffarpur	V				13-1-1958	Ongole	V	Hin/16-1-58	
	Bhagalpur	III				26-4-1958	Anjar	V	TOI/29-4-58	
	Gaya	III					Gandhidham	V	—	
	Raxaul	III			30-10-1958	Bangalore	IV			
5-1-1954	Ramavaram	III	TOI/6-1-54, Hin/6-1-54			Palakodu	III	TOI/31-10-58		
5-1-1954	Bhadrachalam	V	Hin/7-1-54			Dharampura	III			
9-2-1954	Vizianagaram	II	Hin/10-2-54			Taripattur	III			
10-2-1954	Kalimpong	III	Hin/12-2-54, TOI/12-2-54		23-11-1958	Patna	II	Hin/26-11-58, TOI/26-11-58		
11-3-1954	Vizianagaram	III	Hin/14-3-54		3-12-1958	Patna	III	Hin/4-12-58		
2-8-1954	Salem	IV	TOI/3-8-54			Raxaul	III	TOI/4-12-58		
	Shevapet	III	Hin/4-8-54			Ghochardihe	III			
	Arisipalayam	III				Muzaffarpur	III			
	Ammapet	III			15-1-1959	Anjar	II	TOI/18-1-59		
	Hastampatti	III			24-5-1959	Katihar	III	Hin/25-5-59		
	Gurusampalaya- yam	III				Monghur	III			
4-9-1954	Gorakhpur	IV	TOI/5-9-54, 6-9-54		1-6-1959	Gargoti (near Kolhapur)	III	TOI/4-6-59		
	Motipari	III			15-6-1959	Ongole	III	Hin/18-6-59		
27-11-1954	Calcutta	III	TOI/28-11-54		27-7-1959	Nilgiri	III	TOI/29-7-59		
6-13 July 1955	Dhavalgi	III	TOI/14-7-55			Tellichery	III	Hin/30-7-59		
11-7-1955	Mysore	V	TOI/13-7-55		9-8-1959	Cannanore	III			
5-8-1955	Dhavalgi	III	TOI/8-8-55				IV			
30-1-1956	Sehore	VI	Hin/1-2-56, TOI/1-2-56		9-8-1959	Vizianagaram	III	Hin/26-8-59		
					25-8-1959	Puri	III	Hin/26-8-59		
2-2-1956	Sehore	IV-VII	TOI/3-2-56, 5-2-56		9-9-1959	Bhubaneswar	III			
						Cuttack	V	Hin/23-9-59		
5-2-1956	Sehore	IV	TOI/7-2-56		21-9-1959	Palghat District	V	Hin/23-9-59		
10-2-1956	Sehore	III	TOI/12-2-56		24-9-1959	Dakore	III	Hin/26-9-59		
18-2-1956	Ongole	IV	Hin/21-2-56		12-10-1959	Ongole	VI-VII	Hin/13-10-59, 14-10-59		
19-2-1956	Raiganj	III	TOI/21-2-56, Hin/21-2-56			Hyderabad	IV	TOI/13-10-59		
						Chirala	III			
2-4-1956	Jalpaiguri	III	TOI/5-4-56			Tenali	III			
	Raiganj	III			2-11-1959	Mandvi	III	Hin/6-11-59		
July 1956	Sehore	III	—		19-1-1960	Ongole	III	Hin/22-1-60		
7-8-1956	Ramseen village (Rajasthan)	VI	Hin/15-8-56		28-1-1960	Tirupati	IV	Hin/29-1-60		
12-8-1956	Ramseen village	III	Hin/18-8-56		26-5-1960	Sikiguri	III	Hin/28-5-60		
13-8-1956	Sehore	III	Hin/18-8-56, TOI/18-8-56		21-8-1960	Jalpaiguri	III	TOI/22-8-60, 24-8-60		

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TABLE 1 (Contd.)

(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
27-8-1960	Jaipur	III	TOI/28-8-60 29-8-60		12-7-1965	Bombay	III	TOI/14-7-65	
19-10-1960	Srikakulam	IV	Hin/21-10-60		24-3-1966	Cooch Behar	III	TOI/25-3-66	
26-1-1961	Bombay	III	Hin/28-1-61		10-4-1966	Madras	V	Hin/12-4-66, 14-4-66, 18-4-66	
4-2-1961	Siliguri	III	Hin/5-2-61, 6-2-61		24-4-1966	Madras	III	TOI/12-4-66 Hin/25-4-66, 26-4-66	
18-2-1961	Muzaffarpur	III	TOI/18-2-61		4-5-1966	Bombay	III	TOI/5-5-66 Hin/5-5-66	
2-9-1961	Karwar Taluka	IV	TOI/4-9-61, Hin/6-9-61		13-7-1966	Madras	III	Hin/14-7-66	
4-9-1961	Karwar	III	TOI/6-9-61		28-9-1966	Madras	II ₁	Hin/29-9-66	
5-9-1961	Godha	III	TOI/7-9-61		11-1-1967	Palitana	II ₁	Hin/13-1-67	
11-9-1961	Gangtol	VI	TOI/12-9-61		17-2-1967	Ulhasnagar, Kalyan (near Bombay)	III	TOI/18-2-67	
14-9-1961	Chadbet (Rann of Kutch)	III	Hin/23-9-61		4-3-1967	Madras	IV	Hin/5-3-67	
24-9-1961	Calicut	III	Hin/26-9-61		5-3-1967	Madras	III	Hin/6-3-67	
	Calicut	III			25-4-1967	Poona	V	Hin/26-4-67	
	Ramahettukere (near Calicut)	IV	Hin/27-9-61			Bombay Mahabaleshwar	III III	TOI/26-4-67	Epicentre Lat 18.2°N, Long. 73.4°E
27-9-1961	Calicut	III	Hin/29-9-61		6-5-1967	Jalpaiguri	III	Hin/8-5-67	
28-10-1961	Anjar	III	TOI/29-10-61		16-7-1967	Calcutta	III	Hin/17-7-67 TOI/17-7-67	
7-1-1962	Calicut	IV	Hin/9-1-62		28-7-1967	Vizianagaram	III	Hin/29-7-67	
7-2-1962	Kotagiri	V	Hin/10-2-62		31-7-1967	Virpur (near Rajkot)	VI	TOI/2-8-67	
15-2-1962	Porbander	V	Hin/17-2-62			Jatpur Doraji	III III		
15-2-1962	Siliguri	III	Hin/16-2-62		18-10-1967	Jaipur	III	TOI/23-10-67	
9-3-1962	Madhi (near Surat)	III	Hin/10-3-62		18-8-1968	Cooch Behar	III	Hin/19-8-68	
17-3-1962	Bhuj	III	Hin/18-3-62		10-10-1968	Krishnagar	III	IEX/11-10-68	
11-1-1963	Gangtok	III	Hin/13-1-63		16-10-1968	Jatpur Town	III	TOI/18-10-68	
18-2-1963	Cooch Behar	III	Hin/20-2-63		18-10-1968	Jatpur	VI	IEX/20-10-68	
24-3-1963	Bombay	IV	TOI/26-3-63		17-12-1968	Dharangadhara Balambha	III III	TOI/19-12-68	
9-4-1963	Calcutta	III	Hin/10-4-63	Epicentre Lat. 22.5°N, Long. 85.9°E (CGS)	3-5-1969	Calcutta	III	Hin/4-5-69 TOI/4-5-69	
	Jamshedpur	III			10-5-1969	Jamshedpur	IV	Hin/12-5-69 TOI/4-5-69	
	Rourkela	III			20-8-69	Jaipur	III	TOI/21-8-69 Hin/21-8-69	
	Cuttack	III			5-11-1969	Cooch Behar	III	TOI/7-11-69	
	Bairpada	III			12-2-1970	Mysore	III	TOI/14-2-70	
8-6-1963	Mount Abu	III	Hin/10-6-63			Hunsur	III		
1-2-1964	Gangtok	III	TOI/2-2-64		28-3-1970	Kathagudam	V	Hin/30-3-70	
	Darjeeling	III	Hin/3-2-64			Bhadrachalam	III	TOI/30-3-70	
28-3-1964	Darjeeling	III	TOI/29-3-64		31-3-1970	Bhadrachalam	IV	Hin/2-4-70	
	Jalpaiguri	III			26-4-1970	Broach	III	TOI/27-4-70	
	Cooch Behar	III				Panoli	II ₁		
15-4-1964	Calcutta	VI	Hin/16-4-64 TOI/16-4-64			Ankleshwar	III		
23-6-1964	Chalal village	IV	Hin/25-6-64			Shukla Teerth	III		
31-7-1964	Deeghar	III	Hin/3-8-1964			Vapipur	III		
7-10-1964	Pandalam- Adder	III	TOI/8-10-64		24-5-1970	Bhuj	III	TOI/26-5-70	
25-11-1964	Bombay	III	TOI/26-11-64		25-7-1970	Raiganj	III	TOI/26-7-70	Epicentre 25.7°N, 88.5°E, Mag. 5.2
12-1-1965	Darjeeling	III	TOI/13-1-65, 14-1-65		29-7-1970	Katihar	III		
	Jalpaiguri	III				Ranchi	III	TOI/30-7-70, 31-7-70	
	Cooch Behar	III	Hin/13-1-65, 14-1-65			Monghyr	III		Epicentre 26.0°N, 95.4°E, Mag. 6.5
	Gangtok	III	TOI/13-1-65, 14-1-65			Jamshedpur	III		
	Katihar	III		Epicentre 27.6°N, 88.0°E Mag. 6.1, Origin time 13 h 32 m 24 sec (GMT)		Kishanganj	III		
	Siliguri	III				Calcutta	III		
	Alipurdar	III				Krishnagar	III		
	Ghoghadhike	III				Cooch Behar	III		
	Mirmali	II ₁			4-6-1965	Ratnagiri	VI	TOI/5-6-65	
	Monghyr	III				Bombay	III		
4-6-1965	Ratnagiri	VI	TOI/5-6-65		6-9-1970	Broach	VI	Hin/8-9-70	
	Bombay	III			27-1-1971	Jamshedpur	IV	TOI/29-1-71	
8-7-1965	Jamnagar	III	Hin/9-7-65 TOI/9-7-65		26-5-1971		IV	Hin/27-5-71	

TABLE 2
Field effects of felt earthquakes

Date	Felt at	Description of earthquake	Intensity	Epicentre magnitude	Source
(1)	(2)	(3)	(4)	(5)	(6)
2 Apr 1905	Ongole (A.P.)	Felt severely. A number of buildings were damaged.	V	—	Sta/4-4-1905 TOI/4-4-1905
26 Mar 1906	Bombay (Maharashtra)	Felt severely, duration about 20 sec. A few cracks developed in some buildings. Water kept in basins disturbed. Chairs moved and windows rattled. Vibrations felt in multi-storeyed buildings and cracks appeared in a wall of the Police building at Dhobi Talao. In Girgaum, Chinaware and other wares were shaken.	VI	—	Sta/27-3-1906 TOI/27-3-1906
8 Jul 1918	Calcutta (W.B.)	Accompanied by a slight rumbling noise. People rushed into the streets in panic. Seismograph recording pens at Alipore were thrown off the recording drum. The earth's vibration appeared to be in a twisting motion. Some plaster fell of the ceiling in Xvaier's college. The High court building swayed violently and fans and lights started swinging. Most of the clocks in the court stopped. Steeples of churches swayed violently. Cracks (5 to 12 ft long) appeared in few buildings including the University Institute. Municipal market developed serious cracks. Crows created a great flutter, dogs barked violently.	VI	24.5 N, 91.0 E 7.6	Sta/9, 10, 12, 13, 14, 17 Jul 1918; 19 Jan 1919
8 Jul 1918	Krishnagar (W. B.)	Felt for about 2 min. Direction appeared from east to west. Slight damage to property reported.	V	24.5 N, 91.0 E 7.6	Sta/9, 10, 12, 13, 14, 17 July 1918; 19 Jan 1919
30 Jul 1918	Ranchi (Bihar)	Felt for about 4 sec. Almirahs and tables shook, students from a local school rushed out in panic.	IV	—	Sta/2-8-1918
9 Sep 1923	Calcutta (W.B.)	Felt severely. People ran out into the streets. One person was killed. Duration estimated about 1 minute. Recording pen of Seismograph at Alipore observatory thrown off the recorder. High rise buildings affected more than single storeyed buildings. Ornaments thrown off the tables and pictures on wall damaged. Clocks with pendulum swing in an east-west direction stopped at initial shock. Kutcha buildings in north Calcutta damaged considerably. Some bustees completely collapsed. In an instance crows became restless and were found cawing. Water started flowing out of a geyser which had tilted considerably. Light pendant swung more than 4 ft.	VI-VII	25.3 N, 91.0 E 7.1	Sta/11-9-1923
16 Jan 1924	Bombay (Maharashtra)	Two earthquake shocks lasting a few sec each were felt. People were awakened from their sleep. The shock was felt, more in Fort, Dhobi Talao, Marine Lines and Queens road areas. The shock was accompanied by rumbling noise. Doors and windows rattled. The shock was also felt at Palghar near Bombay.	IV	—	TOI/17-1-1924, 19-1-1924
	Surat (Maharashtra)	Two shocks were felt. Doors and windows rattled and glasses jingled. Duration a few sec.	IV	—	TOI/17-1-1924, 19-1-1924
21 Jun 1925	Gaganbavda, Rajapur (Maharashtra)	People felt the shaking of the ground and movement of stones. Duration estimated about 1-2 sec. Two houses collapsed near Rajapur.	IV	—	TOI/1-7-1925
15 Mar 1927	Calcutta (W. B.)	Duration about 30 sec. Felt in certain parts of southern suburbs. No damage was reported. Ceiling fans started swinging and clocks stopped.	IV	24.5 N, 95.0 E 6.5	Sta/16-3-1927, 17-3-1927

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)
11 Jul 1930	Calcutta (W. B.)	Duration about 5 sec. Part of a hundred year old building collapsed.	V	25.0 N, 95.0 E 5.5	Sta/12-7-1930
13 Aug 1930	Jamshedpur (Bihar)	Accompanied by a sound like an explosion. Duration about 15 sec.	IV	—	Sta/15-8-1930
17 Jul 1933	Bombay (Maharashtra)	Windows and doors banged furiously. Furnitures were upset in many houses. Sleeping residents were rudely shaken in their beds.	V	—	TOI/18-7-1933
	Matheran (Maharashtra)	Caused panic in Bazar areas. People fled outside. A small wall at Kapadia market fell down	V	—	TOI/18-7-1933
11 Jan 1934	Sivakasi (Tamil Nadu)	Duration about a minute. Panic stricken people rushed into the streets. People sleeping on cots were thrown down. Some walls collapsed. Direction of earthquake estimated as from west to east.	V	—	Sta/13-1-1934
11 Feb 1934	Sitamarhi (Bihar)	Felt severely. The earth cracked in some places and water gushed out. A few houses collapsed but no deaths were reported.	VIII	Aftershock	Sta/13-2-1934, 14-2-1934
9 May 1934	Muzaffarpur (Bihar)	Accompanied by a rumbling sound. People rushed out of their houses. Some sustained injuries.	IV	Aftershock	TOI/9-5-1934
1 Jun 1934	Muzaffarpur (Bihar)	Accompanied by a humming sound. Duration about 5 sec. People were awakened from their sleep and rushed out terror stricken. Many damaged walls collapsed.	V	Aftershock	Sta/3-6-1934
29 Aug 1934	Muzaffarpur (Bihar)	Duration about a few seconds. Panic stricken people rushed out for safety.	IV	Aftershock	Hin/30-8-1934 Sta/30-8-1934
	Laherisarai (Bihar)	Preceded by a rumbling sound. Duration about 10 sec. Some houses were damaged. People were panic stricken.	V	—	Do.
15 Jan 1935	Jaipur (Rajasthan)	Accompanied by a sub-terranean rumble sound. A solid masonry wall cracked. Duration of the shock was for a few sec.	V	—	Hin/16-1-1935 Sta/17-1-1935
16 Jul 1935	Jaipur (Rajasthan)	Accompanied by a rumbling sound like the roar of distant guns. Panic stricken people jumped out of their beds and ran into streets.	IV	—	TOI/18-7-1935
23 Aug 1935	Muzaffarpur (Bihar)	Severely felt. Duration about 5 sec. People were awakened from their sleep and rushed out of their houses. A humming sound followed the shock.	V	Aftershock	Hin/24-8-1935, 26-8-1935 TOI/26-8-1935
6 Sep 1935	Cooch Behar (W. B.)	Accompanied by a rumbling noise. People were alarmed.	IV	—	Hin/7-9-1935
15 Sep 1935	Kalyan (Maharashtra)	Preceded by a vibration and lasted for about 2 sec.	IV	—	Hin/17-9-1935, 18-9-1935 TOI/17-9-1935
21 Nov 1935	Mettur (Tamil Nadu)	Accompanied by a rumbling noise and lasting about 2-3 sec.	IV	—	Sta/27-11-1935
26 Nov 1935	Hazaribagh (Bihar)	Felt with severe intensity. Accompanied by a rumbling noise and lasting for about 30 sec. People were awakened from their sleep	V	—	Hin/26-11-1935 Sta/27-11-1935 TOI/27-11-1935
8 Apr 1936	Pachamari (M.P.)	Duration about 20 sec. Accompanied by a rumbling sound. Some houses were shaken.	IV	—	Hin/8-4-1936
27 May 1936	Siwan (Bihar)	Two earthquake shocks accompanied by a rumbling sound were felt. People rushed outside in panic.	IV	28.4 N, 83.3 E 7.0	TOI/28-5-1936
	Patna (Bihar)	Doors and windows rattled violently. Duration about 3 sec. Houses were rocked. People rushed out in panic.	IV	—	Do.

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)
9 Jun 1936	Siliguri (W. B.)	Felt sharply followed by a few mild shocks. Duration about 20 sec. A private residence was slightly damaged.	IV	27.5 N, 87.0 E 5.5	Hin/9-6-1936 TOI/10-6-1936
16 Mar 1937	Salem (Tamil Nadu)	Accompanied by a rumbling noise. Duration about 5 sec. Houses, doors, windows and furniture started vibrating. Sleepers were rudely awakened and rushed into the streets.	IV	—	Hin/17-3-1937
22 Aug 1937	Batamcherla (A. P.)	Duration about 5 sec. Accompanied by a low rumbling noise. The shock was also felt by the guard of the Guntakel-Bazwada train near Maliyala R.S.	IV	—	Hin/24-8-1937
8 Jan 1938	Chittoor (A. P.)	People were awakened from their sleep while some were thrown out of their beds.	IV	—	Hin/11-1-1938
14 Apr 1938	Purnea (Bihar)	Severely felt. Some buildings developed cracks. Panic stricken people rushed out of their houses.	V	22.5 N, 94.5 E	TOI/15-4-1938
12 Jul 1938	Bhavnagar (Gujarat)	A number of villages in the district felt the earthquake which was preceded by a roaring noise resembling a cannon.	IV	—	Hin/12-7-1938, 14-7-1938
	Patiad (Gujarat)	Accompanied by a thundering noise. Houses and other structures shook. Panic stricken people started evacuating the places.	IV	—	Do.
13 Aug 1938	Patiad (Gujarat)	Felt severely. Mahajan's Dharamsala was damaged.	VI	—	TOI/17-8-1938
17 Jan 1939	Jaipur (Rajasthan)	Accompanied by a loud rumbling noise. Duration about 50 sec.	IV	—	Hin/18-1-1939 TOI/19-1-1939
19 Apr 1939	Hyderabad, Secunderabad (A. P.)	Duration about 2 sec. Accompanied by a rumbling noise. Crockery and glassware rattled.	IV	—	Hin/20-4-1939 TOI/20-4-1939
29 Apr 1939	Darbhanga (Bihar)	Duration about 30 sec. Accompanied by a rumbling sound. Several buildings including court house cracked.	VI	—	Hin/30-4-1939 TOI/1-5-1939
20 Aug 1939	Tiruvettur (South Travancore) (Kerala)	Duration about 2 min. Vessels and utensils in households started rattling. Mudwalls in certain areas fell down.	V	—	Hin/24-8-1939
1 Oct 1939	Muzaffarpur (Bihar)	Duration about 12 sec. Citizens ran out of their houses in panic.	IV	—	Hin/2-10-1939 TOI/3-10-1939
28 May 1941	Ratnagiri (Maharashtra)	Felt severely. Accompanied by a gentle rocking movement. Duration about a few sec. A cracking noise accompanied the shock. Pots and pans toppled from the shelves.	V	—	Hin/30-5-1941 TOI/30-5-1941
26 Jun 1941	Visakhapatnam (A. P.)	Three earthquake shocks felt within a period of two min. Duration about 5 sec. The Municipal office was rocked violently. People who were walking on the road felt the shock. Chairs and tables were shaken.	V	12.4 N, 92.5 E 8.1	Hin/27-6-1941, 28-6-1941, 29-6-1941
26 Jun 1941	Madras (Tamil Nadu)	The earthquake was felt for about 15 sec. People working in upper storey offices rushed out. Electric fans suddenly stopped, and then resumed running. Open doors and windows alarmed with a bang. Parked cars moved on their own. Things placed on shelves rattled and fell down. Tumbles and almirahs in a hospital rocked. Mangalore tiles, rafters and reapers cracked.	VI	—	Do.
	Chandernagore (W. B.)	Ceiling lamps had a rotating motion as a result of the earthquake.	IV	—	Do.
18 Feb 1944	Muzaffarpur (Bihar)	Felt sharply. Windows and doors rattled. Some of the roofs cracked and people ran helter-skelter.	IV	—	TOI/19-2-1944 Hin/19-2-1944
29 Feb 1944	Madurai (Tamil Nadu)	Two mild tremors each lasting for a few seconds were felt. In a city hospital, bottles kept in an almirah fell down. Vessels in houses fell down. Open doors closed.	V	—	TOI/2-3-1944 Hin/3-3-1944
	Coonoor (Tamil Nadu)	Duration about 30 sec. Doors and windows rattled.	IV	—	Do.

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)
6 Jun 1945	Visakhapatnam (A. P.)	Duration about 2 sec. People sleeping on cots were rocked. Brass and other vessels were toppled.	V		Hin/10-6-1945
29 Dec 1945	Monghyr (Bihar)	Furniture and other articles in houses shook. People started rushing out of their houses.	IV	—	Hin/3-1-1946
12 May 1946	Baudhraj (Orissa)	300 houses were damaged as a result of a severe earthquake.	VI	—	TOI/28-5-1946 Hin/28-5-1946
6 Feb 1948	Rayadurg (A.P.)	Accompanied by a sound like a passing lorry or an aeroplane with a rocking motion of earth. Some roofs of houses fell down and cracks appeared in the walls of a few houses.	VI	—	Hin/10-2-1948
9 May 1952	Rangamalai (Tamil Nadu)	Slight tremors felt in Rangamalai, a chain of mountains in Sondamangalam east and west of Karur taluka and a few villages on the boundary line of Trichy and Madurai districts. Tremors were also felt on some previous days in April. Distinct rumbling and cracking sounds emanated from mountainside followed by intermittent earth tremors. Blasts like airblast in mines were heard. Cracks appeared in walls in a number of houses in the area and a wall was slightly damaged in Karambapatti village.	VI	—	Hin/12-5-1952, 14-5-1952, 17-5-1952
29 May 1952	Rangamalai (Tamil Nadu)	A series of tremors felt again. A huge boulder was dislodged from the summit of the hill.	V	—	Hin/1-6-1952
3 Jun 1952	Rangamalia (Tamil Nadu)	Preceded by a rattling sound. Cracks developed in several houses.	VI	—	Hin/8-6-1952
6 Jun 1952	Rangamalai (Tamil Nadu)	Preceded by a loud noise. This occurred two or three times.	IV	—	Hin/13-6-1952, 21-6-1952, 29-6-1952
25 Feb 1953	Tirunaveli (Tamil Nadu)	Duration about 30 sec. Doors and windows rattled. A few persons were thrown off their cots.	IV	—	Hin/27-2-1953 TOI/27-2-1953
	Thevara and Bloghat Island (near Ernakulam) (Kerala)	Doors and windows rattled. Duration a few sec. Several people woke up.	IV	—	Do.
2 Apr 1953	Valley east of Kottayam (Kerala)	Felt severely. Some buildings shook. The shock was felt in Peermedu area on the summit of high ranges. Cracks appeared in Ponkunnam P.O. building. Walls of a near by church also developed cracks. Wells in the affected area recorded a sharp rise in water level of 4 to 5 ft while some other springs completely dried up.	VII	—	Hin/10-4-1953
5 Jan 1954	Bhadrachalam (A. P.)	Accompanied by big sound and lasting for about 2-3 sec. Direction appeared to be from southeast to northwest. Tiles of some houses rolled down and people rushed out into the open.	VI	—	Hin/7-1-1954
21 Mar 1954	Calcutta (W. B.)	Two moderate shocks lasting for about 10 sec. Citizens ran out of their houses in panic. Doors flew open, windows banged and utensils came down from shelves. Direction of the shock appeared to from east to west.	V	—	Hin/25-3-1954 TOI/25-3-1954
2 Aug 1954	Salem (Tamil Nadu)	Duration about a few sec. Felt in Salem and suburbs. Doors and windows in some houses rattled.	IV	—	Hin/4-8-1954 TOI/3-8-1954
4 Sep 1954	Gorakhpur (U.P.)	Duration about 2 sec. It shook doors and windows.	IV	28.3 N, 83.1 E 6.3	TOI/5-9-1954
11 Jul 1955	Mysore (Karnataka)	Duration about 30 sec. People rushed out of their houses. Furnitures and utensils rattled. The shock was also felt in villages 40 miles around Mysore.	V	—	TOI/13-7-1955

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)
30 Jan 1958	Sehore (M.P.)	Felt moderately. Walls of a number of buildings including agricultural college cracked. The tremors were followed by a loud explosive noise. A few kutcha houses collapsed. People were panic stricken.	VI	—	TOI/1-2-1956, 3-2-1956, 5-2-1956
2 Feb 1956	Sehore (M.P.)	Two tremors accompanied by a noise resembling cannon fire.	IV	—	Do.
5 Feb 1956	Sehore (M.P.)	Accompanied by a rumbling sound. It rattled doors, shook the beds and tables.	IV	—	TOI/7-2-1956
18 Feb 1956	Ongole (A.P.)	Felt moderately. Doors and windows rattled violently.	IV	—	Hin/21-2-1956
7 Aug 1956	Ramseen village (Rajasthan)	Felt moderately. Accompanied by a rumbling sound. Forty houses including a marble Jain temple were damaged.	VI	—	Hin/15-8-1956
1 Jan 1957	Kalimpong (W. B.)	Duration about 60 sec. Accompanied by a rumbling sound.	IV	—	TOI/2-1-1957 Hin/5-1-1957
4 Oct 1957	Tiruchirapalli, Thiraiyur (Tamil Nadu)	Duration about 3 sec. Utensils fell off shelves in several houses.	IV	—	Hin/5-10-1957 TOI/5-10-1957, 6-10-1957
13 Jan 1958	Ongole (A.P.)	Felt moderately. People ran out in panic. The walls of a few houses developed cracks.	V	—	Hin/16-1-1958
26 Apr 1958	Anjar Ghandhidham (Gujarat)	Preceded by a rumbling noise. People left out of their beds and ran into the streets.	V	—	TOI/29-4-1958
30 Oct 1958	Bangalore (Karnataka)	Accompanied by a rumbling noise. Duration about 4 sec. Doors and windows rattled and furniture was rocked. It created a lot of panic in some people.	IV	—	Hin/31-10-1958 TOI/31-10-1958
21 Sep 1959	Palghat district (Kerala)	Felt at Ottappalam, Vaniyammakulam, Kaapulli, Angadipuram, Kettayam, Alattur, Tripalur and Melarcode (all places in Palghat district). Duration about 3 sec. Windows and doors rattled. Vessels and other things arranged on shelves fell down. At the Shiva temple at Timpattur vessels used for Puja kept in Sanctum Sanctorium were found to be thrown down.	V	—	Hin/23-9-1959
12 Oct 1956	Hyderabad (A.P.)	Accompanied by a rumbling sound. Duration about a sec. Doors and windows rattled and articles placed on tables shook. Sleeping people woke up with a start.	IV	6.0 N, 80.0 E 5.5	TOI/15-10-1959 Hin/13-10-1959, 14-10-1959
	Ongole (A.P.)	Duration about 20 sec. Panic stricken people ran outdoors. Tiles of some houses fell down. Followed by a number of minor tremors. Mud houses collapsed in some villages. Some animals died of shock in a few villages. Slight damage was caused to the niche on the alter of Roman Catholic church at Ongole.	VI-VII	—	Do.
28 Jan 1960	Tirupati (A.P.)	Accompanied by a rumbling sound. Houses started shaking.	IV	—	Hin/29-1-1960
19 Oct 1960	Srikakulam (A.P.)	Duration about 3 sec. Accompanied by rumbling sound. People rushed into the streets. The main shock was followed by a tremor of milder intensity.	IV	—	Hin/21-10-1960
2 Sep 1961	Karwar Taluka (Karnataka)	Duration a few sec. Accompanied by a rumbling sound. Doors and window panes clattered while vessels kept on shelves trembled.	IV	—	TOI/4-9-1961 Hin/12-9-1961
11 Sep 1961	Gangtok (Sikkim)	Felt severely. Duration about 3 sec. It caused cracks in several buildings.	VI	—	TOI/12-9-1961
26 Sep 1961	Calicut (Kerala)	Duration about a few sec. Felt severely in the local beach where the chairs and tables in All India Radio, Calicut started shaking and staff members came out of their office. On bank road a car and a jeep proceeding in opposite directions slightly collided with each other.	VI	—	Hin/27-9-1961

TABLE 2 (Contd.)

(1)	(2)	(3)	(4)	(5)	(6)
27 Sep 1961	Calicut (Kerala)	Four earth tremors felt during the day. The first one which was mild was felt at 8 A.M. The second one was accompanied by a rumbling sound and lasted for more than a sec. Third one occurred at 7.10 P.M. when a noise similar to the roar of waves was heard. The fourth one was also accompanied by a similar noise.	III	—	Hin/29-9-1961
7 Jan 1962	Calicut (Kerala)	The town and its suburb experienced two earth tremors at 2.10 A.M. and 2.20 P.M. The first one was accompanied by a rumbling sound. The second one was mild.	IV	—	Hin/9-1-1962
7 Feb 1962	Kotagiri (near Coonoor, Tamil Nadu)	Duration about 10 sec. Two houses in a village 8 miles from Coonoor collapsed.	V	—	Hin/10-2-1962
15 Feb 1962	Porbandar (Gujarat)	Duration about 3 sec and accompanied by a rumbling noise. People woke up from their sleep and came out of their houses.	V	—	Hin/17-2-1962
24 Mar 1963	Bombay (Maharashtra)	Kalyan, Dombivili and Goregaon, suburbs of Bombay were rocked by two tremors. The second one was milder. People jumped out of their beds.	IV	—	TOI/26-3-1963
23 Jun 1964	Chalal village (Junagadh Distt, Gujarat)	Duration about a few second. Accompanied by a rumbling noise. People rushed out of their house.	IV	—	Hin/25-6-1964
10 Apr 1966	Madras (Tamil Nadu)	Tambaram (a suburb of Madras) and its neighbourhood have experienced a series of earth tremors accompanied by sounds of explosion. On the night of 10th doors and windows rattled, small articles placed on table toppled to the ground and children were scared. Three tremors were felt and recorded by Meenanbakkam Observatory. Tremors were also felt at Meenambakkam, Pazavanthangel, Chromepet and Pallavaram.	V	—	Hin/12-4-1966, 14-4-1966, 18-4-1966 TOI/12-4-66
20 Oct 1966	Madras (Tamil Nadu)	Tambaram (a suburb of Madras) felt four tremors between 7 to 10 P.M. Windows and doors rattled. The tremors were accompanied by a loud thud noise. Felt in Chromepet also.	IV	—	Hin/21-10-66
4 Mar 1967	Madras (Tamil Nadu)	Tambaram (a suburb of Madras) was rocked twice at 8 P.M. and 8.15 P.M. The tremors were accompanied by a thud noise. Doors and windows rattled. Duration of the shocks was for a few sec.	IV	—	Hin/5-3-1967
31 Jul 1967	Virpur (near Rajkot, Gujarat)	A dozen kutchha houses collapsed as a result of an earthquake.	VI	—	TOI/2-6-1967
18 Oct 1968	Jetpur (Gujarat)	Accompanied by a rumbling noise. The roof of a house collapsed but no loss of life or property was reported.	VI	—	IEX/20-10-1966
10 May 1969	Jamshedpur (Bihar)	Accompanied by a rumbling sound. Citizens rushed out into the streets in panic.	IV	—	Hin/12-5-1969 TOI/12-5-1969
28 Mar 1970	Kothagudam (Tamil Nadu)	Two tremors were felt within a period of four hours. Doors rattled. People woke up from their sleep and rushed into the streets. In some houses walls developed cracks.	V	—	Hin/30-3-1970
31 Mar 1970	Bhadrachalam (A.P.)	Preceded by a rumbling sound. Windows and doors rattled for a few sec.	IV	—	Hin/2-4-1970
6 Sep 1970	Broach (Gujarat)	Thirty houses collapsed as a result of a moderate earthquake. No loss of life reported.	VI	—	Hin/8-9-1970
27 Jan 1971	Jamshedpur (Bihar)	Duration about 3 sec. Doors and windows rattled. People rushed into the open.	IV	—	TOI/29-1-1971
26 May 1971	Nagapattanam (Tamil Nadu)	Accompanied by a humming noise and lasting for about a few sec. People came out of their houses. No loss of life reported.	IV	—	Hin/27-5-1971

3. Procedure adopted

Based upon the felt reports of earthquakes, the intensity was assigned in M.M. scale. Since detailed field studies have been made for the following earthquakes by the Geological Survey of India, they were excluded from the list:

- (i) Great Kangra earthquake, 1905 (M. 8.2),
- (ii) Dhubni earthquake, 1930 (M. 7.5),
- (iii) Satpura earthquake, 1938 (M. 6.0),
- (iv) Bihar-Nepal earthquake, 1935 (M. 8.3) and
- (v) Assam-Tibet earthquake, 1950 (M. 8.5).

The information about the earthquakes whose epicentral parameters based on the instrumental data is available, could now be used to develop magnitude-intensity relationship through the data provided in this paper. This aspect has gained importance due to generation of strong motion data through accelerographs in the Indian region recently which could directly be utilized by earthquake engineers (Srivastava 1989).

In Table 1, the earthquakes are given in chronological order along with their geographical locations and the intensity in M.M. scale. These do not include the felt earthquakes reported by IMD in the seismological notes in general except for swarms in Sehere (1956), Tambaram (1966) and a few other earthquakes. Table 2 gives detailed description of the type of damage upon which the intensity has been assigned. The epicentral parameters of a few of the earthquakes of intensity VI or more though not reported by Tandon and Srivastava (1974) could be found in I.S.S. where the earthquake magnitude was slightly less than 5. This is attributed to the criteria adopted by Tandon and Chatterjee (1968) for preparation of IMD catalogue for magnitude 5.0 or more.

4. Discussion and conclusions

Completeness of an earthquake catalogue can be best judged by the application of Gutenberg frequency magnitude relationship. Based on the earthquake data from 1340 to 1983 (including new shocks of intensity more than VI first reported by Srivastava 1982) the recurrence periods of earthquakes of magnitude 6.75 and 7.0 were found by Rao and Rao (1984) to be 21 and 35 years respectively for Peninsular India. For earthquake of magnitude 7.0, Srivastava (1989) and Srivastava and Dattatrayam (1986) found a return period of 25 years for northeast India which is one of the most seismically active regions. It may be noted that except for the Rann of Kutch earthquake (1819), no other earthquake of magnitude 6.75 to 7.0 has been reported so far over the Peninsular India, during the last 200 years (Tandon and Srivastava 1974), thus making the analysis of Rao and Rao (1984) unrealistic. This is attributed to the lack of data for the smaller events

which affects the slope of Gutenberg frequency magnitude relation. In their study, inclusion of more than 120 earthquakes reported by Srivastava and Ramachandran (1985) could have improved their result. It is also noticed that assignment of magnitudes on the basis of intensity could have been a major source of error. It may be noted that the epicentre of an earthquake needs to be carefully assigned since an earthquake reported felt at Calcutta could have originated in Bangla Desh but due to sparse population, felt report for the intervening places may not be available, thereby giving an error of a few hundred kilometres if we take Calcutta as the epicentre. Nevertheless, earthquakes reported through this catalogue provide additional data to assess earthquake risk in different parts of the country.

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