Seismic Coda Correlation for Constraining Lunar Seismic Discontinuities

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Constraining seismic structure of the Lunar interior is crucial to understand formation and evolution of the moon and the Earth. The passive seismic experiments of the Apollo missions deployed four seismometers from Apollo 12, 14, 15 and 16 which recorded continuous data from 1969 to 1977 and one, Apollo 11 worked only for 20 days (Nunn et al., 2020). In previous studies, the internal structure of the Moon was roughly divided into regolith, crust, mantle and core from geophysical observations and other modeling and laboratory measurements. However, the depths of theses discontinuities are still imprecise, especially to the Moho discontinuity. The depth of the crust-mantle boundary has been estimated be a quite shallow, 28 km (Garcia et al., 2011) to relatively deep, 60 km (Toksoz et al., 1974). Interfaces within the lunar crust have also been suggested. Autocorrelation of seismic body wave coda from distant deep-moonquake clusters, which are steeply incident, provide a means for recovering the reflectivity beneath the Apollo stations. Up to now, we have already processed vertical component data of A1 deep-moonquake cluster which has the most event numbers at station 12, which suggests two clear phases at 10 s and 15 s that might be related with Moho discontinuity. Based on the velocity models (Nunn et al., 2020), their depths are around 34 km and 54 km.

Key words: Autocorrelation analysis; Lunar internal structure; Moho discontinuity

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