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Coherence and polarization in the coda of Apollo Lunar seismograms

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The Lunar Passive Seismic Experiment was carried out between 1969 and 1977, in the frame of the Apollo missions to the Moon. It provides the only extraterrestrial seismic dataset so far.
This study inquires the longest and most obscure part of lunar seismograms: the coda. The seismic coda is defined as a group of late seismic phases/arrivals caused by scattering in the upper crust. Because of the intense meteoritic bombardments that affected the Moon, the lunar surface is highly fractured. This causes the lunar seismograms to have typical coda characteristics compared to Earth seismograms: the signal is very long and diffuse.
In the extensive literature dealing with lunar seismograms, one can often read that the seismic codas show no coherence between the three components of each seismometer. However, this should be interpreted as "no VISIBLE coherence": a more careful and systematic examination can show that the coda is not totally chaotic, as pointed out in some previous studies [1,2]. In the present study, we examined the peculiarities of this coherent signal at the four Apollo stations, for the different moonquake and impact sources. We show that some stable polarizations in the coda are present, which evoke preponderant scatterers near the seismometers. We propose possible explanations for this non-random scattering, conceivably related to geological features.

Keywords: lunar seismology; Apollo; coda; scattering; polarization; meteoroid impacts.

References

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