Geophysical Research Abstracts
Vol. 16, EGU2014-2823, 2014
EGU General Assembly 2014

Annual fractions of high speed streams from principal component analysis of local geomagnetic activity

Lauri Holappa (1), Kalevi Mursula (1), Timo Asikainen (1), and Ian G. Richardson (2)

(1) University of Oulu, Department of Physics, Finland (lauri.holappa@oulu.fi), (2) Exploration of the Universe Division, NASA/GSFC, USA

We study the spatial distribution of geomagnetic activity in 1966-2009 with local geomagnetic activity indices at 27 magnetic observatories. Using the principal component analysis method we find that more than 97% of the variance in annually averaged geomagnetic activity can be described by the two first principal components. The first component describes the evolution of the global geomagnetic activity, and has excellent correlation with, e.g., the Kp/Ap index. The second component describes the leading pattern by which the spatial distribution of geomagnetic activity deviates from the global average. We show that the second component is highly correlated with the relative (annual) fraction of high-speed streams (HSS) in solar wind. The spatial distribution of the second mode has a high maximum at auroral latitudes, a local minimum at subauroral latitudes and a low maximum at mid-latitudes. We show that this distribution is related to the difference in the average location and intensity between CME and HSS-related substorms. These results demonstrate that the local indices of geomagnetic activity over a spatially extended network can provide useful, quantitative information about the solar wind that is lost when using only global indices.