

Interactive comment on “Comment on “Invariability of relationship between the polar cap magnetic activity and geoeffective interplanetary electric field” by Troshichev et al. (2011)” by Peter Stauning

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Final Author Comments to ANGEOD discussions on angeo-2020-52

(1) Summary of submitted contribution: P. Stauning: "Comment on "Invariability of relationship between the polar cap magnetic activity and geoeffective interplanetary electric field" by Troshichev et al. (2011)." Angeo-2020-52.

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The main issue in the commentary is the incorrect reference to the PC index scaling parameter version "AARI_1998-2001" (AARI#3) in statements and illustrations where different scaling parameters are actually used. The scaling parameters AARI_1998-2001 based on data from the solar maximum years 1998-2001 were derived in Troshichev et al. (2006), presented in their Fig. 3, and named AARI#3 version by McCready and Menvielle (2010) in their Table 1.

Unfortunately, the Interplanetary Magnetic Field (IMF) component IMF BY and IMF BZ in the Geocentric Solar Ecliptic (GSE) representation were used instead of the prescribed Geocentric Solar Magnetospheric (GSM) representation for the geoeffective interplanetary electric field applied for the derivation of the index scaling parameters. Dr. Troshichev was made aware of the mistake in 2009.

In the publication commented here, Troshichev et al. (2011), the authors state that they have used scaling parameters of the (GSE-based) AARI#3 PC index version from 2006 in their work but omit to report that they have actually substituted parameters from a more recent GSM-based version instead. In my view, deliberately using data different from the announced data basis is not acceptable and should be reported.

The main aim for Troshichev et al. (2011) is to demonstrate that using index scaling parameters derived from an epoch of high solar activity (1998-2001) would generate PC index values close to values generated by using index scaling parameters derived from an epoch of low solar activity (1997+2007-2009). Thus, they conclude on basis of results obtained with a GSM-based scaling parameter version substituted for the AARI#3 version from Troshichev et al. (2006) that their version of index scaling parameters are invariant over the solar cycle – that is – forever valid. By substituting a GSM-based AARI version for the GSE-based AARI#3 version the authors avoid disclosing the large differences in scaling parameters and derived PC index values in their results and illustrations that would result from the use of the announced AARI#3 version from Troshichev et al. (2006).

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These differences are illustrated in the submitted commentary to document that the mingling of PC index versions have resulted in erroneous illustrations in Figs. 1, 2, 3, 6, 7, and 8 of Troshichev et al. (2011) and the issuing of a non-substantiated statement on the invariance of scaling parameters over the solar cycle. This statement is repeated in p. 73-74 of Troshichev and Janzhura (2012), in p. 340 of Troshichev (2012), in p. 15 of Troshichev (2017), and in p. 4 of ISO Report TR23989 with reference to the publication by Troshichev et al. (2011) commented here.

(2) Summary of Interactive Comments angeo-2020-52-RC1.pdf and Reply angeo-2020-52-AC1.

The reviewer asks in his contribution from 7 January whether the error in using GSE instead of GSM interplanetary magnetic field (IMF) vector components have been confirmed. This question is answered by Dr. Troshichev in his interactive comment in angeo-2020-52.SC1 from 15 January discussed below where he admits the error.

The reviewer concludes that “this manuscript contains several noteworthy results and should be published. As a comment it should serve as a useful caution regarding the conclusions of [TPJ2011]. It also provides an opportunity for the authors of [TPJ2011] to present a detailed reply about their methods and conclusions”. This opportunity was not used by Dr. Troshichev in his interactive contribution from 15 January discussed below.

The reviewer mentions “that still leaves the question of how to provide a persistent warning regarding [TJS2006]. Ideally, the authors of [TJS2006] could write a correction or erratum in *Annales Geophysicae* which would appear in a citation search. Alternatively [Stauning2020] could be used as the basis for a second comment very similar to this one”.

In my opinion an erratum or corrigendum should also appear in *JGR Space Physics* since the contribution by Troshichev et al. (2006) was published there. The submission by Stauning (2020), which is in review by *JGR* describes the GSE/GSM mistake

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and suggests a text for a corrigendum note. The initial version of the submission was forwarded to the Editorial Board of *Annales Geophysicae* on 1 May 2020 and acknowledged by their reply on 13 May.

(3) Summary of Interactive Comments angeo-2020-52-SC1.pdf and Reply angeo-2020-52-AC2.

Dr. Troshichev mentions that “In 2009 Dr. Stauning found that illustrations were made with use of the GSE instead of the GSM. As a result, all parameters α , β , and φ were recalculated with use of GSM, and just these parameters were used in subsequent analyses”.

This is the first public admission from Dr. Troshichev of the mistake made in Troshichev et al. (2006). It is possibly correct that GSM-based scaling parameter versions have been used by AARI after 2009. However, the basic problem in Troshichev et al. (2011) is the use of GSM-based scaling parameters while in the text and illustrations reference is made to the GSE-based scaling parameters from Troshichev et al. (2006). Thus, instead of admitting the GSE mistake, the publication by Troshichev et al. (2011), as it seems, attempts disguising the invalid scaling parameters set from 2006 by substituting another scaling parameter set.

In his interactive comment, angeo-2020-52-SC1.pdf, Dr. Troshichev argues that the method described in Troshichev et al. (2006) “was approved as the best method by the IAGA Division V-DAT at a special meeting in Vienna in May 2010”. This argument is not seen to be relevant for the present discussion and the statement, furthermore, is incorrect. According to IAGA V-DAT there was no formal (business) V-DAT meeting in 2010 as such meetings are held during IAGA Assemblies, e.g., in 2009 or 2011. Furthermore, there is no IAGA documentation from a V-DAT meeting in May 2010.

In his interactive comment, Dr. Troshichev repels publishing the submitted commentary and avoids admitting that the substitution of another scaling parameter version could be a mistake. However, he forward no argument against the main theme of the

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commentary stated in its abstract: “For the publication commented here, Troshichev et al. (2011), the authors state that they have used scaling parameters of the AARI#3 PC index version from 2006 in their work but they have actually substituted parameters from a more recent AARI_1995-2005 (AARI#4) version instead. The mingling of PC index versions have resulted in erroneous illustrations in their Figs. 1, 2, 3, 6, 7, and 8 and the issuing of non-substantiated statements”.

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