correlated with boundaries at which local conductivity changes or the layer gets compacted. The bottom of the sapropel layer follows the configuration of the top surface of the mineral bed. The boundary between them is discrete, and clearly recorded in profile.

Except for the main GPR boundaries, additional ones are found in bottom-sediment. This allows us to identify three separate layers of internal structure of deposit. The first layer one is characterized by frequent intense axes GPR signal. This indicates variability of density and decomposition sapropel. The second layer has not clear GPR signal reflections in internal structure. Probably this sapropel is well-condensed and includes aleurite. In the third layer the structure of the GPR wave field changes and reflectors appear again. This indicates the presence of aleuritic deposits. In addition, an area of anomalous GPR signal attenuation is identified at the interval pickets 50-100. This may be due to several causes, such as the arrival of mineralized water from the lower layer or clay substance.

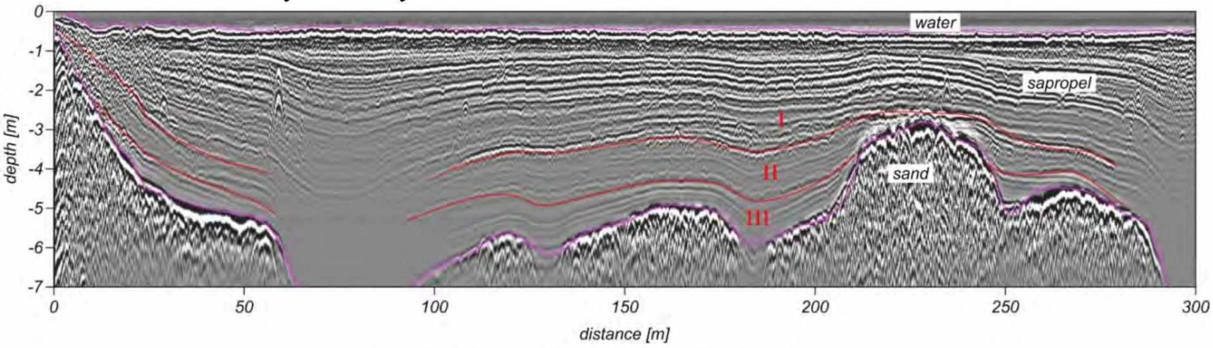

Fig. 1 GPR profile from Lake Gankovskoye

Data collected from GPR surveys of waterbodies are highly informative. Apart from water column thickness, GPR provides a detailed picture of the characteristics of bottom sediments and lake bed. With these results, the error in estimating sapropel reserves can be reduced compared to calculations based on drilling. By analyzing the characteristics of the reflected signal one can draw conclusions about the conductivity of bottom sediments and mineral characteristics.

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MAY DUST BE ABLE TO PROTECT AGAINST GLOBAL WARMING?

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It is known that the space, volcanic, desert and technogenic dust globally spreading in the Earth's atmosphere, like clouds, increases the albedo. This automatically leads to cooling of the earth's surface. The content of continental dust in the ice cores from Antarctic Vostok station was determined in the time interval of 420–4.5 thousand years ago (ftp://ftp.ncdc.noaa.gov/pub/data/paleo/icecore/antarctica/vostok/dustnat .txt). These data, together with the data on the anomalies of the Antarctic temperatures (ftp://ftp.ncdc.noaa.gov/pub/data/paleo/icecore/antarctica/vostok/deutnat.txt), were used to construct a diagram of changes in the corresponding parameters (Fig. 1). The tests with deviations from present temperatures in statistical sampling should coincide with the tests used to study dust concentrations. To do this, the number of the tests of temperature anomalies from the international database was preliminarily reduced without damage to the creation of the diagram (Fig. 2) and further calculations.

The authors (Petit et al., 1999) used the same samples (the same depth of ice core sampling) to determine both deuterium concentrations and dust concentrations for the time interval of 208–4.5 thousand years ago. At later intervals, the shifts between the parameters were from 50–120 years (325–208 thousand years ago) to 200–270 years (421.5–330 thousand years ago). These minor discrepancies did not affect the results obtained for all calculations and constructions (see Fig. 1, 2). Figure 1 shows the exact correspondence of all maximal values of dust concentrations to minimal values of temperature anomalies. It is obvious that the dust content of the atmosphere was minimal during the interglacial periods, which was noted by the authors (Petit et al., 1999).

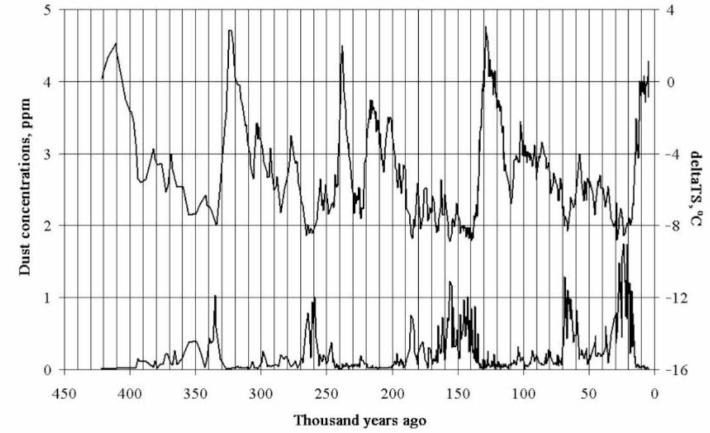

Fig. 1. Deviations of paleotemperatures from present values (upper spectrum) and dust concentration (lower spectrum) in ice cores; 506 values of each parameter from the international database (Petit et al., 1999) were used

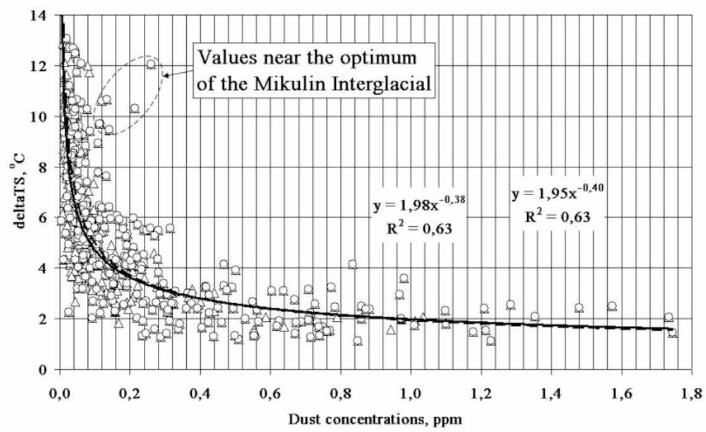

Fig. 2 The dust concentrations and temperature anomalies from ice core data (see Fig. 1); the temperature anomalies are increased by 10 to avoid negative values; the graphs of the power function for the given time intervals practically coincide

The relationship between dust concentrations and temperature anomalies is best described by a power function (see Fig. 2). The constructed models indicate a high sensitivity of the paleotemperatures to the presence of solid suspended particles in the atmosphere in the area of their relatively low concentrations. It is possible that the ingress of large amounts of dust into the terrestrial atmosphere in the past caused not only increased cooling (mainly at the end of the glaciations), but also indirectly affected the subsequent warming due to a combination of positive feedbacks. The sequence of their implementation could be the following: the deposition of dust from the atmosphere due to gravitation leads to the beginning of a new increase in global temperature, the atmospheric precipitation (increased as a result of the warming) more and more quickly flush the dust from the airspace the of, additional portions of CO_2 enter the atmosphere from the ocean. As a result, there is a sharp increase in global temperature. Deviations from the general dependence are observed, for example, near the temperature maximum of the transition from the Moscow Glaciation to the Mikulin Interglacial (130.9–122.3 thousand years ago) (see Fig. 2), and the weakest statistical relationship between dust concentration and temperature anomalies is noted for the time interval of 129.5-55.4 thousand years ago (Table).

The probability of a dangerous temperature change (decrease) with a relatively small increase in dust concentrations should be taken into account when discussing the proposed (Bewick et al., 2012, 2013) geoengineering concept on the using of "dust cloud" or "dust rings" for protecting the Earth from solar radiation. Problems, first of all, will be maintenance of safe (and effective) dust concentration and stabilization of the manipulative asteroid system, suggested by this authors, at the Lagrange point. However, even more important is the problem of the ethical plan, connected with the risk for the planet of large-scale geoengineering tests. Many specialists, including authors of this concept, recognize this.

Table. Statistical relationship between dust concentrations and temperature anomalies by time intervals

Time intervals by ice cores, thousand years ago	Correspondence to glaciations and interglacials	Approximation	Approximation Coefficient (R^2)
387,804 (388,065)–250,413 (250,501)	Likhvin Interglacial, Dnieper Glaciation	$y = 1{,}96x^{-0{,}35}$	0,70
249,148 (249,219)–130,410	Odintsovo Interglacial, Moscow Glaciation	$y = 1{,}52x^{-0{,}43}$	0,71
129,545–55,377	Mikulin Interglacial, Tver Glaciation	$y = 3{,}13x^{-0{,}27}$	0,38
53,606–12,569	Midle Valday period, Ostashkov Glaciation	$y = 2{,}22x^{-0{,}35}$	0,70
387,804 (388,065)–12,569		$y = 2{,}00x^{-0{,}37}$	0,60
421,507 (4218,761)–4,509	See Fig. 1 и 2	$y = 1{,}98x^{-0{,}38}$	0,63

To prevent unjustified and dangerous actions, it is necessary to take into account the global changes in the past. It is also necessary to keep in mind the differences in climatic changes of the past and present, consisting in the impact on the nature and climate of the current human civilization, which, in turn, should be regarded, according to V.I. Vernadsky, as a powerful geological force.

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