

Introduction: As it is known, earthquake arises at sudden energy clearing which have been collecting for a long time as a result of tectonic processes in located zones of the earth's crust and the top cloak. Thus occurs break of rocks, sometimes on many tens kilometers [1].

A line of correlations is known that connects seismicity with parameters of the Earth: in the speed of rotation of the Earth, a magnetic field, etc. [2]. Considering seismicity of the Earth is possible only together with its model of formation, evolution and the internal device [3].

The scale of magnitudes defines standard earthquake and estimates other earthquakes on their maximal amplitudes concerning this standard scale under identical conditions of supervision.

The magnitude of earthquakes M by Richter's definition:

$$M = \lg\left(\frac{A}{A_0}\right),$$

where A_0 and A are the maximal amplitudes of record on a certain seismograph for standard and measured event accordingly.

The magnitude is connected with the energy of an earthquake. Change of the magnitude on a unit is equivalent to increasing (downturning) of the energy of an earthquake in 32 times.

There are 11-years cycles of seismic activity of the Earth, which have essential negative correlation with the cycles of solar activity (with the cycles of solar spots) [1]. During the 11-year solar cycle seismic activity grows during the minimal solar activity and during large solar flashes. With duration cyclic changes of geomagnetic and seismic activity are allocated into three solar cycles also.

Under influence of powerful solar proton events there is a transition of power processes inside the Earth from one condition in another which is kept on an extent approximately three solar cycles before the next large flashes. This level of seismic activity of the Earth defines values of the energy clearing at earthquakes for all this period [4].

In the given work for precision processing of some seismic activity the approach of dynamic regression modeling (DRM-APPROACH), presented as a software - modified in comparison with [5, 6] the automated system DRM, was used

Thus construction of complex model of the earthquakes including trend, harmonious or autoregression components and providing smoothing of noise by a method of martingale approximations [5] was supposed to be made.

Construction of models and their analysis: As the initial data 108 values of the magnitude, calculated by the International seismological center (ISC) with monthly averaging for 1996-2004 (<http://www.isc.uk>) are taken.

At the first stage of application of device DRM for the analysis of time lines check on stationarity was carried out therefore by nonparametric criterion of shift with confidential probability 0,95 the hypothesis about shift of average downwards was accepted; by criterion of dispersion the hypothesis about equality of dispersions of the first and second group is accepted. That's why, it is possible to count the line approximately stationary.

At the following stage the trend of kind $Y=A \cdot B^t$, Average quadratic deviation $AQD = 0,6363$ have been allocated; AQD on external accuracy $\sigma_{\Delta} = 6,48$; then the analysis of the rests from a trend is carried out with the purpose of revealing the periodic component.

Autocorrelation function (Fig.1), Darbin-Watson factor (equal to 0,0083), the spectral analysis of the rests (Fig. 2) and the wavelet-analysis of the rests specify presence of autocorrelation that assumes allocation of harmonious or autoregression components.

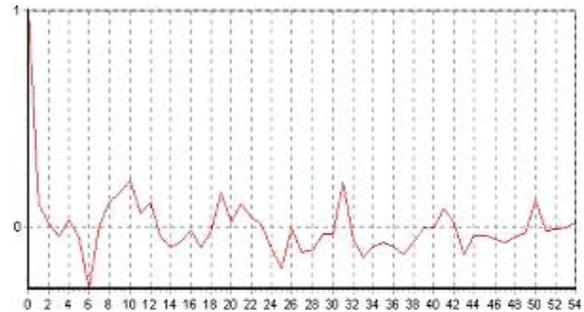


Fig. 1. Autocorrelation function of some seismic activity of the Earth

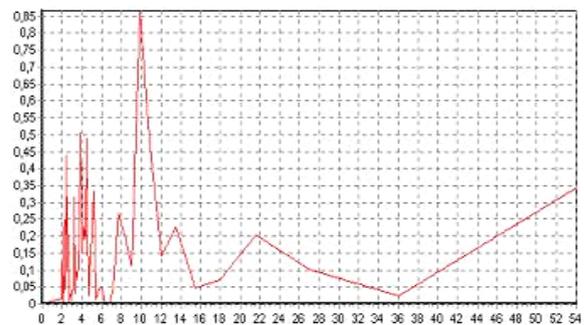


Fig. 2. The spectral analysis of seismic activity of the Earth

As a result of the spectral analysis the following data were allocated: a harmonic 11 with period $T = 2$,

an amplitude $A = 5,9812E15$, a phase $\varphi = -2,5916E-16$; a harmonic '2 with period $T = 3$, amplitude $A = 0,037045$, a phase $\varphi = 124,83$; a harmonic '3 with $T = 4$, $A = 0,085097$, $\varphi = 158,22$; a harmonic '4 with $T = 5$, $A = 0,11285$, $\varphi = 24,046$; a harmonic '5 with $T = 8$, $A = 0,085484$, $\varphi = 148,09$; a harmonic '6 with $T = 10$, $A = 0,21216$, $\varphi = 37,722$; a harmonic '7 with $T = 14$, $A = 0,075976$, $\varphi = 172,94$; a harmonic '8 with $T = 22$, $A = 0,086736$, $\varphi = 46,363$. $AQD=0,3535$, $\sigma_{\Delta} = 6,43$.

On a correlation matrix of harmonics with the set periods some dependence between harmonics with the periods of 2 and 8, 2 and 4, 2 and 22 months has been revealed. Exception of a harmonic with the period 2 months has insignificantly improved quality of model on $AQD=0,3517$; $\sigma_{\Delta} = 6,41$.

The filtration of lines was carried out by a method of martingale approximations of the second degree; in result the model with $AQD = 0,049$ is received; $\sigma_{\Delta} = 6,3$.

Thus, the model describing behaviour of some seismic process for 1996-2004 is received; its graphic realization is submitted on Fig. 3, and the forecast of seismic activity of the Earth for 24 months - on Fig. 4.



Fig. 3. Schedules of some seismic activity and the received model

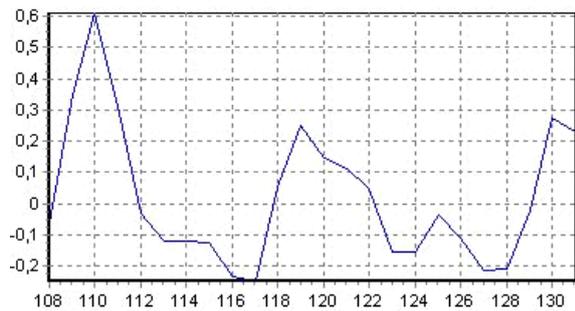


Fig. 4.

While analysing seismic activity of the Earth it is not difficult to notice the connection with solar activity. The considered line has essential negative correlation with the line of solar activity. The maximal earthquakes are observed during the minimum of solar activity or during the periods close to a minimum, and, on the contrary, in maxima of solar activity seismicity of the Earth accepts the least values. In the examined period three maxima of seismic

activity are found out. The first, the strongest, falls at years of a minimum of solar activity, and others two - on a growth phase and recession of solar activity accordingly, that is for the period when there is the greatest number of large solar proton flashes.

Thus, in time dependence of annual values of earthquakes there are the periods caused by geomagnetic activity of the Earth, and the periods of smaller duration caused by solar flashes.

The conclusion: As a result of processing lines the model describing dynamic of changes of seismic activity is allocated optimum on measures of quality. The forecast of lines for 24 months is constructed.

Works on the further updating of DRM [7] are conducted. A number of lines of geophysical and geliophysical characteristics are processed. Data treatment of dynamics of baricentre of the systems the Ground - moon is planned with the purpose of an establishment of dependence, modeling of dynamics of change of lines and the forecast.

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References: [1] Sytinskiy A. D. About dependence and regional seismicity of the Earth from a phase of a 11-years cycle of solar activity // it is GIVEN to the USSR 1982. V.265, '6. with 1350-1356. [2] Shestopalov I.P., Konradov A.A., Kharin E.P. Correlation of seismic and biological processes with solar activity // Biophysics. 1998. V.43, '4. With. 706-709. [3] Locinskaya N.I. Communication of global energy of earthquakes with solar activity // the Bulletin of the Kiev university, sulfurs. Astronomy. 1999, Rel. 35. With. 45-50. [4] Sytinskiy A.D. About connection of earthquakes with solar activity // News of AS the USSR,. The Earth. 1989.'2. with 13-30. [5] Valeev S.G. Regression modeling at data treatment. Kazan: the FAN, 2001. 296 with. [6] Valeev S. G., Sergeev E.S. Algorithmic realization of the approach dynamic regression modeling //Works international conf.. «Methods and means of transformation and processing of the analog information ». Ulyanovsk: USTU, 1999, V.3. with 58-62 [7] Valeev S. G., Kurkina S.V. Regression modeling of changes of terrestrial day // Bulletin USTU, 2005.