CHAPTER 2
SEISMIC HISTORY OF NORTHEAST INDIA AND ITS NEIGHBOURHOOD

A good background of historical information is very much important to evaluate seismicity of a region. Earthquake catalogues containing earthquake location, magnitude, depth and other information are very much essential for seismic study. For some countries, such as China, detailed information about important earthquakes are available for about the last 3000 years. In case of India, such information is available only for the past 200 years. The earthquake catalogue for northeast India is available from early part of 19th century in a systematic manner. In northeast India the occurrence of earthquake can be traced as far back as 1548 from "A history of Assam" by Gait et al. (1967).

Description of earthquakes of northeast India from 1548 to 1988:

Prior to British rule (before 1826) a large part of northeast India was ruled by Ahom kings. It seems that history books describe, in a very brief manner, the devastation that occurred in the Ahom kingdom only irrespective of the location of earthquakes. So the description of historical earthquakes
are fragmentary. From our present experience, we may reasonably assume that the location of these earthquakes were not very far from Brahmaputra valley.

1548 earthquake:
This earthquake has been described as a terrible earthquake in northeast India. During this earthquake earth opened in many places, and sand, ashes and pebbles were poured forth.

1596 earthquake:
This was also a severe earthquake felt in the whole of northeast India. Sand, ashes and hot water were thrown up from below the crust. One of the king’s palaces collapsed.

1607 earthquake:
During this earthquake a number of hills disappeared. The earth also opened in several places in the plains, throwing up water and mud and tracks of ground suddenly sunk.

1642 earthquake:
During this year several earthquakes occurred and were followed by heavy flood in the valley.

7th February, 1663 earthquake:
This was described as a severe earthquake of the region which lasted for about half an hour. Report of damage and
destruction are not available.

1696 - 1714 earthquake:
Without mentioning the particular year of occurrence, the historians have mentioned about seven earthquakes during the region of the famous Ahom king Rudra Singha (1696-1714), in which several temples were destroyed.

10th January, 1869 earthquake:
This severe earthquake called Cachar earthquake, seriously damaged many buildings in Silchar, and cut up the road and wrecked the bridges throughout Sylhet District. It was felt in an area of 640000 square kilometers. Epicentre was reported to be east of Shillong plateau. Subsidence occurred in many parts in this district.

This was also a high intensity shock felt in Silchar, causing some damage.

12th June, 1897 earthquake:
This was first earthquake felt in this region for which instrumental records are available. Oldham (1899) has given a comprehensive review about this earthquake and excellent short summary is given by Davison (1936). Some portions of this description have been taken from these papers. The earthquake
lasted for about two and half minutes, destruction area was about 384000 square kilometers; all means of communication was interrupted, the hills rent and cast down in landslip, and the plains fissured and riddled with vents, from which sand and water poured out in most astounding quantities. The earthquake of 1897 was very severely felt in the Garo Hills, but owing to the lightness of construction of the Garo houses, it was not attended by great loss of life. In Guwahati all the Govt. offices were destroyed and wrecked every masonry building. In Shillong, prior to 1897 most of the public offices and private houses were built of rough-hewn masonry. This earthquake reduced them to a heap of ruins in the span of a few seconds, wrecked the water supply, and destroyed several Government Houses. The earthquake of 1897 caused enormous damage to property in Coch Bihar town also. The bridges along the railways were broken and the permanent way was much cut up by fissurs; roads and their bridges suffered similarly. Nalbari suffered severely from this earthquake, which altered the waterways and rendered it impossible for boats to come up to Chaulkhwa from Barpeta - a route that was formerly open. The town of Goalpara was wrecked and the masonry buildings at Dhubri were destroyed. More than 1540 persons lost their lives, chiefly due to landslips in the hills, falling houses and the falling in of river banks in Sylhet.

The isoseismal lines in Oldham's intensity scale and meizoseismal area of 1897 earthquake are shown in Figure 1.
Figure 1. (a) Isoseismal lines in the Oldham's scale and (b) Meizoseismal area of 1897 earthquake (after Oldham, 1899)
The probable epicentre of this earthquake was latitude 26.0°N and longitude 91.0°E with magnitude 8.7 on Richter scale. This earthquake was caused by a movement along a thrust plane or thrust planes and along secondary thrust and fault planes, which had a maximum length of about 500 kilometers and maximum width of about 125 kilometers. The depth of the earthquake focus was estimated to be within 40 kilometers (Goswami and Sarmah, 1982). The centres of the aftershocks, in the period shortly following the main shocks, were not systematically situated with reference to the axis of the range separating the Brahmaputra and Barak valley; but that they lay for the most part towards the northern edge of these hills or under the alluvium to the north over an area which extends northwards along and near the 91.0°E.

The effect of this earthquake as seen on ground were
(1) landslips, (2) cracks and fissures, (3) ridges and furrows, (4) depression of the surface. Of the fault and fractures, the most conspicuous example is that of Chedrang fault. Following north-north-west trend of Chedrang fault crosses a small tributary with a throw of 32 feet, and shortly after crosses the Chedrang river diagonally, producing a number of waterfalls and as many as 30 lakes in the course of the river. Another fault, much less than the Chedrang fault, its general course is also different, being about E 30°S - W30°N passes near the village of Samin. This fault is known as Samin fault. In addition to these faults, a fractures of ground surface occurred
near Bordwar. Some pools or lakes were also formed by interruptions of the gradient of drainage channels. Some seismologist believe that the Chandubi beel of South Kamrup district was formed during this earthquake.

**8th July, 1918 earthquake:**

This earthquake is known as Srimangal earthquake. Its epicentral location was latitude 24.5°N and longitude 91.0°E with magnitude 7.6. It was felt over 2050000 square kilometers. Damages were reported even from Guwahati also. Many tea estates around Srimangal were destroyed due to this earthquake.

**9th September, 1923 earthquake:**

The epicentre of this earthquake was latitude 25.5°N and longitude 91.0°E and magnitude 7.1. It was felt over north-east India including West Bengal and Bihar.

**2nd July, 1930 earthquake:**

This earthquake is known as Dhubri earthquake, its epicentre was latitude 25.5°N and longitude 90.0°E and assigned magnitude 7.1. It was felt over an area of about 896000 square kilometers. The main shock was succeeded, during the following three years, by a large number of aftershocks, some of which originated near the epicentre, others from Garo Hills. Near Dhubri and Gauripur, the railway line was also seriously affected, embankments were fissured and partially collapsed.
Well-built brick concrete structured suffered comparatively little damage, whilst in case of lightly constructed buildings which were firmly fixed to the ground, suffered considerably. But those which merely rested on a sound brick or concrete mattress were practically undamaged.

14th August, 1932 earthquake:
The epicentre was located at latitude 26.0°N and longitude 95.5°E and magnitude was 7.0. It was felt over the whole of north-east India.

16th August, 1938 earthquake:
The epicentre was latitude 23.5°N and longitude 94.3°E with magnitude 7.2.

23rd October, 1943 earthquake:
The epicentre was located at latitude 26.0°N and longitude 93.0°E. The magnitude of this earthquake was 7.2. It was felt over Assam, Bengal and major part of Bihar and Orissa.

29th July, 1947 earthquake:
This is known as Dibrugarh earthquake with magnitude 7.7. Epicentre was latitude 28.5°N and longitude 94.0°E. Some damage to buildings were reported in upper Assam region.

15th August, 1950 earthquake:
The Assam earthquake (Himalayan earthquake) of 1950
was a very great seismic catastrophe, that occurred on the plateau of Tibet near the India-China border. The epicentre was near a place named Rima, latitude 28.5°N and longitude 96.5°E. The magnitude of the earthquake estimated both at Pasadena and Strasbourg was 8.6 on Richter scale with depth about 25 kilometers. The fault plane solution (see the result in Chapter 9) of this earthquake shows normal faulting with very little strike slip component along a plane striking E-W and dipping to the north at an angle 78°. This earthquake was followed by a large number of aftershocks (about 54 nos.), with epicentres scattered over a large area around the epicentre of the mainshock, with magnitude range 5.6 to 7.1.

Due to blocking of the rivers by land slides, and subsequent release of impounded water, flash flood in the Brahmaputra valley occurred killing about 532 people.

21st March, 1954 earthquake:

This Manipur-Burma border earthquake was felt over a large part of eastern India and its neighbourhood. The epicentre was at latitude 24.38°N and longitude 95.15°E. This shock was of the greatest intensity during the last 20 years in that region. The magnitude of the earthquake as calculated at Pasadena was about 7.1. The depth was about 180 kilometers. The fault plane solution shows thrust fault striking N 50°E and dipping to NW at an angle of 60° (Tandon & Mukherjee, 1956).
30th December, 1984 earthquake:

This earthquake is known as Soniamukh earthquake (Cachar). The epicentre was at latitude 24.67°N and longitude 93.07°E with depth 35 kilometers and body wave magnitude 5.5 mb. This earthquake was found to be preceded by a well-defined precursory seismic swarm and seismic quiescence. Twenty people were killed and thousand became homeless.

6th August, 1988 Manipur-Burma earthquake:

The epicentre of this earthquake was at latitude 25.14°N and longitude 95.12°E with focal depth 92 kilometers. The magnitude was mb = 6.8 and Ms = 7.2. This earthquake was of tectonic origin and may be caused by a sudden fracture of a portion of the earth's crust or relative movements along old fault planes. It occurred in the subduction zone between Indian and Burmese plates. The most extensive damage in life and property was 38,400 square kilometers including the districts of Sibasagar, Lakhimpur, Dibrugarh of Assam.

Cracks developed in many high-rise buildings in Guwahati city. The colony which consisted of four stories blocks was allocated to the Reserve Bank of India's employees, have developed cracks on the walls and the staircases. Some bricks and concrete lumps of the great Shiva Dole temple gave way. The railway line at several places on Lumding-Diphu section of Northeast Frontier Railways was damaged. Near Raha the national Highway 37 had been fissured. The Nagaland Pulp and Paper Company Ltd. at Tuli
was completely damaged. At least 4 persons were killed and 15 others seriously injured during this earthquake in north-east India. Unprecedented flood occurred in all parts of Brahmaputra and Barak valleys.