THE EFFECT OF SOLAR RADIATION ON TELECOMMUNICATIONS

Rakesh. K. Mishra[1] and Prem C. Pandey[2]
[1]Department of Physics, A.P.S.University, Rewa (M.P.)Pin-486661, India, [2]Climate Research Center Leicester U.K.
[1]rakesh_response@rediffmail.com, [2]prem26bit@gmail.com

***ABSTRACT*- Solar radiations affect the total electron content of the ionosphere that may disturb the radio-frequencies used in telecommunications. It may state with full confidence that the increase in the critical frequencies of the F2 layer from the values observed in the morning hours to the afternoon maximum frequencies, is due to ultraviolet (UV) radiation from the Sun. During an ionospheric storm, some radio frequencies are absorbed and others are reflected, leading to rapidly fluctuating signals and unexpected propagation paths. In the present work, we have shown that the effect of various solar activities that effects the electron densities of the ionosphere and how they affect our telecommunication system. During solar maximum years, maximum variations of electron density of the ionosphere have been observed. Hours of maximum disturbance due to increased electron density of the ionosphere were obtaining measuring electron density of the ionosphere. Solar flux is the basic indicator of solar activity that determines the level of radiation being received from the Sun. The solar flare closely related to the amount of ionization and hence the electron concentration in F2 layer region as result it gives a very good indication of condition for long distance communication the solar flux can vary from low as 50 to high as 300; low value indicate the maximum useable frequency will low and over all condition will be very good for higher HF band. Conversely high value generally indicate there sufficient ionization to support long-distance communication at higher than normal frequencies. However it takes a few days of high values for conditions to improve. These results will provide information for space weather forecasting and also enable telecommunication industries make predictions and necessary adjustments to maximize their operational frequencies.**

***Keywords:* radio frequencies, ionosphere, solar activity, electron density, communication disturbance.**

I. INTRODUCTION

The effect of the solar radiation and particles that stream out from Sun would be quite deadly for inhabitants of Earth. Earth's atmosphere, which block out the X rays and most of the ultraviolet radiation. When X-ray or ultraviolet photons encounter the atmosphere they hit molecules and absorbed, causing the molecules to become ionized; photons are reemitted but at much longer (and less biologically destructive) wavelengths. The second protective mechanisms' is the Earth's magnetic field. This protects living organisms from the charged particles that reach the planet steadily as part of the solar wind and the much greater that reach planet steadily as part of the solar wind and the much greator bursts that arrive following mass ejections from the Sun. The properties of the earth's coupled magnetosphere- ionosphere system are dominated by it's interaction with solar wind plasma. Mediated by magnetic reconnection at magnetopause interface as consequences; earth's Magnetospheric dynamics depend on concurrent magnetic field (IMF). The properties of earth's coupled magnetosphere-ionosphere system are dominated by it's interaction with solar wind plasma mediated by magnetise reconnection at the magnetopause interface. as a consequence; primarily on the concurrent orientation of the interplanetary magnetic field(IMF).The earth's magnetosphere is major practical relevance; as it is the plasma medium in which range of applications space craft, used for communication navigation;meterology and defence.Primary source of space weather is Sun. variation in the electromagnetic and particulate output of the Sun is the main cause of change in the Earth's upper atmosphere and surrounding region such as magnetosphere. these effect in communication; naviagation and many other space ground based system. most of the variation occurs in the lower and upper part's of Solar spectrum; the radio and X rays bands. at these wave length the solar radiation can vary by many orders of magnitude .X-radiation in particular, penetrate below about 60 k.m.

The ionosphere can be visualized as containing a number of layers. in fact, there ionization throughout the ionosphere; the layers are really peaks in the levels of ionization. The ionosphere affects radio waves because according to the level of ionization, the signals are refracted, i.e., bent away from traveling in a straight line often the level of ionization is sufficiently high to enable the signals to be returned to Earth. Conditions are continually varying levels of ionization in the ionosphere. The radiation coming chiefly from the Sun hits upper ionosphere, causing positive ions and free electrons. A state of "equilibrium" exists. The free electrons that affect radio waves recombine with positive ions and free electrons that affect radio wave recombine with positive ions to reform molecules. When levels of ionization are higher ionosphere are more capable of bending back radio signals to earth also, high levels of ionization mean high maximum usable frequencies and better HF conditions. The level of ionization at any given point above the Earth is dependent upon a number of factors including the time of day. The season and most important of all the sunspot cycle, it found that level of radiation activity from Sun increases as the number of sunspot increases. Accordingly, the level of radiation received from the Sun peaks around the top of the sunspot cycle. In fact, it is the bright area around the sunspot called plage that emits most of the extra radiation. at the sunspot also rises. this happens as the Sun emits vast quantities of particles. there is normally a steady flows of these at time solar flares emission greatly increases. when hits the earth's magnetic field it becomes disturbed, creating a magnetic storm that detected at point around the globe. Another effects is that the ionosphere it self can disturbed , giving rise to an ionosphere storm. this will degrade HF communications and when particularly bad it can lead to total HF blackout.

II. SOLAR FORCING OF TERRESTRIAL ATMOSPHERE:-

The Sun provides the main energy input to the terrestrial atmosphere and yet the impact of solar variability on longer-term changes remain controversial issue .solar magnetic driven the effect interplanetary perturbation and energetic particles fluxes. The role of Sun in our Solar system goes undisputed and yet the effect of solar variability on the atmosphere remains quite controversial. The sun like any living star-continuous radiates energy outward into the heliosphere.it. The radiated energy carried by 1.Elctromagnetic waves over a frequency band ranging from radio waves to Hard X-rays.

2. A stream of hot plasma (the solar wind) consisting primarily of electron and protons with small fraction of heavier ions.

3. A interplanetary magnetic field (IMF) which carried along with Solar wind often referred to as a frozen-in magnetic field, and 4. Violent Solar out breaks Solar Flares and Coronal Mass Ejections (CMEs).Nearly 70% of the solar radiation that arrive the top of Earth's atmosphere earth's surface; the rest is primarily reflected. In contrast, the efficiency of energy transfer from the Solar wind into magnetosphere is only 1-10% depending on the orientation of the interplanetary magnetic field. wave and particles emission are not only by means by which the sun can influence the earth's atmosphere.

III. THE IONSOSPHERE AND DIFFERENT IONSOPHERIC LAYERS AND IT S IMPORTANCE IN COMMUNICATION:-

The ionospheres are a region of the upper atmosphere, from about 8.5 km to 600 km altitude, and include the thermosphere and parts of the mesosphere and exosphere. it is distinguished because it is ionized by solar radiation. it plays an important role in atmospheric electricity and form the inner edge of the magnetosphere. Ionosphere has practical importance because, among other functions, it influences radio propagation to distant places of earth. Ionization depends primarily on the sun and its activity. The amount of ionization in the ionosphere varies greatly with amount of radiation received from the Sun. thus there is diurnal effect and seasonal effect. The local winter hemisphere is tipped away from the Sun, thus there is less received solar radiation. The activity of the Sun is associated with Sunspot cycle, with more radiation occurring with more sunspots. Radiation received also varies with geographical location (Polar, aurora Zones, mid-latitudes and equatorial regions).there are also mechanisms that disturb the ionosphere and decrease the ionization. there are also mechanisms that disturb the ionosphere and decrease the ionization. There are disturbance such as flares and the associated release of charged particles in to solar wind which reaches the Earth and interact with its geomagnetic field. the ionosphere is part of earth's upper atmosphere where free electron occur in sufficient density to have an influence on the propagation of radio frequency electromagnetic waves. Its ionization depends for the most part on activity on the Sun. its density varies according to the sunspot cycle, the season, and global locations~ polar,auroral zones,mid-latitudes, and equatorial regions. Most of its ionization is produced by X-ray and ultraviolet radiation from the Sun. As Earth rotates ionization in the sunlit atmosphere and decreases on the shadowed side. Ionization appears at atmosphere levels, producing layers or regions which may be identified by their interaction with radio waves. These layers are known as the D, E, F layers are shown in Figure-(1). For both Night and day conditions at mid-latitudes. These ionospheric layers are summarized as:

IV. THE D LAYER:-

The D layer is the closet to earth surface. Its altitudes ranges from 50 km to 90 km. due to high density, recombination is important. The overall electron density is very low. This layer is mainly present in the daytime, but during the night, Cosmic rays produce a residual amount of ionization. it does not reflect HF radio waves but mainly responsible for their absorption, particularly at lower frequencies. Consequently, the absorption is smaller at nighttime than at mid day. One can notice that the AM radio station are best during received during the day time.

V. THE E LAYER

The layer is higher in altitude, from 90 km to 120 km. it only reflects radio waves with frequency lower than 10 MHz and partially absorbs higher frequencies.

VI. THE F LAYER

The F layer ranges from120 km to 400 km above the earth surface. it is responsible for most of the sky-wave radio propagation. during the day, it divides in to two layers, called F1 and F2 layers,F1 at about 170 km, and F2 at about 250 km altitude. Also F layer reflects radio waves.

VII. UPPER ATMOSPHERE AND THEIR EFFECT ON RADIO WAVE COMMUNICATION:-

The Upper atmosphere is host to variety of "weather events" or disturbances which are mostly apparent by their effects on radio wave communication, by unusual auroras displays or by fluctuations in the magnetic field at the surface of earth. The solar wind also has profound impacts on Earth's upper atmosphere, a region known as the mesosphere and lower thermosphere/ionosphere. This zone, 40–110 miles (60–180 km) above Earth's surface, is difficult to probe. Ground-based instruments can detect only a small portion of it, and sounding rockets provide just a brief picture of the region before falling back into the lower atmosphere. Scientists want to know more about the upper atmosphere, partly to bolster communications networks and help keep satellites on course, and partly to learn how it influences temperature and energy in the lower atmosphere.

Ionosphere is directly related to radiation emitted from the Sun. the movement of the earth about the Sun of changes in the Sun's activity will result in variation in ionosphere. These variations are two general types

(1) Those which are less regular occur in cycles

(2) Abnormal behavior of sun.
Both regular and irregular variation has important effects on radio wave propagation.

VIII. VARIATIONS AFFECT IN IONOSPHERE

The regular variation that affects the extent of ionization in ionosphere can divided into main classes: daily, seasonal, 11year, and 27 day variation. Daily variation in ionosphere is result of 24 hour rotation of the earth on its axis. Daily variation on different ionospheres layer The D layer reflects VLF waves is important for long VLF communication; Ionization density of the F_1 layer depend on the angle of the sun It's main effect is to absorbs HF wave passing through to the F_2 layer F_2 layer important for long wave HF communications.

Seasonal variation are result the earth revolving around the sun seasonal variation of D, E,F_2 layers correspond to highest angle of the Sun. 11 year sun spot cycle has both a minimum and maximum level of sunspot activity that occur. Sunspots are responsible for variation in ionization level of the ionosphere. U ring period of maximum sunspot activity, the ionization density of all layers increases. Because of this, absorption in the D layer increases and critical frequencies for the E, F_1 Layer and F_2 layers are higher. At these times, higher operating frequencies must be used for long distance communications. 27 days sunspot cycle-causes variation in the ionization density of the layers on day to day basis. Irregular variation in ionospheric condition also has an important effect on radio wave propagation. Sporadic E irregular cloud like patches of unusually high ionization, called sporadic E often format heights near the normal E layer. It is known to vary significantly with latitude, and northern latitude, it appears to be closely relegated to the aurora borealis or northern lights. The sporadic E is so thin that radio wave Penetrate and are returned to earth by the upper layers. It extended up to several hundred miles and is heavily ionized.

Sporadic E layer may blank out the use higher, more favorable ionospheric layers or cause additional absorption of radio wave at same frequencies. Also it can cause additional multipath problem and delay the arrival times the rays of RF energy. The sporadic E can form and disappear in short time at all transmitting or receiving station

IX. SUDDEN IONOSPHERIC DISTURBANCES:-

The most starting of the Ionospheric irregularities is known as Sudden Ionospheric Disturbance (SID). This disturbance may occur without warning and prevail for length of time, from a few minute to several hours. When SID occur long distance propagation of HF radio wave almost totally "blackout."When SID occur examine the sun has revealed a bright solar eruption. All station lying wholly, or in part, on sunward side of earth are affected. The solar eruption produces intense burst of UV light, which absorbs by F_2, F_1, and E layers, but causes a sudden abnormal increase in ionization density of D layer. Sudden Ionospheric disturbances influences by Solar Photon events/Solar energetic particle events may influencing Ionization process excesses through ionization processes change in electrical conductivities which influence in VLF phase and amplitude changes

X. IONOSPHERIC STORMS

Ionospheric storms are disturbance in earth's magnetic field. They are associated with solar eruption and the 27 Day intervals, thus corresponding rotation of the sun. 18 hours time difference between a SID and ionospheric storm. Ionospheric storm associated with sunspot activity may begin any time from 2 days before an active sunspot crosses the central meridians of sun until four hour days after it passes the central meridian. However, active sunspots have crossed the central region of the sun without any ionospheric storms have occurred when there were no visible spots on the sun and no preceding SID. Some correlation between ionospheric storms', SID, and sunspot activity is possible, ionospheric storm the most prominent effect of are turbulent ionosphere and very erratic sky wave propagation. Critical frequencies are lower than normal, particularly for F_2 layer. We correlation between the variation of ionization in F_2 layer and variation in solar activity. The ionosphere containing number of layers. In fact there is ionization throughout the ionosphere; the layer are really peak's in the level of ionization, the ionospheric affect radio waves because the level of signal refracted, i.e., bent away from traveling in straight line. Often the level of ionization is sufficiently high to enable the signal to returned earth. Varying on HF bands as result of varying level of ionization in ionosphere. The Solar radiation coming from the Sun hit's earth upper atmosphere causing molecules to ionize. Creating positive ions and free electrons, a state of "dynamics equilibrium" exists. Cap albdeo of bending back radio signals to earth also high level of ionization means high maximum usable frequency and betters HF conditions.

At sunspot peak the level of geomagnetic storm activity also rises. This happen as the sun emit's vast quantities of particle. When solar flares the level of emission increase they hits the earth's magnetic field it become disturbed, creating a magnetic storm that can be detected at points around the globe. Another effect is that the ionosphere itself can disturbed, giving rise to ionospheric storm. This will degrade HF band communication and when particularly bad it can lead to total black out. Solar flux is used as basic indicator of solar activity and determines the level of radiation being received from the sun. solar flux measure by solar flux unit and amount of radio noise or flux that emitted at frequency of 2800MHZ (10.7 c.m.). The solar flare closely related to the amount of ionization and hence the electron concentration in F_2 layer region as result it gives a very good indication of condition for long distance communication the solar flux can vary from low as 50 or 50 to high as 300; low value indicate the maximum useable frequency will low and over all condition will be very good for higher HF band. Conversely high value generally indicate there sufficient ionization to support long-distance communication at higher than normal frequencies. However it takes a few days of high values for conditions to improve.

XI. GEOMAGNETIC ACTIVITY AND IONOSPHERIC STORM

Geomagnetic activity determine by A index and K index These give indications of severity of magnetic flucation and hence disturbance to ionosphere. K index describes as same level of magnetic disturbance no matter whether the observatory is located in the auroal region or at the earth equator. A index reading varies from one region to the next. Value of k index between 0 to 1 represent quite magnetic condition and this would indicate good HF band condition due to sufficient level of solar flux. K index value between **2 to 4** indicate unsettled or even active magnetic conditions and are likely to be reflected in degradation of HF condition moving up the Scale for K index 5 to 6 minor storm and **7 to 9** very major storm that would result in a black out of HF communions. Although geomagnetic and ionospheric storm are interrelated it worth noting that they are different. A geomagnetic storm is disturbance of the earth's magnetic field and ionospheric storm is disturbance of the ionosphere.magentospheric and ionospheric current are coupled through field –aligned current. The ionosphere and magnetosphere are coupled in so many different ways that nearly every Magnetospheric process bears on the ionosphere in some way and every ionospheric process on magnetosphere(Wolf et al , 1974) the magnetosphere- ionosphere system and interaction is strongly governed by the activity of the sun (see, e.g., Hargreaves, 1992), the magnetosphere is directly influenced by solar wind parameter and by the strength and direction of interplanetary magnetic Field(IMF) , the condition of ionosphere , the existence of which is due to the X ray and ultraviolet radiation emitted by the sun, is principally determined by the level of both solar activity and geomagnetic perturbation. to provide global and specific information on physical state of entire system at given epoch, several geophysical indices were introduces. Sunspot number and solar flare F10.7 highly correlated (Brekke , 1997; Hargreaves , 1992),the ionospheric field solar indices are used to forecast ionospheric characteristics , in particular frequencies of E and F layers and the M(3000) F_2 factor (CCIR, 1990) there are some disadvantage using sunspot number anf frequencies of f_0 and f_2 layer, e.g the well known saturation and hysteresis effects (Gopala rao and Sambasiva Rao , 1969) , chiu (1975) found systematic difference between 1960-1961 and 1970-1971 when sunspot number R were identical. Smith and King (1981) investigated the dependence of F_0 and F_2 values on sunspot number R and F10.7 and photosphere faculae and their results shows that the effects on f_0 and f_2 values of faculae-associated radiations are significant. Recently the possibility to predict the solar indices using neural networks has been investigated (Macpherson et al., 1995) there are some disadvantage using R or R12 to forecast F_0, F_2 ,. e.g., the well known saturation and hysteresis effect (Gopal Rao and sambasiva Rao 1969, Chiu 1975 fond difference between F_0F_2 with sunspot number R were identical. It may be stated that with full confidence that the increase in the critical frequencies of F_2 layer from the value in the morning hour to the afternoon maximum frequencies. Is due to ultraviolet radiation from Sun. the difference in the value of critical frequencies observed in afternoon maximum and morning hours minimum. (by A.I Lekhachev ,(1960).)

XII. IONOSPHERE AND ATMOSPHERE IT'S IMPORTANCE IN COMMUNICATION

Ionosphere the upper part of the earth's atmosphere absorbs large quantities of radiant energy from the Sun. which not only heats the atmosphere but also produce some ionization in the form of free electrons, and positive and negative ions. The part of the upper atmosphere, where the ionization is appreciable is called ionosphere. The ionization is apparently caused by ultra violet radiation from the sun and it varies with the time of the day, the time of the year, and the longitude. at the earth's surface the ions density is very small; increasing to appreciable values at altitudes between 100 and 150 km. while ions are distributed continuously in the atmosphere, the concentration vary and several maxima are reached at various latitudes the regions near these maxima are called layer. For each such layer there is a critical frequency above which an electromagnetic wave, directed vertically , will not returned to earth. These layers are charecterirsed in terms of their critical frequencies and virtual heights. The critical frequencies are a direct measure of the maximum electron density of the layer and vertical height it and indication of the height at which maximum density occur. The three ionospheric regions of great importance as far as radio communication in concerned, are denoted by the E, F1,F2,Layers. the range of all altitudes over which these layers vary. An anomalous ionization termed sporadic E, is often present in the E region in addition to the regular E ionization. it often occurs in the form of clouds, varying from roughly 1 km to several hundred km across. Such sporadic E ionization occasionally will reflect V.H.F waves up to 60 or 70 mc/s, giving very long distance transmission on such frequencies. the occurrence of sporadic E layers is quite unpredictable. it may be observed both in the day and night. The cause of sporadic E ionization is still uncertain. Variation of critical frequencies and virtual height of layers with time of the day and of the year. Refer to figure, in which monthly average of critical frequencies and virtual height as a function of time of day for winter and summer, and for two parts of the 11 years sunspot cycle are shown. D layer virtual height of reflection lies between 70 and 80 km.it is able to reflect back very long waves>10 km incident on it. Reflection of waves is not due to bending but corresponds to the processes of reflection from boundary

discounuity. The maximum electron number density is few thousand electrons per cm3. The virtual height of E layer remains substantially constant between 110 and 120 km throughout the day and from season to season however, the critical frequency of the E layer However, the critical frequency of the E layer shows diurnal and seasonal variation. it increase with the altitude; of the sun and is maximum at noon. it has been shown that f_E the critical frequency for E layer given by f_E=K$forth\ square\ root\ of$ $\cos\varphi$.
it show that variation of critical frequencies and vertical height of layers with time of the day and the year.

XIII. E LAYER:

It exists only in day time. The virtual Height is of the order of 225 Km. during the middle of the day and consistently maintained from season to reason. variation in critical frequency of F_1 layer are the same as in case of E layer i.e. the maximum occurs at noon and summer values are greater than winter values.

XIV. F_2 LAYER:

The virtual height and critical frequencies of this layer shows quite large variation during of this layer show quite large variation during the day and from season to season. Virtual Height in summer ranges from 300 to 400 Km., whereas in winter it goes down to 225 Km. The critical Frequencies is much higher in winter than in summer. In the night F_1 layer disappear where as F_2 layer continues throughout the night at a height of 300 K.m. approximately.

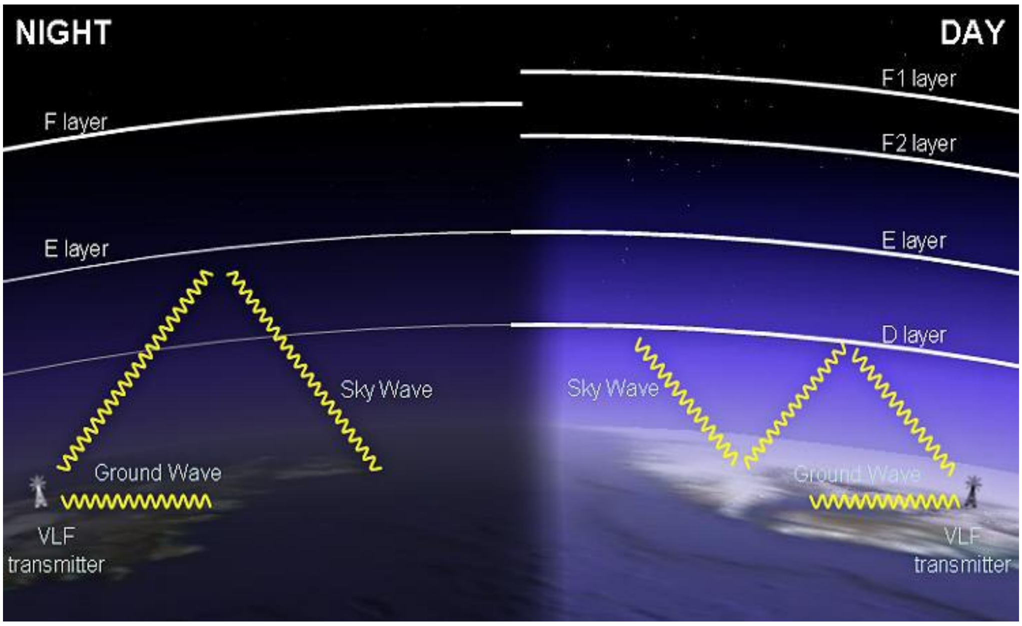

figure 1 Shows the different layers of ionosphere for both night and day conditions at mid-latitudes.

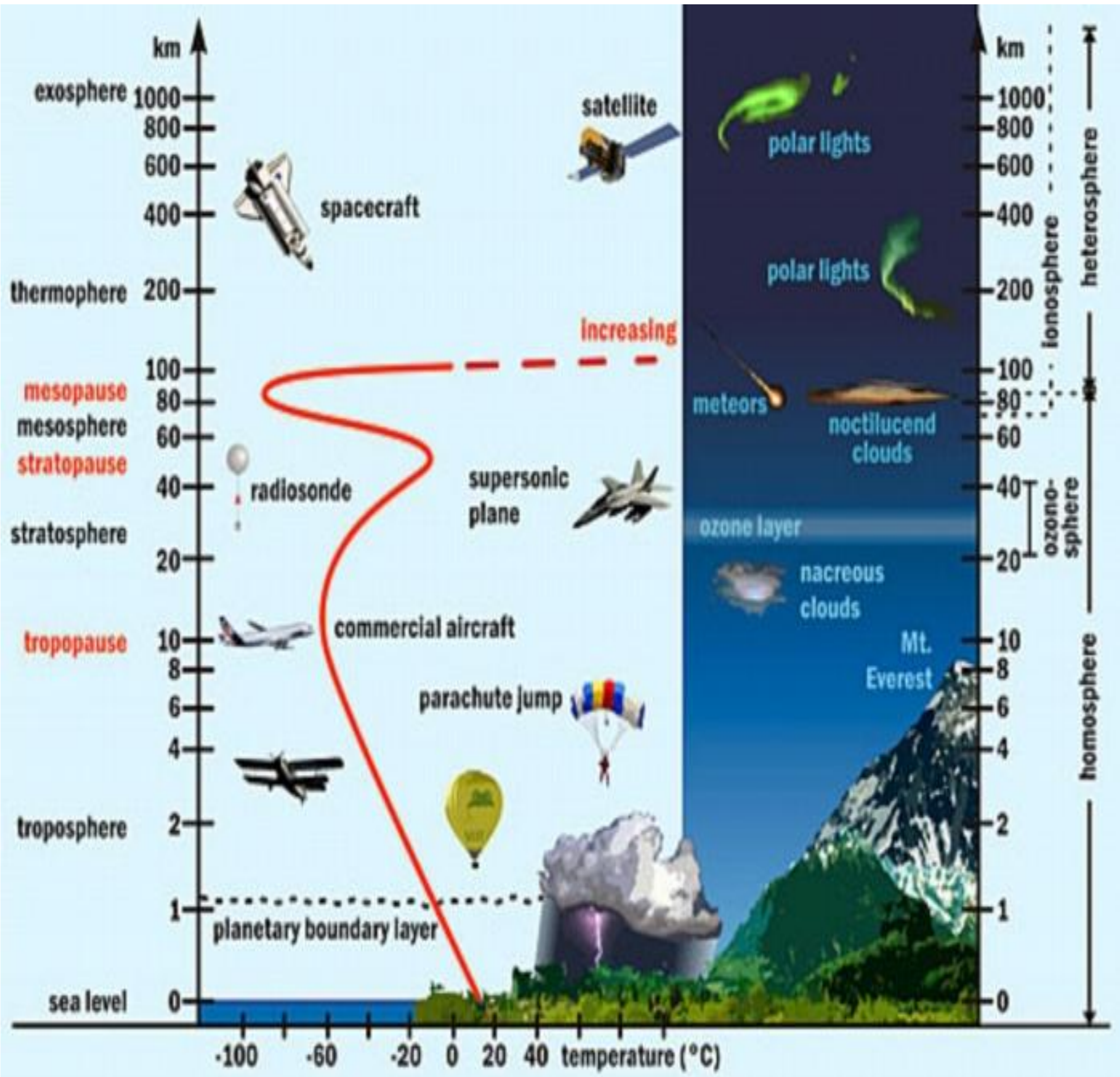

Figure 2 **Shows the different atmospheric layers and their temperature variation with height.**

XV. IONOSPHERIC D-LAYER AND GEOMAGNETIC STROM

Responses of mid latitude ionospheric D-region storms a complex nature. This work is continuing the experimental studies (Gokov et al 2004.) of the variations of the electron density in the multitude ionospheric D region and the variations of the Noise and the scattered signals at frequency of 2.3MHz performed by using the MF radar technique and encompass . Data used in this study were collected with MF radar and flux magnetometer at the kharkiv V. Karazin National University Radio physical Observatory (49.5N,36.3 E). the scattered signal were sampled at 3 km intervals from the 60-102 km region and magnetic fluctuations in the 1-1000s periods range. The magnetic storm was associated with increase of 2 to 4 orders of magnitude in proton fluxes and of 3 to 4 orders of magnitude in electron fluxes, with a significant variation in the geomagnetic field and with a decrease of 400nT in the Dst index during the storm's main phase. During day time, the electron density in 80 to 90 km region showed the increase of 50%-400% comparing to the undisturbed conditions. Under nighttime conditions, the scattered signals appeared intermittently over 1-10 min intervals, and the electron density was apparently associated with electrons and protons precipitation from magnetosphere. Estimates of the electron fluxes based on these disturbances with theoretical prediction and the data obtained under disturbed conditions.

XVI. EXTREME ULTRAVIOLET VARIABILITY EXPERIMENT (EVE)

The EVE measures the Sun's extreme ultraviolet irradiance with improved spectral resolution, "temporal cadence", accuracy, and precision over preceding measurements made by TIMED SEE, SOHO, and SORCE XPS. The instrument incorporates physics-based models in order to further scientific understanding of the relationship between solar EUV variations and magnetic variation changes in the Sun. The Sun's output of energetic extreme ultraviolet photons is primarily what heats the Earth's upper atmosphere and creates the ionosphere. Solar EUV radiation output undergoes constant changes, both moment to moment and over the Sun's 11-year SC, and these changes are important to understand because they have a significant impact on atmospheric heating, satellite drag, and communications system degradation, including disruption of the Global Positioning System.

XVII. THE FLUCTUATION OF THE TERRESTRIAL IONOSPHERE AND RADIO OCCULTATION:-

The fluctuation of the terrestrial Total Electron Content (TEC) along the ray path between the space craft and receiving station will be estimated from two coherent signals transmitted from several Global System (GPS) satellites. The observed TEC is multiplied by the ratio of thickness of the ionosphere to the ray path within the ionosphere, on the assumption that plasma in the ionosphere exists between 250kmaltitudes by averaging the above TEC value inside a circle with the center at the interaction. The averaged values is converted to salnt TEC along the ray path of the radioocultation.the fluctuation of the terrestrial ionosphere,which is a serious error source.

Human Impact of Solar Flares:-

Sun radiates more than light,these solar radiation are variable over scales of time of days to years.

solar radiations damaging effects on the technological systems that are increasingly important for daily living.for example,electric Power transmission system and communication links have proven Vulnerable to Solar Phenomena. and outside of earth's protective atmosphere and magnetic shield, there is a small but genuine risk of Solar Energetic Particles burst that would be lethal to satellite sensor and commons and control systems and astronauts.durnig solar flares ,the flux of photons emitted at X-ray wavelengths increase up to several hundred times it's usual level. Solar radiation at wavelength shorter than 100nm does not reaches the earth's surface but is absorbed in the upper atmosphere(approximately 40k.m.),producing a layer where some atom have been ionized-rays wavelengths particularly contribute to ionization at altitudes between 60 and 160 k.m.Radio waves can be reflected from the Ionosphere like light reflected from a mirror.

however , the efficiency of reflection depends on the radio wave frequency and properties of the Ionosphere itself, which can change over a time scale of minutes.extremly high frequencies, such as those used to communicate with satellites, pass right through the ordinary ionosphere.Radiowave from terrestrial sources with frequencies below about30 MHz are directly affected by the Ionosphere, during large Solar flares, which can occur at the rate of several per day during peak activity condition, all high-frequencies(HF) radio waves(3-30MHz) reaching the day time ionosphere are absorbed for duration of the flare. Such as" Radio Blackout" are significant because HF radio propagation permits communication over long distances, such as short-wave radio broadcasting by amateur radio. at the same time, the phase of very low wave frequencies(VLF,3-30KHz) reflecting the bottom side of the ionosphere advances as the propagation.

XVIII. IMPACT OF CR AND SOLAR ENERGETIC PARTICLES ON THE EARTH'S IONOSPHERE AND ATMOSPHERE

Ionosphere and atmosphere play important role of space weather mechanisms. the galactic Cosmic rays(CR) influence the ionization and therefore the electrical parameters in the planetary atmosphere(Singh et al.2011).they change chemical also chemical processes-for example, ozone creation and depletion in earth's stratosphere(Brasseur & Solomon2005).In this way CR transfer the impact of Solar activity in to atmosphere(Singh et al.2010).The lower part(50-60Km) of ionospheric D-region is formed by the Galactic CR,which create there an independent CR layer(Velinov1968).the cosmic rays ionize the whole atmosphere up to 100 km. above the altitude the contribution of the electromagnetic and UV radiations dominates. In such a way Cosmic ray influence the ionization, Chemical and electrical state in the region 5-100 km. near ground(0-5km),there is an additional ionization source via natural radioactivity of the soil that may important in some regions related to radon gas emission(Usoskin et al 2011). three main components are important for the particles ionization(1.)High energy galactic CR(GCR with energies~10^{9}-10^{21}eV that are always present in Earth environment and are subjected to 11-solar modulation(Kudela 2009).(2) anomalous CRat high geomagnetic latitudes above 65˚-70˚and (3) sporadic solar energetic particles(SEP) of energy ~10^{6}-10^{10}eV). Scientific community is interested in the ionization effects of space weather radiation on the atmosphere and earth's environment.The V2 rocket measurement in the mid latitudes of 20th century by James Van Allen(1952) led to the first empirical profiles of the ionization effect until 100 k.m.(Velinov et al 1974).

the application of monte-carlo methods for investigation of cosmic ray ionization is important, because it is possible to consider explicitly the hadron component and therefore to estimate effects in the lower(0-10km) and middle(10-100km) atmosphere. As was recently demonstrated their application in specific, realistic conditions(Mishev and Velinov2008,2010) permits to study of the ionization effect, especially at different altitudes(Mishev et al;Usoskin et al 2011). it is shown that effect is significant at sub polar and polar atmosphere(Usoskin et al,2011),with fast tropospheric decreases,Moreever,it is demonstrated that the ionization effect at low latitudes. Therefore the effect of sporadic solar energetic events could be strongly locally, practically in sub-polar and polar region, affecting the physical-chemical properties of the upper atmosphere. General agreement that cosmic ray ionization due to CR and SEP influences the ozone concentration in the atmosphere.

Sun produced enough energetic particles that had been an astronaut on the Moon, Wearing only Space craft particles that there been an astronaut on the moon, wearing only Space suit and caught burnt of storm, death would have been probable. Astronauts who might have gained safety beneath moon soil would have absorbed only amount of radiation. the annual SEPs radiation dose limits set for general public-on board supersonic transport flying at high altitudes ove the polar caps. At sea level, there was no noticeable solar radiation increase because the Earth's atmosphere has the absorption equivalent of 10 m of Water. Solar Energetic particles Radiation Pose a special hazards at low-Earth orbit and above, where they can penetrate barriers such as space suits and aluminum and destroy living cells and solid state electronics. The penetration of high-energy particles into living cells, measured as radiation dose, lead to chromosome damage and, potentially, cancer.solar proton of energies between 10 to 100 MeV are particularly Hazardous. Satellites at high altitudes or in low-altitude polar orbits accumulate radiation doses many times that of the lethal human limit with results ranging from damaged surface materials to logic circuit upset in computer systems and control mechanism. The only strategies for mitigation are shielding, careful selection of design and materials, and the use of redundancy and self checking in logic systems. Energetic solar flare particles also influence terrestrial radio wave propagation through Polar Regions in spates process cause by solar flare ray radiation, which affect only the sunlit side of Earth. Although energetic particles are shielded is less effective. Polar Cap absorption (PCA) events are troublesome, and hence the distance, to the bacon during PCA event the height of reflection lowers. Positioning errors on the order of kilometer are possible on transpolar paths. At the time geomagnetic Storm in earth's ionosphere layer increases energization of population of electron and ion resident in the magnetosphere. These trapped particles, guided by the roughly dipolar geomagnetic field, usually enter the upper atmosphere near the Polar Regions. They strike the molecules and atoms of the thin, high atmosphere, exciting some of them glow. These are auroras, dynamic and delicate displays of colored light seen in the night sky. The incoming particles deposited their energy in the orbit satellites up to about 1000k.m. increase significantly. As result of the added frictional drag, satellite loses energy and their orbits change. All low altitude satellite are slowly falling back to earth owing to atmospheric drag; this process accelerated during geomagnetic storms. During storm time lower altitude navigation satellites can be affected to the point that useless until their new orbits stabilize. During magnetic storms, some of the energized Magnetospheric energetic particles are trapped above the tangible atmosphere; they circulate around Earth and form a ring current that can be sensed on the ground by its associated magnetic field. When these energized particles impact satellites-especially at geostationary orbits-ortionof the satellite surface charge up. Differential charge exceeding 10,00 V has been measured. The effects of satellite are not predictable due to differential charging the physical properties of satellite materials properties can be altered. Another result due to high energy deposited in the upper atmosphere during geomagnetic storms can converted in ionospheric storms. Ionospheric storm affect radio communication at all latitudes, but these storms last for hours to days and disturb frequencies from 3kHz to 30GHz..geomagnetic storm change in geomagnetic field affected biological systems in particular ,homing Birds(Pigeons) and other migratory creatures appears to use magnetic field as at least a backup navigational aid.

XIX. INFLUENCE ON TECHNOLOGICAL SYSTEMS :-

The investigation of impact of cosmic rays and solar energetic particles on the earth's environment is important not only for the atmospheric processes but also for technological and biological systems ions accelerated to several tens to hundreds of MeV are very important for the radiation hazard effects during solar radiation storms with electronic element failures on satellite, communication and biological consequences (Kudela et al.2000).before their arrival a network by several stations operating in real time can provide useful alerts several minutes to ten of minutes in advance CR and SEP of lower energy interact with material of satellite, space crafts and airplanes and many cause failures. There is variety of effects with consequences on the reliability of the electronic elements the energy deposition in materials result results in permanent reason to study in detail the cosmic ray variability and the corresponding ionization effects (Kudela et al.2010).

XX. CONCLUSION:-

Solar activity enhanced SolarEUV radiation and plasma(Winds,CMEs) should result in permanent forcing of the Upperatmospheres,which can ionize,heat,expand,chemically modify ,and erode it driving the early phase of life time in some case thermosphere may expand beyond an atmosphere Magnetospheric shield. Highly irradiated terrestrial planets can thus be even in danger of being stripped of their whole atmosphere (Ludin et al,2007).the lower and Upper ionosphere plasma vary sensitive to external forcing: solar radiation, energetic fluxes The VLF techniques(remote sensing of the Lower Ionosphere) which use very simple and cheap instrument facilities is therefore a very promising tools to study many aspects of the space weather dynamics. as long solar cycle and transient solar flare phenomena may influencing in ionospheric disturbances in upper and middle and lower atmosphere. Over ever-growing dependence on space based technology weather services. The health of the nation's technological infrastructure will depend heavily on our understanding of Space environment and our ability to predict Hazardous space weather system.

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