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Meridional and zonal electric fields in Solar corona and ionosphere Earth, caused by the horizontal tidal forces

N. Tokiy (1), V. Tokiy (1), V. Efimenko (2)

(1) Donetsk Institute of Physics & Techology, Donetsk, Ukraine, (2) Astronomical Observatory, National T. Shevchenko University, Kiev, Ukraine, (nat1976@mnogo.ru / Phone:+38-062-3111121)

Let's consider a thin spherical isothermal collisionless plasma layer by thickness h on distance r from the center of the Sun or Earth ($h << r$), with concentration of ions N_0. Let Ω denote the angular speed of the Earth's or Sun's rotation; let r denote the distance of a point in the spherical plasma layer from the sun's center, let e denote charge of electron and m_i denote mass of ion, let ψ denote the heliographic or geographic longitude, θ the heliographic or geographic co-latitude of this point and let δ_j denote the declination. For consideration perturbations we shall take advantage of linear system of the six hydrodynamic equations, including the continuity, ion motion, local electron equilibrium equations and equation of quasineutrality of spherical plasma layer under the homogeneous temperature of components. That is neglecting inertial and gravitational properties of electrons. A periodical (semi-diurnal, diurnal and long) solution for perturbation induced by horizontal tidal forces taking into account both the gravitational and electric fields is examined. The dependence of the ion velocity and concentration, electric field and electron density in dependence from time and heliographic or geographic and geographic coordinates is derived. For example, under action horizontal semi-diurnal constituent of tidal forces there are established oscillations of meridional electric field

$$E_\theta = 9\frac{kT}{e}G\frac{M_j m_i r}{R_{SJ}^3}\frac{\cos^2\delta_j \sin\theta\cos\theta\cos\left[2\left(\Omega t-\psi\right)\right]}{6kT(1+Z)-4\Omega^2 r^2 m_i}$$

where M_j - mass of Planets or Moon, R_{SJ} - distance up to a planet or Moon, Z - positive charge of ion. Conditions of supervision of the resonant phenomena in a solar corona and a plasma layers of ionosphere Earth are considered.