

EGU22-6096

<https://doi.org/10.5194/egusphere-egu22-6096>

EGU General Assembly 2022

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## Pressure-Gradient current at high latitude from Swarm measurements

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The pressure-gradient current is among the weaker ionospheric current systems arising from plasma pressure variations. It is also called diamagnetic current because it produces a magnetic field which is oriented oppositely to the ambient magnetic field, causing its reduction. The magnetic reduction can be revealed in measurements made by low-Earth orbiting satellites flying close to ionospheric plasma regions where rapid changes in density occur. This type of current can be revealed at both low and high latitudes and more generally in all those regions where the plasma pressure gradients are greatest. In the recent past, most studies have focused on low latitude, in the equatorial belt, while only a few papers have focused on high latitudes. Here these currents, although weak, may pose additional challenge since they seem to appear preferentially at the same geographic locations.

Using geomagnetic field, plasma density and electron temperature measurements recorded onboard ESA Swarm constellation from April 2014 to March 2018, we reconstruct the flow patterns of the pressure-gradient current at high-latitude ionosphere in both hemispheres, and investigate their dependence on magnetic local time, geomagnetic activity, season and solar forcing drivers. Although being small in amplitude, these currents appear to be a ubiquitous phenomenon at ionospheric high latitudes, characterized by well defined flow patterns, which can cause artifacts in main field models. Our findings can be used to correct magnetic field measurements for diamagnetic current effect, to improve modern magnetic field models, as well as understanding the impact of ionospheric irregularities on ionospheric dynamics at small-scale sizes of a few tens of kilometers. All these points are important in the framework of space weather effect modeling and confirm the key role of Swarm mission in providing information even on phenomena of very weak signature.

