

Development of new methods of auto-and cross-correlation analysis of quasi-star objects' x-rays intensity

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Abstract

© 2018, International Multidisciplinary Scientific Geoconference. All rights reserved. The present paper demonstrates capabilities of flicker-noise spectroscopy (FNS) as a phenomenological approach to the analysis of astrophysical objects' time signals using an example of the study of quasars radio-wave radiation dynamics in various frequency ranges (S band (2 GHz) and X band (8 GHz)). The promise of FNS application to the study of signals generated by accreting astrophysical objects is caused by inclusion of informational parameters characterizing the components of time sequences in various frequency ranges analyzed, which allows conducting parametrization – qualitative and quantitative description of evolution of the systems investigated. The retrieved information includes specific for each signal low-frequency “resonances” as well as parameters of chaotic components. Besides, two-parameter FNS cross-correlators allow establishing dynamic interconnection between signals generated by the specified distributed systems. The intensity of 0420-014 and 2251+158 quasi-star objects radio-wave radiation considered in the work is characterized by distinguishable dynamics nature, degree of non-stationarity and dynamic intermittency effects manifestation, and magnitude of frequency-phase synchronization. In quasar 0420-014 time sequence of radio-wave radiation there is a quasi-periodic process prevailing in the dynamics studied. Radio-wave radiation of 2251+158 quasar is characterized by the absence of distinguishable outbursts which may point at the manifestation of strong intermittency effects – overlapping of a large amount of quasi-periodic processes. The paper provides the results of using two-parameter FNS cross-correlators in the analysis of frequency-phase synchronization effects occurring in radio-wave radiation of 0420-014 and 2251+158 quasars at various frequencies. Signals of 0420-014 quasar are notable for strongly pronounced set of eigenfrequencies with feebly marked non-stationarity effects and high level of frequency-phase synchronization. On the contrary, a high non-stationarity, absence of distinguishable set of resonant frequencies, and significant influence of dynamic intermittency effects are typical of 2251+158 quasar. The results of the present work will generate interest from the scientists concerned with the issues of matter accretion in quasi-star objects and mechanisms of radiation in them.

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Keywords

Accretion, Autocorrelation, Cross-correlation, Flicker-noise spectroscopy, Quasars, Radio-wave

radiation, Space observations, Time series

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