DEFICIT OF HIGHER FREQUENCY PHOTONS IN SOLAR SPECTRUM TRANSFORMS GREENERY TO DESERTIFICATION

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Received July 29, 2018
Accepted October 09, 2018

ABSTRACT

The earth is the only known planet in the universe where creatures can survive due to its affable climate. But this ambiance has been changing since it’s born by the natural and manmade disasters. Desertification is a process by which fertile lands transforms into desert when climatic change, deforestation, draught, and improper agriculture take place. Not only those but recent observations also show that solar spectrum may play a vital role of this transformation. Since 2006 local temperature, zenith and rotational angles of earth and color intensities of solar spectrum have been recording. Results show that earth has been falling in aperiodical nature. Intensities of colors and the temperature have been changing as well. Oxygen is the core intake of living beings and that comes from Photosynthesis where solar spectrum and green leaves play crucial roles. Recently ratios of different color intensities have been measured by colored LEDs in Kalyani (88°26'E, 22°58'N), Dubai (55°16'E, 25°12'N), New York (73°56'W, 40°43'N), Philadelphia (75°9'W, 39°57'N) and Orlando (81°22'E, 28°32'N). The differences of ratios between Dubai with other places are significant (~ 62 %) in average that may cause the deforestation. Environment in Kalyani with other places in the United States are trivial and climates during the summer are almost same except Dubai. In the following sections these issues are described.

Key Words : Climate change, Desertification, Frequency, LEDs, Photons, Solar spectrum

INTRODUCTION

Desertification is a term coined by Helmut Geist as the process of fertile land transforming into desert typically as a result of deforestation, drought or improper agriculture. Not only that land degradation in arid, semi-arid and dry sub-humid regions result climatic variations and human activities are the basis of desertification. The impact of global warming and human activities are presented in the sub-Saharan Sahel and associate neighboring countries like Dubai. In this area, the level of desertification is very high compared to other areas in the world which are characterized by a dry climate, hot temperatures, and low rainfall (300–750 mm rainfall per year) resulting draughts and some studies have shown that Africa has lost approximately 650,000 km² of its productive agricultural land over the past 50 years. The United Nations Convention (UNC) says that about six million Sahelian citizens would have to give up the desertified zones of sub-Saharan Africa and leave for North Africa and Europe between 1997 and 2020. In India Gobi Desert is another major part that has been being impacted by desertification and the fastest moving desert on Earth which swallows up over 3,370 km² of land annually. Recent observations over the past 157 years show that surface temperatures on Earth have risen globally. In the last century warming has occurred in two phases, from the 1910s to the 1940s (0.35°C), and more strongly from the 1970s to the present (0.55°C). An increasing rate of warming has taken place over the last 25 years, and 11 out of the 12 warmest years on record have occurred in the past 12 years. Above the surface, global observations since the late 1950s show that the troposphere (up to about 10 km) has warmed at a slightly greater rate than the surface since 1979. Confirmation of global warming comes from the warming of
the oceanic environment, melting of glaciers, sea ice diminishing in the Arctic zone in the Northern Hemisphere. Intergovernmental Panel on Climate Change (IPCC) shows the Special Report of Global Warming of 1.5 °C on October 08, 2018 and stated by the Secretary-General that the climate change is running faster than we are. According to its report, global warming will increase poverty with increasing deforestation. It also suggests mitigation measures to reduce anthropogenic net emissions of carbon-di-oxide (CO₂). Hansen et al. reported in 2010 from the Goddard Institute for Space Studies (GISS) that Global temperature is rising as fast in the past decade as in the prior two decades, despite year-to-year fluctuations associated with the El Niño-La Niña cycle of tropical ocean temperature. Recently, we have studied the characteristics of solar spectrum and found that the ratios between red & white (R/W), blue & white (B/W) and green & white (G/W) are fluctuating all over the years which have persuaded in desertification in some areas of the globe.

AIMS AND OBJECTIVES

The aim of this study is to discover whether solar radiation spectrum has any role on transformation of greenery to desertification. The objectives of this comparative research are the findings of spectrum characteristics in greenery and desert areas. The colors of light are the utmost catalyst of Photosynthesis as well impactful in Respiration. Hence experimental results will help us to know the function of colors of light on desertification. In the living cycle we see that human beings are dependent on animals and plants for their survivable. The growth of plants depends on temperature, condition of soil, climates, respiration and photosynthesis. In aerobic respiration plants produce CO₂ and energy (ATP: Adenosine-tri-phosphate) through the reaction of Glucose (C₆H₁₂O₆) and Oxygen (O₂):

\[
C_6H_{12}O_6 + 6 O_2 \rightarrow 6 CO_2 + 6 H_2O + ATP
\]

In the process of Photosynthesis plants collect CO₂ from air and water from the soil and in the presence of sunlight (Δ) they produce O₂ and

\[
6 CO_2 + 6H_2O \xrightarrow{\Delta} C_6H_{12}O_6 + 6 O_2
\]

The production rate of O₂ depends on colored light intensity, chlorophyll (green pigments) and stomata size of leaves. By measuring the branching ratio of those colors we can find one of the clues of desertification profoundly. It is found that red has better O₂ production rate than blue color in a recent study. Rise of Global temperature affects the germination of seeds and plantation. In January 2019 hundreds of thousands of fish died that is coined as the ecological disaster in the Darling River of Western New South Wales State of Australia. We have been facing the similar heat wave annually in India: e.g., in 2015 that killed at least 2,500 people. If the world gets warmer by 2 °C over pre-industrial levels, says the much-anticipated world’s biggest review report on climate change by IPCC more and more people will die from several natural disasters in this subcontinent.

MATERIAL AND METHODS

In order to study the characteristics of solar spectrum a solar spectrum monitor (SSM) was developed and detail of its applications can be found elsewhere. A SSM consists of light emitting diodes (LEDs) of various colors and mode of operation is reverse bias. During my visit to Dubai in the Middle East, New York, Philadelphia and Orlando in the USA last year, data were collected with these LEDs. In Fig. 1 location of experiments are depicted.

RESULTS AND DISCUSSION

Intensities of solar radiation spectrum were measured with colored LEDs at different places in sunny days of August 2018. Data were taken from morning to afternoon and the ratios of colors between Blue-Red (B/R), Blue-Orange (B/O) and Green-Yellow (G/Y) are estimated in average. The ratios are taken into account to minimize the experimental and environmental effects on each color. The locations of Kalyani is 88° 26' E, 22° 58' N, Dubai is 55° 16' E, 25° 12' N, New York is 73° 56' W, 40° 43' N, Philadelphia is 75° 9' W, 39° 57' N and Orlando is 81° 22' E, 28° 32' N. The ratios of different colors are plotted along the vertical axis with latitudes along the
horizontal scale are shown in Fig. 2. The error bar of each point indicates the statistical uncertainties of the measurements. The spectrum infers that ratios of colors are similar within error limit in Greenery places e.g., Kalyani, New York, Philadelphia and Orlando except Dubai which is placed in the upstream of extended Sahara.

Fig. 1: Five data taking cities are exposed with different colors in the World map

The B/R falls of drastically in Dubai rather than other places. It is an alarming condition for plants, many of those pigments are sensible to light (higher frequency photon, Blue color). No tropical and seasonal plants are found in Dubai. The shortfall intensity of Blue color is not good enough in solar radiation spectrum (observed in Dubai), photosynthesis and respiration of plants are being affected resulting extinction of many species of plants in the arid areas perhaps.

Fig. 2: The ratios of colors (B/R, B/O and G/Y) along the latitudes of different places are depicted. Sharp fall of these ratios implies the deforestation of Middle East Dubai

Consequently CO\textsubscript{2} has been increasing by other means in the environment and it is reflecting the rise of temperature globally. If we look forward on various reports we find that climatic variations and human activities are two major causes of desertification. Climate change, drought, moisture loss on a global level are associated with climatic change on the other hand overgrazing, deforestation and removal of the natural vegetation, taking too much fuel wood, agricultural activities in the vulnerable ecosystems of arid and semi-arid areas are the causes of human activities. Hence we observe that 40% and 39% population live in the desertification areas of Africa (5.8 % land in
hector) and Asia (30.1 % land in hector) respectively and those are higher than any other desertification areas of the globe. Rajasthan is the Western part of India with arid climatic condition and low average rainfall (150 – 200 mm). In the past fifty years number of drought came is twenty four which is ~ 47%. Out of total thirty four districts the most droughts affected districts are nine. These nine districts have dry climate and average rainfall (32 – 78 mm). The Great Indian Desert Gobi has similarity with other deserts of the world in respect of flora and fauna.

Scientists of NASA’s Goddard Institute for Space Studies explained that around 8,000 years ago, the Earth’s orbit was slightly different to how it is today. The tilt changed from around 24.1 degrees to the present-day 23.5 degrees. They estimated Earth’s axial tilt changes at a rate of approximately 2.6 centimeters each year. Changes in the Earth’s orbital tilt affect the weather and our climate. In my previous studies the similar phenomena was observed including an Inkpot movement of our earth revealed by measuring the earth’s zenith and rotational angles. One of the strongest pieces of evidence for human-induced climate change is the augment of CO₂ consistently in modern times, as measured at the Mauna Loa Observatory in Hawaii, where CO₂ has been observed since 1958. As of December 2008, the concentration of CO₂ in Earth’s atmosphere was about 386 parts per million (ppm), with a steady recent growth rate of about 2 ppm per year since 1950 (285 ppm). Almost a quarter of the CO₂ emitted by human activities is absorbed by land areas; another quarter is absorbed by the ocean. The remainder stays in the atmosphere for a century or longer.

CONCLUSION

Our experimental results infer that the surface of Dubai receive fewer intense blue light than any other greenery places of the globe and a major cause of deforestation. If we desire to sustain in our lovely planet in a century or more, exclusively we need to end deforestation and plant billions of trees on the globe; drastically reduce the use of fossil fuels and phase out coal by 2050. It is our first and foremost priority to focus on installation of wind and solar power; invest in climate-friendly sustainable agriculture; and consider new technologies such as carbon capture and storage. The US has 4% of the world's population, but it produces 25% of all the greenhouse gases. In 2005 the Kyoto treaty came into effect. This was signed by over 160 countries, and requires them to reduce their emissions of CO₂ and other greenhouse gases. The US and Canada are the only major countries that have not ratified the treaty. The impact of desertification is huge: (a) the average river run-off and water availability in some dry areas are projected to decrease 10 – 30 %. (b) About 60 million people could move from sub-Saharan Africa to North Africa and Europe by 2020. (c) About 2.4 billion people will suffer from water scarcity by 2025 and 700 million people will migrate globally. (d) By 2050, 200 million people migrate from desertification areas, which are quite alarming. The increasing rate of desert in India affects our economy, anthropology, sociology and geography which affect global warming too.

REFERENCES


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