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Study Of Cause Of Rise In Temperature Of Earth And Effect Of Temperature (Heat) On Human Body

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Abstract
Temperature rise is one of the most important problem globally, a lot of research is going on globally to see effect and cause of global warming, because it remedial measure are not taken now then it will become a threat for human civilization. The rise of temperature is also imparting great effect on humans, and it is still a subject of study globally to see the effect of temperature of human body. I have investigated the cause of rise in temperature of universe and effect of such high rise in temperature on human body.
Keywords:- *Global Warming, Radiative Forcing, Green House Effect, Heat and human body.*

1- INTRODUCTION

Climate change is one of the major causes in changing environment and increasing heat in all areas of planet (1). Hotter summers at many places on the planet lead to change in biodiversity. With more heat waves on the horizon and a big one currently sweeping much of the areas the risk of heat-related health problems has also been on the rise. Heat exhaustion is a relatively common reaction to severe heat and can include symptoms such as dizziness, headache and fainting. It can usually be treated with rest, a cool environment and hydration (including refueling of electrolytes, which are necessary for muscle and other body functions). Heat stroke is more severe and requires medical attention it is often accompanied by dry skin, a body temperature above 103 degrees Fahrenheit, confusion and sometimes unconsciousness. Extreme heat is only blamed for an average of 688 deaths each year in the India. But when sustained heat waves hit a region, the other health ramifications can be serious, including sunstroke and even major organ damage due to heat. An observational study of some of those patients revealed that 28 percent who were diagnosed at the time with severe heat stroke had died within a year of being admitted to the hospital, and most who initially survived the high temperatures had "permanent loss of independent function," according to a 1998 study of the heat wave, published in *Archives of Internal Medicine*.

2- CLIMATE CHANGE

It is seen that climate was drastically change from a period of time, reportedly influencing the earth biodiversity causing climate change. These factors have caused Earth's climate to change many times. Scientists have pieced together a record of Earth's climate, dating back hundreds of thousands of years (and, in some cases, millions or hundreds of millions of years), by analyzing a number of indirect measures of climate such as ice cores, tree rings, glacier lengths, pollen remains, and ocean sediments, and by studying changes in Earth's orbit around the sun.[2] This record shows that the climate system varies naturally over a wide range of time scales. In general, climate changes prior to the Industrial Revolution in the 1700s can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in greenhouse gas (GHG) concentrations.[2] Recent climate changes, however, cannot be explained by natural causes alone. Research indicates that natural causes do not explain most observed warming, especially warming since the mid-20th century. Rather, it is extremely likely that human activities have been the dominant cause of that warming.[3] To understand it properly one will have to understand the Radiative Forcing.

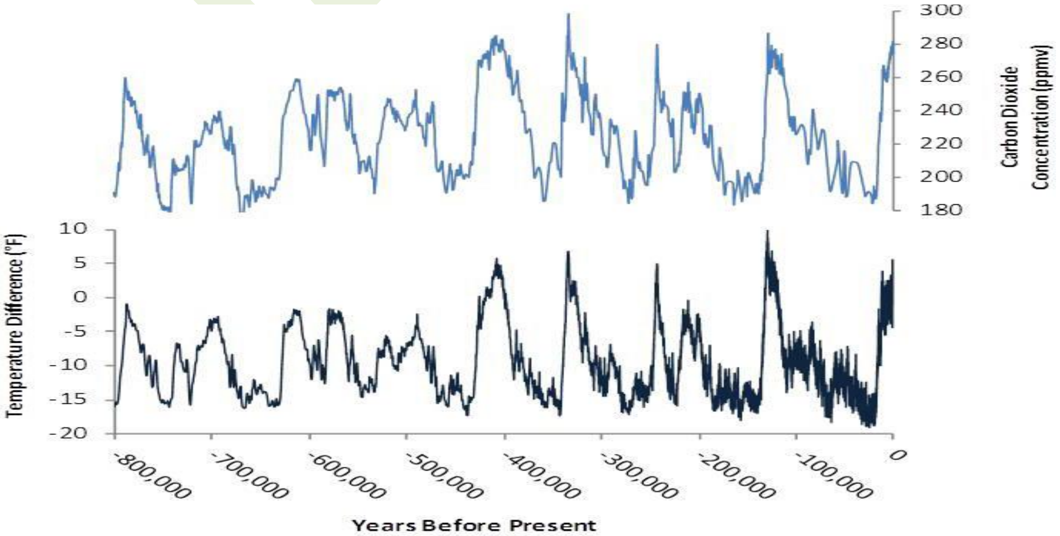
3- RADIATIVE FORCING

Radiative forcing is a measure of the influence of a particular factor (e.g. GHGs, aerosols, or land use changes) on the net change in Earth's energy balance. On average, a positive radiative forcing tends to warm the surface of the planet, while a negative forcing tends to cool the surface.(4) GHGs have a positive forcing because they absorb energy radiating from Earth's surface, rather than allowing it to be directly transmitted into space. This warms the atmosphere like a blanket. Aerosols, or small particles, can have a positive or negative radiative forcing, depending on how they absorb and emit heat or reflect light. For example, black carbon aerosols have a positive forcing since they absorb sunlight. Sulfate aerosols have a negative forcing since they reflect sunlight back into space. NOAA's Annual GHG (Green House Gases) Index, which tracks changes in radiative forcing from GHGs over time, shows that such forcing from human-added GHGs has increased 27.5 percent between 1990 and 2009.(4) Increases in CO_2 in the atmosphere are responsible for 80% of the increase. The contribution to radiative forcing by CH_4 and CFCs has been nearly constant or declining, respectively, in recent years.(5)

4- GREEN HOUSE EFFECT

When sunlight reaches Earth's surface, it can either be reflected back into space or absorbed by Earth. Once absorbed, the planet releases some of the energy back into the atmosphere as heat (also called infrared radiation). Greenhouse gases like water vapor (H_2O), carbon dioxide (CO_2), and methane (CH_4) absorb energy, slowing or preventing the loss of heat to space. In this way, GHGs act like a blanket, making Earth warmer than it would otherwise be. This process is commonly known as the "greenhouse effect."(6)

The role of the greenhouse effect in the past; over the last several hundred thousand years, CO_2 levels varied in tandem with the glacial cycles. During warm "interglacial" periods, CO_2 levels were higher. During cool "glacial" periods, CO_2 levels were lower.[2] The heating or cooling of Earth's surface and oceans can cause changes in the natural sources and sinks of these gases, and thus change greenhouse gas concentrations in the atmosphere. These changing concentrations are thought to have acted as a positive feedback, amplifying the temperature changes caused by long-term shifts in Earth's orbit.[2]



Estimates of the Earth's changing CO_2 concentration (top) and Antarctic temperature (bottom), based on analysis of ice core data extending back 800,000 years. Until the past century, natural factors caused atmospheric CO_2 concentrations to vary within a range of about 180 to 300 parts per million by volume (ppmv). Warmer periods coincide with periods of relatively high CO_2 concentrations. Note: The past century's temperature changes and rapid CO_2 rise (to 400 ppmv in 2015) are not shown here. Increases over the past half century are shown in the Recent Role section.(7)

5- GREENHOUSE EFFECT IN PRESENT SCENARIO

Since the Industrial Revolution began around 1750, human activities have contributed substantially to climate change by adding CO_2 and other heat-trapping gases to the atmosphere. These greenhouse gas emissions have increased the greenhouse effect and caused Earth's surface temperature to rise. The primary human activity affecting the amount and rate of climate change is greenhouse gas emissions from the burning of fossil fuels.(8)

The main greenhouse gases; The most important GHGs directly emitted by humans include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and several others. The sources and recent trends of these gases are detailed below. (9)

Carbon dioxide; Carbon dioxide is the primary greenhouse gas that is contributing to recent climate change. CO_2 is absorbed and emitted naturally as part of the carbon cycle, through plant and animal respiration, volcanic eruptions, and ocean-atmosphere exchange. Human activities, such as the burning of fossil fuels and changes in land use, release large amounts of CO_2, causing concentrations in the atmosphere to rise.

Atmospheric CO_2 concentrations have increased by more than 40% since pre-industrial times, from approximately 280 parts per million by volume (ppmv) in the 18th century to over 400 ppmv in 2015. The monthly average concentration at Mauna Loa now exceeds 400 ppmv for the first time in human history. The current CO_2 level is higher than it has been in at least 800,000 years.[2]

Some volcanic eruptions released large quantities of CO_2 in the distant past. However, the reports state that human activities now emit more than 135 times as much CO_2 as volcanoes each year. Human activities currently release over 30 billion tons of CO_2 into the atmosphere every year.[10] The resultant build-up of CO_2 in the atmosphere is like a tub filling with water, where more water flows from the faucet than the drain can take away.

If the amount of water flowing into a bathtub is greater than the amount of water leaving through the drain, the water level will rise. CO_2 emissions are like the flow of water into the world's carbon bathtub. "Sources" of CO_2 emissions such as fossil fuel burning, cement manufacture, and land use are like the bathtub's faucet. "Sinks" of CO_2 in the ocean and on land (such as plants) that take up CO_2 are like the drain. Today, human activities have turned up the flow from the CO_2 "faucet," which is much larger than the "drain" can cope with, and the level of CO_2 in the atmosphere (like the level of water in a bathtub) is rising.

METHANE; Methane is produced through both natural and human activities. For example, natural wetlands, agricultural activities, and fossil fuel extraction and transport all emit CH_4. Methane is more abundant in Earth's atmosphere now than at any time in at least the past 800,000 years.[2] Due to human activities, CH_4 concentrations increased sharply during most of the 20th century and are now more than two-and-a-half time's pre-industrial levels. In recent decades, the rate of increase has slowed considerably.[2]

NITROUS OXIDE; Nitrous oxide is produced through natural and human activities, mainly through agricultural activities and natural biological processes.

Fuel burning and some other processes also create N_2O. Concentrations of N_2O have risen approximately 20% since the start of the Industrial Revolution, with a relatively rapid increase toward the end of the 20th century.[2] Overall, N_2O concentrations have increased more rapidly during the past century than at any time in the past 22,000 years.[2]

6- OTHER GREENHOUSE GASES

Water vapor is the most abundant greenhouse gas and also the most important in terms of its contribution to the natural greenhouse effect, despite having a short atmospheric lifetime. Some human activities can influence local water vapor levels. However, on a global scale, the concentration of water vapor is controlled by temperature, which influences overall rates of evaporation and precipitation. Therefore, the global concentration of water vapor is not substantially affected by direct human emissions. (11)

Tropospheric ozone (O_3), which also has a short atmospheric lifetime, is a potent greenhouse gas. Chemical reactions create ozone from emissions of nitrogen oxides and volatile organic compounds from automobiles, power plants, and other industrial and commercial sources in the presence of sunlight. In addition to trapping heat, ground-level ozone is a pollutant that can cause respiratory health problems and damage crops and ecosystems.

Chlorofluorocarbons (CFCs), hydro chlorofluoro carbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6), together called F-gases, are often used in coolants, foaming agents, fire extinguishers, solvents, pesticides, and aerosol propellants. Unlike water vapor and ozone, these F-gases have a long atmospheric lifetime, and some of these emissions will affect the climate for many decades or centuries.

7- OTHER CLIMATE FORCERS

Particles and aerosols in the atmosphere can also affect climate. Human activities such as burning fossil fuels and biomass contribute to emissions of these substances, although some aerosols also come from natural sources such as volcanoes and marine plankton. (12)

Black carbon (BC) is a solid particle or aerosol, not a gas, but it also contributes to warming of the atmosphere. Unlike GHGs, BC can directly absorb incoming and reflected sunlight in addition to absorbing infrared radiation. BC can also be deposited on snow and ice, darkening the surface and thereby increasing the snow's absorption of sunlight and accelerating melt. For information on how BC is impacting the Arctic, see EPA assessment *Methane and Black Carbon Impacts on the Arctic*. Sulfates, organic carbon, and other aerosols can cause cooling by reflecting sunlight.

Warming and cooling aerosols can interact with clouds, changing a number of cloud attributes such as their formation, dissipation, reflectivity, and precipitation rates. Clouds can contribute both to cooling, by reflecting sunlight, and warming, by trapping outgoing heat.

8- CHANGES IN THE SUN'S ENERGY

The sun's energy received at the top of Earth's atmosphere has been measured by satellites since 1978. It has followed its natural 11year cycle of small ups and downs. Changes occurring in the sun itself can affect the intensity of the sunlight that reaches Earth's surface. The intensity of the sunlight can cause either warming (during periods of stronger solar intensity) or cooling (during periods of weaker solar intensity). The sun follows a natural 11-year cycle of small ups and downs in intensity, but the effect on Earth's climate is small.[1] Changes in the shape of Earth's orbit as well as the tilt and position of Earth's axis can also affect the amount of sunlight reaching Earth's surface.[1][2]

Changes in the sun's intensity have influenced Earth's climate in the past. For example, the so-called “Little Ice Age” between the 17th and 19th centuries may have been partially caused by a low solar activity phase from 1645 to 1715, which coincided with cooler temperatures. The “Little Ice Age” refers to a slight cooling of North America, Europe, and probably other areas around the globe.[2] Changes in Earth’s orbit have had a big impact on climate over tens to hundreds of thousands of years. In fact, the amount of summer sunshine on the Northern Hemisphere, which is affected by changes in the planet’s orbit, appears to drive the advance and retreat of ice sheets. These changes appear to be the primary cause of past cycles of ice ages, in which Earth has experienced long periods of cold temperatures (ice ages), as well as shorter interglacial periods (periods between ice ages) of relatively warmer temperatures.

Changes in solar energy continue to affect climate. However, over the last 11-year solar cycle, solar output has been lower than it has been since the mid-20th century, and therefore does not explain the recent warming of the earth.[2] Similarly, changes in the shape of Earth’s orbit as well as the tilt and position of Earth’s axis affect temperature on very long timescales (tens to hundreds of thousands of years), and therefore cannot explain the recent warming.

9- CHANGES IN EARTH REFLECTIVITY

When sunlight reaches Earth, it can be reflected or absorbed. The amount that is reflected or absorbed depends on Earth’s surface and atmosphere. Light-colored objects and surfaces, like snow and clouds, tend to reflect most sunlight, while darker objects and surfaces, like the ocean, forests, or soil, tend to absorb more sunlight. The term albedo refers to the amount of solar radiation reflected from an object or surface, often expressed as a percentage. Earth as a whole has an albedo of about 30%, meaning that 70% of the sunlight that reaches the planet is absorbed. Absorbed sunlight warms Earth’s land, water, and atmosphere. Reflectivity is also affected by aerosols. Aerosols are small particles or liquid droplets in the atmosphere that can absorb or reflect sunlight. Unlike greenhouse gases, the climate effects of aerosols vary depending on what they are made of and where they are emitted. Those aerosols that reflect sunlight, such as particles from volcanic eruptions or sulfur emissions from burning coal, have a cooling effect. Those that absorb sunlight, such as black carbon (a part of soot), have a warming effect.

Reflectivity in the past; Natural changes in reflectivity, like the melting of sea ice, have contributed to climate change in the past, often acting as feedbacks to other processes. Volcanoes have played a noticeable role in climate. Volcanic particles that reach the upper atmosphere can reflect enough sunlight back to space to cool the surface of the planet by a few tenths of a degree for several years. These particles are an example of cooling aerosols. Volcanic particles from a single eruption do not produce long-term change because they remain in the atmosphere for a much shorter time than GHGs.

The recent role of reflectivity; Human changes in land use and land cover have changed Earth’s reflectivity. Processes such as deforestation, reforestation, desertification, and urbanization often contribute to changes in climate in the places they occur. These effects may be significant regionally, but are smaller when averaged over the entire globe. In addition, human activities have generally increased the number of aerosol particles in the atmosphere. Overall, human-generated aerosols have a net cooling effect offsetting about one-third of the total warming effect associated with human greenhouse gas emissions. Reductions in overall aerosol emissions can therefore lead to more warming. However, targeted reductions in black carbon emissions can reduce warming.(13)

10- EFFECT OF HEAT ON HUMAN BODY

The two ways in which humans cope with heat are by perspiring and breathing. The humidity is a huge factor. If you have tremendously high temperatures and high humidity, a person will be sweating but the sweat won't be drying on the skin. That’s why it's not just heat but the combination of heat and humidity that matters. That combination results in a number called the apparent temperature or "how it feels".[14] Obviously there are thresholds for both temperature and humidity above which we see an increase in death and it's going to be a different temperature in Phoenix than it's going to be in India.

The other major factor in terms of temperature that causes both mortality and morbidity is the temperature that it falls to in the evening. If the temperature remains elevated overnight, that's when we see the increase in deaths. The body becomes overwhelmed because it doesn't get the respite that it needs. The systems in the human body that enable it to adapt to heat become overwhelmed. When a person is exposed to heat for a very long time, the first thing that shuts down is the ability to sweat. We know that when perspiration is dried by the air there is a cooling effect on the body. Once a person stops perspiring, in very short order a person can move from heat exhaustion to heat stroke.

11- TRANSITION FROM HEAT EXHAUSTION TO HEAT STROKE

It begins with perspiring profusely, and when that shuts down, the body becomes very hot. Eventually that begins to affect the brain, and that's when people begin to get confused and can lose consciousness. The analogy we use is if you're driving a car and you notice that the temperature light comes on, what's happening is the cooling system of the car is becoming overwhelmed. If you turn off the car and let it cool eventually you can start driving again. But if you continue to drive the car, the problem goes beyond the cooling system to affect the engine, and eventually the car will stop.

The extreme overheating of human body affects the other areas of the body, as the body temperature increases very rapidly; the central nervous system and circulatory system are impacted. In places where there have been prolonged heat exposures, there is probably a broad impact on many organ systems. From heat waves that have been studied, like in Rajasthan, there are increases in emergency department visits and hospital stays for medical crises that are not normally associated with heat, such as kidney problems. But it really hasn't been studied very much.[15] One of the reasons for that is the main focus of the studies has been on mortality from heat waves, and there hasn't been that much focus on morbidity. That would take looking at people who are hospitalized from heat exhaustion or heat stroke and following them into the future.

11.1- SYMPTOMS

Normally there are early symptoms in one’s body before someone gets full blow heat stroke they are heat rash and muscle cramps are early signs of people being overwhelmed by heat. If those aren't dealt with, it can lead to more severe symptoms. Cramping of muscles can be for a number of different issues, including electrolytes not getting to the muscles. People should be aware that their skin turning red and dry is indicators that heat is impacting them.

We know the risk factors for dying from heat are urban dwellers who are elderly, isolated and don't have access to air conditioning. Obese people are at increased risk as are people on certain medications. And people who are exercising or working in the heat, who don't meet those criteria, can be at risk.

11.2- MEDICATION TO PREVENT HEAT STROKES

It is found that diuretics for high blood pressure were some that helps protecting heat strokes, and beta blockers. There are some studies that have shown that certain mental health medications may impact a person's ability to deal with the heat. But that's a difficult one to get at. When you look at the number of people who die in a heat wave and the number of people who are taking those medications, the numbers can get pretty small pretty quickly.[16]

I think it's always been a problem. There's history over hundreds of years of people dying of heat. We're also living to older ages, and we're more urban now than we have been in the history of the human species. That intense crowding can combine with the heat island effect in big cities. Our elderly people are also more isolated than they have been in the past, so those factors can play a part, too.

12- CONCLUSION

It is a known fact that from primitive times, the earth temperature is increasing day by day; our ancestors are very use to cope with the high temperatures, as they make competent themselves to cope with high heat and temperature. Modernization leads to development of Air conditioners, Coolers and other methods, all is well but the major problem arises only when there is a sudden change in temperature, the ones body is not build to cope with the sudden changes. Certainly society has evolved in dealing with the heat and that has been in the development of air conditioners. The number one factor that ameliorates death from heat is access to air conditioning. Seeing current scenario it is necessary that one should take utmost care of one's health in summer, because as the Universe is expanding the problem of heat is increasing in all parts of world, and directly effecting health status of persons living there. We are continuously talking about the Global Warming,[17-19] Green House Gases and other aspects which causes rise in earth temperature, but the much need is that how to educate our society to cope with the climatic changes happening very fast. In my paper I tried to correlate the major causes of heat increase in atmosphere and its effect, and to educate the society about the various precautions and actions to be taken to prevent further loss, and to give our future generation a green and cool planet.

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wavelengths, primarily in the infrared part of the spectrum (see Figure 1). Much of this thermal radiation emitted by the land and ocean is absorbed by the atmosphere, including clouds, and reradiated back to Earth. This is called the greenhouse effect."

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