

GLOBAL WARMING AND GLACIERS MELTING AT FJORDS IN GREENLAND

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ABSTRACT

This paper presents a discussion on the validation or not of a likely paradigm about the melting of polar glaciers and their direct impact on increasing ocean levels. Physico-chemical properties of ocean waters, as well as anomalies in the thermal behavior of water are used as providers of this discussion using fjords of Greenland as study area. This text seeks to infer the relationship between the most recent developments in global warming, specifically dealing with the melting of glaciers located in fjords in the eastern part of Greenland, increasing the water temperature in ocean currents and changes in sea levels. We emphasize the importance of the correlation of the water physico-chemical characteristics in these changes perceived in the studied environment. Greenland is defined by convention as the widest oceanic island in the world. In its fjords formed in the last glaciation of the Quaternary period, basically made of ice mountains with entries to the sea, there has been melts that are discussed in this work. At first, global warming and the melting of glaciers with a consequent rise in sea levels are presented almost as an axiom. This paper seeks to address the conclusions arising from this type of research according the basic laws of physics and chemistry, related to the behavior of water in their states (typically solid and liquid). The ultimate goal of this work glimpsed through some inferences and validation of water behavior in the ice condition and in its liquid state, a broader view with regard to the findings applied to the relationship

between global warming and ice melting processes. Will be guided some water anomalies in the variation between its liquid and solid states to attempt a better understanding of the phenomena occurring and treated in this area of interest as well as their possible impacts. It is noteworthy the fact that the water does not behave thermally as most liquids, with very specific consequences in relation to the variation between its liquid and solid states because of the temperature variation.

Keywords: Melting Glaciers. Levels of Ocean Waters. Global Warming.

INTRODUCTION

This text seeks to infer the relationship between the most recent developments in global warming, specifically as the melting of glaciers located in fjords in the eastern part of Greenland, increased water temperature in ocean currents and possible changes in ocean levels. We emphasize the importance of the correlation of the physico-chemical characteristics of water in these changes perceived in the studied environment.

Greenland is defined by convention as the highest or the widest oceanic island in the world. Located between the northeast coast of North America and the Arctic Ocean, with the Greenland Sea at east direction, to the southeast the Atlantic Ocean, Iceland and the European continent, and to the west the Labrador Sea and Baffin Bay. It is an independent region of Denmark, covered by ice in about 80% of its territory (HOUAISS, 1995). Its sparse population depends on fishing and mining (north). It is characterized by mild summers and intense and harsh winters. Presents indented coastline with the presence of fjords in extensive area and mostly formed on the last glaciation of the Quaternary period (GUERRA, 2005). In these fjords, basically made of ice mountains with entries to the sea, there has been melts that are discussed in this paper.

FIGURE 1

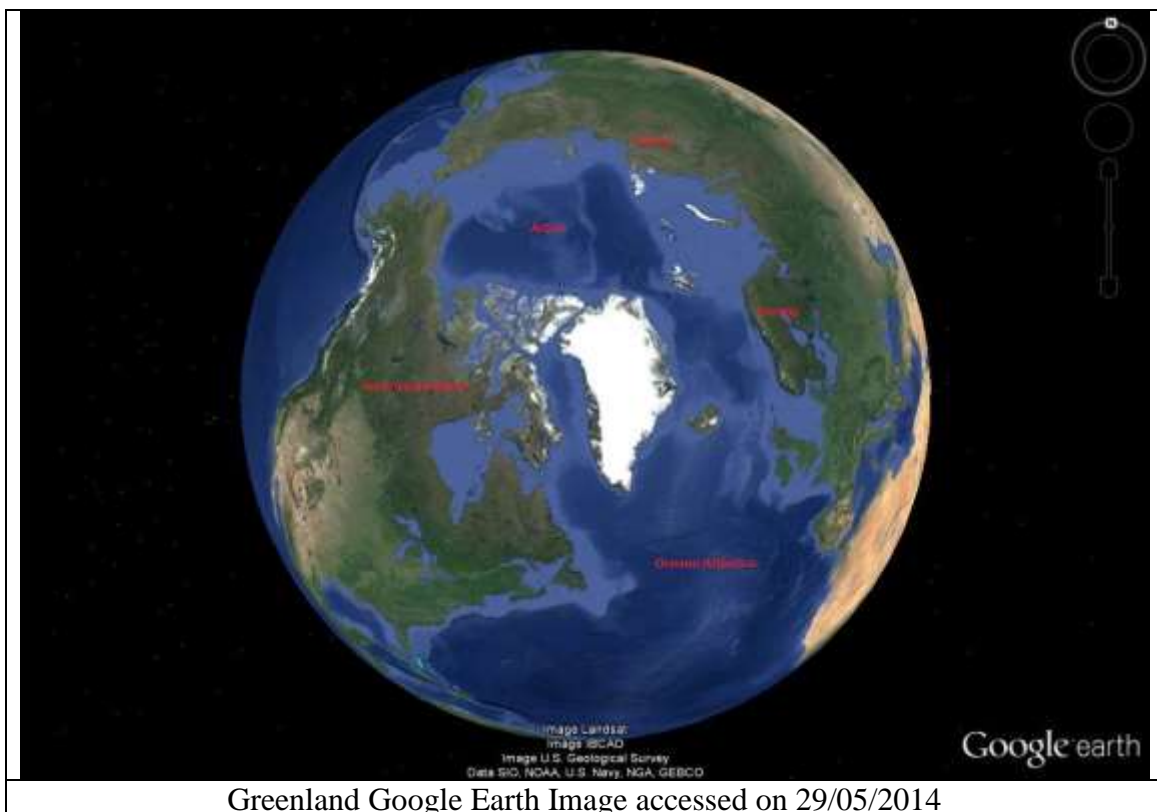


FIGURE 2



OBJECTIVES

The search for the accuracy and the application of scientific criteria in the investigation and characterization of phenomena and changes in the planet must be directly related to proper concatenation of the findings of these research subjects. At first, global warming and the melting of glaciers with a consequent rise in sea levels, have virtually as an axiom.

This paper seeks to address the conclusions arising from this type of research in according to the basic laws of physics and chemistry, related to the behavior of water in their states (typically solid and liquid). The ultimate goal of this work glimpsed through some inferences and validation of water behavior in the ice condition and in its liquid state, a broader view with regard to the findings applied to the relationship between global warming and the melting processes ice.

METHODOLOGY

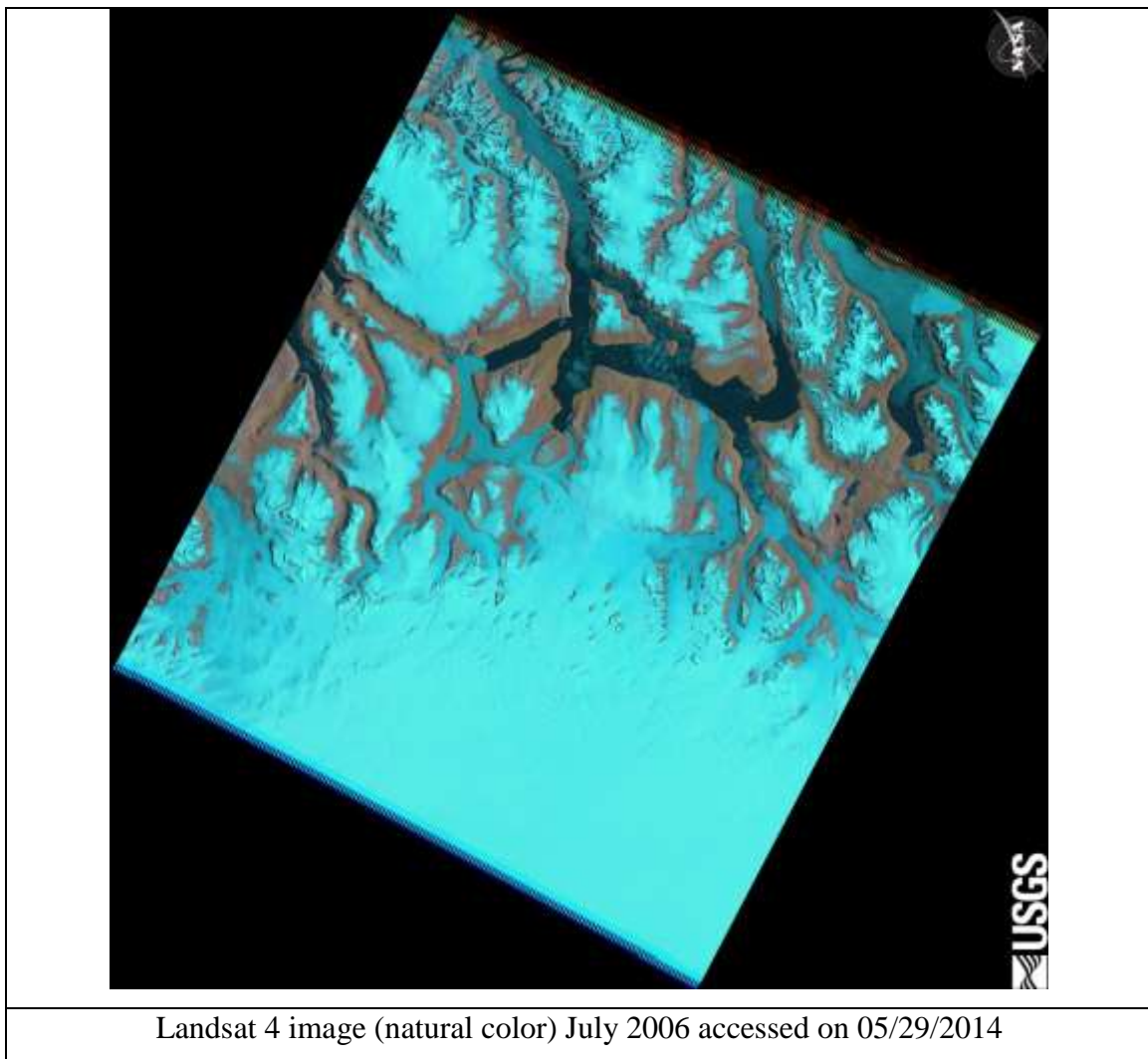
Based on questioning this almost axiomatic condition of presentation of global change that relates global warming resulting in the melting of glaciers and rising sea levels on a global scale, will be made some inferences guided by laws of physics and chemistry in the water behavior.

Similarly, will be guided some water anomalies in the variation between its liquid and solid states, to attempt a better understanding of the phenomena occurring and treated in this area of interest as well as their possible impacts.

Therefore, the relationship between global warming (and warming of ocean waters) and the melting glaciers will be analyzed according to the basic physical laws that regulate the behavior of water in its liquid and solid states.

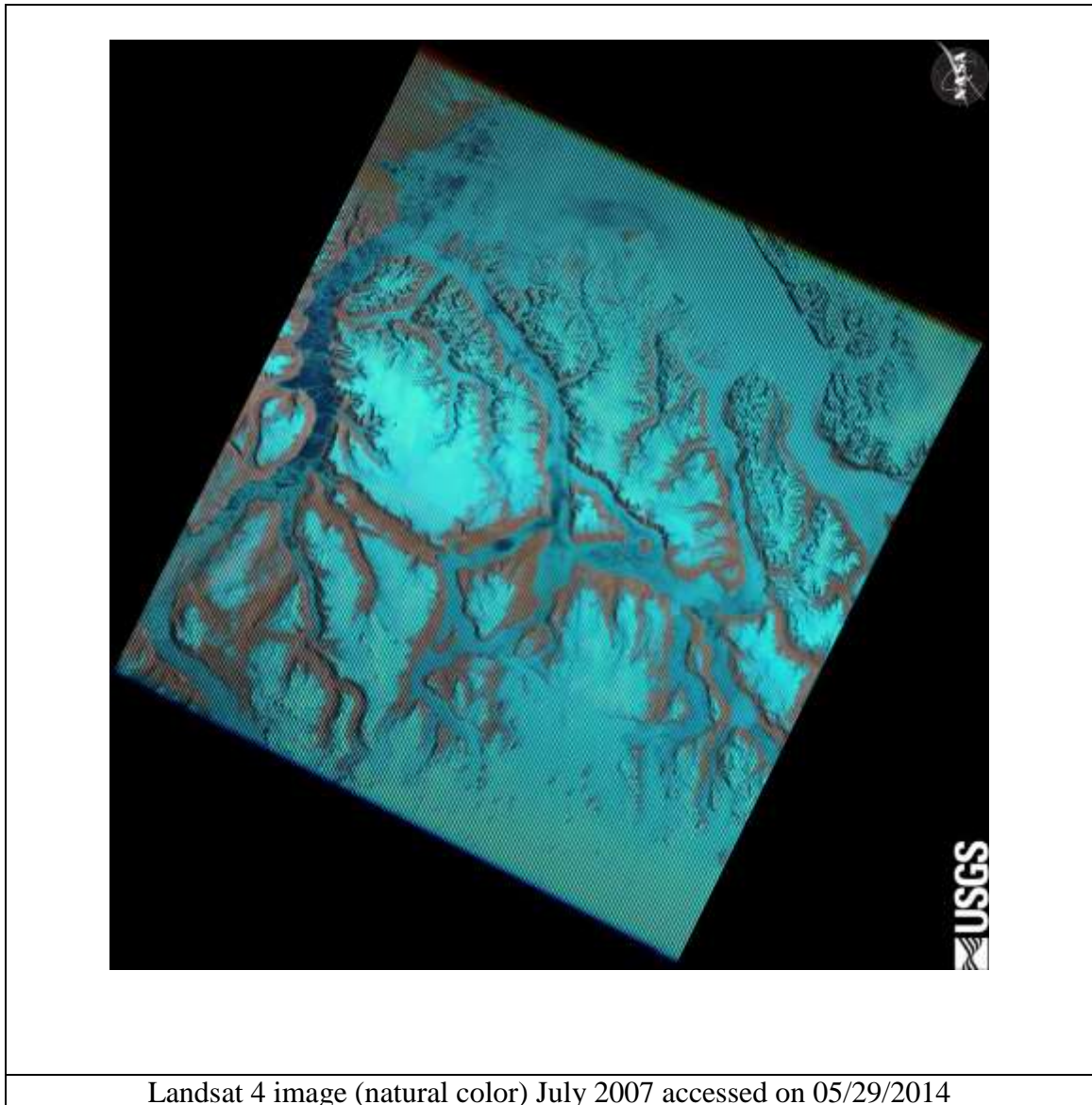
In the following figures, we can see the increase in the amount of ice at the sea between the fjords. Based on the images of Landsat 4 and Google Earth (Figures 3 and 4) in the years 2006, 2007 and 2013 (all collected in July) one can see a slight increase in the amount of ice on land between the years 2006 and 2007, but it is easy to see the reduction of the ice in the mountains and also the ice located at sea in 2013 compared to previous years.

FIGURE 3



One can infer that there may be variations between shorter periods of time as occurred between the situation in figure 3 and figure 4. Similarly, we can infer that there was a change of temperature between 2006 to the following year. Observing the amount of ice in the mountains in 2007 we can see a slight increase in the frozen area over the previous year, indicating a reduction in temperature. Moreover, despite the slight increase in the frozen area of land, it is perceived a large difference in amount of ice in the sea. This may indicate that the large amount of submerged ice of the fjords begins to melt and be the drift in the ocean waters.

FIGURE 4



Landsat 4 image (natural color) July 2007 accessed on 05/29/2014

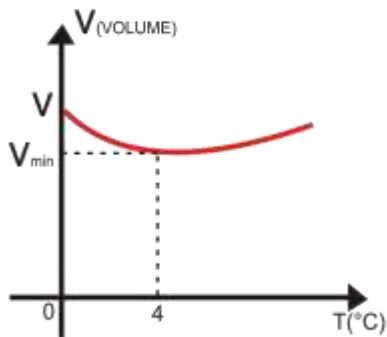
Also with regard to the analysis of images, is well evidenced in the image of July 2013 the reduction in the extent of frozen areas on land and in the mountains for the years 2006 and 2007 (both in July). Comparing the amount of floating ice the perception of difference is even greater, as the image of July 2013 hardly detects the presence of ice in the water, a fact which indicates a greater melting of glaciers surrounding the fjords.

FIGURE 5



Google Earth image in July 2013 accessed on 05/29/2014

Alongside the analysis of the images, it emphasizes the fact that the water does not behave thermally as most liquids, with very specific consequences in relation to the variation between its liquid and solid states due to temperature variation. In a situation where the water is heated starting at 0°C , its volume tends to decrease to 4°C . Continuing heating, the liquid volume passes to increase, as shown in the following graph:



Source: Adapted from (PAULA, 2008)

With respect to this fact, one may conclude that on heating from 0°C to 4°C , the water undergoes contraction. On heating above 4°C , there is dilatation. Not considering other variables, then we can infer that this volume variation due to

temperature variation suffered in large amounts of water not only in the fjords of Greenland, but in all polar waters has something to do with the ocean levels. This assumption can be ratified by the fact that the physical properties of water show several deficiencies when compared with the typical properties of other liquids. As stated, one of the most remarkable is their abnormal dilation, and that the maximum density occurs at approximately 4 ° C, expanding so as to increase with decreasing temperature. This is due to the quantity of hydrogen bonds formed as the temperature decreases, and the maximum number of bonds in each molecule (six) at 4 ° C occurs when the molecules are closer to occur, therefore, a greater density.

With an increase in density can further assume, by asserting the equation $d = m / v$ (density equals mass divided by volume), the higher the value of this density, the lower the volume.

Another anomaly in the thermal behavior of water is the volume increase in frozen water under high pressure, such as the case of deep glaciers located in the fjords of Greenland. In the case of a thawing of these deep glaciers (3000 ft deep) there may be a reduction of up to 15% by volume, a fact that contradicts the axiomatic situation by numerous vehicles that relate the melting glaciers to the increase in the volume of sea levels.

CONCLUSIONS

Due to the increase of atmospheric temperature, research has shown the occurrence of accelerated ice melting Greenland. Thus, recent studies reveal that the ice of the highest regions are melting at an accelerated rate and the characteristic of run off and this larger volume of water has reached the seas. In this case, it is clear the addition of new volumes of water to the ocean, whose consequences will be felt on a global scale sooner or later, because there are no scientific studies and work that we provide concrete data and proven measurement.

Other studies have recently been published in "Nature Geoscience 7 June 2014" also seek to relate the increase of the melting temperature marine bulk submerged ice. In this situation, it can be inferred that the increase in temperature of the Gulf Stream in its trajectory towards Scandinavia therefore promotes increased water temperature bathing fjords in the eastern part of Greenland.

Creates room for further discussion the fact that, despite being indicated that occurs melting glaciers due to the increase of the temperature of the resulting seawater warming ocean stream, we can not conclude that the melting of the submerged ice will promote rising sea levels. The reason why this rise in sea levels would not occur due to the fact that this ice melting process is already in sea water and submerged.

Added to the fact that the melting of submerged and exposed to pressure glaciers promotes a reduction in the volume of ice when it converts to its liquid state, due to the aforementioned thermal anomaly of water. That is, the amount of water increases in its melting function seas, but not necessarily an increase in volume.

Anyway, despite the use of secondary sources, there are no studies that prove when these inferences, but the explanations promote reflections on this issue that takes up so much space and concerns in our societies.

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