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Evidence for the Partial Melt Beneath the Central Anatolia Elucidated from Frequency Dependent Shear Wave Attenuation

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The Central Anatolian Plateau, featuring volcanic provinces, serves as a significant transition zone between compressional deformation in the east and an extensional regime in the west. The Central Anatolian Fault Zone acts as the demarcation between the Kırşehir Block to the north and the Anatolide-Tauride block to the south within the plateau. A comprehensive understanding of physical properties, particularly seismic attenuation in the crustal volume of this region, offers insights into the potential sources of past and present geodynamic events, contributing to the observed deformation. In our study, we adopt a non-empirical coda wave modeling approach to separately analyze intrinsic and scattering attenuation. This involves a fitting process between observed and synthetic coda wave envelopes for each earthquake across multiple frequency bands. Utilizing acoustic radiative transfer theory with assumptions of multiple isotropic scattering, we forward model synthetic coda-wave envelopes for local earthquakes. Our findings highlight the dominancy of intrinsic attenuation over scattering attenuation, suggesting the presence of thick volcanic rocks with relatively high attenuation values beneath Central Anatolia. The spatial distribution of attenuation at various frequencies distinctly identifies the Kırşehir Massif with its considerable high attenuating character. Our results, coupled with earlier seismological and geo-electrical models suggests the possibility of partial melt beneath much of the Central Anatolian Volcanic Province. Zones with elevated fluid content exhibit dominant intrinsic attenuation. Toward the southeast, a gradual decrease in observed attenuation aligns with the Central Tauride Mountains, where high altitude is believed to have evolved following slab break-off and subsequent mantle upwelling.