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Power-law decay characteristic and frequency dependence of seismic coda envelopes

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To date, coda envelopes have been described by bending curves which have several systematic changes in decay rate with lapse time in a log-log scale. However, for NS component seismograms of regional earthquakes, applying the Hilbert transform to make seismic envelopes and taking regression analysis on the envelopes in period bands from 1/4-1/2s to 16-32s with lapse time as long as 4000s, we found that coda envelopes decay according to some power of lapse time. The 'power-law' decay characteristic of seismic envelopes indicates that the spectra amplitude of seismic coda could be simply expressed as of the form $A(t, T_C) \propto t^{-\alpha(T_C)}$, where t is lapse time and T_C is central period in second. The exponent α value has frequency dependence; $\alpha_1 = -2.0(\pm 0.4) \log T_C + 4.0(\pm 0.2)$ for before *ScS*, $\alpha_2 = -2.5(\pm 0.5) \log T_C + 4.8(\pm 0.5)$ for after *ScS*. Moreover, it shows no significant difference between shallow and deep focus events. The simple and distinct characteristics of seismic coda envelopes could provide reliable information to determine physical values such as attenuation parameters or source size, and to identify the regional difference of medium heterogeneity in the deep Earth. We also note that the attenuation mechanism in the D'' layer should be considered to explain the change of coda decay rate after the *ScS* arrival.