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Discussion on "Damping coefficients for near-fault ground motion response spectra"

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ABSTRACT

This discussion is based on the paper by Hubbard and Mavroeidis [1]. In this paper, the authors have presented an interesting study on the effect of near-fault ground motions on the damping coefficients examining single degree of freedom (SDOF) systems. This discussion presents some comments on the results and the conclusions of that paper, which imply that some aspects need further clarification and/or improvement.

1. Discussion

The paper under discussion [1] studies the effect of near-fault strong ground motions on the damping coefficients of response spectra by utilizing single-degree-of-freedom (SDOF) systems. The work reported in that paper is original and presents some interesting results.

On the basis of previous research work [2,3] of the second author of [1], classification of near-fault spectra according to their M_w (moment magnitude) as well as normalization of the spectral period with the velocity pulse duration T_P are performed. More specifically, to investigate the effect of M_w, the strong ground motions of Table 1 [1] are grouped into three categories labeled as moderate (M_w=5.6–6.3), moderate-to-large (M_w=6.4–6.7), and large (M_w=6.8–7.6), whereas the values for T_P to be used for normalization purposes for all individual strong ground motions records listed in Table 1 [1] have been taken from [2]. The near-fault strong motion database considered in Table 1 [1] includes 38 records with pronounced forward directivity and permanent translation effects. Therefore, the results of this study are valid only for strong ground motions records that exhibit strong velocity pulses. This brings us to the first comment for paper [1]. Motions recorded at stations in the proximity of faults and exhibiting a sequence of strong velocity pulses, e.g., the Takatori recording from Kobe earthquake (16/01/1995, Japan), or motions exhibiting the characteristic velocity pulse of near-fault motions recorded far from the fault, e.g., the Bucharest recording from Bucharest earthquake (04/03/1977, Romania) have not been considered in Table 1 [1]. From this perspective, the authors should mention if their results can be applied to cases of motions like the aforementioned ones. Furthermore, it should be also noted that in other studies, which have also proposed damping coefficients for SDOF systems, a much larger number of accelerograms, e.g., hundreds [4] or even thousands of records [5], has been used.

The second comment is related to the conclusions section: '*The results indicated that damping coefficients proposed in building codes and previous studies, based primarily on far-field ground motion records, tend to not be conservative for near-fault seismic excitations. Only the study by Priestley [6] that gave special consideration to near-fault seismic excitations does remain conservative for the levels of damping that it could be compared to.*' The discussers have not found in [1] any investigation effort of the authors to confirm the first sentence, i.e., to show that the damping coefficients for near-fault and far-fault records are different. Therefore, this statement seems to be a surmise and in our opinion has been inappropriately placed in the section of conclusions. At the same time, the paper does not give full credit to previous work on the field. More specifically, the authors have neglected to refer to the work of Hatzigeorgiou [4] on the comparative investigation for damping coefficients between near-fault and far-fault ground motions. Examining 100 far-fault and 110 near-fault records, Hatzigeorgiou [4] found that near-fault and far-fault earthquakes lead to similar damping coefficients. Furthermore, he found that the results of previous studies, which have mainly been proposed for far-fault earthquakes, vary significantly between themselves (p. 1253 in [4]). Additionally,

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