



On the saturation of Polar Cap (PC) indices during strong solar wind conditions

Peter Stauning

Danish Meteorological Institute, Copenhagen, Denmark (pst@dmi.dk)

The Polar Cap (PC) indices, PCN (north) and PCS (South) are derived from the geomagnetic measurements at Qaanaaq (Thule) and Vostok, respectively (e.g., Troshichev et al., 2006). The magnetic variations, to a large degree, relate to the transpolar plasma convection driven by the cross-polar cap potential (CPCP) field generated by the interaction of the solar wind with the magnetosphere. In the derivation of PC index scaling coefficients, the projection of the horizontal disturbance vector to an optimal direction, considered to be perpendicular to the central flow of the dominant DP2 polar convection pattern, is assumed to be proportional to the solar wind merging electric field, E_m (Kan and Lee, 1979). Thus the PC index values, on the average, should equal the merging electric field in mV/m. For actual PC index values, the equality between average index and electric field values extend up to around 5 mV/m. Beyond that level reaching index values that for Space Weather applications are most important, the relation between PC index and E_m field values indicates saturation effects. The PC index saturation could result from (i) saturation of the CPCP fields compared to the impinging solar wind electric fields, (ii) increasing polar cap size, (iii) convection inertia reducing the response to sudden high electric field values, and (iv) the PC index derivation method. The relative importance of the four potential sources of PC index saturation shall be discussed.