ISSN 2277 – 5528
Impact Factor- 4.015

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES &MANAGEMENT

THE CO-RELATION BETWEEN SOLAR WIND AND IONOSPHERIC CURRENT

Amresh Chandra Pandey*[1], Rakesh Ranjan[2], Nilanjan Sil[3], and Binay Kumar Mishra[4]

[*1]Department of Physics, St.Xavier's College, Mahuadanr,Latehar,Jharkhand-822119.
[2,]Department of Physics,*Veer Kunwar Singh University*, *Ara*, Bihar-802301.
[3]Department of Physics, Government Polytechnic Silli, Ranchi, Jharkhand-835102
[4]Department of Physics,*Veer Kunwar Singh University*, *Ara*, Bihar-802301.

ABSTRACT

The ionospheric O^+ is an important component of plasma pressure in the inner plasma sheet and ring current regions. We have shown a global ionospheric plasma pressure response to local Magnetospheric conditions imposed by correlation of solar wind H^+, Polar wind of and anroral wind O^+ we have shown the motion of millions of test particle in the global fields at randomly distributed positions and times. We inter that the empirical scaling of auroral wind outflows are consistent with a substantial pressure contribution to inner plasma sheet and plasma source surrounding the ring current.

Keywords- Solar wind, IONOSPHERIC current etc.

I. INTRODUCTION

Renewable sources of energy acquire growing importance due to its enormous consumption and rapid exhausting of fossil fuel. The world is experiencing a great need for additional energy resources so as to reduce dependency on conventional energy sources, and renewal energy could be an answer to that need. Renewable energy becomes an essential source for many applications in the last four decades.

Solar energy is the most available source of energy and it is free. Energy supplied by the sun in one hour is equal to the amount of energy required by the human in one year. It is difficult to supply electrical energy to small applications in remote areas from the utility grid or from small generators. Energy generated by Photo voltaic systems can be used in many applications such as water pumping, street lighting in rural town, battery charging and grid connected PV system. In addition, solar energy is clean, renewable and its decentralized character is appropriate well even at low populated areas around the globe. Consequently, it can contribute to the environmental protection and can be regarded as an alternative in future to conventional energies. There are two ways to generate electricity from sun; through photovoltaic (PV) and solar thermal systems. Generally, PV systems can be divided into three categories; stand-alone, grid-connection and hybrid systems. For places that are far from a conventional power generation system, stand-alone PV power supply system has become a good alternative. Stand alone photovoltaic (PV) systems are the best solutions in many small electrical energy demand applications such as communication systems, water pumping and low power appliances in remote area.

The characteristics of the PV module clearly indicate that the operating point of the module is not same as the maximum power point of the module. The electrical characteristics of PV module depend on the intensity of solar radiation and operating temperature. Increased radiation with reduced temperature results in higher output. The aim of the tracker is to derive maximum power against the variations in sunlight, varying atmosphere and temperature and local surface reflectivity. The electrical characteristic of PV module depends on the intensity of solar radiation and operating temperature. Increased radiation with reduced temperature results in higher module output.

The maximum power point tracker is used with PV modules to extract maximum energy from the Sun. The maximum operating point of solar photovoltaic (PV) panels changes with environmental conditions. The maximum power point (MPP) of a PV system depends on cell temperature and solar irradiation, so it is necessary to continually track the MPP of the solar array.

The relationship between the high altitude potential and the ionospheric potential associated with auroral areas. The potential drops responsible for the accelerated electrons that produce the auroral and for upward acceleration of ions and electrons. It is clear that the plasma density on auroral field lines and the ionospheric density a fundamental role for where and when potential structures are formed in the upward and downward current region. For a current generator feeding the auroral current particle acceleration is necessary to maintain the current through regions of low plasma density. The altitude distribution of fields alighed potential well thus depend strongly on the local ambient plasma conditions, and thus vary with local time seasons and magnetic activity level. If there is insufficient magnetic field and plasma to stand the solar wind off the planetary surface. A magnetopuase simultaneously holds off the solar wind from direct incidence on the planet, while selectively coupling the solar wind with conjugate auroral zones. There is correlation between outflows of ionospheric plasma into the magnetosphere [1-2] strong correlations have been found between outflow fluxes and local electromagnetic energy fluxes and also with the local precipitating electron density. The former is interpreted to reflect ion heating by plasma wave.
The process of ionospheric expansion is much more complex [3-5] the pressure cooker effect are important for understanding the observation and Fung *etal* who showed that large ion outflow fluxes can be created by substantial energy fluxes of Alfvenwaves propagating from magnetospheric sources.

II. POLAR WIND AND PLASMASPHERE :-

The plasmasphere is the end state of polar wind outflows on flux tubes that remain closed between the twohemispheres rather than circulating through the reconnection regions at high latitudes. Magnetospheric disturbances create sunward plasmaspheric plumes on flux tubes that are depleted as they reconnect with the solar wind field. When reconnected with their conjugate counterparts. They circulate into the inner. Approximately co-rotating magnetosphere, fill up and approach hydrostatic equilibrium [6].The plasmasphere is properly thought of as at light ion extension of the ionosphere. In the present work, we will ignore the plasmasphere proper and its dynamics, in part because it is populated with ions that are of such low energies, and move with such low velocities. That single particle calculations of their motions are not useful for global test particle simulations. Plasmasphereic plumes may be an important supply to the global magnetosphere, especially during refilling after episodes of deep magnetospheric convection. The effects of such plasmaspheric material will be more readily tracked in fluid global circulation models that include ionospheric fluids, because of the low velocities of the protons involved. However the plasmasphere contains little O^+ so it cannot contribute significantly to the pressure dominance of O^+ observed during larger geospace storms. Which is our main focus here. Outside the plasmasphere proper, polar wind light ion plasma flows continuously out of the ionosphere onto circulating flux tubes that circulate throughout the auroral and polar magnetosphere, driven by high latitude reconnection at the magnetopause. These flows rapidly become supersonic, yielding sufficiently high velocities for effective single particle simulations, which we report. Here we treat the polar wind as flowing continuously outside 55 latitude, or L=3.0, which includes about 18% of the emitting area of the ionosphere. We consider the polar wind to flows through the auroral energization regions, and we track the parallel velocity consequences of this, influencing large scale convection.

III. STROMS AND AURORAL WIND

Many prior studies. as noted above, have shown that the amount of heavy ion outflow from the ionosphere through the magnetosphere is strongly dependent on the intensity and coupling strength of the solar wind. Over 30 years of observations, both the outflow details and the accumulations of heavy ions in the hot plasma have been documented. Recent observations have contributed to the date available on near-Earth plasma sheet and ring current composition, especially for larger storms showed that O^+ in particular becomes the majority component of these plasma regions, even when observing is restricted to the energetic component of the full plasma pressure (.15keV). These authors also showed their data on a trend line relative to other previous observations. The trend is an exponential increase in the ratio of P_{o+}/P_{H+} with increasing magnitude of the ring current as measured by D_{ST}. Such an exponential growth of this ratio can only occur if the H^+ pressure is much more slowly varying with D_{ST} that the O^+ pressure.

Well known as the presence of such plasma in the magnetiosphere has been for over 30 years. It has not been though that the storm time ring current disturbance is substantially influence by the ionosphereic plasma contribution, as suggested by pressure dominance in the plasma sheet and ring current. The goal of the present work is to investigate whether the observed pressure contribution of ionospheric plasmas is consistent with reported outflows of ionospheric plasmas into realistic available global simulations of disturbance fields. In subsequent sections we describe the process we have used, the results obtained, then summarize the quantitative results and their implications.

IV. IONOSPHERIC EXPANSION

Polar wind protons were introduced at 1000 km. altitude with initial conditions guided by observations from the Polar/TIDE survey (Su et al., 1998) at all geomagnetic latitudes greater than 55^0 (L~ 3). These conditions included a solar zenith angle variation of flux that results from solar illumination of the ionosphere, with substantially lower fluxes originating from darker regions.

Like the polar wind protons auroral wind oxygen ions were introduced at 1000km. altitude, at all latitudes above 55. However, unlike the polar wind protons, the oxygen initial conditions were locally specified in response to the boundary conditions imposed on Poynting the ionosphere by the global simulation; notably the flux of electromagnetic energy into the ionosphere (DC), and the density of high altitude solar plasma precipitating into the ionosphere, as well as the current density being driven through the ionosphere by the magnetospheric circulation dynamo.

These quantities were transformed into upflowing oxygen ion properties. While both those studies cite similar correlations, the steeper dependences than based on somewhat data than the former. We have used the scaling relations from the former study. An additional relationship was used to specify the ionosphereic O^+ temperature dependence on Poynting flux. Ion heating and electron heating are observed to produce independent outlfows and theoretical work. However the O^+ flux was specified as the geometric mean of the two scaling. Because it is though that some level of Poynting flux is essential to convert up-flow into out-flow. When trajectories were computed. Ions were assigned a perpendicular velocity randomly selected form the thermal speed range. The lowest energy oxygen ions were promptly returned to the atmosphere by gravity. So that the net flux is reduced from that specified when the temperature was very low generally very early and late in the simulation integrals.

V. CONCLUSION

The local ionospheric outflow relationship when implemented within the fields of a dynamic global cor5elation model are consistent with the observed importance of ionosphereic O^+ in the near-earth plasma sheet and region surrounding the ring current, as the solar wind interaction increases. Increasing magnetic reconnection as controlled by IMF, and increasing solar wind intensity as measured by its dynamic pressure, each produced substantial increases in the auroral wind flux of O^+ and its pressure in magnetosphere. Low levels of O^+ pressure in the magnetosphere were produced for northern and of typical dynamic pressure. The results we have obtained demand that future global circulation models must consider the ionospheric plasma as a dynamic element in the magnetosphere. We suggest that the inability of current global simulations to produce realistic ring current magnitudes may owe in large part to their omission of ionospheric plasma expansion and circulation at high altitudes

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