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Locked crustal faults associated with the subducting Indian Lithosphere and its implications in seismotectonic activity in the Central Indo-Burmese Ranges, Northeast India

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Northeast India is a geodynamic hotspot for tectonic activities where three different plates viz., Indian, Eurasian and Burma Plates collide and deform with respect to each other. Northeast moving Indian Plate subducting transversely beneath Burma Plate results in the formation of the Indo-Burmese Ranges (IBR). In central IBR, the north-south trending Churachandpur-Mao Fault (CMF) is situated in the east of the Mizoram-Tripura Fold belt. The northwest-southeast trending Mat River Fault or Mat Fault (MF), which is another major crustal-scale strike-slip transverse fault, upholds the movement of the CMF. In this work, seismotectonic analysis of these two active intra-plate faults which are related to the June–September 2020 earthquake series, have been discussed. It is observed from satellite imageries, earthquake data and confirmed by the field investigation that these faults are not directly involved in the generation of the earthquakes; rather epicenters are distributed in the junction between the MF and CMF. It is evident from the seismotectonic analysis that this stress is distributed through some northwest-southeast synthetic faults, located north of MF and parallel to it, close to the junction with the CMF. The focal solution of the strongest of the 2020 earthquakes, the 5.5 M_w Champhai earthquake (on 22^{nd} June 2020 at 04:10 IST) in Mizoram shows that the principal nodal plane was aligning along MF. Therefore, it is these synthetic faults that are responsible for the earthquakes rather than the locked zone between intra-plate MF and CMF crustal faults. This juxtaposition has caused a major shift in the geodynamic regime in the central IBR. Champhai earthquake might not be the only large devastating earthquake in the region and could be followed by more major earthquakes in the future.

Keywords: locked plate, Indo-Burmese Range, seismotectonics, Mizoram

1. Introduction

The north-eastern part of the Indian subcontinent is seismically very active where many medium to large earthquakes were recorded. The 1897 Shillong Earthquake of M_w 8.1 and the 1950 Great Assam Earthquake of M_w 8.4 are examples of two great earthquakes in the region (Kayal, 1987; Oldham, 1899; Sharma and Zaman, 2019). There are more than 20 large earthquakes of magnitude greater than M_w 7.0 that had been reported in the entire northeast India region, since the 1897 Shillong earthquake (Kayal, 2008). Several M_w 6.0 earthquakes were also recorded in this seismic belt (Rakshit and Rakshit, 2021). The majority of the seismic events originate in the Himalayas or in the Indo-Burmese Ranges (IBR) as shown in Fig. 1A. All these events cause major devastation in the region, taking hundreds of lives. It is observed from Incorporated Research Institute for Seismology (IRIS) earthquake data that most of the earthquakes are between M_w 3.0–4.9 and only a few earthquakes are greater than M_w 6.0

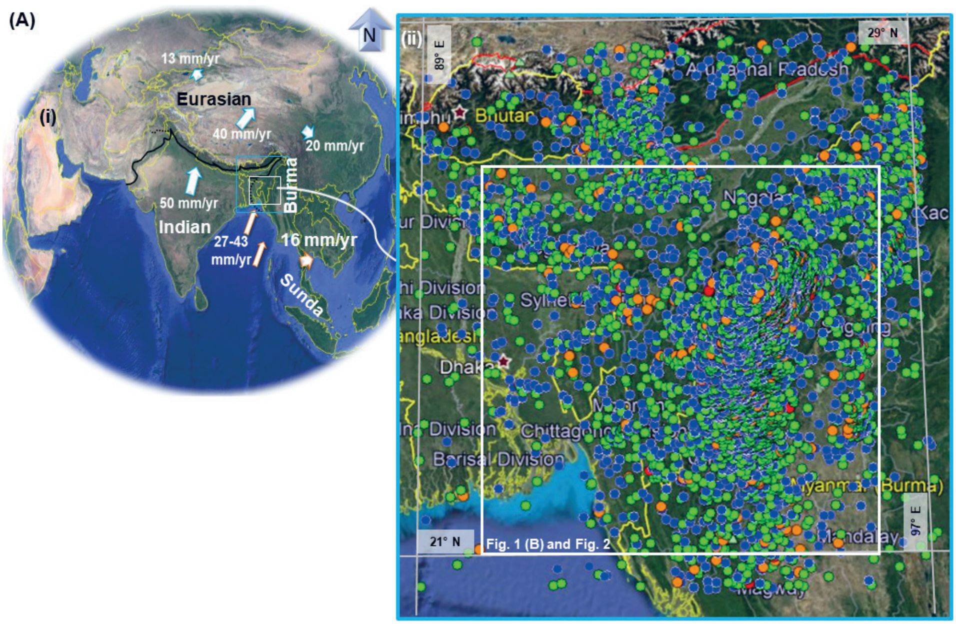

Figure 1. (A) (i) Plate movement of Indian, Eurasian, Burma and Sunda plates that influences the evolution of northeast India. Indian and Eurasian Plate motions are shown with respect to Siberia by blue-lined arrows (Avouac and Tapponnier, 1993), orange-lined arrows represent the direction of Indian and Sunda Plates motion (Wang et al., 2014). Blue box indicate NE India and white box represents the area as shown in Fig. 2; (ii) Epicentral map of the entire Northeast India with seismicity of last 50 years. Source is USGS catalogue having magnitudes 3 and above. Blue circles 3<M<4, green circles 4<M<5, orange circles 5<M<6 and red circles M>6 earthquake epicenters were plotted in the Google Earth image (www.earth.google.com). The white rectangle is showing the region for which the geological map is produced as shown in Fig. 2

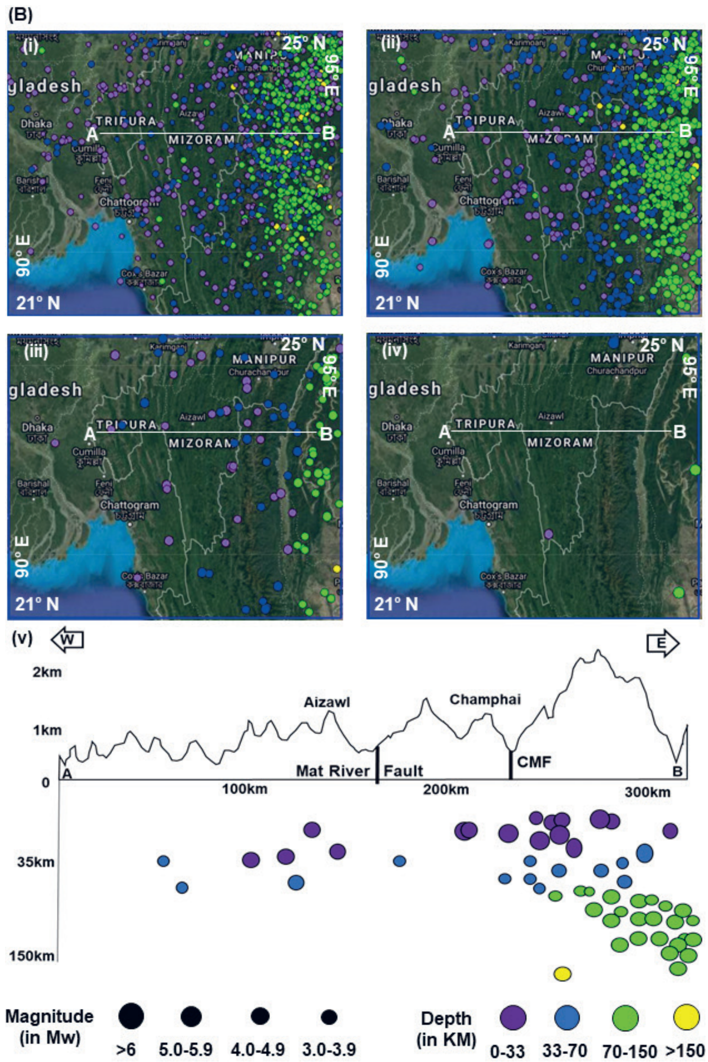

Figure 1. (B) Earthquake epicenters for the study area (i) M_w 3.0–3.9, (ii) M_w 4.0–4.9, (iii) M_w 5.0–5.9 and (iv) > M_w 6.0 and (v) depth section view for the profile line A-B as shown in Fig. 1.B. i–iv; indicates the subduction process, evident by the hypocenters.

(Fig. 1B). Moreover, their hypocentral distribution clearly indicates the subduction process of the Indian lithosphere (Fig. 1B.v). These events are the result of slip movement along the major fault surfaces through which the stress is dissipating (Nandy, 2001). The oblique subduction of Indian Plate under the Burma Plate gave rise to the complex tectonic setting of IBR. Apart from these two plates, the southern part of the IBR is also related to Sunda Plate (Gahalaut et al., 2013). This setting along with the northeast movement of the Indian Plate generates stress that accumulates and releases from time to time through major active faults (Dasgupta, 1984; Chen and Molnar, 1990; Tiwari, 2002; Steckler et al., 2016). Intra-plate movements of the regional faults in the Indian Plate cause differential stress distribution among different tectonic blocks. Intra-plate faults generally control the tectonic elements and orographic architecture within the blocks (Rakshit et al., 2020). In IBR, all the tectonic features including the active faults are accommodating westward rotational stress is therefore, susceptible for many moderate earthquakes although large earthquakes of > 7.0 M_w are not recorded till date (Nandy, 2001; Kayal, 2008). In this present work, investigation of such active and crustal scale faults of Central IBR and seismotectonic analysis of their juxtaposition, which are responsible for recent devasting earthquakes have been discussed.

IBR is evolving since Oligocene to an arcuate shape orogenic belt where the central part shows the wedge system above the seismogenic megathrust involving Indian lithospheric slab (Brunnschweiler, 1966; Copley and McKenzie, 2007). Chittagong Coastal Fault and Kaladan Fault in western part towards Bangladesh and Kabaw Fault in the Myanmar are other important fault systems that influence the deformation of the Mizoram-Tripura Fold belt as marked in the Fig. 2. The variable deformation of the block resulted by the deformation of the subducting lithospheric slab that is being subjected to the arc normal compression, buckling and then slab pulling processes at depth (Kumar et al., 2015; Copley and McKenzie, 2007). The geodetic studies of IBR and the surrounding region by many authors reveal that the movement along Mat Fault (MF) and Churachandpur-Mao Fault (CMF) is low, although the block movement indicates more than 10 mm/year of southwest motion which is attributable to the study area (Gahalaut et al, 2016; Mallick et al., 2020; Steckler et al., 2016). This movement creates a swirling effect in the central IBR rather than a southern movement of the Shillong Plateau (Fig. 2). This plate motion affects the local tectonic features and therefore strain partitioning in the region is complex.

2. Geological settings

Tertiary sediments of Barail and Surma Group which were deposited in the forearc basin, are now upheaved to form north-south trending hill ranges by the mechanism of fault-propagating folds and associated faults (Nandy et al., 1983; Dasgupta, 1984; Tiwari, 2002; Bharali et al., 2017, 2021a). These intra-crustal strike- to oblique- slip faults are responsible for the distortion of otherwise north-south ridgelines and are formed in the later part of the evolution of IBR (Rakshit et al., 2020). These faults are formed by the subduction of the Indian Plate lithosphere and thereby control their distribution. Kaladan Fault (KF), Kabaw Fault (KBF), Gumti Fault (GF), Mat Fault (MF) and Churachandpur-Mao Fault (CMF) are examples of such fault systems (Fig. 2). Here, the MF and CMF are the two important features around which most of the recent 2020 earthquakes occurred. Hundreds of small to medium magnitude (2.0–4.9 M_w) and a few large magnitudes (> 5.0 M_w) earthquakes occurred around the Champhai region of Mizoram state, from June to September 2020. They are the major seismic events since the M_w 6.7, 2016 Tamenglong, Manipur earthquake where the Gumti Fault was the causative fault (Gahalaut et al., 2016; Gahalaut and Kundu, 2016). Prior to these events, there were 17 earthquakes around the Champhai region, with a magnitude more than 3.0 M_w, recorded in the GCMT catalog (Rakshit et al., 2018). Many researchers also predicted that these faults are capable of generating > 7.0 M earthquakes, however, none is recorded to date (Dasgupta, 1984; Gahalaut et al., 2013; Rodgers et al., 2014; Vasudevan and Ramanathan, 2016). MF is a prominent and distinguishable regional scale transverse tectonic feature, through which Mat River is flowing (Tiwari et al., 2015). Northwest-southeast striking MF has many active deformational evidences like deep fault scarps and

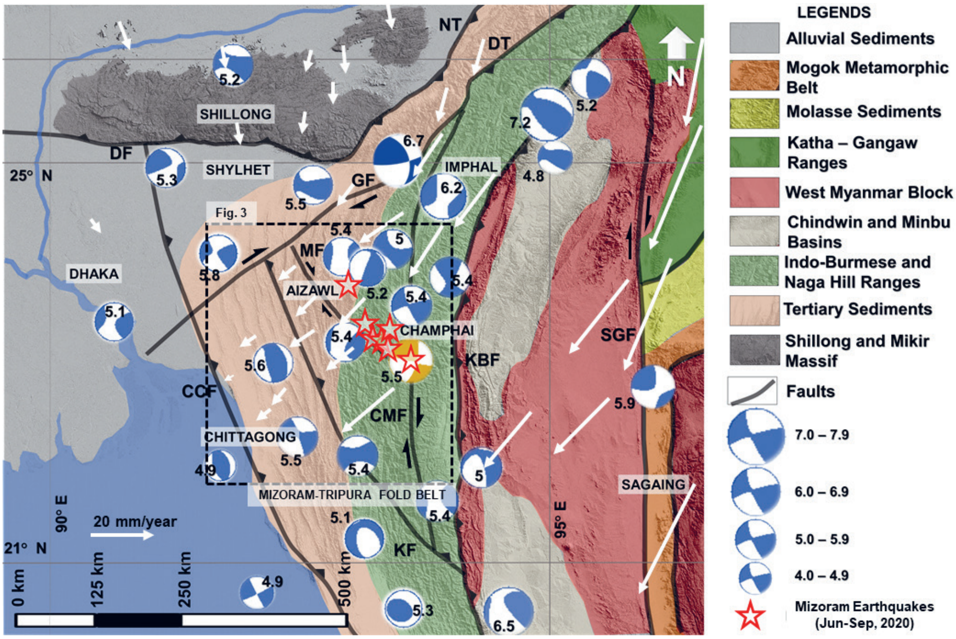

Figure 2. Regional seismotectonic map of southern part of northeast India and Mizoram-Tripura Fold Belt region with major active faults. Focal mechanism diagrams for significant earthquakes above M 5.0 for last 50 years (beachball diagrams, source GCMT catalogue). 2020 Champhai earthquake epicenters (M_w>4.5, shown by stars), including the 5.5 M_w main shock (focal solution showing as yellow-white beachball) are found to be related with Mat fault. White colour arrow indicate the rate of geodetic movement in the India-stable reference frame using the Euler pole of Steckler et al. (2016) (after, Mallick, 2020; Gahalaut et al., 2016). Here, CCF: Chittagong Coastal Fault, KF: Kaladan Fault, MF: Mat Fault, CMF: Churachandpur-Mao Fault, KBF: Kabaw Fault, SGF: Sagaing Fault, GF: Gumti Fault, DF: Dauki Fault, DT: Disang Thrust, NT: Naga Thrust. Black dotted line indicates the region for Fig. 3.

many channel offsets (Nandy, 2001). Though MF shows low seismicity around the fault zone with most earthquakes < 4.5 M_w, recent earthquakes in the eastern end of the fault generated a few > 5.0 M_w events that raise new doubts about 'no motion' of the Mat fault (Tiwari et al., 2015). The eastern end shows greater seismicity than the central and western parts; although no description has been provided prior to this study. MF meets GF in the western end in the Tripura state of India, runs for about 100 km to meet with the CMF in the east. MF has a dextral or right-lateral slip motion at a low velocity of 0 ± 5 mm/year (Tiwari et al., 2015). CMF is an older crustal fault which has a length of about 300 km, running through three Indian states, from Nagaland to Mizoram through Manipur (Kumar et al., 2011). This strike-slip fault has also moved in dextral pattern along its fault zone and accommodates about 16 mm/year out of 35 mm/year of total rate of motion between India and Sunda Plates (Gahalaut et al. 2013; Tiwari et al., 2015; Kumar et al., 2011). Scarps, ridges and drainage patterns are deformed in either northeast-southwest or northwest-southeast direction, that indicate the active strike-slip motion (Tiwari et al., 2015; Rakshit et al., 2020). In the junction between the MF and CMF, some synthetic strike- to oblique-slip faults are present and have been investigated as the potential sources of the recent 2020 earthquakes in the Champhai region (Bharali et al., 2021b).

3. Seismotectonic setting of central IBR

Mizoram-Tripura Fold belt and surrounding part of IBR comprise of similar antiform-synformal pattern; though the tectonic elements, tightness of the hills and, depth of the gorges and valleys increases from west to east in this wedge system (Figs. 1B.v and 2) (Tiwari 2002; Wang et al., 2014; Rakshit et al., 2018). Lithological setting of the area is comprised of Eocene shale dominating Barail Group in the eastern part whereas western section comprised mainly of Oligocene to Pliocene Surma and Tipam Group of rocks (Ganguly, 1975; Bharali et al., 2017). The area is surrounded by Dauki Fault (DF) and Gumti Fault (GF) in the northwest corner, Naga Thrust (NT) in the north where the fault plane solutions indicate mostly thrust to reverse-dominated oblique slip faults; eastward dipping Kabaw Fault (KBF) and north-south transverse Sagaing Fault (SGF) systems in the east on the Myanmar region show reverse and strike-slip motion in the fault plane solutions respectively (Evans,1964; Steckler et al., 2008). Kaladan (KF) and Chittagong Coastal Fault (CCF) positioned in the west of Mizoram in the Bangladesh Plains show reverse motion in the fault plane solutions (Evans,1964; Steckler et al., 2008; Rakshit and Bezbaruah, 2016). KBF is an east dipping back thrust comprising of many subparallel faults, marks the boundary between central Myanmar basin and IBR (Socquet et al., 2006; Maurin and Rangin, 2009; Tiwari et al., 2015; Khin et al., 2017). KBF and SGF have seismic potential to generate > 7.0 M_w earthquakes (Socquet et al., 2006; Wang et al., 2014; Steckler et al., 2008). DF and NT are also seismically active and can produce large earthquakes (Bilham, 2004; Tiwari 2002; Zaman and Bezbaruah, 2019). GF was found to be the causative fault for the 6.7 M_w inter-plate event of the 2016 Tamenglong, Manipur earthquake (Gahalaut and Kundu, 2016). In the west, basement involved CCF is deforming the Bangladesh plains and had jolted the region with > 8 M_w earthquakes in the past (Betka et al., 2018; Wang et al., 2013; Steckler et al., 2016). KF is in the western boundary of the central block and has major role in the evolution of the central IBR (Maurin and Rangin, 2009; Wang et al., 2014). The north-south striking crustal fault along the eastern part is the CMF which once had reverse slip motion, is now changed to more off strike-slip motion with few oblique movements along its length (Kundu and Gahalaut, 2013). CMF is geodynamically associated with India-Burma Plate collision and evolving with the IBR for long time (Luirei et al., 2018). MF also has many sub-parallel linear features which show oblique-slip movement with major strike-slip component (Fig. 3). These faults are younger than the other faults and some transverse faults are also associated with them (Rakshit et al., 2018).

4. Methodology

All the information related to the seismic events is taken from the open source reviewed earthquake catalogues from different national and international agencies and/or institutions like National Centre of Seismology (NCS), New Delhi, India; United State Geological Survey (USGS) Earthquake catalogue, Incorporated Research Institute for Seismology (IRIS) and Global Centroid Moment Tensor (GCMT) solutions. Field investigation included a study of geologic and geomorphic signatures of the MF and CMF in their junction, as well as study of the transverse faults signatures. Aster Global Digital Elevation Map (GDEM) are also used to delineate the major lineaments and to understand the movement of the faults. Damage assessment were carried out for post 5.5 M_w event. Geodetic measurements from previous studies are also used here (Gahalaut et al, 2016 and Mullick et al., 2020).

5. Recent seismicity in the junction between MF and CMF

Champhai is situated in the junction between the two major active faults of central IBR, viz., the MF and CMF. This is the eastern most district of the Mizoram state, which borders with Myanmar. During the June to September, 2020; a sequence of small to large earthquakes jolted the region (Tab. 1). More than 25 earthquakes of magnitude > 3.0 M_w were recorded by the NCS, though many small earthquakes of < 3.0 M_w were also felt by local people that have not been reported. M_w 5.5 main shock occurred on 22nd June 2020 at 04:10 IST. The epicenter was near the Samthang and Dungtlang village, south of Champhai district, Mizoram (Bharali et al., 2021b). These villages are located on the junction between the MF and CMF. This earthquake shows dextral slip motion with

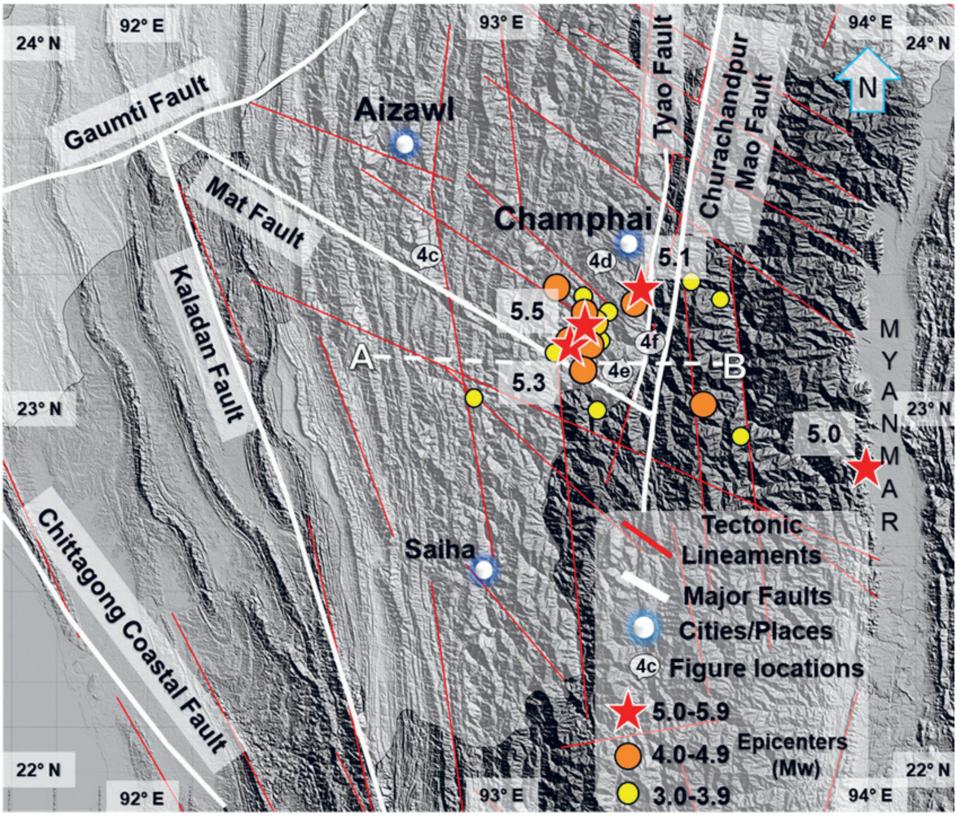

Figure 3. Seismotectonic map of study area. Crustal scale active faults (white) and structural lineaments (>35 km in length) including the synthetic faults (red) north of Mat Fault are included in the map. 2020 Champhai earthquake epicenters are also shown here. White dotted AB line used for the cross-section in Fig. 6.

principal nodal plane that follows the east-west trend, as reported by the GCMT and USGS focal solution data. The majority of the earthquake swarms were located in the southern Champhai near the Mat fault region (Fig. 3). There are several NW-SE synthetic faults and some of the earthquake epicenters fall on them. The mainshock also caused destruction of many buildings and killed many livestock (Fig. 4).

6. Geological evidences of active faults in the junction

MF is a prominent tectonic feature which can be identified in a satellite imagery and DEM as shown in Figs. 5a and 5b. Field mapping of the geomorphic features associated with the active faults was carried out in the region to search

Table 1: List of earthquakes around Champhai during June to September, 2020 (Source: Official Website of National Center of Seismology)

Magnitude	Origin Time	Lat.	Long.	Depth	Region	Location
5.0	2020-06-18 19:29:25	22.82	94.00	80	Champhai Mizoram	98km SE of Champhai, Mizoram, India
5.1	2020-06-21 16:16:24	23.88	93.09	30	Champhai, Mizoram	12km W of Ngopa, Mizoram, India
5.5	2020-06-22 04:10:52	23.22	93.24	20	Champhai, Mizoram	27km SSW of Champhai, Mizoram, India
3.7	2020-06-23 19:17:37	23.01	93.03	25	Champhai, Mizoram	39km SE of Thenzawl, Mizoram, India
3.2	2020-06-23 23:03:48	22.89	93.64	10	Champhai Mizoram	70km SSE of Champhai, Mizoram, India
4.1	2020-06-24 08:02:36	23.18	93.25	10	Champhai, Mizoram	31km SSW of Champhai, Mizoram, India
4.5	2020-06-25 01:14:44	23.26	93.34	136	Champhai, Mizoram	21km S of Champhai, Mizoram, India
4.6	2020-07-03 14:35:41	23.02	93.53	25	Champhai, Mizoram	52km SSE of Champhai, Mizoram, India
4.6	2020-07-05 17:26:37	23.24	93.24	77	Champhai, Mizoram	25km SSW of Champhai, Mizoram, India
4.3	2020-07-09 14:28:16	23.30	93.18	10	Champhai, Mizoram	23km SW of Champhai, Mizoram, India
4.2	2020-07-17 15:56:42	23.17	93.22	10	Champhai, Mizoram	33km SSW of Champhai, Mizoram, India
5.1	2020-07-17 22:03:58	23.29	93.35	78	Champhai, Mizoram	18km S of Champhai, Mizoram, India
3.7	2020-07-17 22:35:35	23.19	93.27	80	Champhai, Mizoram	30km S of Champhai, Mizoram, India
3.5	2020-07-18 20:31:36	23.31	93.48	10	Myanmar	22km SE of Champhai, Mizoram, India
3.2	2020-07-20 03:39:38	23.24	93.29	20	Champhai, Mizoram	24km S of Champhai, Mizoram, India
3.8	2020-07-24 11:16:00	23.27	93.53	10	Myanmar	29km SE of Champhai, Mizoram, India
4.4	2020-07-28 20:08:52	23.22	93.26	10	Champhai, Mizoram	27km SSW of Champhai, Mizoram, India
4.0	2020-08-14 06:38:10	23.12	93.24	10	Champhai, Mizoram	38km SSW of Champhai, Mizoram, India
5.3	2020-08-27 17:37:18	23.16	93.20	30	Champhai, Mizoram	35km SSW of Champhai, Mizoram, India
3.6	2020-08-27 18:16:10	23.16	93.18	25	Champhai, Mizoram	36km SSW of Champhai, Mizoram, India
4.1	2020-08-27 18:47:23	23.17	93.21	25	Champhai Mizoram	34km SSW of Champhai, Mizoram, India
3.3	2020-08-28 06:27:19	23.00	93.27	5	Myanmar	51km S of Champhai, Mizoram, India
3.7	2020-08-29 00:44:45	23.27	93.24	10	Champhai, Mizoram	22km SSW of Champhai, Mizoram, India
4.6	2020-09-20 07:29:06	23.00	93.65	45	Myanmar	60km SSE of Champhai, Mizoram, India

Figure 4. Damages of (A) roads and (B) houses due to 5.5 M_w main shock around Champhai region

for any possible relation with recent seismicity. The activity of the features is identified by the geomorphic indicators visible both in DEM and studied in the field. Shutter ridges are one such structure that was easily identified in the satellite imagery and observed during the field investigation. They are found on both sides of the MF (Fig. 5a). These small ridges were actually part of the Aizawl anticline, that have moved from NS to EW trend due to the movement of MF. These ridges also deflected the channel patterns around the ridges (Figs. 5a and 5b). Many synthetic faults have been developed in the CMF and MF junction due to the stress distribution. Moreover, these seismogenic transverse synthetic faults (SF) parallel to MF in the Champhai region were also investigated during the field visit (Fig. 5c). These faults too have strike- to oblique-slip movement, which is confirmed by the pull-apart basins near the displacement zone (Fig. 5d). The right-lateral fault movement has been observed in the field as basin developed along the slip direction. Few earthquake epicenters were also located on these faults (Fig. 3 and Tab. 1). The junction has been deformed by these fault systems and caused formation of many local structures. In Champhai region, for example, some small scale faults are also observed in the field which show a trend similar to the northwest-southeast faults (Fig. 5e). These faults have strike direction in the range of 295°–315° and dip angles about 38°–70° *i.e.* towards east. This indicates the formation of successive faults in the zone due to the tensional forces.

CMF is a regional scale feature and to identify its seismogenic activity, associated fault systems were investigated. A north-south trending Tyao fault, which is parallel to CMF has been studied. This thrust pushes the lower rock units above the upper one and by doing so, it has formed piggy-back basins east of the valley, through which a river is flowing (Figs. 3 and 5f). Interestingly, this acts as the geopolitical border between India and Myanmar. This fault is related to the CMF though it has a reverse sense of motion as confirmed in the field.

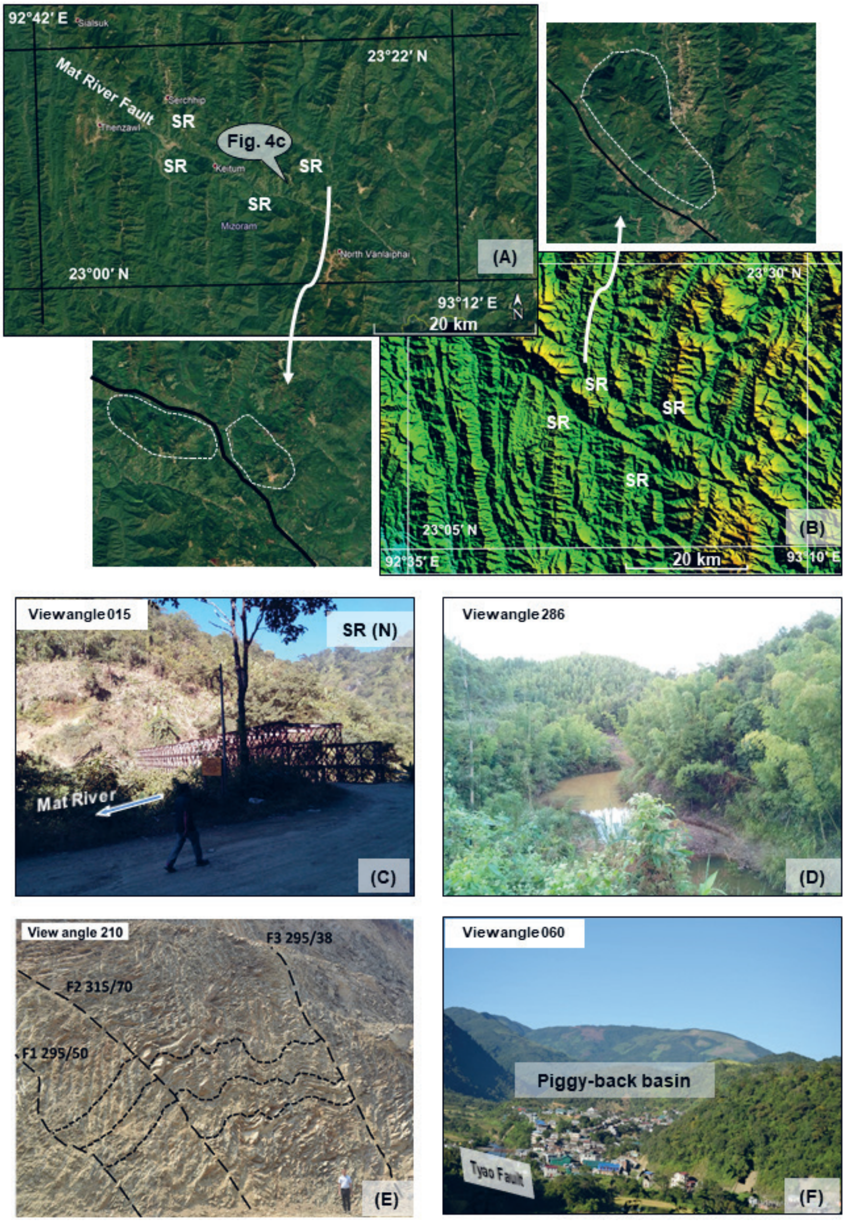

Figure 5. Prominent Mat Fault and shutter ridges (SR) can be identified in (A) Google Earth images including the zoomed SR regions and (B) DEM images; (C) Field evidence of the fault movement near the Mat river with north side shutter ridge as SR (N-north); (D) Pull apart basin formed near one of the seismogenic synthetic faults in Champhai; (E) Faults and small scale folding near northwest-southeast faults and (F) Tyao Fault which is a parallel fault of CMF has a Piggy-back basin which indicate reverse sense of movement

There are few epicenters that are located near this fault, which infers lower activity in the present context. The CMF is devoid of any major activity during this period and therefore, more focus was given to the north-south orientated Tyao fault. It has been observed that only a few aftershocks have been recorded near this fault; however, this only means that the block was adjusting post major seismic event.

7. Discussions and conclusions

The IBR is influenced by the oblique subduction of the Indian lithosphere which gave rise to the arcuate shaped hill ranges. The region is comprised of many deep-rooted crustal fault systems which compensate the plate movements through the oblique slip motion (Rakshit et al., 2018; 2020). The accumulated stress is distributed through these faults and causes seismogenic activities. The recent 2020 earthquakes that occurred in this region around the southern Champhai, Mizoram; appears to be in the junction between MF and CMF. Long crustal CMF is working as a tectonic scale stress compensator although the entire

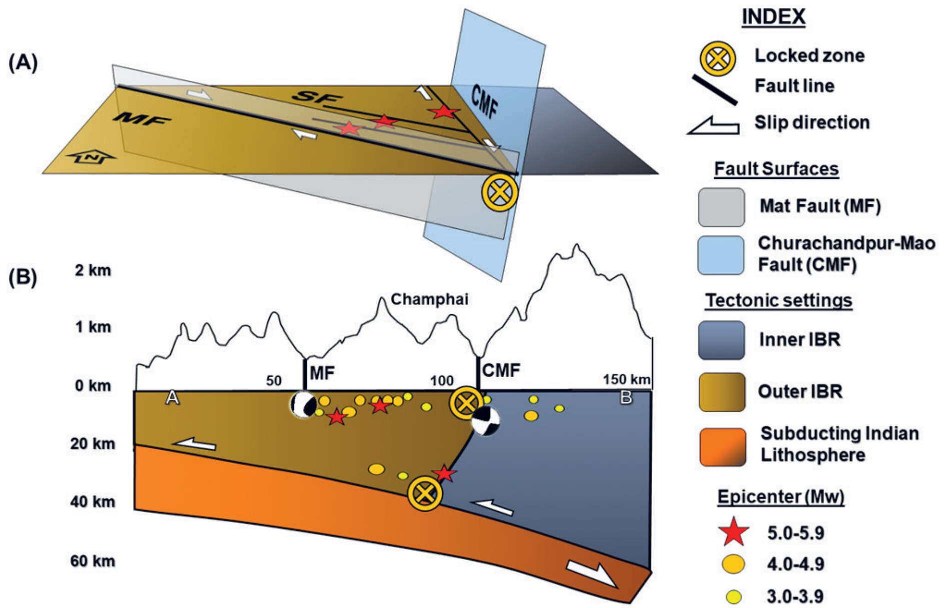

Figure 6. (A) Seismotectonic model for the seismicity (>5.0 M_w) occurred during June-September 2020, due to the movement on the syntetic faults (SF), parallel to the Mat Fault, in the locked junction between Mat Fault (MF) and Churachandpur-Mao Fault (CMF); (B) Seismicity (> 3.0 M_w) shown in the cross-sectional view of the study area. The locked zone of the subducting Indian lithosphere is found to be below the upper locked zone (in this study). Modified after Steckler et al., 2016 and, Maurin and Rangin, 2009. The fault plane solutions are obtained from GCMT data.

stretch has variable displacement rate at different sections (Kumar et al., 2011). This fault is cut across at several points by other transverse faults. MF is one of the prominent features that hindered the active motion of the CMF. The rotational stress component from the Burmese side also caused a deformation of already squeezed tightly folded sections. This present kinematics of the region can be understood by studying the recent seismic activities. The depth seismicity plot for the events and their relation with topographic expressions indicates that most of the earthquakes occurred north of MF at the junction with CMF (Figs. 3 and 6). In this part, where the faults create an angle, stress is being accumulated. In the south of MF, the angle between the two faults is larger and the stress can be distributed rather easily. The subducting Indian lithosphere is locked beneath the junction (Steckler et al., 2016) which can also change the geodynamic perturbation in the subsurface conditions. Slab bending around the same latitude also increases the stress in the upper crustal regime (Rakshit et al., 2020). This stress is accommodating in the juncture, although it cannot be freely distributed along CMF, as cross-cutting MF is creating a hindrance in the movement due to the transverse MF surface. This geodynamic condition led to the locking of the juncture with respect to the motion of the faults. This stress is than releasing through northwest-southeast parallel synthetic faults. Through the geodetic study it is evident that the plate motion is around 20 mm/year or more in the east of CMF although above the junction the rate decreases to 10 or less. However, the southwest orientation of the block movement evident from geodesy is similar throughout the region. This movement is also responsible for generation of stress in the block, north of MF. The strain partitioning along MF is high, as the low magnitude earthquakes are distributed through many oblique-slip faults. The absence of any major earthquakes in the juncture indicates asperities or slow movement of the locked faults. Moreover, the slip rate of 0 ± 5 mm/year of the MF suggests relatively slow movement along the fault surface, as others have movement of up to 5 mm/year around the study area (Tiwari et al., 2015). This infers that the intra-crustal MF and CMF faults are locked in the juncture of their intersection point where the seismotectonic and geodynamic settings have produced the recent earthquakes. The locking of the faults at the juncture near the upper as well as lower crust increases the possibility of larger earthquakes in the future.

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Declarations – The authors declare that they have no conflict of interest.

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SAŽETAK

Zatvoreni rasjedi u Zemljinoj kori povezani sa subdukcijom Indijske litosfere i njezinim posljedicama u seizmotektonskoj aktivnosti u središnjim indo-burmanskim planinskim lancima u sjeveroistočnoj Indiji

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Sjeveroistočna Indija geodinamičko je žarište tektonskih aktivnosti gdje se tri različite ploče, naime, indijska, euroazijska i burmanska ploča sudaraju i deformiraju jedna u odnosu na drugu. Indijska ploča koja se pomiče na sjeveroistoku poprečno ispod Burmanske ploče rezultira formiranjem Indo-Burmanskog raspona (IBR). U središnjem IBR-u, rasjed Churachandpur-Mao (CMF) u smjeru sjever-jug nalazi se na istoku Mizoram-Tripura Fold pojasa. Sjeverozapadno-jugoistočni rasjed rijeke Mat ili Matov rasjed (MF), koji je još jedan veliki poprečni proklizavajući rasjed u razmjeru kore, podržava kretanje CMF-a. U ovom radu razmatrana je seizmotektonska analiza ova dva aktivna rasjeda unutar ploče koja su povezana sa serijom potresa od lipnja do rujna 2020. godine. Iz satelitskih snimaka, podataka o potresima uočeno je i terenskim istraživanjem potvrđeno da ovi rasjedi nisu izravno uključeni u nastanak potresa; nego su epicentri raspoređeni na spoju između MF i CMF. Iz seizmotektonske analize vidljivo je da je to naprezanje raspoređeno kroz neke sintetske rasjede sjeverozapad-jugoistok, smještene sjeverno od MF i paralelno s njim, blizu spoja s CMF-om. Žarišno rješenje najjačeg od potresa 2020., potresa Champhai od 5,5 M_w (22. lipnja 2020. u 04:10 IST) u Mizoramu pokazuje da je glavna čvorna ravnina bila poravnata duž MF. Stoga su ovi sintetički rasjedi odgovorni za potrese, a ne zatvorena zona između MF i CMF rasjeda kore unutar ploče. Ova jukstapozicija izazvala je veliki pomak u geodinamičkom režimu u središnjem IBR-u. Potres u Champhaiju možda nije jedini veliki razorni potres u regiji i mogao bi biti praćen još većim potresima u budućnosti.

Ključne riječi: Zaključana ploča, Indo-burmanski raspon, seizmotektonika, Mizoram

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