Geophysical Research Abstracts
Vol. 21, EGU2019-13798, 2019
EGU General Assembly 2019

Explicit IMF By-dependence in geomagnetic activity

Lauri Holappa and Kalevi Mursula
University of Oulu, Space Climate Research Unit, OULU, Finland (lauri.holappa@oulu.fi)

The interaction of the solar wind with the Earth's magnetic field produces geomagnetic activity, which is critically dependent on the orientation of the interplanetary magnetic field (IMF). Most solar wind coupling functions quantify this dependence on the IMF orientation with the so-called IMF clock angle in a way, which is symmetric with respect to the sign of the By component. However, recent studies have suggested that the sign of By is an additional, independent driver of high-latitude geomagnetic activity, leading to higher (weaker) geomagnetic activity in Northern Hemisphere (NH) winter for By > 0 (By < 0). In this paper we quantify the size of this explicit By-effect with respect to the solar wind coupling function, both for Northern and Southern high-latitude geomagnetic activity. We show that high-latitude geomagnetic activity is significantly (by about 40-50%) suppressed for By < 0 in NH winter and for By > 0 in SH winter. When averaged over all months, high-latitude geomagnetic activity in NH is about 12% weaker for By < 0 than for By > 0. The By-effect affects the westward electrojet strongly but hardly at all the eastward electrojet. We also show that the suppression of the westward electrojet in NH during By < 0 maximizes when the Earth's dipole axis points towards the night sector, i.e. when the auroral region is maximally in darkness.