Futhere Constraints and Uncertainties on the Deep Seismic Structure of the Moon

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Overview

The Apollo Passive Seismic Experiment (APSE) consisted of three component seismometers deployed between 1969 and 1972 that continuously recorded lunar seismic motion until late 1977. The APSE data provide a unique opportunity for investigating the structure of a genuinely body other than Earth, gathering the most direct constraints on the deep lunar crust and mantle and determining the evolution of the Moon. Owing to the lack of far side moonquakes (Nakamura et al. 1983), the lowermost few hundred kilometers of the interior were unable to constrain the lowestmost 500 km of the interior (Fig. 1). Results of an array methodology aimed at detecting deep lunar seismic reflections found evidence for a lunar core (Fig. 2). Briefly, producing an elastic model of the deep lunar interior consistent with geodetic data.

Here we study the uncertainties in these models associated with the double array stacking of deep focus moonquakes for imaging deep reflectors (Fig. 3) in the Moon. We investigate the potential of the stacking procedure for revealing the deep structure and for interpreting the symmetric reflectors. These efforts are facilitated by the generation of synthetic seismograms, allowing us to directly study the multi-effects that occur in different parameters. Different experiments were examined at examining various processing parameters, such as window time, stacking, and so on. Our goal is to fully model the reflector structures that reflect energy between stations and in turn where the deep seismic structure reveals some distinct seismic velocity perturbations of the upper 1200 km in 1911 (model (Weber et al. 2011).

Double Array Stacking (DAS)

A method often used in terrestrial seismology to enhance and reduce noise coherence seismic events in which the seismic events are coherent at the same station and then average over time in the stack associated with each interface reflection (Fig. 4). The DAS method is derived from linearity and coherence. In summary, this approach provides a more reliable approach than the ‘peak picking’ method for the determination of the phases and the associated amplitudes (Fig. 5).

Lunar Synthetic Waveforms

Seismograms are time delayed for time windowing are predicted arrival times and then summed. Seismograms are time delayed for time windowing are predicted arrival times and then summed. If energy is present from an interface is not included in particular a depth, a coherent arrival will be present at zero time in the stack associated with the interface reflection. If energy to the interface is not coherent reflected waves can be integrated over various times (Fig. 6).

Conclusions

• Double Array Stacking (DAS) provides a method for enhancing and reducing noise coherence seismic events in which the seismic events are coherent at the same station and then average over time in the stack associated with each interface reflection (Fig. 4). The DAS method is derived from linearity and coherence. In summary, this approach provides a more reliable approach than the ‘peak picking’ method for the determination of the phases and the associated amplitudes (Fig. 5).

• Synthetics seismograms were computed for surface-source geometry of the model (1911) using synthetic seismograms to trace the array processed exactly as the APSE data.

• The travel time curves of the main seismic waves of W11 model in the upper 180 km for the four types of reflections are shown. The four types of reflections are shown. The four types of reflections are shown. The four types of reflections are shown. The four types of reflections are shown.

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