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Research Article

THE IMBALANCE IN MARS'S CONDITION MAY CAUSE A COOLING EFFECT ON ITS MAGNETIC POLE

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Abstract

The level of radiant energy emitted by Mars and its seasonal energy imbalances are crucial considerations. To data from NASA Insight (various missions), we now have a more comprehensive understanding of the overall energy dynamics on Mars. Our analysis indicates that there are energy imbalances on Mars at different points in its seasonal cycle. These imbalances have implications for our comprehension of the mechanisms driving dust storms on the planet. Current models and theories assume that Mars' energy budget is consistently balanced, but our findings reveal that this is not true, particularly when considering Mars' seasonal variations. This implies that existing theories and models may be in light of these new energy characteristics. This research paper will use secondary data mainly from Ellen's research article in 2022. By utilizing her article, we discovered an interesting phenomenon that may indicate the possibility of semi-ice lake formation inside Mars. Our research paper further interpreted the data from Ellen's paper and we believe that Mars may have an imbalance of semi-ice lake formation in different areas due to the imbalance of energy conditions on Mars. Additionally, our research paper suggests that this imbalance may trigger the cooling effect of the Mars magnetic pole, causing it to cool down internally.

Keywords: Radiant energy, Cooling effect, Martian magnetic pole, Ellen'2022.

INTRODUCTION

The understanding of a planet's radiant energy budget is crucial for comprehending its atmospheric and surface processes. A thesis research conducted by Ellen in 2022 provides systematic measurements of Mars' emitted power, used to estimate the planet's radiant energy budget. The research utilized observations from NASA missions. The measurements indicate that Mars' average emitted power globally is 111.7 ± 2.4 Wm−2. Based on these findings, this research paper focuses on projecting the average temperature on Mars and proposes the existence of a large semi-ice lake or ice cave in the north pole of Mars. Our research also suggests the presence of semi-ice-caps and lakes on the back side of Mars. Furthermore, our findings reveal significant seasonal and daily variations in Mars' emitted power, indicating an energy imbalance over the course of Mars' seasons, which may induce the inside MARs core cooling down effect, causing semi-ice structure formation of a semi-liquid ice lake inside the north pole area zone of Mars. Based on the findings from NASA, Mars Global Surveyor, Curiosity, and InSight, we predict that there may be a massive extreme weather condition, which has happened before. We estimate that due to the extreme condition, the energy emission may vary extremely, causing a cooling-down emission effect, which may cause there to be a high significant amount of semi-ice inside Mars. Due to these temperature and energy emissions imbalances, we estimate there will be seasonal solid variations. Specifically, there will be approximately a +_16.2% increase in emitted power in the northern autumn for the southern hemisphere. This discovery could influence the prediction of ice-aged zone formation on Mars. Furthermore, based on Ellen's research shows that the 2001 global dust storm led to a decrease of approximately 22% in the global average emitted power during daytime but an increase of approximately 29% at nighttime. This indicates that global dust storms significantly impact Mars' radiant energy reserve.

This may imply the radiational effect may be causing the imbalance situation on the inner side of Mars, where they may form a kind of semi-structure of semi-ice-liquid, which may cave inside Mars in the North Pole of the area zone. The radiant energy budget, determined by emitted thermal energy and absorbed solar energy at the top of the atmosphere, is crucial for understanding a planet or moon. It impacts weather, climate, and atmospheric circulation. While some planets and moons have well-determined energy budgets, others, like the giant planets, can have large energy imbalances caused by internal heat. Terrestrial bodies such as Earth, Titan, and Mars typically have balanced energy budgets, but seasonal and interannual imbalances are possible. Recent studies have shown that Titan has a dynamic energy budget with an imbalance of approximately 2.9 ± 0.8% during the Cassini period. (Ellen, 2022). It is important to note that there have been many studies on the radiant energy budgets of terrestrial bodies and gas giants, but Mars has been relatively understudied in this regard. Previous studies on Mars' radiant energies have mainly focused on limited areas, and others have relied on model results to estimate the energy budget. There is a lack of systematic studies on the global radiant energy budget of Mars. Given Mars' large axial obliquity and orbital eccentricity, we can expect significant seasonal variations in radiant energies, potentially leading to an energy imbalance on a seasonal timescale, similar to what occurs on Titan. Furthermore, there is a possibility of a relatively long-term energy imbalance akin to that observed on Earth, which could significantly impact the climate on Mars. In our research paper, we primarily utilize data from Ellen's 2022 article. We will analyze and interpret observations from the Thermal Emission Spectrometer onboard the Mars Global Surveyor (MGS/TES) during the period 1997 to 2005 (Mars Years 24–28), supplemented by data from other Mars missions such as the Mars Science Laboratory Curiosity Rover and the InSight Lander. This time frame includes a planet-encircling dust storm in 2001 (MY25). While Ellen's studies extensively examined the evolution and surface atmospheric conditions, its influence on emitted energy has not been explored. By comparing MY25 to years without a global dust storm, we aim to gain insight into the impact of planet-encircling dust storms on emitted energy. The MGS/TES observations also offer a unique opportunity to analyze the meridional, seasonal, and hemispheric averages of emitted power for the first time. Through measurements of Mars' emitted power and estimates of absorbed solar power, we will further investigate Mars' radiant energy budget, particularly on a seasonal time scale.

In the "Ellen'2022" section, a comprehensive methodology is presented for calculating emitted energy, processing TES data, and analyzing errors for computed emitted power on Mars. This study will delve into seasonal variations of Mars' emitted power and briefly touch upon other temporal variations. Furthermore, based on Ellen's data, this research paper includes time-varying solar flux data. Our aim is to interpret the data to assess Mars' conditions, particularly its weather patterns. We hypothesize that extreme weather conditions may result in a cooling effect, potentially influencing movement in Mars' core cooling, which could cause an energy shift due to magnetic effects and subsequent thermal radiation. Thermal radiation unequivocally signifies the emission of electromagnetic waves from any form of matter with a temperature exceeding absolute zero. It unmistakably represents the conversion of thermal energy into electromagnetic energy. Thermal energy is the kinetic energy that arises from the random movements of atoms & molecules within matter.

In the field of physics, Wien's displacement law explains that the peak of the blackbody radioactivity curvature alterations to shorter wavelengths as temperature increases. This shift is a result of the Planck radiation law, which describes the intensity of blackbody radiation at different wavelengths for a given temperature. Wilhelm Wien discovered this relationship before Max Planck developed a more general equation describing the overall shift of the black-body radiation spectrum as temperature rises. Formally, Wien's displacement law states that spectral radiance of blackbody radiation per unit wavelength mountaintops at a specific wavelength. This implies that the function of wavelength varies with temperature. Each temperature curve mountaintops at a different wavelength describe the shift of that peak. This absolute temperature and a constant are involved in a proportionality relationship known as Wien's displacement constant, which is equal to $2.897771955 \times 10^{-3}$ m·K, or approximately 2898 μm·K. This constant describes an inverse relationship between the wavelength and temperature of thermal radiation. In simpler terms, as the temperature increases, the wavelength of the thermal radiation becomes shorter, and as the temperature decreases, the wavelength becomes longer. For visible radiation, hotter objects emit bluer light compared to more extraordinary objects. When considering the peak of emission black body per unit frequency or proportional bandwidth, a different constant must be used, but the basic principle remains identical: the topmost wavelength is inversely proportional to temperature, and the highest frequency is directly proportional to temperature. So, it provide an solid theoretic assumption backup, that stated as an inverse relationship between wavelength and temperature. That will support our research paper's assumption due to this inverse relationship and the data from Ellen's article. This research paper suggested that Mars may have a cooling down effect due to the extreme weather and energy emissions that trigger a core of Mars to cool down, especially when we estimate the condition, that we may discover that the core may have a greater possibility of cooling down by triggermen, due to the extreme condition. And it is well supported by the theory of Wien's Law. When the temperature is higher, the wavelength of the thermal radiation is shorter or smaller. The lower the temperature, larger the wavelength of thermal radiation. In visible radiation, hot objects emit bluer light than extraordinary objects. Considering the mountaintop of blackbody emission per unit frequency or proportional bandwidth, one must use a different proportionality constant. So, this implies a reverse relationship from both sides. However, the form of the law remains the same, but the topmost wavelength is inversely proportional to temperature, & the highest frequency is directly proportional to temperature. This may imply a supportive theory to our paper's assumption.

The implicit equation yields the spectral radiance density function peak expressed in the parameter radiance per proportional bandwidth. This means the density of irradiance per frequency bandwidth is proportion to frequency itself, which can be calculated by considering infiniteness intervals of wavelength (or equivalently frequency) rather than frequency itself. This provides a more intuitive way of presenting the "wavelength of peak emission." This yields λ = 3.920690394872886343. (Wien's Wiki)

We propose that instead of using Wien's shift law, the average photon energy should be used to demonstrate the reverse relationship due to extreme weather conditions. Additionally, based on the data provided in Ellen's article, this may serve as a meaningful indicator of changes that occur with changing energy forms. Therefore, this research paper suggests discussing the average number of photons in connection with the Stefan–Boltzmann law. This reverse phenomenon may cause a cooling effect, leading to the cooling of the main core of Mars, which could result in the formation of a semi-ice structure inside the Mars cave, contributing to the cooling of the core magnet pole of Mars. Furthermore, we utilize this approach as a concept that can be further interpreted as "spectral energy density per fractional bandwidth distribution," potentially leading to a shift of energy effects through the scatter of radio magnet fluctuations in the wavelength scale, causing an inverse extreme frequency.

In conclusion, this research paper predicted that, due to the Mars phenomenon condition, there may be hints at the potential existence of semi-ice lakes within Mars. Our paper delves into further interpretation and posits that the formation of semi-ice lakes on Mars may be uneven across different areas due to variations in energy conditions. Furthermore, our research suggests that this imbalance could lead to a cooling effect on the Martian magnetic pole, resulting in internal cooling. The imbalance condition of Mars may lead to a cooling effect on the Martian magnetic pole, resulting in internal cooling, causing a semi-ice structure inside.

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