

Periodicity and mechanism of Apollo deep moonquake activity

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Apollo passive seismic experiment over 7 years on the moon has revealed deep moonquake sources generating nearly identical waveform at a given station observed near-monthly intervals. Nakamura(2003) updated the Apollo long-period event catalog by a new computer search of the Apollo seismic data. The catalog includes 77 sources out of 104 previously known and 88 newly identified sources with identical waveforms at multiple stations. Here we made a periodicity analysis of deep moonquake activity for all these sources.

The results are:(1) one-month periodicity for almost all the sources, (2) half-month periodicity, which was observed only a few cases previously, now appears common, (3) successive activity within a few days and (4) successive activity spread over a month are commonly identified, (5) large scattering of periodicities and (6) nearly random activity for some sources are found, (7) many sources generating similar waveforms but with inverted polarity are newly found.

A trigger model would not explain all these new findings, which considers the mechanism of deep moonquakes by the lunar tectonic stress in addition to the tidal stress as a trigger. We often find such an activity with sporadic periodicity and/or periodicity with large scatters developing into nearly random activity in the field of chaotic dynamics. Deep moonquake activity with periodic, sporadic and random natures would be such a chaotic activity controlled totally by the periodic tidal stress due to the earth.