Verification of the attenuation model using NGA West-2 GMPEs in the Ayeyarwady Delta Basin, Myanmar

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Abstract

Ayeyarwady Delta Basin is classified as a moderate seismic zone, bounded by the Kabaw and Sagaing faults. The high population density and economic development of this region have exacerbated the impacts of past earthquakes. Consequently, researchers have conducted numerous studies in this area, particularly in Yangon. This study aims to identify the most suitable ground motion model by evaluating four attenuation models from the NGA West-2 GMPEs for shallow crustal earthquakes in active tectonic regions. To validate these models, Peak Ground Acceleration (PGA) and Spectral Acceleration (SA) data from 28 seismic events were analysed. Ground motion data from these events, recorded at eight broadband seismic stations in Myanmar, were used to assess each attenuation model. The optimal model was determined through best-fit testing and optimization techniques applied to both observed and predicted ground motion data. The findings provide valuable insights for future seismic studies and hazard preparedness efforts by enabling the selection of a more accurate, region-specific attenuation model.

Keywords: Attenuation Model; Ground Motion Prediction Equation; Peak Ground Acceleration; Spectral Acceleration; Ayeyarwady Delta Basin

1. Introduction

Ayeyarwady Delta Basin is situated in the south western part of the Myanmar and is a rift basin within the north-south trending Central Myanmar Basin, characterized by its elongated structure and bounded to the east by a North-South trending fault and to the west by a fault that demarcates the boundary with the Rakhine Yoma[1]. The rift basins within the Central Myanmar Basin exhibit predominant orientations of North-South, trends. These basins are segmented by East-West trending uplifted regions that form structural divides. The sedimentary processes across these basins are dominated by southwards sediment transport[1]. Tectonically, the Ayeyarwady Delta Basin shares significant structural relationships with the Mottama Basin[2] and shown in Fig. 1.

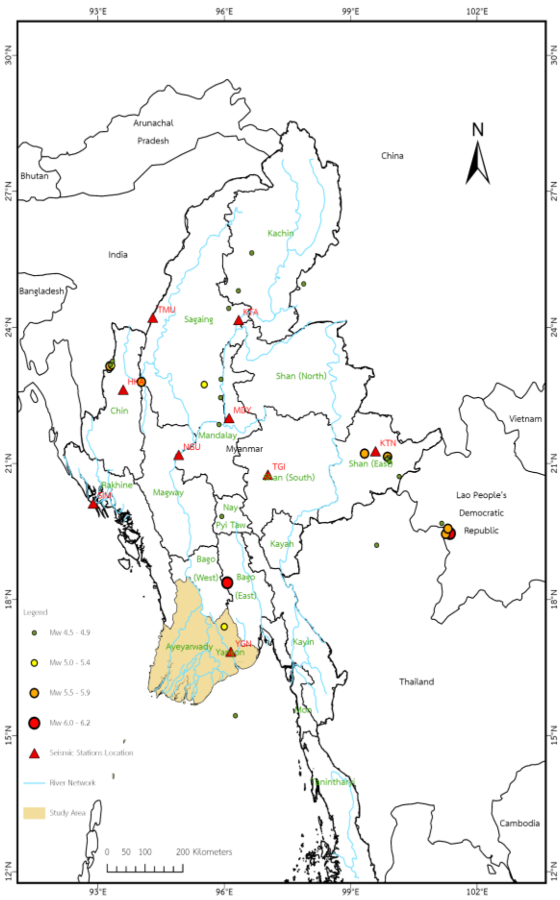

Fig. 1 Map of epicentres, seismic stations and the Ayeyarwady delta basin in Myanmar.

The Ayeyarwady Delta Basin is classified as a moderate seismic zone, as identified in the seismic zone map published by the Myanmar Earthquake Committee in December 2005. This classification highlights the region's susceptibility to seismic activity, which, while not as high as that of more active zones, still poses a considerable risk to its densely populated and economically significant areas. Furthermore, the basin is geologically bounded by two major tectonic features, the Kabaw Fault and the Sagaing Fault, as delineated in Aung (2019)[1]. The delta's soft alluvial deposits and high groundwater table further exacerbate its susceptibility to seismic-induced liquefaction, whereby soil instability arises due to ground shaking. Historical and recent seismic events, including the 2019 Yangon earthquake, have provided empirical evidence of liquefaction, such as water seepage, ground deformation, and structural damage. These factors underscore the critical need for in-depth studies and the implementation of seismic resilience measures to safeguard the region's densely populated and economically vital areas. A significant magnitude 7.7 M_w earthquake occurred on 28 March 2025, with an epicentre near the Sagaing Region in central Myanmar. Despite the considerable distance (~600 km) from Yangon, moderate ground motion was experienced across a substantial portion of southern Myanmar, encompassing the Ayeyarwady and Yangon regions, as reported by the Prompt Assessment of Global Earthquakes for Response (PAGER)[3].

Many researchers conducted the evaluation on the liquefication studies in Yangon while less focused on the Ayeyarwady Region. In fact, the Ayeyarwady Region, which ranks third in population in Myanmar and serves as the primary supplier of rice for the nation, faces significant natural hazards, with earthquakes being secondary to flooding and storm hazards. However, despite its critical role in the country's economy and the potential impact of seismic events, the region's seismic hazards remain underexplored in the existing literature. Given the presence of active tectonic features and the potential for substantial damage to both infrastructure and livelihoods, a comprehensive understanding of the region's seismic vulnerability is essential.

This study aims to select an appropriate attenuation model for the Ayeyarwady Delta Region by analysing multiple seismic events across Myanmar. It introduces a novel approach to attenuation modelling for the study area, which can be utilized in future research on seismic hazard assessment and liquefaction analysis. Additionally, the findings will aid in estimating potential seismic-induced building damage and contribute to the advancement of knowledge in earthquake engineering.

The study evaluates four attenuation models from the Next Generation Attenuation (NGA-West 2) [4] framework to identify the most suitable model for the Ayeyarwady Delta Region. The analysis involves comparing observed peak ground acceleration (*PGA*) and spectral acceleration (*SA*) at 0.2s and 1.0s, recorded from seismic broadband stations, with values predicted by the models. Two statistical metrics, Root Mean Squared Error (*RMSE*) and the coefficient of determination (R^2), are employed to assess model performance. Based on these comparisons, the study examines the applicability of the selected attenuation model for the Ayeyarwady Delta Basin.

2. Previous studies of the seismic Hazard Assessment in Myanmar

Chang et al(2023)[5] focused on the probabilistic seismic assessment for Myanmar, incorporating various seismogenic sources and ground motion prediction equations (GMPEs). In this research, the existing GMPEs are validated by comparing them with instrumental observations and felt intensities from recent earthquakes in Myanmar. The analysis results indicate that Akkar and Cagnan (2010)[6] GMPEs best represent crustal earthquake ground motions, while Atkinson and Boore (2003)[7] GMPEs most accurately model subduction event ground shaking.

Htwe and Shen (2010)[8] performed a probabilistic seismic hazard analysis cantered on Yangon, Myanmar, and its environs, generating hazard maps that quantify Peak Ground Acceleration (*PGA*) on rock sites and in selecting Ground Motion Prediction Equations (GMPEs), the authors incorporated an attenuation relationship of Boore et al, (1997)[9] to construct iso-*PGA* contours for the specified exceedance probabilities. However, the specific GMPEs utilized in the analysis are not explicitly stated in their research.

Thant (2014) [10] conducted the seismic hazard assessment for the Yangon region, a suite of seven Ground Motion Prediction Equations (GMPEs) was utilized to validate the ground motion model. Among these, Boore et al., (1997)[9], Abrahamson and Silva (1997) [11], and Idriss (1999) [12] were initially assigned equal weighting. However, the Boore et al. (1997) GMPE was ultimately selected as the preferred model for seismic hazard analysis in the Yangon region, particularly for the determination of *PGA* and spectral acceleration (*SA*). This validation process underscores the necessity of selecting GMPEs that accurately represent regional seismicity to enhance the reliability of hazard assessments.

3. Seismic ground motion data from Ayeyarwady Delta Region

The Ayeyarwady Delta Region is situated within the active tectonic boundary and surrounded by the subduction of the Indian and Burma plates to the west, the Sagaing Fault to the east, the West Bago Yoma Fault to the north, the Kyaykkyan Fault to the northeast, and the Andaman Rift Zone to the south Thant (2014)[10].

Seismic band board stations were established in Myanmar in 2016 that are shown in Fig. 1 and the ground motion within a 300 km radius of each station are collected. Since their establishment, significant seismic events have been recorded in the region. The most substantial ground motion events occurred in Laos and Myanmar, with magnitudes of 6.2 M_w in 2019 and 6.0 M_w in 2018, respectively, both occurring at depths of approximately 10 km. Additionally, eight moderate-magnitude seismic events, ranging from 5.1 to 5.9 M_w, were recorded at similar depths across Myanmar, India, and Thailand.

Furthermore, lower-magnitude events, with a minimum magnitude of 4.8 M_w, were primarily recorded in Myanmar, with some occurrences in Thailand and India. Over the data collection period from 2017 to 2023, a total of 28 seismic events were documented by the monitoring stations. Among these, eighteen events occurred in Myanmar, five in India, three in Thailand, and two in Laos. Each recorded event was systematically documented in terms of its magnitude, depth, and time of occurrence, as detailed in Table 1.

4. Description of the Next Generation Attenuation (NGA) West-2 Model

The NGA-West2 project[4] is a comprehensive, multidisciplinary, and long-term research initiative focused on the development of Next Generation Attenuation (NGA) models for shallow crustal earthquakes occurring in seismically active tectonic regions. This project has been overseen by the Pacific Earthquake Engineering Research Center (PEER) and involves extensive collaboration among numerous researchers and organizations. Its central objectives focus on improving seismic hazard assessment methodologies through the development of Next Generation Attenuation (NGA) models.

Key components of the research involve updating the NGA database to encompass earthquakes with magnitudes ranging from 3.0 to 7.9 and refining ground motion prediction equations (GMPEs) of for the "average" horizontal component. Additionally, the project focuses on improving response spectral scaling for damping ratios other than the standard 5%, quantifying the influence of directivity and directionality on horizontal ground motion, and resolving inconsistencies between NGA and the National Earthquake Hazards Reduction Program (NEHRP) site amplification factors. The details of these new horizontal GMPEs can be found in Abrahamson, Silva, and Kamai (ASK14)[13], Boore, Stewart, Seyhan, and Atkinson (BSSA14)[14], Campbell and Bozorgnia (CB14)[15], Chiou and Youngs (CY14)[16] and Idriss (I14)[17]. Furthermore, the study aims to assess epistemic uncertainties associated with NGA GMPEs and develop GMPEs specifically for vertical ground motion.

Ultimately, NGA-West2 seeks to advance the precision and reliability of seismic hazard assessments, thereby facilitating improved earthquake engineering design and risk mitigation strategies[4].

5. Methodology

The primary step of this research is to collect the ground motion data of the earthquake events from the available open sources. First, the seismic record, the intensity starting from magnitude M_w 4.6, is gathered from the US Geological Survey (USGS). In this study, the data is collected starting from January 2016 because the seismic band board stations in Myanmar are established in 2016, and nine stations are totally built up in August 2017. The standard information of the catalogue such as date, time, location, magnitude, focal depth, distance to the surface projection can be listed according to the data collected from USGS. Then, the fault type and dip angle to the fault are collected form Global Centroid Moment Tensor - GCMT[18].

Table 1 Seismic stations and input parameter of ground motion data.

Date (UTC)	Time (UTC)	Station	V_{S30} (m/s)	M_w	Z_{TOR} (km)	R_{JB} (km)	Dip (°)	Ground Motion Parameter			W (km)	R_{RUP} (km)	Z_{HYP} (km)	Z_1 (km)	$Z_{2.5}$ (km)
								PGA	*SA (0.2s)*	*SA (1.0s)*					
13-3-2017	14:19:00	YGN	760	5.1	10	61.63	85.5	0.00352	0.00866	0.00536	4.19	62.43	12.09	0.048	1.99
18-4-2017	09:13:00	KTN	760	4.6	9.87	86.69	85.5	0.00391	0.00935	0.00284	2.90	87.25	11.31	0.048	2.02
2018-11-01	18:26:00	TGI	760	6.0	9	284.99	47.0	0.00061	0.00157	0.00109	8.13	285.13	11.97	0.048	16.66
2018-11-01	18:26:00	YGN	760	6.0	9	167.84	47.0	0.00204	0.00305	0.00705	8.13	168.08	11.97	0.048	1.99
2018-07-03	21:13:00	MDY	760	4.6	10	243.63	79.5	0.00010	0.00025	0.00013	2.90	243.84	11.42	0.048	8.45
2018-07-03	21:13:00	NGU	760	4.6	10	186.20	79.5	0.00117	0.00153	0.00172	2.90	186.46	11.42	0.048	1.95
2018-07-03	21:13:00	TGI	760	4.6	10	154.69	79.5	0.00138	0.00516	0.00095	2.90	155.02	11.42	0.048	8.45
16-1-2019	21:39:00	TMU	760	4.6	10	215.53	72.0	0.00006	0.00011	0.00007	2.90	215.77	11.38	0.048	9.60
20-2-2019	09:05:00	KTN	760	4.6	10	232.56	75.0	0.00241	0.00134	0.00097	2.90	232.78	11.40	0.048	2.02
31-8-2019	15:09:00	HKA	760	5.4	10	197.58	78.0	0.00060	0.00087	0.00152	5.22	197.83	12.55	0.048	8.58
31-8-2019	15:09:00	TMU	760	5.4	10	207.18	78.0	0.00038	0.00088	0.00047	5.22	207.42	12.55	0.048	8.58
31-8-2019	15:09:00	TGI	760	5.4	10	269.33	78.0	0.00165	0.00650	0.00090	5.22	269.51	12.55	0.048	8.58
20-11-2019	21:03:00	KTN	760	5.7	10	268.30	75.0	0.00151	0.00171	0.00689	6.52	268.49	13.15	0.048	2.02
20-11-2019	23:50:00	KTN	760	6.2	10	274.65	73.5	0.00484	0.00554	0.01844	9.42	274.83	14.52	0.048	2.02
2020-04-03	00:20:00	KTA	760	4.8	10	36.04	76.5	0.00425	0.00957	0.00722	3.36	37.40	11.63	0.048	2.08
2020-04-03	00:20:00	TMU	760	4.8	10	183.85	76.5	0.00022	0.00029	0.00020	3.36	184.12	11.63	0.048	8.72
16-4-2020	11:45:00	NGU	760	5.9	10	199.57	51.5	0.00234	0.00249	0.00583	7.55	199.82	12.95	0.048	1.95
16-4-2020	11:45:00	TMU	760	5.9	10	161.34	51.5	0.00079	0.00108	0.00179	7.55	161.65	12.95	0.048	50.26

Table 1 Seismic stations and input parameter of ground motion data.

Date (UTC)	Time (UTC)	Station	V_{S30} (m/s)	M_w	Z_{TOR} (km)	R_{JB} (km)	Dip (°)	Ground Motion Parameter			W (km)	R_{RUP} (km)	Z_{HYP} (km)	Z_1 (km)	$Z_{2.5}$ (km)
								PGA	*SA (0.2s)*	*SA (1.0s)*					
21-6-2020	22:40:00	HKA	760	5.6	10.84	64.62	77.5	0.00453	0.00300	0.00251	6.05	65.52	13.79	0.048	9.29
21-6-2020	22:40:00	TMU	760	5.6	10.84	158.85	77.5	0.00115	0.00398	0.00213	6.05	159.22	13.79	0.048	9.29
2020-05-07	11:56:00	HKA	760	4.8	10	66.83	81.5	0.00036	0.00084	0.00048	3.36	67.57	11.66	0.048	8.58
2020-05-07	11:56:00	NGU	760	4.8	10	275.15	81.5	0.00018	0.00006	0.00003	3.36	275.33	11.66	0.048	1.95
2020-05-07	11:56:00	TMU	760	4.8	10	155.72	81.5	0.00005	0.00007	0.00015	3.36	156.04	11.66	0.048	8.58
28-7-2020	14:38:00	HKA	760	4.8	10	73.47	86.0	0.00050	0.00130	0.00124	3.36	74.15	11.67	0.048	7.44
28-7-2020	14:38:00	NGU	760	4.8	10	279.92	86.0	0.00010	0.00003	0.00005	3.36	280.10	11.67	0.048	1.95
28-7-2020	14:38:00	TMU	760	4.8	10	145.64	86.0	0.00013	0.00022	0.00016	3.36	145.98	11.67	0.048	7.44
27-8-2020	12:07:00	HKA	760	5.3	10	64.53	76.5	0.00322	0.00446	0.00761	4.85	65.30	12.36	0.048	8.72
27-8-2020	12:07:00	TMU	760	5.3	10	154.61	76.5	0.00074	0.00080	0.00215	4.85	154.94	12.36	0.048	8.72
24-12-2020	08:09:00	KTA	760	4.8	10	165.46	73.0	0.00098	0.00082	0.00098	3.36	165.76	11.61	0.048	2.08
24-12-2020	08:09:00	TMU	760	4.8	10	284.44	73.0	0.00012	0.00003	0.00004	3.36	284.62	11.61	0.048	11.52
25/2/2021	02:34:00	HKA	760	4.9	10	239.34	72.5	0.00083	0.00009	0.00017	3.61	239.55	11.72	0.048	9.77
25-2-2021	02:34:00	KTA	760	4.9	10	152.99	72.5	0.00125	0.00202	0.00069	3.61	153.32	11.72	0.048	2.08
2021-12-06	10:00:00	YGN	760	4.9	10	178.83	88.0	0.00009	0.00010	0.00005	3.61	179.11	11.81	0.048	1.99
2021-07-07	06:43:00	KTN	760	4.7	10	242.40	77.5	0.00108	0.00150	0.00260	3.12	242.61	11.52	0.048	2.02
2021-10-08	03:18:00	HKA	760	4.8	10	238.08	65.5	0.00210	0.00009	0.00013	3.36	238.29	11.53	0.048	15.01
2021-10-08	03:18:00	KTA	760	4.8	10	196.95	65.5	0.00126	0.00217	0.00216	3.36	197.20	11.53	0.048	2.08
2021-10-08	03:18:00	NGU	760	4.8	10	172.46	65.5	0.00025	0.00041	0.00053	3.36	172.75	11.53	0.048	1.95
2021-10-08	03:18:00	TGI	760	4.8	10	220.60	65.5	0.00097	0.00492	0.00030	3.36	220.83	11.53	0.048	15.01
2021-10-08	03:18:00	TMU	760	4.8	10	256.87	65.5	0.00008	0.00018	0.00007	3.36	257.06	11.53	0.048	15.01
19-12-2021	21:06:00	KTN	760	5.5	10	262.60	78.0	0.00091	0.00095	0.00305	5.62	262.79	12.75	0.048	2.02
29-6-2022	18:54:00	KTN	760	4.7	10	35.62	70.5	0.00855	0.02367	0.00977	3.12	36.99	11.47	0.048	2.02
29-6-2022	18:54:00	TGI	760	4.7	10	299.48	70.5	0.00027	0.00032	0.00022	3.12	299.65	11.47	0.048	9.60
21-7-2022	16:40:00	KTN	760	4.9	10	34.85	73.0	0.00983	0.01632	0.00689	3.61	36.26	11.73	0.048	2.02
21-7-2022	16:40:00	TGI	760	4.9	10	296.13	73.0	0.00010	0.00037	0.00011	3.61	296.30	11.73	0.048	9.14
21-7-2022	17:07:00	KTN	760	5.9	5	33.43	80.5	0.04438	0.10527	0.04650	7.55	33.80	8.72	0.048	2.02
29-7-2022	09:58:00	KTN	760	4.8	10	43.96	53.5	0.00486	0.01521	0.00266	3.36	45.08	11.35	0.048	2.02
14-12-2022	20:46:00	NGU	760	4.8	10	123.04	66.0	0.00186	0.00343	0.00199	3.36	123.45	11.53	0.048	1.95
14-12-2022	20:46:00	TGI	760	4.8	10	170.34	66.0	0.00229	0.01002	0.00044	3.36	170.63	11.53	0.048	13.34
22-6-2023	00:12:00	YGN	760	4.9	13.56	159.13	47.0	0.00020	0.00034	0.00038	3.61	159.71	14.88	0.048	1.99
17-11-2023	01:37:00	KTN	760	5.7	15.73	27.95	79.5	0.13106	0.18519	0.06641	6.52	32.08	18.94	0.048	2.02

The next step is to evaluate the peak ground acceleration of all seismic events from every band board stations. Before collecting the data from the station, the seismic events within 300 km distance from the stations are filtered at first. After that, the data are accumulated from every station within 300 km distance especially the horizontal components of the instruments, HNE (Horizontal East) and HNN (Horizontal North). This information is available from the Department of Meteorology and Hydrology – National Earthquake Data Center (2016) through the International Federation of the Digital Seismographs Network[19].

For each ground motion record, the peak ground acceleration (*PGA*) was directly obtained from the recorded data, while the spectral accelerations (*SA*) at 0.2 seconds and 1.0 seconds were determined through seismic response analysis[20]. This analysis utilized single-degree-of-freedom structural models with a 5% damping ratio, performed using the PRISM software[21].

As the next process, the required input parameters, listed in Table 1, are calculated to evaluate the peak ground acceleration (*PGA*) and spectral accelerations, *SA* at 0.2s and *SA* at 1.0s using the weighted average of 2014 NGA WEST-2 GMPEs' spreadsheet[22]. This evaluated ground motion predictions obtained from attenuation models are compared with the recorded PGA and *SA* gathered from the stations by using the Root Mean Squared Error (RMSE) and coefficient of determination (R^2) to select the most appropriate attenuation model from the NGA West-2 models [20, 23].

6. Result and Discussion

The comparison between the predicted ground motion data from the NGA West 2 models and the observed data from the stations reveals significant insights into the applicability of different attenuation models for the study area. Based on the evaluation results presented in Table 2, the attenuation model

(BSSA14) proposed by Boore et al. (2014)[14] demonstrates the highest accuracy in estimating ground motion parameters, including Peak Ground Acceleration (*PGA*), Spectral Acceleration at 0.2 second (*SA* 0.2s), and Spectral Acceleration at 1 second (*SA* 1.0s).

Table 2 Comparison of R^2 and *RSME* of each attenuation model.

Model	PGA		SA 0.2s		SA 1.0s	
	R^2	RSME	R^2	RSME	R^2	RSME
ASK14	0.19	3.35	0.29	2.79	0.22	2.21
BSSA14	**0. 68**	**2.09**	**0.83**	**1.38**	**0.47**	**1.83**
CB14	0.43	2.81	0.53	2.26	0.35	2.02
CY14	0.25	3.21	0.41	2.53	0.28	2.12

Among the considered attenuation models, the Boore et al. (2014)[14] model consistently exhibits the best agreement with the observed ground motion data that is shown in Fig. 2, indicating its suitability for seismic hazard assessment in the study region. The model's superior performance suggests that its underlying assumptions and empirical relationships align well with the geological and seismological characteristics of the area. This outcome emphasizes the importance of selecting an appropriate attenuation model for accurate ground motion prediction, as discrepancies in model selection can lead to variations in seismic hazard estimates.

Furthermore, the comparison highlights the variability among different attenuation models in predicting ground motion parameters. While other models in the NGA West 2 database provide reasonable estimates, their deviations from the observed data suggest that they may not fully capture the local ground motion characteristics. These findings reinforce the necessity of model validation against regional seismic records to ensure reliable hazard assessments.

The importance of model validation is underscored by the significant earthquake along the Sagaing Fault in March 2025, which generated widespread ground shaking across central Myanmar, highlights the critical and immediate requirement for precise ground motion prediction within national seismic hazard assessments. Despite the epicentre location outside the Ayeyarwady Delta, the perceptible tremors in Yangon and adjacent areas illustrated the potential for far-field seismic wave propagation to impact critical infrastructure even in regions characterized by lower seismicity.

Within this context, the validated performance of the BSSA14 ground motion attenuation model assumes heightened importance. Its demonstrated accuracy in estimating ground motion parameters within the Ayeyarwady region suggests its potential for effective application to future seismic events exhibiting comparable magnitudes and fault mechanisms. In the event of a similar earthquake occurring closer to the delta or within the Yangon metropolitan area, the integration of a reliable ground motion prediction equation (GMPE) such as BSSA14 into hazard assessments and building code specifications could substantially enhance preparedness and resilience.

Moreover, this recent earthquake event serves as an important awareness trigger, emphasizing the role of regionally validated ground motion models not just for academic purposes, but for real-world applications including emergency planning, infrastructure design, and public safety strategies. The incorporation of such verified models into seismic risk assessments will be vital for improving the accuracy of hazard maps and informing mitigation measures in future earthquake scenarios.

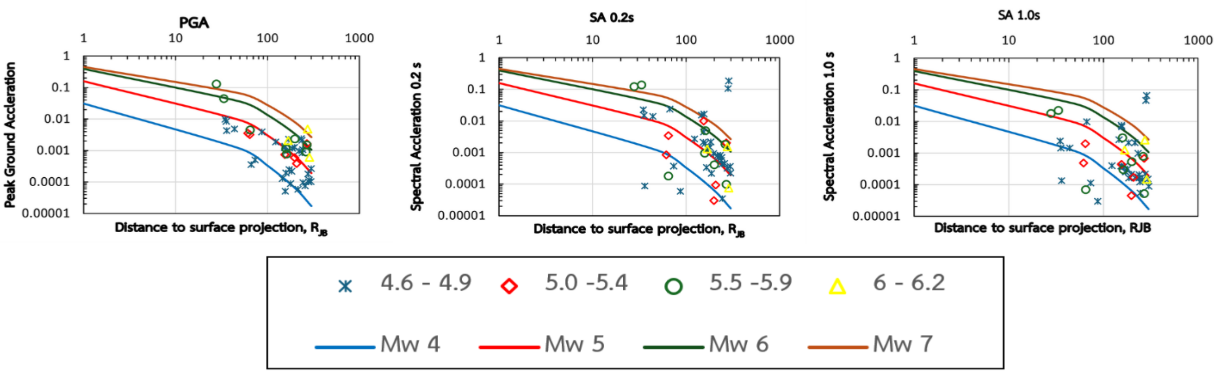

Fig. 2 Comparison of observed ground motion data withBSSA14 attenuation model for different magnitudes.

7. Conclusion

This study aimed to identify the most appropriate attenuation model for the Ayeyarwady Delta Region by evaluating four Next Generation Attenuation (NGA-West 2) models using recorded ground motion data. The comparative analysis of observed and predicted seismic parameters, including *PGA* and *SA* at 0.2s and 1.0s, revealed that the BSSA14 attenuation model proposed by Boore et al. (2014)[14] provides the highest accuracy in ground motion estimation for the study area. This model demonstrated the best agreement with the recorded seismic data, making it the most suitable choice for seismic hazard assessment in the region.

The findings of this research underscore the importance of selecting an appropriate attenuation model, as variations in model predictions can significantly influence seismic hazard assessments. The BSSA14 model's superior performance suggests that it effectively captures the local geological and seismological characteristics of the Ayeyarwady Delta Basin. Furthermore, this study highlights the necessity of validating ground motion models against regional seismic records to enhance their reliability and applicability.

Recognising the Ayeyarwady Delta Basin moderate seismicity and significant liquefaction risk due to its soft alluvial deposits, the findings underscore the paramount importance of regionally validated attenuation models for enhancing earthquake preparedness and risk mitigation, ultimately contributing to more precise seismic hazard assessments that inform infrastructure design, urban planning, and disaster risk management, and whose integration into national codes and hazard maps is crucial for bolstering Myanmar's earthquake resilience, especially in this vulnerable region.

Future research should focus on expanding the dataset by incorporating additional seismic events and further refining attenuation models to account for region-specific ground motion characteristics. Additionally, integrating site-specific geotechnical parameters could enhance the predictive accuracy of seismic hazard assessments, ultimately contributing to the development of more resilient infrastructure in Myanmar's Ayeyarwady Delta Region.

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