Estimation Of High-Frequency Attenuation Parameter (Kappa) For Hard Rock Stations Of Turkish Strong Motion Network

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Site-specific decay in the Fourier Amplitude Spectrum (FAS) at high frequencies, a.k.a. the zero-distance kappa (κ₀), is frequently used in seismic analysis of critical infrastructure; especially for the host-to-target adjustment of the design spectrum and the site response analysis. The zero-distance kappa value for hard rock sites is more crucial but harder to constrain because the amount of strong-motion stations on hard-rock sites is limited in the global datasets. The objective of this study is to calculate the zero-distance kappa value for the hard rock strong-motion stations operated by the Disaster and Emergency Presidency of Turkey (AFAD). For this purpose, 6463 recordings from 22 strong-motion stations with measured average shear wave velocities at the first 30 meters (V₃₀) higher than 740m/s and having at least 100 records have been analyzed. The slope of the decay in the S-wave portion of the FAS (kappa) at high frequencies is determined for a carefully selected and record-specific frequency range. Variation of the kappa with epicentral distance is evaluated to determine the median zero-distance kappa and its uncertainty for each recording station. Estimated median zero-distance kappa values vary between 0.01s to 0.06s and are consistent with the limited amount of previously published data. Only a weak reduction in median zero-distance kappa is observed with increasing V₃₀ and a rather large scatter in kappa for the same V₃₀ values is observed. More robust results might be attained by isolating the site amplification effects of weak surficial layers and subcategorization based on available geological and geographical information.