

Numerical Analysis Amount of Solar Radiation on Earth

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ABSTRACT

The philosophy of building and construction was ever on the basis of harmony with nature and this throughout the centuries went forward in its development and changing route one of the prominent examples of nature that is very useful for human is sun. Today using un limited and permanent natural energies like the energy of sun could be an extended and deliberately subject. In the structure of this report firstly the structure of sun and reactions of its surface will be known. Then the description of the way the sun radiates, exact recognition of atmosphere or the space between earth and sun and recognition of different parts of atmosphere looks necessary. All of these arguments are premises that will be set as the basis for effective use of the heating energy of sun as an unlimited natural energy. In the different areas of the earth that has different geographical and atmosphere conditions, the man to continue his life has created his home in accordance with agreeing and disagreeing forces. In other words, the philosophy of building and construction was on the basis of accordance with nature and living with it and this for generations and centuries in different areas has went forward in its development and changing route.

KEY WORDS: Solar, Reactions, Atmosphere, Factors, Composition.

INTRODUCTION

The quality and physical and chemical properties of the sun, the earth and the atmosphere, also reactions of these three factors to each other caused the climate quality on the surface of the earth. Of course there is concepts related to thermodynamic and Quantum mechanics which is not known yet completely. The mass of sun or the particles that compose the mass of sun, from the physical view are under the pressure of an infernal gravity force. The suitable example for this concept is the approaching of people to the door of a sport stadium or a cinema. If everybody considered as a particle of sun, at first when the more the distance of people from the door of stadium is the more the distance of people from each other and as we get closer to the door, the distance of people from each other becomes less than before, until close to the entering door people are in physical contact with each other. This quality of partied takes place in the sun with great force and in the spiral form that in the center the movement and pressure is more than other parts. This physical quality of the mass of sun on the particles of sun is named cold accretion in such conditions the particles are attracted to the mass of sun and the accumulation of particles under the pressure of the gravity force becomes increased and this pressure confronts with the inter particle force [the force between the particles] which at the end causes the equilibrium of forces in the sun. The gravity force of the particles, which has been mentioned before, brings near the particles in such a way that you can say these particles are parted from each other with stretched springs. As the particles become closer to the center of sun the springs return to their places and as the result the distance of particles from each other became less. What is important is that in this state the energy, movement and internal pressure of the particles is out of limit. The intensity of energy at such a amount that the elements of the sun even come out of their atomic form. In fact, these causes that particles particularly at the nucleus of sun be in a equilibrium state with temperature of several million degree of Celsius but the cause of equilibrium of the temperature of the sun is also because of nuclear reactions and at the end because of radii tonal energy which is issued from it.

The temperature at the nucleus of sun reaches to ten million degree of Celsius and particles at this part as mentioned before are in unnatural form, and are out of known atomic structure particles in this state are called plasma in other words, in this state, nucleus and electrons are moving without relation or nuclear composition with each other. All of the nucleus of atoms have positive load and should repel each other but whereas the temperature is so high mostly hit each other and cause nuclear explosions like thermonuclear explosions. Viewing the structure of the sun which temperature is less than its internal part we could find the kind of nuclear reactions which take place in its internal parts.

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The temperature at the viewable external part of the sun reaches five thousand and five hundred degree of Celsius, this temperature is so high that some atoms on this temperature have a unstable or broke down state. Also the temperature is so low that some atoms preserve their known structure and state. These states are distinguished by quality and reaction of particles and atoms with radiated energy that is issued from the nucleus of the sun. In fact, we can express that the properties of the sun specify that about two third of elements that are found in the earth exist in the sun too. but, the element that exist more than other is the atoms of Hydrogen and is the most sight weight atom or element which composes approximately eighty percent of particles or mass of sun. The other twenty percent is Helium or the second light weight element. In fact, the radiation source of the sun is fusion of the Hydrogen nucleus which at the end leads to creation of Helium atoms.

The Hydrogen nucleus is called proton which has positive load, basically these protons repel each other but when the environmental temperature is high like the surface of the sun. The protons are stimulated and under the gravity force cause nuclear reaction. These chain-like reactions change the states of atoms and four nucleus of Hydrogen create one nucleus of Helium. This action release two particle or the nucleus of Hydrogen that is called Neutrinos and causes radiation of some gamma energy. In these reactions neutrinos, basically don't do anything and are released from sun and don't have any role in physical or chemical reactions in the sun. In fact, constantly the mass of sun is reduced which amount to four million Ton per second.

2. Solar radiation

Ruler reactions which take place at the central part of sun causes production of gamma ray. Central part of sun composes three percent from the bulk of sun and the external part of sun which has thousand kilometers thickness is the refiner of the radiation that is radiated from the centric part of sun. All electromagnetic waves qualitatively and naturally are similar. only their wavelength, distinct them from each other quantitatively the gamma ray has the most small wave length in the spectrum of waves radiating from sun which is several millionth of one millimeters. From this stage, the relation between radiation and particle and their reactions to each other could be found out simply, if we suppose that particles themselves have radiate energy in this state, the particles are called photon, and each of them have specific quantum of energy and the radioactive energy of each photon has a reverse relation with the wavelength of the radiated energy of that photon namely, the more small is the wavelength of away the more the radiated energy in quantity thus, the gamma ray photon has the most energy because it save length is the most small. A loading part of gamma ray which is issued from the central part of the muss of sun loses some of its energy, passing across different parts of sun, as the result of contact with the nucleus of atoms and electrons. This causes that some photons of gamma ray change into X-ray and other ray that have a greater wave length, and the result of a decrease in their energy, this action consistently continues. In the other words, the photon's energy reduces and their wavelength increases until they reach the surface of sun where the temperature is so low that the atoms almost could preserve their atomic structure. These transformations take place at the external surface of sun, too. In fact, the radiation that is issued from the surface of sun and circulated in the atmosphere includes ray, with different wave lengths. (The energy of sun is very similar to the energy radiated from the supposed Black body at the temperature of five thousand and five hundred degree of Celsius, a temperature which is equal to the temperature of the external surface of sun. The measuring unit of wavelength is micron or micrometer which equals to one millionth of meter with a smoke – colored glass or welding mask we can see that the sun surface is not monotonous and local nuclear explosions like the action of a volcano have hundreds of thousand kilometer height. These transformations at the surface of sun create sensible disorders in its radiation which takes place greatly at the altar-violet part of the spectrum of the sun. The other incident that happens in the sun is called solar wind which is unalternative movement of the particles and mostly the protons. This phenol me non as the result of sun and run away from sun system with the speed of hundred thousand kilometer per second. Reaction of this act with the gravity of the earth causes disorder in radio systems.

3. Solar radiation and the Atmosphere

It takes eight minute that solar radiation reaches compass of earth with the three hundred thousand kilometer. [One hundred and eighty miles] per second. The route from the earth to sun is a circular route that has a radius about ninety three million miles or one hundred and fifty million kilometer. The radiation of sun is so much that after travelling this distance, the intensity of radiation at the external part of the earth Atmosphere amount to one thousand and three hundred watt per square meter. From the all of radiation of sun the earth catches only one part from two million parts. Because of the reactions that take place in the route of the sun radiation movement, the radiation that is issued to earth doesn't reach the surface of the earth. at the top of the surface of earth at the altitude of twenty five kilometers. A reaction takes place that almost all of ultra-violet part of the sun radiation is absorbed. In the part that the oxygen molecules that are in the O₂ from are converted to the oxygen atoms, as the result of the radiation with the sun radiation. The needed energy for breaking oxygen molecules is the energy of photons. That has a wave length less than 0.18 Micron. In fact, almost all of sun varies that has a wavelength less than 0.18 micron is filtered in this part of the earth atmosphere. Some of the oxygen atoms which were in the form of oxygen molecules [O₂] are combined. Together and at this time they are combined with

the oxygen molecules which exist in the atmosphere and cause aeration of the composition of ozone [O₃]. The ozone [O₃] itself is one of the absorbent elements for sun radiation. But the atomic solidity of the ozone is not as much as the oxygen molecules. For this a less energy is needed for the breakdown of the ozone atoms. Finally, the energy of photons that have almost 0.32 micron wavelength converts the ozone atoms again to the atoms and molecules of oxygen. This process continues constantly and the result is, in fact, the absorption of almost all of the ultra-violet part of solar radiation in this part of atmosphere and their conversion to the photons that have less energy and longer wave length. This natural process is one of the important advantages of nature for existence of human beings at the earth, because the human's contact with ultra-violet varies is dangerous and deadly.

The radiation of other part of sun spectrum hit the different particles suspended in the atmosphere and very meek physical and chemical reactions are created. Because the energy of these wavelengths are not too much they can't create power full chemical atomic reactions. As a result, these radiations are dispersed to some extent but they are dispersed monotonously in different directions. A part of solar radiation is dispersed again out of atmosphere. Basically, the dispersion of solar radiation takes place at the ultra-violet section. Dispersed solar radiation which shines at earth from different directions causes that the earth is perceived clear and in blue color from a high altitude.

4. The space between the earth and sun

The space between the earth and sun which is called atmosphere has the same importance that the earth or the sun has. Also the atmosphere part of the earth is as important and considerable as dry lands and waters of the earth. In fact, the surface of the earth is the external part of the earth atmosphere. Because the density of the air is almost insignificant in comparison with the density of earth and water, and external compass of atmosphere is much extended, it is usual to call the surface of the earth and waters the external surface of the earth. In fact, humans are located at the most lowest and condensed part of the air ocean and this compass considerably is affected by atmospheric and geographic factors. Although the air seems weight less, but it is not so weight less than it is supposed. so that one column of air which has one inch latitudinal section and continue from the surface of sea to top of atmosphere, its weight will be equal to 14.7 pounds. The weight of this column of air is measured with milliard. At the surface of sea the atmosphere pressure is – milliard which is equal to 14.7 pound per each square inch. Considering the size of earth that has a radius of – kilometer or – miles. The thickness of atmosphere that surrounds the earth is almost short. In fact, ninety nine percent of the atmosphere's mass is located at thirty two kilometer or twenty altitudes and is affected by the gravity of the earth too. The density of air in this part of atmosphere is too high in comparison to the higher parts and because of pressure and weight of the higher parts, density and firmness of air is focused with its altitude from the surface of the earth. The altitude from which mountains and some urban and rural areas are located more higher is a thin layer of Air Ocean which regulates atmospheric factors like temperature and humidity and prepares the surface of the earth for living. It is usually said that the water is the main source of life in earth. We can express these sentences in other way that water prepares the physical environment for living. If there is no water, equilibrium of heating energy at the surface of each will be deranged. In other word, parts with high latitude because of very cold weather and equatorial parts because of very hot weather cause that the surface becomes unsuitable for living and life existence. One of the properties of air and to tally gases there is their movement, expansion and condensation property. Although the air is weight less and not so sensible and perceivable but has very great force in itself. Even in calm weather, atmosphere pressure is so that when a car is moving fast, its resistance force can be sensed distinguishably.

5. The layers of the atmosphere

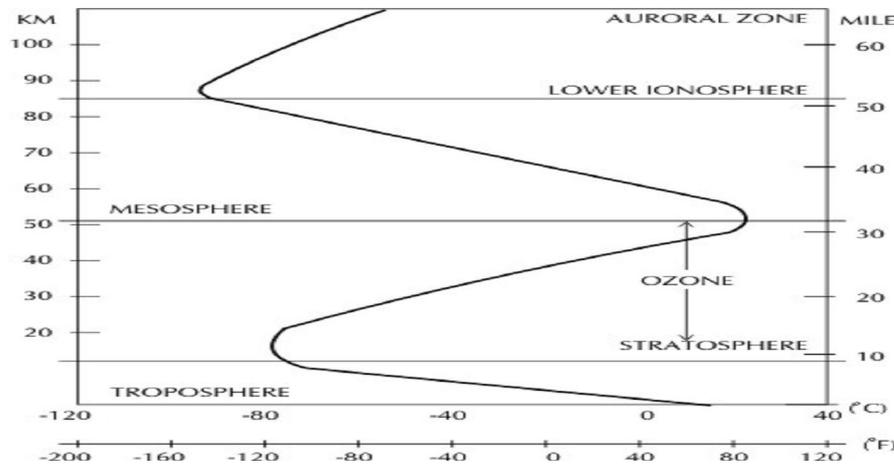
The atmosphere can be divided to several almost specific layers. Generally this division is based on temperature change with an increase of altitude in the atmosphere the first and the most important part which is called. Troposphere is eight kilometers or five miles high from the surface at the equatorial areas. Generally in this layer by increase in altitude the temperature decrease. This layer includes almost seventy five percent of total mass of the atmosphere. All of the vapor, clouds and suspended particles of atmosphere are also in this layer, at morpheme changes could be seen clearly. Each layer is specified by an increase in altitude that causes an increase or reduction in temperature. At the altitude of one kilometer from the surface of the earth the effect of the air contact and friction with the earth and water could be observed completely. Moisture and Temperature at the lower layer which is ten meter high from the earth's surface, moisture and temperature is completely controlled by the kind of the earth covering at dry lands and also the water surface. In fact, this layer is common part between atmosphere and external crust of the earth.

The paper layer of Troposphere itself is divided in several distinctive layer which has the altitude of hundred kilometers or miles from the troposphere and may be it has more altitude but the mass of all these layers is more than one third of the troposphere mass. Which in contrast was not so much.

The upper layer of atmosphere is called stratosphere. In this part whatever the altitude is increased the temperature is increase too, thickness, or depth of this upper layer of troposphere is fifty kilometers or thirty miles. The relatively high temperature that exist in this layer is because of the photochemical absorption of the ultra-violet ray of Chemical reactions that form the sun, is done (Photochemical Absorption) and this action caused the ozone gas in the middle and upper parts are. Since UV radiation can be absorbed solar radiation is high ozone gas; Maximum temperature in the

upper part of the temperature in the stratosphere is Earth's surface. Of other interactions in this part of the system and effect on the troposphere destination unknown material in this section have active research and study in different countries still continues. Here, (Ionosphere) is called and one of its properties, which reflect some radio waves from distant radio communication, is used.

Diagram 1. Different parts of the atmosphere or the atmosphere



6. Composition of the Atmosphere

The atmosphere of chemical composition of the few stable gas composition of dry air which has been called; but also some other material and non organic and organic like particles of dust and water vapor in the atmosphere to disperse smoke available. Pure dry air that was not visible and is odorless contains seventy-eight percent (with unit volume) of gas Nitrogen . Twenty one percent and one percent oxygen and Argon gas, carbon dioxide gas and also contains small amounts Other gases a Carbon Dioxide gas there in terms of natural climate is an important area of the face amount of solar radiation reflected from Earth's atmosphere can absorb Terrestrial Radiation and heat balance in the region cause is. Carbon dioxide permanently absorbed by the plants and creatures that are constantly breathing through food fuel is produced in the body, breathing out is through. Volcanoes in the mountains often a significant amount of activity dioxide emit carbon in the atmosphere. Spoil or rot practice materials and significant levels of carbon dioxide in the atmosphere are reported. Or depraved act spoil material on the surface and inside the earth cause is carbon dioxide. Amount of water vapor particles, which are colorless and odorless. In different parts of the Earth's atmosphere varies significantly elevated in the cold parts of the atmosphere without water vapor particles is cold and humid regions, but the amount of water vapor in three to four percent volume of air reaches. Since the particles of water vapor formed by evaporation in dry operation and oceans are carried by particles of water vapor in the lower atmosphere is the focus... Importance of water vapor in the air much more than that shows its value in air water vapor in the air not only the main source of cloud and rain, but also a significant amount of radiation from the disposal of both surface absorbs that should be added When cloud particles, water vapor masses are formed. Have a significant amount of heat energy that is used in the evaporation operation is released. In fact, conversion of cloud particles, water vapor, and finally back to earth as rain, and are always in the process is repeated at all general physical and chemical reactions that are carried in the air and cause the balance amount of planning and type of sunlight that reaches Earth's surface, is. Although V full control of a local weather and climate of a region are similar, but the air of a place or time per day varies from one region if the climate is almost certain other words, the air is different in each place, while climate in each region is different because the difference in the amount and intensity of climatic factors are. One of the most important factors controlling air and heat and cold climate imbalances in different parts of the Earth, although Earth is generally the same amount of heat energy that the disposal of the sun but this is not the same in all areas in some areas spend more than excreted thermal heat energy is absorbed. And in other areas photographs this action is an imbalance of energies and large areas of heat the Earth's surface occurs in areas with the highest difference of low or high latitude of the system. The temperature difference between land and sea areas between adjacent regions covered with snow and without snow, desert and plains between the city and even between the city and surrounding environment are carried out and this action causes the air flow and wind will create. Large-scale flow and direction of the wind depends on the particular geographical location latitude region. Steam or moisture in the air by evaporation from the surface of most oceans, especially in the tropics is done of course the role of vegetation in providing humidity is ineffective. Humidity to form clouds and eventually rain and snow will return to ground level and the trend over the years and weak intensity, which is dependent on seasons occur because of moisture or water vapor in the atmosphere Overall, not much can be variable moisture in the atmosphere or water vapor atmosphere

to a constant factor considered. The maximum moisture in the air might depend on the temperature is complete in areas where the temperature is low, such as polar regions and regions with more than forty degrees latitude, at least in situations where humidity is low in winter and summer moisture in these areas a and a half percent of the unit volume reaches. In humid tropical regions (near the sea) to three percent humidity with a unit volume reaches and in desert regions with low latitude of about four percent humidity is the unit volume. Generally, moisture or water vapor in the air in most areas of the equator and Polar Regions is minimal. Humidity in the desert regions of three to four times the equator is the Polar Regions. Absence or lack of rain in the desert regions due to low humidity in the air but not the main factor, the temperature in these regions, which often higher than the Dew Point temperature which is said.

In nature when the temperature goes down hot and humid weather or when the cold air in the vicinity of water vapor particles placed in the air as dew or cloud appears. The humidity as the humidity or moisture is determined to be more or dew point temperature will be even higher.

REFERENCES

- [1] H.Z.Tabor, WEC Solar Power, Montreal Canada: 14th Cogress The World Energy, 2002.
- [2] A.B.Meinel , P.Meinel, Applied Solar energy , Reading,MA:Addison-Wesley Publishhing Company,1997,pp39-115
- [3] T.Beardsley , Bright Future for a New Photovoltaic Ceel, Scientific American, January,2002,pp138-139
- [4] J.P.Rollefson,Canadian Solar energy review-March 1996,Ottawa,Canada:National Research Council,May 1986,p25-30.
- [5] HKSchneider, W.Schulz, Investment Requirements of the World Energy Ludustrirs 1980-2000, Cannes, France: 13th Conferences of the World Energy, 5-11 October 1999.
- [6] J.F.Frisch, World Energy Horizons 2000-2020, Paris, France, 1999.
- [7] S.C.Carpenter,T.Caffell,Active Solar Heating in Canada to the Year 2010, November 1999,pp37-43.
- [8] Scanada Consultants LTD,Passive Solar PDtential in Canada1990-2010,11 September 1989.
- [9] Cassedy S. Edwards, Grossman Z. Peter. Introduction to Energy, Resources, Technology & Society. Cambridge University Press, 1990.
- [10] Ashrae Hand Book of Fundamentals, 1998.
- [11] Trewartha T. Glenn, Horn H. Lyle an Introduction to climate, McGraw. Hill International Book CO., 1980.
- [12] Gettys W. Edwards, Keller J. Fredrick, Skove J. Malcolm. Classical and Modern Physics. McGraw. Hill International Book CO., N.Y., 1989.
- [13] Lovell Bernard. In the Center of Imensities, A Pplanden Book pub. Co. .GRANADA, 1978.