IS THERE ANY RELATION BETWEEN THE SUN'S MOTION AND GLOBAL SEISMIC ACTIVITY?

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Резюме: Временный ряд глобальной сейсмической энергии (1900—1982 г.) был коррелирован с рядом \( F = |V| \), где \( |V| \) абсолютное значение изменения ускорения Солнца. Для глубокофокусных землетрясений (\( h > 60 \text{ км} \)) и для вероятности \( P = 0.95 \) коэффициент корреляции достигает 0.45. Для поверхностных землетрясений зависимость не была подтверждена.

Summary: The seismic energy released by global earthquake activity with time was correlated with \( F = |V| \), where \(|V|\) is the absolute value of the change of the Sun's acceleration with time. For deep earthquakes and probability \( P = 0.95 \), the coefficient of correlation was found to be around 0.4. For shallow earthquakes, the dependence was not proved.

1. INTRODUCTION

The position of the Sun with respect to the solar system is not invariable, but moves towards the barycentre of the solar system in dependence on the distribution of the planets. Thus, the Sun moves round the barycentre at different distances \( \varrho \) with a time-variable velocity. In [3], some of the characteristics of the Sun's motion were computed, and their harmonic analyses were carried out. In the present paper, we shall study if the Sun's motion has any influence on global seismic activity.

2. SEISMIC GLOBAL ENERGY RELEASE WITH TIME

The global value of the square-root of the released energy \( z_j = \sum_i \sqrt{E_i} \) was computed from earthquake catalogues [4—7, 9, 11]. The function \( z_j \) was chosen because, according to H. Benioff, the value \( \sqrt{E} \) is proportional to the deformation. The value of \( z_j \) was determined for every year of the time interval (1900, 1982). The released energy was estimated for shallow earthquakes (with foci at depths of less than 60 km) using the relation \( \log E = 11.55 + 1.5M \), for deep earthquakes (with foci of depths of more than 60 km) using the formula \( \log E = 5.8 + 2.4m \), where \( M \) and \( m \) are the earthquakes magnitudes. The magnitude \( M \) is determined from the surface waves, the value \( m \) from the space waves.

Catalogue [7] was compiled for the time interval 1904, 1956 and for \( M \geq 7.9 \), catalogue [6] with supplement [11] for the time interval 1897, 1977 and for \( M \geq 7.0 \), catalogue [5] for the time interval 1904, 1972 and for \( M \geq 7.0 \); catalogue [4] as a list of deep earthquakes for \( M \geq 7.3 \) from catalogue [5]. The values of \( z_j \) were computed for the years 1972—1982 with the aid of catalogue [9].

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The computation of $z_j$ was carried out separately for shallow and for deep earthquakes. The curves representing the time dependence of the root of the global released energy were correlated with different characteristics of the Sun’s motion round the barycentre of the solar system. The procedure of computing about 10 characteristics of the Sun’s motion was explained in [3].

The positions of the planets were determined according to the Newcomb’s theory. The computations were checked for the years 1800—2060 by means of tables [1]. The function $F = |\dot{V}|$ introduced later was determined independently twice: from our computations of $(x, y, z)$ and from the tables in [1].

It was found that the time dependence of the root of the global energy released by seismic activity best approached the function $F = |\dot{V}|$ where $|\dot{V}|$ is the absolute value