

## Minutes: IAGA 1997

On August 6, 1997 IAGA Division V - Working Group 2 (now V-DAT) met in Uppsala, Sweden. The Co-Chairs David Boteler and Susan McLean headed discussions on several topics including the merger of applications, indices, forecasting and data services. It was suggested that Task Forces be set up for each of the Working Group focus areas. A tribute was paid to Anich Berthelier, who died March 1997 and it was recommended Michel Menvielle replace Anich as co-chair for indices. This was approved and accepted. Other topics discussed and described in more detail below include the proposal to adopt a new Polar Cap (PC) index and the problem of "pseudo" indices. The Working Group proposed two Resolutions (see the IAGA Web for [current Resolutions](#)). For current information on the IAGA [Executive Committee](#) and [Latest Resolutions](#), visit the [IGA](#) homepage.

[Task Force](#) | [Reports on Indices](#) | [Pseudo Indices](#) | [Resolutions](#)

**Task Forces** were implemented for the four focus areas of the Working Group. The head of each task force and the current members are noted below. [Information on the activities](#) of each task force will be posted as it becomes available .

### Task Forces:

- Indices: Michel Menvielle (Leader)  
H. Joachim Linthe  
T. Kamei  
JJ Curto  
Oleg Troshichev
- Forecasting: Alicia \_de Gonzales (Leader)  
Toby Clark  
John Freeman
- Data Services: Susan McLean (Leader)  
Susan MacMillan  
Don Campbell
- Effects: David Boteler (Leader)  
Risto Pirjola

**Reports on Indices** were given by Kevin Ivory (Kp), Hans-Joachim Linthe (Kp), Michel Menvielle (ISGI and a indices), T. Kamei (Dst and AE), JJ Curto (Rapid Magnetic Variations), and O. Troshichev (PC). The Task Force on Indices will work with Dr. Troshichev to develop a report on the Polar Cap index by August 1998. The Task Force will forward the report to David Boteler for circulation to the community so action can be taken concerning the adoption of the PC index at the next IAGA. David will submit an item to the IAGA News expressing the intention of the WG-V2 to adopt the Polar Cap (PC) index as an IAGA index in 1999.

- **Speaker: Kevin Ivory for Prof. Siebert** [KP Index](#)
- **Speaker: Prof. Hans-Joachim Linthe** [KP Service Index](#)
- **Speaker: Michel Menvielle**
  - [AM, AA, AS, AN](#)
  - [Activities and Publications of I.S.G.I.](#)
- **Speaker: T. Kamei** [Equatorial DST Index and the AE Index](#)
- **Speaker: JJ Curto** [Service on Rapid Magnetic Variations](#)
- **Speaker: Dr. Oleg Troshichev POLAR CAP**
  - Proposal to adopt new Polar Cap (PC) indices
  - Dependent on 2 stations

**Problem of "Pseudo" Indices** Several attendees expressed concern over the number of

"psuedo" indices currently being computed and being referenced in the literature. The official IAGA indices are produced by the institutes mentioned above, and nowhere else. The "label" of the real index should be reserved for official producers for funding reason. However, there are definite needs for estimated indices for real-time and near-real-time applications. In certain uses, other institutes are computing similar indices. The group agreed that these "psuedo" indices should be clearly labeled to avoid confusion with the actual indice. A resolution was proposed to add "est" to the label of any estimated indices computed, i.e. Kpest and Apest. The group also recommends that the "pseudo" indices not be referenced in reports or journals and we work to educate the public.

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**The following resolutions** were submitted by the Working Group:

**Resolution # 4.**

IAGA, **noting** the effectiveness of the Polar Cap (PC) geomagnetic activity index for prompt characterisation of the magnetosphere, and **recognising** the great contribution of the Arctic and Antarctic Research Institute (AARI) and Danish Meteorological Institute (DMI) in producing and testing the preliminary PC index time series since 1977, **emphasises** that the usefulness of such an index is dependent on having a continuous data series and **urges** that all possible effort be made to maintain continuous operation of the stations contributing to this index, and to provide the PC-index to the international scientific community in near-real time via satellite data links.

**Resolution # 5.**

IAGA, **recognising** the value of preserving the uniqueness of the official IAGA indices, and **noting** that estimated values of these indices produced by independent agencies for operational use are becoming confused with the official indices, **urges** the producers of the estimated indices to clearly label them with "est" at the end of each index name to distinguish them from the official IAGA indices.

**Resolution # 6.** IAGA, **recognising** the importance of geomagnetic activity indices for characterisation and prediction of a wide range of geomagnetic phenomena, and **noting** the particular value of long time-series of such indices, **thanks** the staff of observing stations that contribute data, the organisations that produce, disseminate, and publish indices and the national funding agencies that support these activities.

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**The following other issues and concerns were discussed at the meeting.**

Are the 'effects on technology' being left out of the IAGA version of "Space Weather"?  
Forecasting is still apart of this WG - how can we be more active with other Divisions in IAGA involved in forecasting?  
Recommend contined contact and work with Division III.

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**Sessions submitted for IAGA 1999**

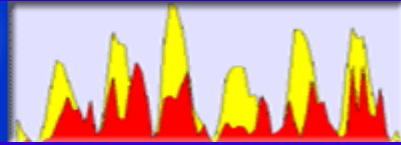
Session	Convener	Div/Assoc
Geophysical Hazards Internal/External	Susan McLean Co-Convener	IASPEI / IAVCEI / IAG / Oceanography
Geomagnetic Observatory Data Services & Indices	Dr. Linthe Co-Convener	Div.-V
Space Weather Science, Forecast & Effects	3 Day David Boteler	Div. III / IAMAS

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For page content questions please contact: [Alan W.P. Thomson](#)

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<http://www.ngdc.noaa.gov/IAGA/vdat/minutes97.html>  
Revised: 13 April 2004



## IGA Working Group V-Dat Task Forces

At the IUGG in Birmingham (July 1999), Division V-DAT (formaly Working Group 2) business meeting, several items needing action during the next two years were identified. These action items, along with the main contacts, are determine indice users needs, report on the PC indice, referee report on the PC indice, and data exchange format.

### Determine Index Users Needs

#### Members:

[Richard Holme](#) (GFZ)

[Chris Balch](#) (NOAA/SEG)

Activities for this group include a survey of community to determine:

- Who is using indices?
- Which indices are they using?
- How timely do they need the various indices?

### Report on the PC Index

#### Members:

[Oleg. Troshichev](#) (AARI)

[Ole Rasmussen](#) (DMI)

[Volodya Papitashvili](#) (U of Michigan)

Activities for this group include:

- produce report describing the PC family, method of producing, and use of index in sufficient detail to enable others to continue to produce the index.
- The report should include such things as a table of coefficients.

Download report ***A new IAGA index for description of polar cap magnetic activity*** ([pdf 782Kb](#))

### Referee Report on the PC Index

#### Members:

[Richard Coles](#),

[Michelle Minvielle](#)

Activities for this group include:

- referee report
- provide approved report (or url to report) to WG chairs (chairs will then draft a letter from the President of IAGA to the institutes operating Thule and Vostok)
- announce PC Index in IAGA News

## Data Exchange Format

### Members:

[Susan McLean](#) (WDC Boulder)

[Volodya Papitashvili](#) (U of Michigan)

[Susan Macmillan](#) (BGS)

[Don Herzog](#) (USGS)

Activities of this group include:

- Data [Format Recommendations](#) for 1-second, monthly means -  
**Comments should be sent to members of the task force or to the chairs of WGV2.**
- Carry-over tasks from previous year:
  - WIPO - report on attempts to copyright data and database;
  - Review and improve the mean hourly magnetic database;

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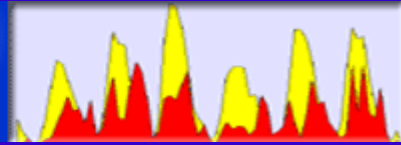
URL: <http://www.ngdc.noaa.gov/IAGA/vdat/taskfrc.html>

Revised: 13 January 2004

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## Report on Kp, ap, Ap, Cp, C9, Q-days and D-days

**IAGA 1997, Uppsala, Working Group V-2,  
Wed Aug 6, 1997**

**presented by Kevin Ivory (representing Prof. M. Siebert)**

This is the final report on that part of the International Service of Geomagnetic Indices (**ISGI**) carried out at the [Geophysics Institute](#) at [Göttingen](#), hereafter referred to as **Kp-Center Göttingen**. It originated in the work of the late [Prof. Bartels](#) who introduced the [geomagnetic indices](#) Kp, ap, Ap, Cp and C9 in the years around 1950. Since 1951, monthly tables with definitive data of the Bartels indices have been distributed within the scope of ISGI. Since 1957, with the beginning of the International Geophysical Year, the tables were edited half-monthly. The monthly tables were supplemented by musical diagrams of Kp, semi-graphic tables of C9 and lists of the quietest and most disturbed days (Q-days and D-days). Normally the data were available within less than four weeks after the end of each period concerned.

While over all the decades since 1951 the distribution of the data took place by mail, the recent development in the field of electronic data transmission was fully incorporated in this service. So, as an additional offer, the latest tables of indices are immediately distributed per email to a list of interested scientists worldwide after calculation on a half-monthly basis. Archives of these indices from 1932 through the most recently calculated values are offered for public access on several [anonymous FTP servers](#) as well as on a well-documented [World Wide Web server](#).

Since the death of Prof. Bartels in 1964, Prof. Siebert has been responsible for the service of the Kp-Center Göttingen up to the end of 1996, that is already six years in excess of his retirement. Due to changes in the fields of activity of the Geophysics Institute at Göttingen, an arrangement has been made to terminate the Kp service at Göttingen and to continue this service at the [Adolf-Schmidt-Observatorium](#) Niemegk, which is an observatory of the [GeoForschungsZentrum \(GFZ\)](#) Potsdam. The transfer from Göttingen to Niemegk happened without any interruption of service; the Kp-Center Göttingen closed at the end of 1996, which is the reason for this final report from Göttingen.

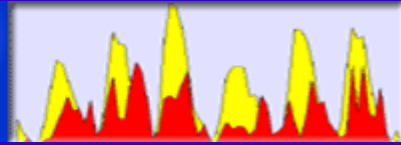
Due to the fact that the series of the Bartels indices have been extended backwards until 1932, 65 annual sets of these data covering six solar cycles have been made available by this service for use of the scientific community. This, of course, was possible only due to the cooperation and help of so many persons all over the world, especially members of the Geophysics Institute of the [University of Göttingen](#), the financial support by the Göttingen Academy of Sciences and last but not least the steady contributions of the Kp observatories over so many years. All of them cordial thanks.

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For page content questions please contact: [Kevin Ivory](#)

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URL: <http://www.ngdc.noaa.gov/IAGA/vdat/kpreport.html>  
Revised: 2 March, 2009



## Report of the International Kp Index Service

at the Adolf-Schmidt Observatory Niemegek  
of the GeoForschungszentrum Potsdam (Germany)  
January - July 1997

The [Adolf-Schmidt-Observatory Niemegek](#) of the [GeoForschungszentrum Potsdam](#) took over the responsibility for the International Kp Index Service on January 1, 1997 from [Institute of Geophysics](#) of the [University Gottingen](#). This process took place without any problems. The Adolf-Schmidt Observatory Niemegek is very thankful to Kevin Ivory. The software packet, which he developed for the calculation and design of the tables and diagrams is on a very high level. He thoroughly instructed and trained the staff of the Niemegek observatory to continue the Kp Index Service with the same quality as at the University Gottingen.

At the GeoForschungszentrum Potsdam the software package was adopted and installed at the computer network of the institute. They use several platforms at the data center of the institute in Potsdam for the purpose of e-mail, [FTP](#) and [WWW](#) presentations. The main calculations are carried out at a SPARC 5 workstation under Solaris 2.5 at Niemegek observatory, which is connected to the data center in Potsdam. The tables and diagrams are printed at Niemegek, where the preparation of the mailing material is also done. Presently 398 copies of the Kp table, the musical diagram and the R9/C9 table are sent once per month to 300 recipients all over the world.

The International Kp Service offers several presentations via the Internet. Its WWW homepage can be found from the homepage of the GeoForschungszentrum Potsdam or the Adolf-Schmidt Observatory Niemegek. Besides several descriptions the actual Kp table and the musical diagram can be displayed. Also, the whole Kp series beginning in 1932 is prepared in several formats. Of course, the derived indices as [ap](#), [Ap](#), [Cp](#) and [C9](#), the [quietest days](#) and the [disturbed days](#) of every month are available. All data can be inquired in different formats via FTP from the FTP server of the GFZ, the University Gottingen and the [WDC for Geomagnetism](#) Edinburgh, UK. Up to now one diagram, the R9/C9 quasi graphic table is only available on paper. It is still made by hand. Because of lack of time it is not presented also via the Internet. It is intended to be accomplished at the next available opportunity.

Presently twice a month the Kp are calculated from the K numbers of the 13 Kp stations. The tables are transferred by e-mail to 48 recipients. Immediately after the receiving of the K numbers of the last received Kp station the calculation process is started. The time delay of the sending of the e-mails containing the Kp tables depends on the time point when the last Kp station has sent its K numbers.

There is a discussion of increasing the computing frequency of activity indices. For the Adolf-Schmidt Observatory Niemegek as the responsible and executing institution of the International Kp Index Service this is no problem. We are ready to operate the Kp calculation procedure much more frequently. We can imagine to do so once a week. We also see a possibility to do it in maximum each working day. In our opinion the frequency depends only on the necessity and the possibilities of the Kp stations to send their K numbers just in time for a very high frequency. We would like to ask all users of activity indices (not only Kp and derived indices): which frequency of computation is necessary and which time delay of receiving the indices is acceptable? We think, this is the central question. Depending on the answer, the Kp stations could be asked possibly to increase the sending of their K numbers if necessary.

Unfortunately, once we confused the users of the Kp numbers a little bit. Because of several wrong K numbers of Eskdalemuir observatory ( a timing error caused that) in February and March and wrong received K numbers of Brorfelde observatory in May we had to recalculate the Kp numbers for these three months. We apologize for this confusion.

By chance we have found in the Internet an activity index, which is also called "Kp". It is offered by the Space Environment Center (SEC) of the National Oceanic and Atmospheric Administration (NOAA) under "Today's Space Weather" very actual with a time delay of only a few hours, but only the three recent days are presented. All attempts to contact the responsible person, Captain Carter Borst, Air

Force officer, working in liaison between SEC and the 50th Weather Squadron at Flcom Air Base, did not have satisfactory success up to now. We tried to get information about the used algorithm and the reason for the using of the name "Kp" for this index. We urge this Working Group to recommend to IAGA that the name "Kp" be used only by the index introduced by [Julius Bartels](#) and now provided by Adolf-Schmidt Observatory Niemegek. Everybody can do and offer what he wants, but the name "Kp" has to be protected.

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For page content questions please contact: [Dr. H J Linthe](#)

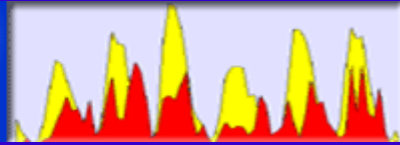
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Revised: 02 March, 2009

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## Report on the Derivation of am, an, as and aa Planetary Magnetic Indices

**presented by Michel Menvielle during the 8th IAGA Scientific Assembly**

On 1997, January 1st, the am and aa services moved from the Université Paris Sud (Orsay, France) to the Centre d'étude des Environnements Terrestre et Planétaires (C.E.T.P., Saint Maur, France). Provisional and definitive values are computed with the K values provided by the observatories. Provisional values are circulated on a monthly basis with a few weeks delay for am, an, and as, and on a weekly basis with a few days delay for aa. Reducing these delays down to a few days implied to derive provisional K values from digital minute values.

Algorithm for computer derivation of SR, leading to automatic calculation of K indices have then been set up and tested by different research groups. Four of them have been acknowledged by I.A.G.A. and are now available through I.S.G.I. [IAGA News N°32, p. 27, December 1993]. A software which aims at calculating in quasi real time these indices was then developed at the I.S.G.I. Publication Office. It gets automatically on a daily basis digital minute values from geomagnetic observatories through electronic data transfer procedures, and computes K indices using the FMI method.

The quick-look values of planetary indices are then computed and circulated once data availability makes it possible. Since the end of 1996, quick-look values of K-derived planetary indices are then made available on the server IMAGINE, with a nominal time delay of a few days. The am and Km quick-look indices are derived on an 'available data' basis, and a due caution is required in using them.

Uppsala, August 1997

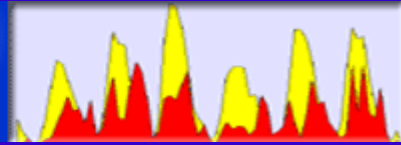
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Revised: 17 September, 2003





## Report on the activities of I.S.G.I. and of I.S.G.I. Publication Office

presented by Michel Menvielle  
during the 8th IAGA Scientific Assembly

The basic activities of I.S.G.I., and of I.S.G.I. Publication Office are to prepare and circulate magnetic indices and other geomagnetic data, based on the report of magnetic observatories distributed all over the planet, with the help from the following I.S.G.I. Collaborating Institutes (see addresses in Appendix):

- Centre d'étude des Environnements Terrestre et Planétaires (C.E.T.P./C.N.R.S.; am, Km, aa; Saint Maur, France)
- WDC-C2 for Geomagnetism (Dst, AE; Kyoto, Japan)
- GeoForschungsZentrum (GFZ) Potsdam (Kp, ap; Potsdam, Germany)
- Observatorio del Ebro (Rapid Variations; Roquetes, Spain)

I.S.G.I. and I.S.G.I. Collaborating Institutes have the responsibility to ensure the homogeneity of the data series. I.S.G.I. has an Advisory Board, appointed by the Executive Committee of the International Association of Geomagnetism and Aeronomy (C. Barton, Australia, chair; T. Araki, Japan; R. Coles, Canada; M. Menvielle, France, ex officio).

### PRESENT ACTIVITIES

#### Data dissemination: on-line services

The question of dissemination of geomagnetic indices through electronic network is at present our major concern. There is in fact a strong request from industrial and military communities to have preliminary values of geomagnetic indices available on line within very short delays. Some of them are asking to have them circulated within a one hour delay. On the other hand, it is very easy to make data available through electronic networks, and Institutes which are not part of I.S.G.I. may easily derive and circulate preliminary values of geomagnetic indices. This would be confusing, and would result in a dramatic loss of quality of geomagnetic indices. I.S.G.I. has then to face up two challenges:

- establish a policy of dissemination of geomagnetic indices through electronic networks which prevents any confusing situation
- ensure a quasi real time derivation and dissemination of reliable provisional I.A.G.A. geomagnetic indices.

As for the first point, discussions between representatives of I.S.G.I. Collaborating Institutes clearly pointed out that the I.S.G.I. label is actually the simplest and the safest way to guarantee the quality of circulated geomagnetic indices. The I.S.G.I. Collaborating Institutes therefore decided to quote their I.S.G.I. membership in all their publications and data bases.

As for the second point, the I.S.G.I. Publication Office (for K-derived planetary indices) and the WDC-C2 for Geomagnetism (for Dst and AE indices) are now routinely preparing and circulating quick-look values of geomagnetic indices within delays of the order of a few days.

The I.S.G.I. Publication Office also started operating a mail interface which allows users on remote computers to obtain geomagnetic indices from the I.S.G.I. data base by simply sending messages to the Internet address [I.S.G.I..DATA@cetp.ipsl.fr](mailto:I.S.G.I..DATA@cetp.ipsl.fr). The new service is named IMAGINE, that is Interface for Mailing Automatically Geomagnetic INDices via Electronic networks. It has been established on the model of the automatic e\_mail running at the INTERMAGNET GIN of Edinburgh, thanks to the kind co-operation of Simon Flower. It runs on

computer at C.E.T.P.

All the am and aa data series are available on the server IMAGINE, quick look and provisional values of these indices being made available as soon as they are computed. am and aa indices expressed in terms of Kp units (Kpa and Kpm indices) are also made available on the server IMAGINE. The IMAGINE server is presented in notes which appeared in the IAGA News N° 35 [pp. 45-46, July 1996] and N° 36 [pp. 16-17, February 1997].

An I.S.G.I. WWW homepage is being developed in the frame of the C.E.T.P. homepage, with mirror link with each I.S.G.I. Collaborating Institutes WWW homepage. It will then be possible to have easily access to descriptions of I.A.G.A. indices, and to all the available data.

#### **Data dissemination: printed Bulletins**

In parallel with the development of the on-line facilities described in the previous section, the I.S.G.I. Publication Office and the I.S.G.I. Collaborating Institutes continue to issue printed bulletins. Therefore they ensure the circulation of data primarily through both printed bulletins and electronic network facilities. It is worth being underlined that these services are complementary. The on-line services ensures a rapid dissemination of provisional values of geomagnetic indices, while the printed bulletins make these basic data available to all the laboratories, even if they have no computer facilities for transferring data from World Data Centres. In order to help local digital access, diskettes at the PC format are now associated to each copy of the IAGA Bulletin 32.

All the printed bulletins described hereafter are available on request. Copies of former Bulletins relative to indices, coming from the former I.U.G.G. Publication Office in Paris and from De Bilt are gathered at the I.S.G.I. Publication Office. A list of still available Bulletins can be found in IAGA News N° 32 [p. 41, December 1993].

The provisional values of geomagnetic indices are also sent to H. Coffey for publication in the Solar Geophysical Data NOAA/NGDC reports, and in Journal of Geophysical Research. The final values of geomagnetic indices are sent to World Data Centers from where they are also available.

The I.S.G.I. Publication Office circulates a monthly bulletin and the yearly IAGA Bulletin 32 series:

- the monthly bulletin contains the provisional values of planetary magnetic indices (am, aa, Kp, and Dst), the list of the quiet magnetic days of the month and a preliminary report on remarkable magnetic events. The regular publication of the monthly bulletin resumed in 1994, after updating the bulletin contents and presentation. It is normally sent six to eight weeks after the end of the current month
- the yearly IAGA Bulletin 32 series contain the definitive values of the I.A.G.A. indices and the list of remarkable magnetic events for the year. These bulletins are aimed to be published within a delay of about two years after the end of the year. Free copies are sent to contributing institutes; about 50 copies are kept at the I.S.G.I. Publication Office in Saint Maur for distribution to subscribers and for sale. In order to facilitate local digital access to the geomagnetic indices published in the IAGA Bulletin 32 series, we now add to each copy a floppy containing all the data published in the Bulletin. The IAGA Bulletin 32r (1987) and the followings were thus circulated with the corresponding floppy, and the floppies for the years 1981 to 1986 were also prepared. They are now available at the I.S.G.I. Publication Office. The present status of the publication of the IAGA Bulletins N° 32 series is:
  - the IAGA Bulletins 32s (1988), 32t (1989), and 32u (1990) are now published
  - the IAGA Bulletins 32u (1991), 32v (1992), and 32w (1993) are likely to be published in December 1997 or January 1998. Copies of former Bulletins relative to indices, coming from the former IUGG Publication Office in Paris and from De Bilt are gathered at the ISGI Publication Office, and a list of still available Bulletins has been circulated.

**Uppsala, August 1997**

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## **APPENDIX**

## I.S.G.I. Collaborating Institutes

Centre d'Etude des environnements Terrestre et Planétaires (C.E.T.P.)  
4, Avenue de Neptune  
F-94107 SAINT MAUR DES FOSSES CEDEX  
FRANCE  
[michel.menvielle@cetp.ipsl.fr](mailto:michel.menvielle@cetp.ipsl.fr)

GeoForschungsZentrum (GFZ) Potsdam  
Adolf-Schmidt observatorium für Geomagnetismus  
Lindenstr., 7  
D-14823 NIEMEGK  
GERMANY  
[linthe@gfz-postdam.de](mailto:linthe@gfz-postdam.de)

Observatorio del Ebro  
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E-43520 ROQUETES  
SPAIN  
[ebre.jjcurto@readysoft.es](mailto:ebre.jjcurto@readysoft.es)

WDC-C2 for Geomagnetism  
Faculty of Sciences  
Kyoto University  
KYOTO 606-01  
JAPAN  
[Toyo@kugi.kyoto-u.ac.jp](mailto:Toyo@kugi.kyoto-u.ac.jp)

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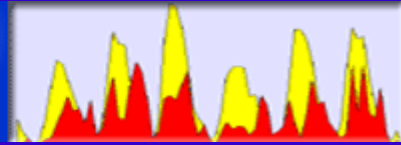
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Revised: 17 September, 2003

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## Status of Derivation of the Equatorial Dst Index and AE Index

We derived the Equatorial Dst index (Dst index) and the Auroral Electrojet Index (AE index) in two steps. One is the final index and the other is the provisional index.

Because of growing demands for quicker availability of Dst index and AE index we started derivation of near realtime indices (this is called also Quick Look Index or QL index). The QL Dst index was made available in October 1996 and the QL AE index was made available in January 1997 through WWW service of the [WDC-C2](#) Geomagnetism. The Final Index is derived and distributed on an annual or bi-annual basis with enough quality suitable for any scientific analysis and made public by ISGI publication and by data book series of the WDC-C2 for Geomagnetism, Kyoto. The Provisional Index is derived as soon as the necessary (provisional) data are received from the contributing observatories and which is disseminated by post or by other means on a monthly basis. We added one more step for quick look monitoring. Quick Look index, which is derived very quick without waiting for enough number of stations and derived on a daily basis. There is only a set of values for the Final Index and another set of values for the Provisional Index but QL values are updated daily or more frequently if necessary (Users should be careful that there can be many versions of QL index). We receive requests to provide the values of QL indices for prediction purposes. We are in consideration of how we can provide the values as a input of the prediction users without confusions. To make the QL Dst and QL AE index more reliable, we need to consider the use data from more stations and we need to improve reliability of each station.

### Dst index:

We derived the final Dst index through December 1996, with a delay of 6 months after the end of the year and the provisional Dst index was done through May 1997 with a delay of two months after the end of the month. We added Alibag in derivation of the provisional Dst index since January 1997. We found it to be more suitable when using additional stations due to the fact that we are suffering from variations caused by missing data in some observatories. QL Dst index is derived and distributed since October 1996 using regular 4 observatories (Kakioka, Honolulu, San Juan and Hermanus). Alibag is not used for QL index as e-mail data transmission is not stable from the station. The WWW has [plots](#) of all three levels (final, provisional and QL). When provisional index is derived QL index is deleted from the WWW and when the final index is derived, provisional and QL index is deleted for the period.

### AE index:

We apologize for the slow progress in the final AE index. The derived final AE index is through June 1988 and we will be putting more effort into catching up the provisional AE index. The derived provisional AE index is for 1990, 1993 and 1994. We hope that 1991 and 1992 will be derived by September 1997 and 1995 will be derived by the end of 1997. QL AE index has been derived since January 1997 and is plotted with colors which show the number of stations at each minute to give the reliability of the data.

The problem of derivation of the final AE index is mainly in quality of data. The problem of provisional (and QL) AE index is difficulty in obtaining data from stations especially the Russian observatories. To reduce the problems, we started cooperative work with Russian Institutions such as AARI, IZMIRAN, WDC-B and IKFIA for digitization and transmission of data throughj STEP, WDC Panel and INTERMAGNET project.

Of the 12 AE stations we are now able to receive data almost in realtime (every hour) from one station (Abisko), daily from 7 stations (College, Tixi, Yellowknife, Fort Churchill, Poste-de-la-Bleine and Narsarsuaq). There are still heavy problems in obtaining data from Russian stations but we have some good indications of possibly collecting data from Dikson. So we hope we can increase the number of stations for QL AE index. Cape Wellen was closed in October 1996 because of power failure and we expected it to be reopened in the summer of 1997 but it turned out that it will not be fixed for a few more years. This will affect not only QL index but also provisional and final AE index.

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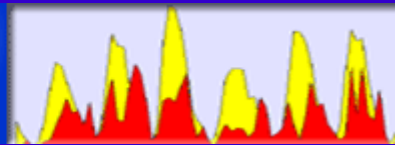
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Revised: 17 September, 2003

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[IUGG](#) > [IAGA](#) > [Division V](#) > [Working Group V-DAT](#)



## Service on Rapid Magnetic Variations

We presented some statistics on actual routine work (number of collaborating observatories and events reported in the monthly lists) for the period 1995-1996. Then we presented some statistics on IAGA BULLETIN 32 (1990-1991 period). We noticed that too much events were reported in the monthly lists. In the process of selection we had to reject 73% of the pretended SSC events and 68 % of the pretended SFE events.

Then we exposed some problems in the process of identification:

- \* Poor coverage of magnetic observatories over the world.
- \* Morphology of the events not clear.
- \* Definition does not precise limits.
- \* Not homogeneous criteria in the observatories.
- \* Poor signal/noise ratio.

Some open questions still remains:

- \* Meaning of SSC after Mayaud criteria: (Storm - change of rhythm in the agitation).
- \* Possible SFE at night (Intrusion of the current system loop in the non-illuminated hemisphere).
- \* SFE only visible in a reduced part of the illuminated hemisphere.
- \* SFE without solar confirmation (H $\alpha$ , X ray, radio burst).

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Revised: 17 September, 2003



## A new IAGA index for description of polar cap magnetic activity

In July 1999, during the 22<sup>nd</sup> General Assembly of the International Union of Geodesy and Geophysics (IUGG) in Birmingham, UK, the International Association of Geomagnetism and Aeronomy (IAGA) thoroughly considered and then officially adopted the Polar Cap (PC) Magnetic Activity Index as the IAGA index of geomagnetic activity in the polar regions. This index was initially proposed in 1979 (see the index's description below) and therefore it has been in use for 20 years. Geomagnetic variations recorded continuously at the two near-pole magnetic observatories, Qaanaaq (Thule) in Greenland and Vostok in Antarctica, are utilized in producing the Northern and Southern PC-indices on a regular basis at the Danish Meteorological Institute (DMI, Copenhagen, Denmark) and the Russian Arctic and Antarctic Research Institute (AARI, St. Petersburg, Russia).

It was recommended by IAGA that the service should be continued if possible for both the Northern and Southern polar caps. Dr. David Kerridge, President of IAGA, submitted this request to the DMI and AARI Directors to confirm the institutional commitments. Their responses were positive assuring IAGA that there are no plans to discontinue this service.

Thus we are happy to announce that the Polar Cap (PC) index is now accepted as the official IAGA index for describing geomagnetic activity over the polar caps. Currently both the Northern and Southern PC indices are available on-line via the World Wide Web: from DMI – <http://www.dmi.dk/projects/wdcc1/pcn/> and from AARI – <http://www.aari.nw.ru>, respectively. More information about all IAGA indices of geomagnetic activity can be found at the International Service of Geomagnetic Indices (ISGI) Web site <http://www.cetp.ipsl.fr/~isgi/homepag1.htm>.

Vladimir Papitashvili  
Chair, IAGA Division V

Michel Menvielle  
Chair, IAGA Commission on Geomagnetic Indices

## Polar Cap (PC) Magnetic Activity Index

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The PC-index has been introduced by *Troshichev et al.* [1979, 1988] as an index for monitoring geomagnetic activity over the polar caps caused by changes in the interplanetary magnetic field (IMF) and solar wind. *Troshichev and Andrezen* [1985] have shown that ground geomagnetic disturbances measured at a single near-pole station highly correlate ( $r > 0.8$ ) with the “merging electric field”  $E_m$  applied to the Earth’s magnetosphere [*Kan and Lee*, 1979]:

$$E_m = V_{sw} B_T \sin^2(\theta/2) = V_{sw} (B_y^2 + B_z^2)^{1/2} \sin^2(\theta/2)$$

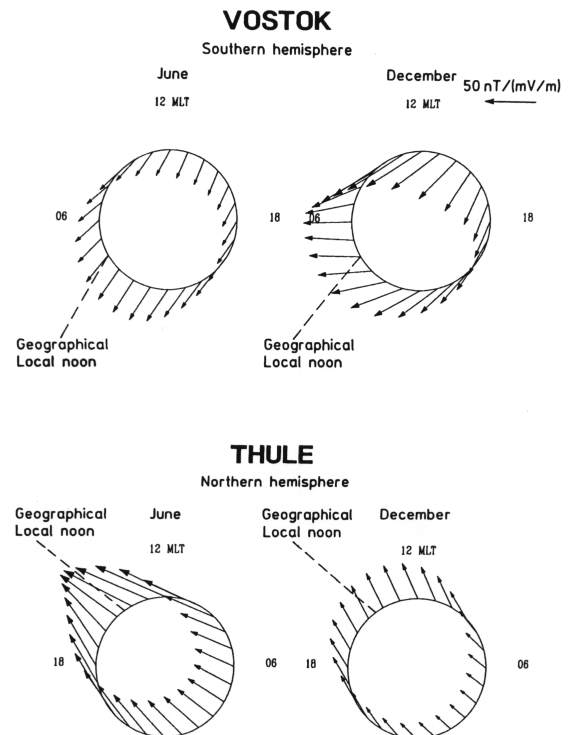
Here  $V_{sw}$  is the solar wind velocity,  $B_y$  and  $B_z$  are the IMF azimuthal and vertical components, respectively, and  $\theta$  is the IMF “clock-angle” measured between the Earth’s magnetic field vector and  $B_T$ .

The algorithm to derive the PC-index is based on a statistical analysis of the relationship between variations in  $E_m$  and geomagnetic perturbations  $\Delta F$  at the Earth’s surface. Two near-pole magnetic observatories were proposed for derivation of the index: Qaanaaq (Thule) in Greenland at  $85.4^\circ$  corrected geomagnetic (CGM) latitude and Vostok in Antarctica at  $-83.4^\circ$ . Since a near-pole station is located under the sunward, transpolar portion of the two-cell ionospheric current system DP2, observed magnetic perturbations point approximately towards dusk. The exact direction is slightly varying in time because DP2 is somewhat skewed with respect to the noon-midnight meridian. Thus, the transverse magnetic perturbation caused by the DP2 transpolar current can be written as:

$$\Delta F_{PC} = \Delta H \sin \gamma \pm \Delta D \cos \gamma$$

where  $\gamma = \lambda \pm D_E + \phi + UT \cdot 15^\circ$ . Here  $\Delta H$  and  $\Delta D$  are deviations in the ground horizontal  $H$  and  $D$  magnetic field components from the pre-selected quiet level,  $D_E$  is the station’s average declination angle,  $\lambda$  is its geographical longitude, and  $\phi$  is the UT-dependent angle between the DP2 transpolar current and the noon-midnight meridian. “+” is used for Vostok, and “−” for Qaanaaq. The quiet level is deduced for Qaanaaq by interpolating between field’s values determined at nighttime hours of quiet winter days in the two consecutive years. The quiet level for Vostok is determined from quiet days for the examined month.

The “true” angle  $\phi$  is obtained through a correlation analysis relating  $E_m$  and horizontal magnetic perturbations projected on various directions; the direction where correlation is maximal is then used for derivation of the index. Figure 1 shows optimal directions obtained at Vostok and Qaanaaq (Thule)



**Figure 1.** The CGM latitude - MLT diagram for the selection of optimal directions in the PC index derivation [after *Vennerstrøm et al.*, 1994].

for June and December. It was found that these optimal directions vary with UT and season; therefore, the projected horizontal perturbation  $\Delta F_{PC}$  should be normalized with respect to  $E_m$ :

$$\Delta F_{PC} = \alpha \cdot E_m + \beta \quad \text{and} \quad PC = (\Delta F_{PC} - \beta) / \alpha \cdot \eta$$

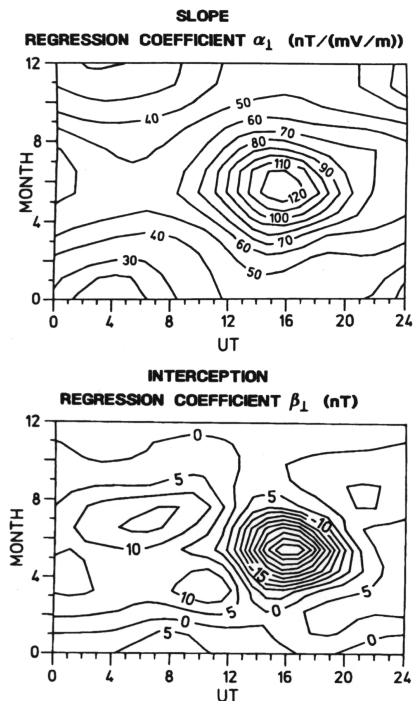
where  $\alpha$  (slope) and  $\beta$  (intercept) are functions of local time and month, and  $\eta = 1 \text{ mV/m}$  is a normalization coefficient required to make the PC index dimensionless. The PC index is now calculated from a set of 12 (months) by 24 (hourly) values of the coefficients  $\alpha$  and  $\beta$  and angles  $\phi$ . These coefficients have independently been determined for Qaanaaq and Vostok for the period when good coverage of the IMF data has been available. For example, Figure 2 shows contour plots of the coefficients  $\alpha$  and  $\beta$  obtained for Thule as functions of the months and UT hour. Further investigation of the PC-index is underway [e.g., Papitashvili and Rasmussen, 1999; Troshichev et al., 2000]

The World Data Center B2 (Moscow, Russia) and the NOAA National Geophysical Data (Boulder, Colorado, U.S.A.) have published the index catalogs [e.g., Troshichev et al., 1991; Vennerstrøm et al., 1994]; NGDC has also made PC-index available through regular publications. Currently the Northern PC index is continuously derived from geomagnetic data obtained at Qaanaaq; the Southern PC index – from geomagnetic data obtained at Vostok. Both indices are available on-line from the Danish Meteorological Institute (Copenhagen, Denmark, <http://www.dmi.dk/projects/wdcc1/pcn>) and from the Arctic and Antarctic Research Institute (St. Petersburg, Russia, <http://www.aari.nw.ru>).

The International Association of Geomagnetism and Aeronomy (IAGA) has officially adopted the Polar Cap (PC) Magnetic Activity Index at the 22<sup>nd</sup> General Assembly of International Union of Geodesy and Geophysics (IUGG, Birmingham, UK, July 1999). It has been recommended by IAGA that the service should be continued for both the Northern and Southern polar caps in near future upon availability of resources at DMI and AARI.

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**Figure 2.** Contour plots of regression coefficients  $\alpha$  and  $\beta$  [after Vennerstrøm et al., 1994].