International Journal of Progressive Sciences and Technologies (IJPSAT)
ISSN: 2509-0119.

http://ijpsat.ijsht-journals.org
Vol. 26 No. 1 April 2021, pp. 554-557

On Estimation Of The Influence Of Some Factors Leading To Increasing Melting Of Ice Coverings Of The Earth Surface

Abdukakhor Artikov

Candidate of Physical and Mathematical Sciences Associate Professor of the Department of Physics

Andijan State University

Abstract – The article presents the results of the study of some mechanisms and physical foundations of thawing processes of ice coatings contaminated with household and industrial waste.

Keywords – mechanisms, modelling representations, absorption of a light solar energy, dispersion section, a solar energy.

I. INTRODUCTION

Further pollution of the ice cover of the mountains, as well as the south and north poles, create more serious complications in the ecological situation of the planet. The simultaneous influence of various natural forces, which increases the negative impact of pollution, can be a source of emergency situations.

In this paper, an attempt is made to follow the development of a possible negative situation by following the radiophysical methods of multiple wave scattering. For accurate calculations, the task is very difficult and it is almost impossible to trace through the process of the development of negative phenomena. Therefore, the work mainly evaluates the influence of various natural factors [1-4].

II. SOME TYPES OF POLLUTION AND SOME ENVIRONMENTALLY HAZARDOUS AREAS.

The main dangerous areas exposed to natural and industrial pollution are the mountains and ice sheets of the south and North poles. There are a lot of mechanisms of contamination. For example, part of the industrial emissions and natural dust for more than two hundred years due to the convection of air masses settle at the north and south poles (moreover, the dust settles for as long as it exists). It should be added here that the charged particles of emissions and dust drift and fall out at both the north and south poles, depending on their charges. Further, the particles of pollution drift into the thickness of the glaciers, almost evenly polluting them vertically. Accordingly, the conductivity of ice increases and, as a result, their absorption properties increase. Here we also need to add the possible influence of clusters (especially if they have a closed form) on the absorption of radiation,

followed by the conversion of the energy of the latter into the thermal energy of the surrounding ice particles. All of the above points lead to an increase in the melting of glaciers.

III. ESTIMATION OF THE ABSORBED SOLAR RADIATION POWER BY THE GLACIER SURFACE.

We take the incident field as a plane wave - $\mathrm{E}(\vec{r}) = \mathrm{E}_0 \exp(i\vec{k}\cdot\vec{r})$ with a unit amplitude. Let the incident power be equal to one. As a result of contamination, snow and ice particles will become good conductors.

Under these conditions, a significant part of the incident power in the particles is converted into thermal radiation. The refractive index of the contaminated particle can be represented in a complex form:

$$n = n_1 + i n_2 \quad (2)$$

In the Born approximation, for the absorption cross section of such a particle, we can obtain the formula [2]:

$$\sigma_\alpha = \int k \frac{4n_2}{|n+1|^2} \exp\left[-2kn(z-z_2\right] dv^1 \quad (3)$$

here, the z_i - coordinate inside the particle

In addition to this exact formula, you can also take into account the particle size distribution, but this will greatly complicate the task (estimates), although the corrections will not be very significant. Therefore, assuming that the particles are spherical with a diameter a for the absorption cross section, we obtain:

$$\sigma_a = \pi a^2 \left\{\frac{4n_2}{(n_2+1)^2+n_2^2}\right\}\left\{1+\frac{2\exp(-4kn_2a)}{4kn_2a}+\frac{2}{(4kn_2a)^2}\left[\exp(-4kn_2a)-1\right]\right\} \quad (4)$$

Here, the exponential terms give a significant contribution only for radiations with λ=10 cm. Therefore, for the optical, infrared, or even millimeter ranges, the absorption cross-section can be assumed to be equal to

$$\sigma_a = \pi a^2 \frac{4n_2}{(n_2+1)^2+n_2^2} \quad (5)$$

Note another assumption, namely, the particles are considered to be evenly distributed over the surface of the ice cover and located so close to each other that their number in one square meter can be estimated as:

$$N = \frac{2}{\pi a^2} \quad (6)$$

Further, for the amplitude of the absorbed field as a result of multiple scattering, we obtain a decreasing series:

$$E_s = \sigma + \sigma^2 + \sigma^3 + \cdots \quad (7)$$

The total absorption power is equal to:

$$P_s = |E_s|^2 \quad (8)$$

or

$$P_s = \sigma^2 + \sigma^3 + \sigma^4 + \cdots \quad (9)$$

This expression, if written as $P = \sigma(1 + \sigma + \sigma^2 + \sigma^3 + \cdots)$ it strongly resembles a decreasing geometric progression. It can be evaluated as $P_s \approx \sigma^2 / 1 - \sigma$. This power is accounted for by one particle. If the number of particles on the 1м² - $N = 2 / \pi a^2$, then the power absorbed by them is respectively equal to $2\sigma^2 / \pi a^2 (1 - \sigma)$.

It was noted above that the thickness of the glaciers is polluted with centuries-old dust, industrial waste. These contaminants, as well as on the surface, increase the absorption of electromagnetic energy in the long-wave part and, accordingly, increase the melting rate. Among other things, the following mechanism of increasing the melting of ice is also possible. In the thickness of glaciers, the formation of "dirty clusters"is possible. Let's say that such clusters have closed structures. Then temporary changes in the magnetic field or fluctuations of glaciers can lead to the appearance of induction currents in the clusters and, accordingly, the release of Joule heat. The simultaneous influence of these circumstances in the merchant with the pressure of the upper layers, reducing the melting threshold, can lead to a significant increase in the rate of ice melting.

IV. Estimation of the pressure of the glacial layer on the base line of the glacier

Let's consider a simple problem of estimating the pressure force on the base line of a glacier. Despite its simplicity, this task will allow us to calculate the critical parameters by which it will be possible to distinguish the most unfavorable slopes covered by a glacier.

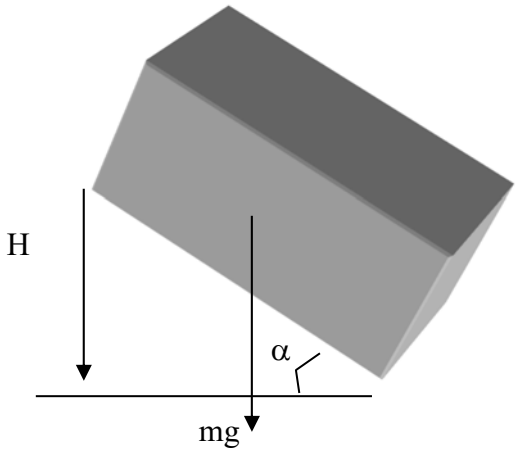

Fig. 1

Let the slope (Fig. 1) have the parameters: slope angle α, height H, respectively, the length of the glacier H/sinα and the thickness of the glacier h. Then the weight of the glacier length N / sinα thickness and width of 1 meter will be equal to $p = \rho \cdot h \cdot H / \sin\alpha \cdot g$. Let's estimate this value for h=10m, $H = 7 \cdot 10^3$ m and $\alpha = 45^0$: then $p = 9 \cdot 10^2 \cdot 7 \cdot 10^3 \cdot 10 / 0{,}7 = \frac{63}{0{,}7} \cdot 10^6 H = 9 \cdot 10^8 H$. This weight without taking into account the friction will be carried down to the bottom with force $F_y = P \cdot Sin\alpha = 63 \cdot 10^7 H$.

The forces of intermolecular adhesion mainly hold the ice on such slopes, in which the pressure of the glacier lying on top exceeds the value of 1 N / cm², then the ice begins to melt at 0^0C, and at a pressure of 675 N / cm², the ice melts at a temperature of -5.53^0 C, if the pressure is about 1500 N/cm², then melting occurs even at-14^0C, at a pressure of 2000 N/cm², this temperature is already equal to-20^0C.

V. Conclusion

From the above estimates, it follows that when the snow-glacial surface is polluted, the ice – granite boundary may be loosened, followed by an increase in the pressure of the ice floe on the base line, and as a result, the melting of the glacial slope may increase.

If we take into account the tidal forces during the periodic action of the moon, then the ice floe may split, and its subsequent sliding. This contribution and the contributions of other mechanisms can also be taken into account using simple calculations. The absorption of acoustic waves, radio waves, and a wide range of electromagnetic waves in molecular, intermolecular, and other processes also leads to the melting of glaciers [5-6]. This data will be presented in subsequent publications. The continued contamination of the northern and southern ice surfaces by industrial emissions (including transport emissions) can have irreversible consequences for the melting of ice.

References

[1] С. М.Рытов, Ю. А.Кравцов, В. И.Татарский Введение в статистическую радиофизику. Ч. II. Случайные поля. М. «Наука». 1978

[2] А. Исимару. Распространение и рассеяние волн в случайно-неоднородных средах. Ч.1. М. «Мир».1981. с.279

[3] Р.Маттук. Фейнмановские диаграммы в проблеме многих тел. М. «Мир». 1969. с.366

[4] Е.А.Штрауф. Молекулярная физика. М. Гос. Издательство технико- теоретической литературы. 1949. с.575

[5] М.И. Шахпаронов. Механизмы быстрых процессов в жидкостях. - М.: Высшая школа, 1980. - 352 с.

[6] V.A. Durov. Thermodynamic Models of the System with Internal Variables: Fluctuation and Relaxation Phenomena. // J.Mol. Liquids, 2004, 113(1-3), 81-99.