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What is the main source of the electric field in the heliosphere? Not solar rotation!

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There are electric fields of various origins in the heliosphere. Some of them are associated with fast nonstationary processes and disturbances. The others are present in a particular area constantly and do not disappear when they are averaged over large spatial or time scales. Quasistationary and large-scale electric fields are considered in global models of the solar wind. Usually their main predictions relate to the magnetic field, velocity and thermodynamics parameters of the solar wind. The electric field is often not provided, even if it is possible in the model. Observationally less attention is paid to the electric field because it is not always measured by the spacecraft. The electric field is often regarded as a secondary value, because it can be evaluated from the frozen-in equation E=-c-1[v,B] where the solar wind speed v and the interplanetary magnetic field B are known.
In the axissymmetrical approximation, poloidal components of the electric field can be calculated with helps of equations (1,2):
Er=-BzΩr/c (1)
Ez=BrΩr/c (2)
The function Ω has the dimension of the angular velocity and is called the angular velocity of isorotation. It is determined by the spatial distribution of the electric potential in the area where the source of the electric field is located. This source can have any nature, and the frozen-in equation is not obliged to be carried out inside it. Traditionally, the function Ω means the angular velocity footpoints of the magnetic field lines at the Sun. In this case the value of Ω does not exceed the angular velocity of the Sun near the equator of the photosphere or the corona. The electric field here is generated by the rotation of the Sun due to unipolar induction.
According equations (1,2), it is possible to evaluate which angular velocity Ω corresponds to measured electric field. I appears, that Ω is hundreds of times the angular velocity of the Sun at the region of the heliospheric current sheet and at polar heliosphere! This clearly indicates the presence of additional powerful sources of electric field. And they do not have to be of solar origin.
Simple estimates of the possible contribution of various sources of the electric field to the function Ω are presented. Most attention is paid to the double electrical layers in the solar atmosphere, the reconnection effects, interaction of the heliosphere with interstellar wind and processes in kilogauss tubes at the Sun. All of these sources are fundamentally able to provide high Ω, but the kilogauss tubes are the most efficient.