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New Changes of Insolation and Last Glaciations in Western Siberia

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There are three components of the astronomical theory of climate change: the problems of the orbital and rotational motions of the Earth and the problem of its insolation depending on the parameters of the orbital and rotational motions. All three problems were solved in a new way. Our independent solutions of the first and third problems confirmed the researches of predecessors. But the results of rotational motion are others. The amplitude of the angle of inclination of the Earth's equator to its orbit, known as obliquity ε, is higher in about seven or eight times. According to the former theory on the time span of 200 thousand years ago (t.y.a.) the obliquity ε varies from 22.21° to 24.43°. But according to our solutions the obliquity ε varies from 14.8° to 32.1° on the same time span. Approximately the same range of variation of the obliquity ε is obtained by solving the problem for the future of 200 t.y.

These fluctuations of the obliquity ε give such changes of insolation that can explain the climate variations in the past. For example, according to the former theory the summer insolation I in equivalent latitudes at latitude 65° varies from 60° to 70°. It is unlikely that changes the amount of heat at latitude 65° to such values, which are now available at latitudes 60° and 70°, can lead to significant warming or cooling. According to the new theory, the amount of heat in the summer at latitude 65° may be greater than now at the equator, and at other times may be less than now at the pole.

The moments of occurrence of the insolation extrema are also others. The first small peak summer insolation at latitude 65° of Northern hemisphere Q_s^{65N} = 5.97 GJ/m^2 occurs 4.16 t.y.a. Note, the contemporary insolation is equal 5.92 GJ/m^2. The first extremum coincides with the Holocene optimum. According to S. A. Arkhipov, M.G. Grosswald and many others the optimum of the Holocene clearly manifested in the range of 9 t.y.a – 3.3 t.y.a.

The second extremum, significant low insolation Q_s^{65N} = 5.36 GJ/m^2, occurs 16.04 t.y.a. It matches the last glaciation, which is referred to as the Sartan horizon in Western Siberia and to as the late Weichsel in Scandinavia. For example, J. I. Svendsen the maximum glaciations in the Archangel region relates to 17 t.y.a. and deglacial – to 16 t.y.a. The deglacial of the East of lake Onega is related to 14.4 t.y.a. – 12.9 t.y.a. The age glacier in Taimyr of late Weichsel or Sartan glaciation refers to 18 t.y.a. – 7.5 t.y.a. The space between southern Novaya Zemlya and Northern Norway is covered by ice-sheet up to 10.7 t.y.a. According to S.A. Arkhipov the radiometric age of Sartan glacial horizon is located within 23 t.y.a. – 10 t.y.a.

The third extremum, maximum of insolation Q_s^{65N} = 7.43 GJ/m^2, occurs 31.28 t.y.a. That's the largest peak of heat on the interval from 0 to 200 t.y.a. It corresponds the Karginsky interglacial period in Siberia. J. I. Svendsen believes that the former Barents-Kara ice sheet completely disappeared to 40 t.y.a. According to S.A. Arkhipov the Kazym layer of Karginsky horizon (dorp Kazim-Cape, the right bank of the lower Ob) extends along the Ob valley to the Kolpashevo and the Vasyugan river basin, as well as to the village Lipovka on the Tobol. Its age is 33 t.y.a. - 31 t.y.a. On the lower river Yenisei from the town of Igarka to the mouth Bakhty traced konoschelsk layers, similar to Kazym layer with the age of 33 - 32 t.y.a. As a rule, there are the alluvial-lacustrine deposits with layers of peat.

According to A.G. Illarionov the third terrace of the Irtysh and Tobol with an altitude of 70 - 75 m near the village Lipovka composed of lacustrine-alluvial deposits. The age of wood and crop residues is from 31.78 t.y.a. to 32.77 t.y.a. The fossil remains of bison, woolly rhinos and horses have the same age.

The fourth extremum Q_s^{65N} = 4.72 GJ/m^2 occurs 46.44 t.y.a. It is the most significant low insolation on the interval from 0 to 200 t.y.a. It coincides with Ermakovsky glacial period. S.A. Arkhipov the most southern belt of moraines, reaching the foot of the Siberian ridges, refers to Ermakovsky horizon. J. I. Svendsen the age of the maximum stage of the Barents-Kara ice-sheet relates to 50 t.y.a.

So, a small warming in the Holocene and the last two ice ages and interglacial period between them are consistent with the extrema of insolation and their values.