CREATION OF A STOCHASTIC MODEL OF H2O DISTRIBUTION FOR THE LUNAR SURFACE

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Introduction: The work is focused on regression modeling of the quantitative content of H2O on the surface of the Moon according to space observations and its correlation with the material composition of the lunar surface. It should be noted that the behavior of K and Na in the exospheres of the Moon and Mercury is currently being analyzed [1]. Works are also being performed to reduce spectral observations of the Moon's exosphere in K and Na lines at the 2-m telescope at Terskol Peak and to analyze the observational data using the Moon as a calibration source [2].

Methods: The method is based on the study of the deep absorption gradient of the region of the H2O spectrum depending on the lunar latitude and time of day. This method allows for estimation of energy and relationships between OH and H2O. It is also possible to study correlations between the surface structure of H2O and certain lunar minerals.

Results: An analysis of lunar regions with a high content of Mg and ilmenite stone formations was done. An improved material model was constructed, in which the assumption of a homogeneous structure of the lunar surface was used in modeling the dynamics of H2O, and the assumption of an inhomogeneous surface was used in modeling the infrared lunar spectra. This makes it possible to more accurately estimate the quantitative composition of alkali metal atoms in the lunar exosphere, which is important for studying the weak dynamics of the amount of K and Na and in the lunar exosphere. It is also possible to calculate the g-factor resonance emission lines for the most probable temperature gradients of the parameters of alkali metals and the heliocentric velocities of the Moon.

Conclusions: The results of these studies will be used to analyze the dynamics of water-containing compounds at the lunar poles, presumably at the landing sites of future spacecraft [3]. When developing numerical algorithms and computer programs for the purpose of statistical processing of time series of moonquake data, modern methods of non-equilibrium statistical physics were used, which made it possible to obtain a set of statistical parameters and information measures for studying the effects of statistical memory, periodic patterns, effects of non-stationarity and dynamic intermittency, matching or mismatching effects, frequency-phase synchronization from time signals [4, 5]. A study was carried out, taking into account that the main difficulties arising in the analysis of time signals produced by complex, including natural, non-equilibrium systems, were associated with their parameterization. For complex systems, often characterized only by a set of experimental data, it is problematic to construct distribution functions or probability distributions usual for statistical physics [6–10]. In addition, the existing theoretical approaches insufficiently reveal such properties of complex systems as discreteness, long-term correlations, long-range order of interrelations of fixed parameters, aftereffects (statistical memory), change of different-scale modes in their dynamics intermittency, non-stationarity, non-equidistance in time, arising due to the nature of the object under study or recording equipment errors [11–12]. The results of the work can be used for modern selenodetic studies [13 - 14].

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