

عنوان مقاله:

Influences of temporal evolution of ground motion frequency content on developed dynamic ratcheting in SDOF systems

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خلاصه مقاله:

Dynamic Ratcheting (DR) is a nonlinear dynamic phenomenon occurring in hysteretic damping systems. It means the structural plastic deformation increases asymmetrically in successive cycles under an earthquake excitation. Although it is generally recognized that DR is closely related to the frequency contents of an earthquake excitation applied to the structure, no targeted analysis has been conducted on the influence of time-varying frequency content on occurrence and development of DR. This manuscript aims to analyze the influence of time evolution of DR-inducing ground motion frequency content on developed DR phenomenon in the Single Degree-Of-Freedom (SDOF) system with the Elastic-Perfectly-Plastic (EPP) hysteretic behavior. To survey the influence of time evolution of ground motion frequency content on the developed DR: In the first step, the three DR-inducing ground motion records were selected as excitations input of EPP SDOF systems. In the second step, time-varying frequency of ground motions were changed by shifting their frequency content forward or backward in time using wavelet transform to produce altered versions records. In the final step, the displacement responses of EPP SDOF systems under selected records and their altered versions were compared. By analyzing the displacement response of EPP SDOF systems excited by selected ground motions and their altered versions, it can be found that the time-varying frequency content considerably influences the developed DR behavior in SDOF systems. In the selection of records for dynamic analysis of structures, time-varying frequency content could be further considered as an important characteristic variable for ground motion records.

کلمات کلیدی:

Keywords: Dynamic Ratcheting, Time-varying frequency content, EPP SDOF system, Wavelet transform

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