

Methodology for detecting for informative features before earthquakes in the electromagnetic regular noise background of the VLF range

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Abstract [PDF RUS](#) [PDF ENG](#) [Full text](#) [PDF RUS](#)

Abstract. The study addresses the pressing scientific challenge of identifying informative features in the electromagnetic regular noise background of the VLF (very low frequency) range, which is related to creating a model for earthquake prediction. The aim of the study is to develop and test a methodology for detecting informative features by analyzing the power spectral density of electromagnetic radiation, using deep machine learning technologies. During the research, a comprehensive approach was applied, which included continuous monitoring of electromagnetic signals in the VLF range (0.3–30 kHz), as well as the data processing using convolutional neural networks. Based on the analysis of a dataset of Kamchatka earthquakes from 2016 to 2019 which included 29 major seismic events significant results were obtained: an original data preparation methodology for neural network classification was developed; high recognition accuracy (up to 96 %) was achieved; and the presence of earthquake precursors in the electromagnetic regular noise background of the VLF range was confirmed. The scientific novelty of the study lies in the development of a new approach for preparing input data in a graphical format and the application of modern neural network technologies for analyzing geophysical signals. This has made it possible to identify hidden patterns that precede seismic events. The practical significance of the study consists in creating a tool for monitoring earthquake precursors. This tool contributes to the development of early warning systems and confirms the potential of applying machine learning methods to analyze geophysical data and forecast natural phenomena.

Keywords:

earthquake, precursors, electromagnetic radiation, neural network analysis

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