Unreliable IAGA-endorsed Polar Cap (PC) index series and a different approach

Peter Stauning
Danish Meteorological Institute, Research Department, Copenhagen, Denmark (pst@dmi.dk)

The Polar Cap (PC) indices are derived from the magnetic variations generated by the transpolar convection of magnetospheric plasma and embedded magnetic fields driven by the interaction with the solar wind. The PC indices are potentially very useful for Space Weather monitoring and forecasts and for related research. However, the PC index series in the near-real time and final versions endorsed by the International Association for Geomagnetism and Aeronomy (IAGA) have been proven unreliable (Stauning, 2013, 2015, 2018a,b,c, 2020). Both versions include solar wind sector (SWS) effects in the calculation of the reference levels from which magnetic disturbances are measured. The SWS effects are caused by current systems in the dayside Cusp region related to the Y-component, BY, of the Interplanetary Magnetic Field (IMF). However, the IAGA-endorsed handling of SWS effects may generate unfounded PC index changes of up to 3 mV/m at the nightside away from the Cusp. For the real-time PCN and PCS indices, their cubic spline-based reference level construction may cause additional unjustified index excursions of more than 3 mV/m with respect to the corresponding final index values. Noting that PC index values above 2 mV/m indicate geomagnetic storm conditions, such unjustified contributions are considered to invalidate the IAGA-endorsed PC index series. The presentation shall include a description of alternative derivation methods shown to provide more consistent index reference levels for both final and real-time PC indices, to reduce their unfounded excursions, and to significantly increase their reliability (Stauning, 2016, 2018b,c).


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