

JERK MODELS ON THE BASIS OF GENERALIZED SPLINES FOR TIME SERIES OF THE GEOMAGNETIC DATA

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The study views the construction of a jerk models for a time series of the geomagnetic data using the generalized splines as partially smooth spline functions with fractures which correspond to the jerks – the discontinuities of the first derivative of the time series. The parameters of the jerk model – time moments of jerk occurrences and the corresponding geomagnetic values – are estimated.

Generalized spline functions are based on approximation splines. The basis spline functions are assigned. For a time series of geomagnetic observations, in a common case with non-uniform sampling, nodes of the first and second kind are determined. In the nodes of the first kind the conditions of equality for the zero and the first derivatives of the spline functions are formulated, and in the nodes of the second kind the conditions of equality for the zero derivatives corresponding to the jerks are formulated. A functional of the sum of squares of the differences between the model values and the time series is defined. Constrained optimization problem is solved with the equality conditions. The determination of a generalized spline jerk model and the estimation of the parameters are implemented on the basis of optimization of the positioning of the nodes of the second kind.

The suggested jerk models were applied for digital processing of the time series of 25- years average values of the geomagnetic data. The calculations confirmed the efficiency of construction of the jerk models on the basis of generalized splines.