RECONCILING BIAS IN MODERATE MAGNITUDE EARTHQUAKE GROUND MOTIONS PREDICTED BY NUMERICAL SIMULATIONS

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This study employs the Graves-Pitarka broadband ground motion simulation method, integrated within the SCEC Broadband Platform BBP, to conduct finite fault simulations for 51 well-recorded moderate magnitude events in Southern California, ranging from Mw 3.92-5.52. The core objective is to evaluate whether simulated ground motions are biased relative to observations through a direct comparison of effective amplitude spectra (EAS). If bias is found, we also seek to identify sources of misfit in the simulations. We anticipate bias may be present based on systematic underprediction of low-frequency spectral accelerations from prior work (Nweke et al. 2022). We extend that work by considering additional events and using EAS. Bias at frequencies $<$ 1 Hz persists in the present results. Further investigation of residuals shows that while site and path-related biases exist, they are minor, as substantial bias remains after accounting for their influence. Therefore, we posit that the remaining bias is likely related to the earthquake source attributes. We hypothesize that the empirical magnitude-rupture area scaling relationship applied in the simulations from Leonard (2010) breaks down for lower magnitude events. This hypothesis appears valid for the 2008 Mw 5.36 Chino Hills event. However, further testing is limited by the unavailability of finite fault models to establish rupture area for events in our dataset. Ongoing research focuses on the effects of fault rupture area - related to stress drop and average slip - on the overall bias. Moreover, we intend to conduct a sensitivity study of other earthquake source attributes, such as average rupture speed, on an event-specific basis to explore potential resolutions for the remaining observed bias.