
Space environment (natural and artificial) — Operational estimation of the solar wind energy input into the Earth's magnetosphere by means of the ground-based magnetic polar cap (PC) index

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Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction.....	v
1 Scope.....	1
2 Normative references.....	1
3 Terms and definitions.....	1
4 Symbols and abbreviated terms.....	2
5 General parameters.....	3
5.1 Solar wind parameters determining the magnetosphere state.....	3
5.2 Magnetic activity in the polar cap and its relation to the solar wind parameters.....	3
5.3 The PC -index: method of derivation.....	4
5.4 Relationship between the PC index and magnetic substorms and storms.....	4
5.5 Relation of the PC index to the interplanetary electric field, E_{KL}	5
5.6 PC index as a verifier of the solar wind parameters presented at OMNI website.....	5
5.7 PC index as a proxy of the solar wind energy input into the magnetosphere.....	6
5.8 PC index as a standard for calibration of the magnetospheric disturbances power.....	6
6 Availability of the PC index.....	6
6.1 Production of the PC index.....	6
6.2 Access to the PC data.....	6
7 Compliance criteria for use of the PC index as a calibrator of the magnetospheric disturbance.....	7
7.1 Rationale.....	7
7.2 Reporting.....	7
7.3 Documenting.....	7
7.4 Publishing.....	7
7.5 Archiving.....	7
Annex A (informative) Resolution No. 3 of XXII Scientific Assembly of International Geomagnetism and Aeronomy Association (12th IAGA), Merida, Mexico, August 2013: PC index.....	8
Annex B (informative) Map of spreading of the auroral absorption calibrated by the PC index value.....	9
Bibliography.....	10

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The polar cap magnetic activity *PC* index was introduced as a measure of the magnetic activity generated in the Earth's polar caps by interplanetary electric field and is regarded at present as a proxy of the solar wind energy input into the magnetosphere in course of solar wind – magnetosphere coupling.

The *PC* index can be required as input parameter for monitoring and nowcasting the space weather influence on various characteristics of magnetosphere and high-latitude ionosphere.

The *PC* index can be applicable for a variety of engineering and scientific domains and can be used to monitor the state of the magnetosphere and high-latitude ionosphere to solve the problems of navigation, radio-connection and induced currents typical of high-latitude regions during magnetospheric disturbances.

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1 Scope

This document provides guidelines for specifying the qualitative estimation of the solar wind energy input into the magnetosphere with use of operative ground-based information on the polar cap magnetic activity (*PC* index).

The solar wind energy incoming into the magnetosphere predetermines development of the magnetospheric disturbances: magnetic storms and substorms. Magnetospheric disturbances include a wide range of phenomena and processes directly affecting human activity, such as satellite damage, radiation hazards for astronauts and airline passengers, telecommunication problems, outages of power and electronic systems, effects in the atmospheric processes, and impact on human health.

This document is intended for on-line monitoring the magnetosphere state and nowcasting the intensity and extent of magnetic disturbances as well as parameters of the high-latitude ionosphere. The method and accuracy of estimating is ascertained by close relationship between the *PC* index and interplanetary electric field (as the most geoeffective solar wind parameter), on the one hand, and between the *PC* index and magnetospheric disturbances, on the other hand.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

solar wind

SW

fully ionized, electrically neutral plasma that carries a magnetic field, B , and streams outward from the inner solar corona at all times

3.2

interplanetary electric field

E_{KL}

electric field, affecting the magnetosphere in course of the *solar wind* (3.1) – magnetosphere coupling, calculated according to formula of *Kan and Lee* [1979]

$$E_{KL} = vB_T \sin^2 \theta / 2$$

where