

A new approach for computing insolation of the Earth

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The Earth's insolation in the theories of paleoclimate is calculated by the method of M. Milankovitch. It is enough complicated approach, and some of its features are not clear for some researchers. Therefore the insolation is calculated by approximate methods in town planning, climatic and other researches.

At calculating insolation the main difficulty is caused by motion of the Sun above the Earth's surface, which is defined by the Sun's longitude λ . In the new method the longitude λ is defined on the basis of the exact solutions of two-body problem. In addition, the method is designed for computer technology. In the methodology of M. Milankovitch a series of tasks about insolation is solved for the certain time intervals by approximate analytical method. The computer technology allows solving these tasks by sampling the daily insulations in these time intervals.

The paper discusses the highlights of the two-body problem, the geometric characteristics of insolation, the distribution of solar radiation on the Earth's surface and in dependence on the Sun's position. The algorithms are given for computing of the daily insolation for each day of year, for one year, for the caloric half-year, and also the algorithm is given for computing insolation in equivalent latitudes. All components of insolation are computed in concrete examples by the methodology of M. Milankovitch and by the new method, and are obtained their coincidence.

The method is realized in the MathCad software and is submitted for free access. It allows researcher to define kinds of analyses of insolation, and do not limited by those that have been developed at creation of the method. By new approach the dynamics of insolation of the Earth's surface is computed at different latitudes for 100 years from epoch 1950. The results of computing represent a detailed structure of small changes of insolation. It is necessary for research of the reasons for short-periodic changes of the natural processes caused by insolation. These results testify of ample possibilities of the method. They allow carrying out researches, which could not be executed earlier.