

Abstract:

The Conditional Mean Spectrum (CMS) is often employed to select ground motions for intensity-based assessments of tall buildings. However, the seismic demands determined by response history analyses with ground motions from a single CMS may be unconservative because multiple vibration modes often significantly influence the response of tall buildings. Existing solutions to this problem include analyzing the building with: (i) a Uniform Hazard Spectrum (UHS), (ii) multiple CMSs conditioned on different vibration periods, and (iii) a complete risk-based assessment. To minimize computational effort while preserving accuracy, we propose an alternative target spectrum that combines features from both the CMS and the UHS (referred to as the CMS-UHS Composite Spectrum). Results from a realistic case study suggest that this engineering solution provides seismic demands that are as accurate and precise as those obtained from analyzing the building with multiple CMSs while simultaneously reducing the computational effort by a factor of two or more.