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The method of moonquakes selenophysical parameters analysis

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Abstract

© SGEM2017 All Rights Reserved. The purpose of the present study is to apply the new methods of multi-parametric analysis to moonquakes. It should be noted such physical phenomena as moonquakes are some kinds of complex systems. As the works in which analysis of moonquakes observations is conducted have shown, lunar seismophysics is much more complex process than Earth's geophysics. This is why to study the physical nature of moonquakes and their parameters it is necessary to use methods of statistical physics and robust estimates. Currently, there are some attempts to study the lunar internal structure based on moonquakes using different seismic methods, such as signal's passage time analysis, tomography techniques, seismic interferometry waves for deep moonquakes in order to conduct backward reflection on "Apollo" mission stations. Based on simulation of tidal lunar parameters which have been improved during the recent space missions, such as GRAIL (gravity), LRO (shape), and LLR (rotation), the presence of lunar internal layer with low viscosity coinciding with the areas where deep moonquakes take place is assumed. The method of moonquakes database analyzing is developed using the author's time series analysis introduced for the Earth's seismics studies based on space observations. The software applications to quantitatively describe parameters of moonquakes dynamic features are developed. A theoretical model for analyzing correlation with the lunar pole dynamics is developed for deep moonquakes. The connection of lunar poles motion dynamics and their uneven rotation with seismic activity has been tested. When developing numerical algorithms and software for moonquakes time series data processing, the modern methods of non-equilibrium statistical physics allowing obtaining a set of statistical parameters and information measures to study the statistical memory effects, periodic patterns, non-stationarity and dynamic intermittency effects, alignment and/or misalignment effects, frequency-phase synchronization from time signals have been used.

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Keywords

Lunar seismophysics, Moonquakes, Selenodesy, Space astrometry, Space mission

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