

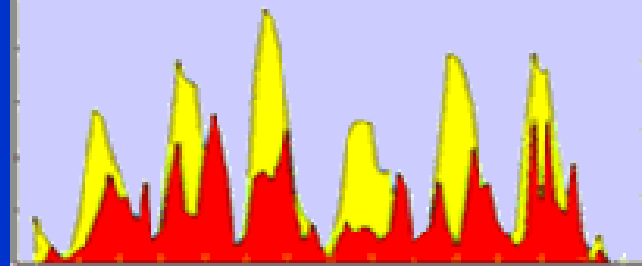
Working Group V-DAT Business Meeting

August 30, 2017

12:00-13:00 @Room 1.41

Cape Town, South Africa

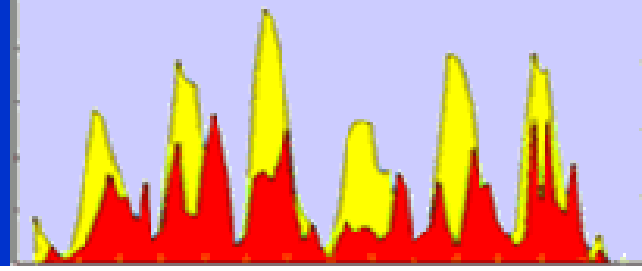
Working Group V-DAT: Geomagnetic Data and Indices



Agenda

1. Status of the IAGA indices
 - Kp, Ap, Cp, QD
 - am, aa
 - AE, Dst
 - PC
 - SSC, SFE
2. Reports
 - Petition letter for USGS
 - Update of WG V-DAT web site
3. Data DOI Task Force
4. Data licensing
5. Sessions for IAGA 2019
6. Any other businesses

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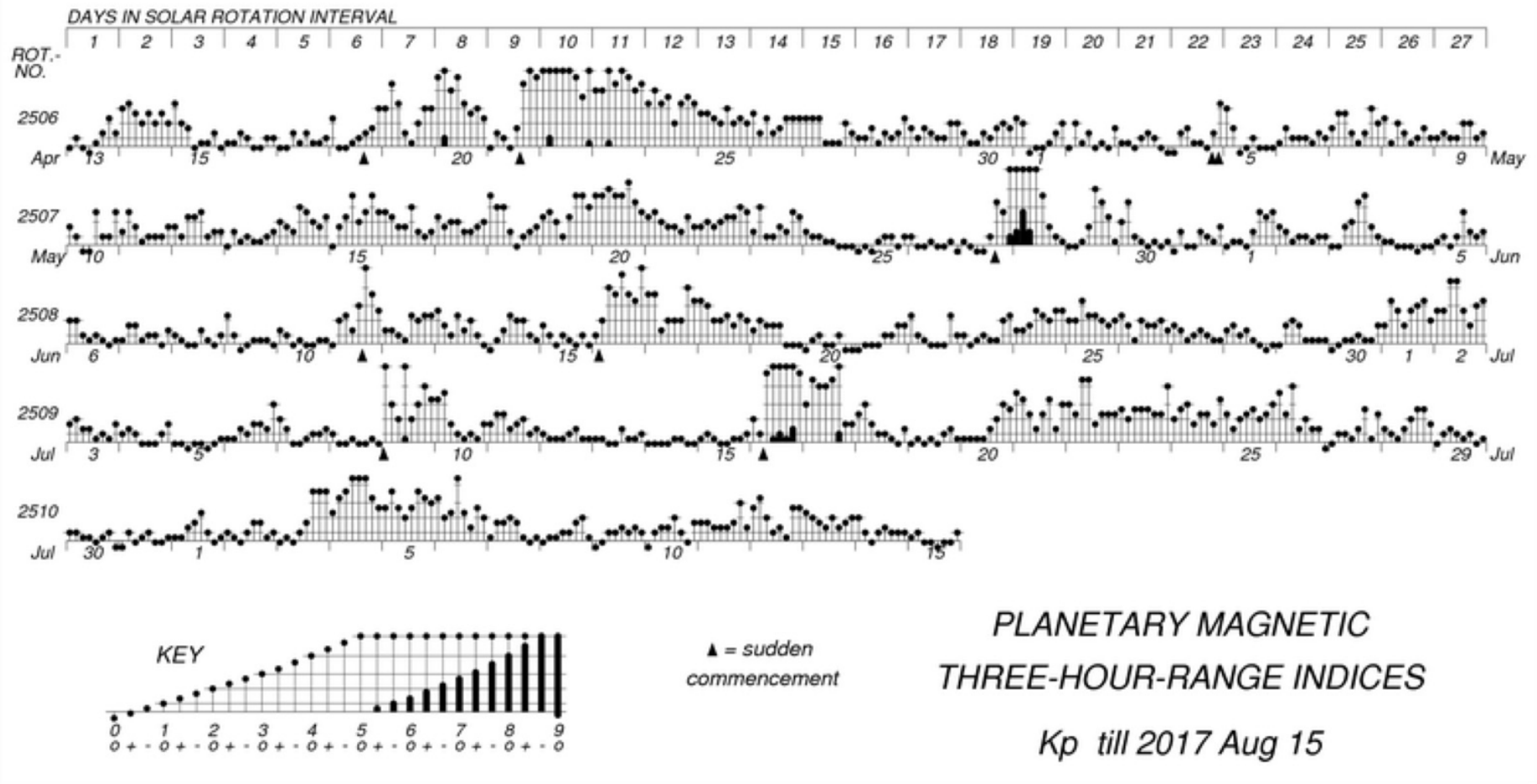
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Current state of the Kp index: Report to the IAGA V-DAT Business Meeting

Jürgen Matzka

GFZ German Research Centre for Geosciences

Current state of the Kp index

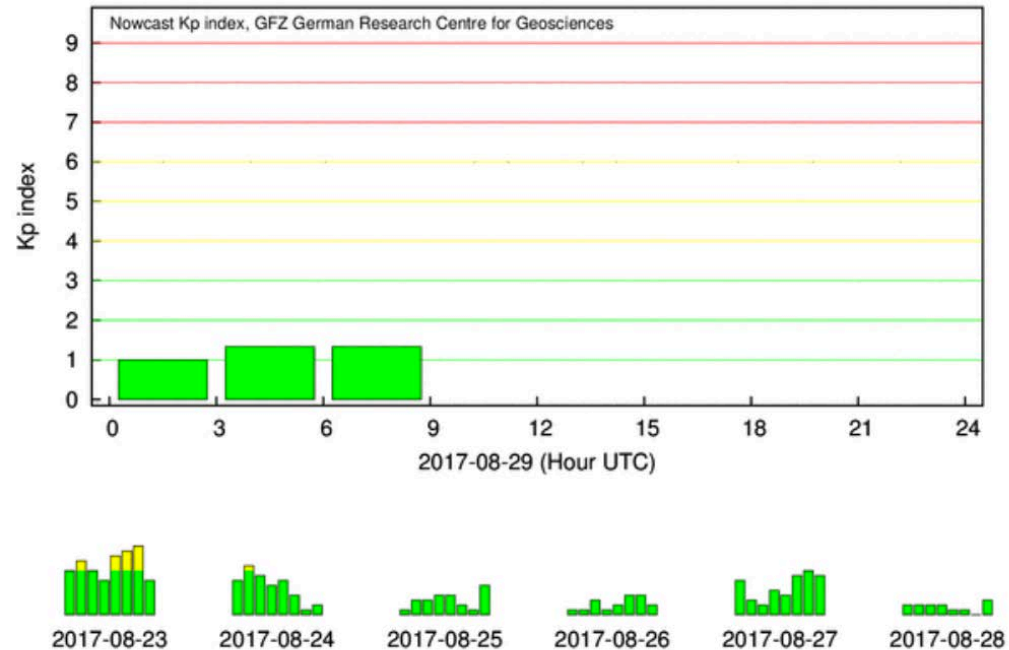
Production, archiving and dissemination is normal for all products: Kp, ap, Ap, Cp, C9, Q-days, D-days

Redistribution of F10.7 (Ottawa) discontinued in 2007.

Redistribution of sunspot numbers (Brussels) discontinued in 2015 (after they got revised).

We recently introduced CC BY 4.0 licence.

We will introduce DOIs.



Kp index data from this website is distributed under the Creative Commons Attribution 4.0 International ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/))





- Main properties of the licence:

You are free to:

Share — copy and redistribute the material in any medium or format

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

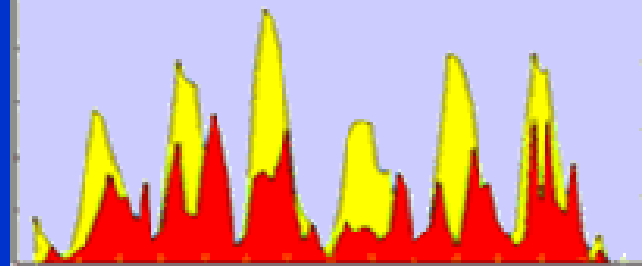
No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.

- In close cooperation with the contributing observatories.
- We will inform the community and the major redistributors (ISGI, Kyoto, Boulder) about the licence.
- Encourage use of licences for other geomagnetic data products.

Current state of the Kp index – introduction of DOIs

- DOIs will be introduced.
- To satisfy data reproducibility, a new DOI will have to be given to any revision of any data-set linked to a DOI.
- Historically, revisions of Kp values have been very rare.

Nevertheless, we currently review our internal procedures to avoid future revisions whenever possible.



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International Service of Geomagnetic Indices



Activities are going-on in a smooth and regular way thanks to:

- the efficient work achieved by the 6 ISGI-Collaborating Institutes (CIs) and
- the active communication between ISGI-CIs and ISGI headquarters.

(current status of actions is not detailed here as there is a talk in session JA2 and plenty of important topics to deal with in BM V-DAT)



Ecole et Observatoire
des Sciences de la Terre

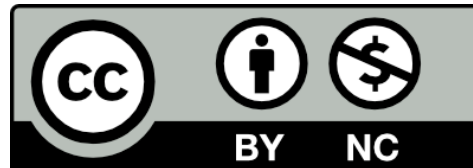
One of the 6 ISGI-CIs.

It is in charge of *aa*, *am* and *CKdays* calculation and it hosts ISGI headquarters since end 2014.

aa, CKdays and am indices

- Quicklook (Q) & Provisional (P) data are calculated in an automated way;
- Definitive (D) are calculated from definitive K indices provided by geomagnetic observatories.

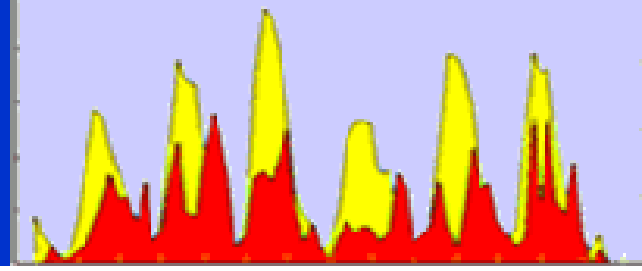
→ **CC BY-NC Licenses**



→ **DOI in-progress**

NOTE: possible closure of USGS magnetic observatories (FRD, NEW, TUC, ...)

→ possible huge discontinuity in *am* (2 sectors impacted over 5 in Northern hemisphere)



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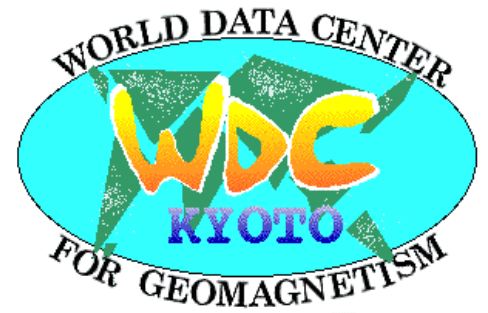
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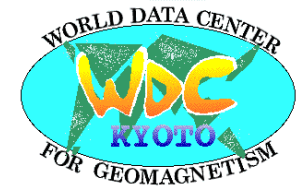


Status report of Dst and AE indices

M. Nosé

World Data Center for Geomagnetism, Kyoto

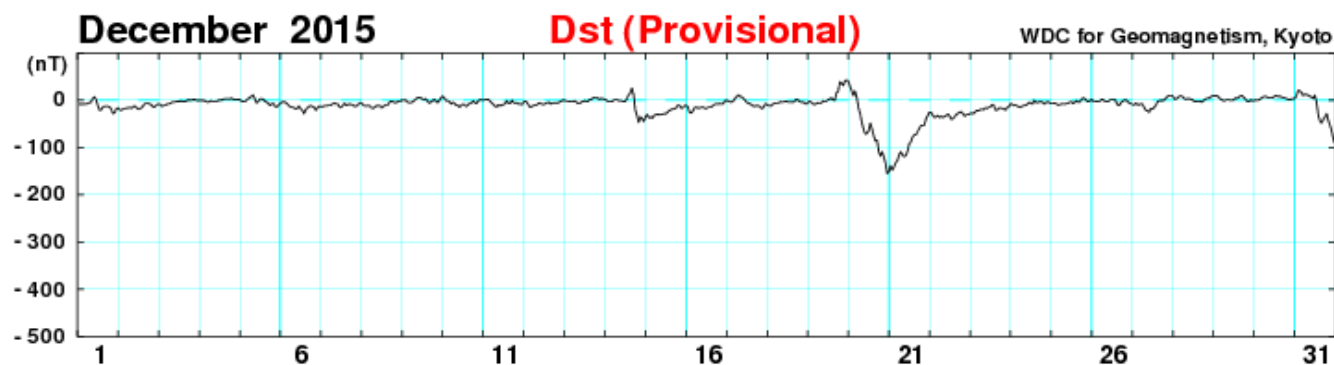
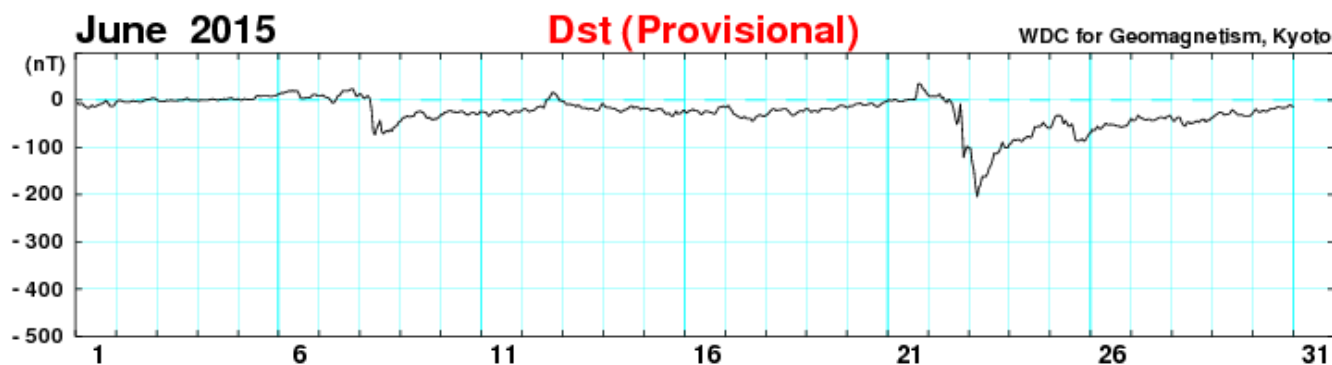
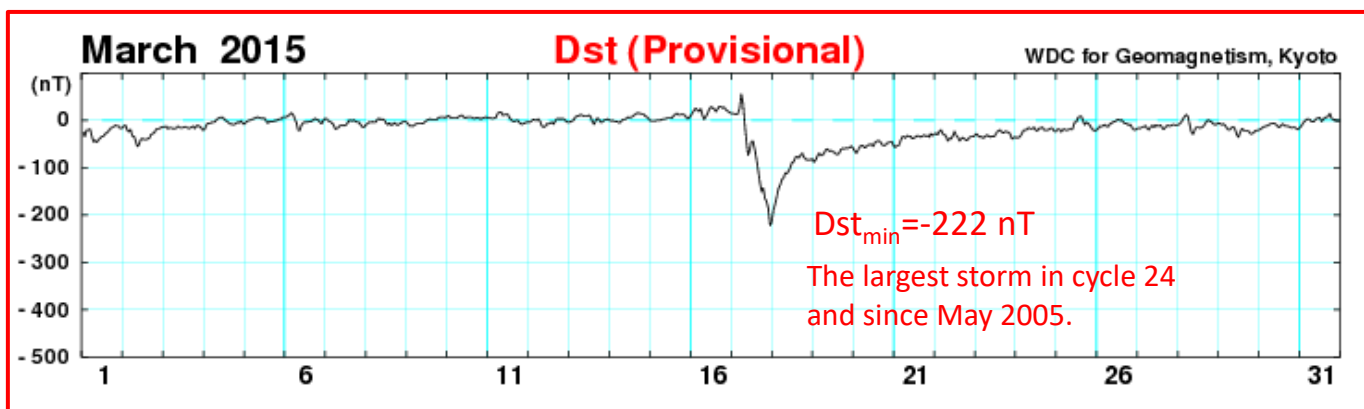
Current status of Dst index derivation (as of August 2017)



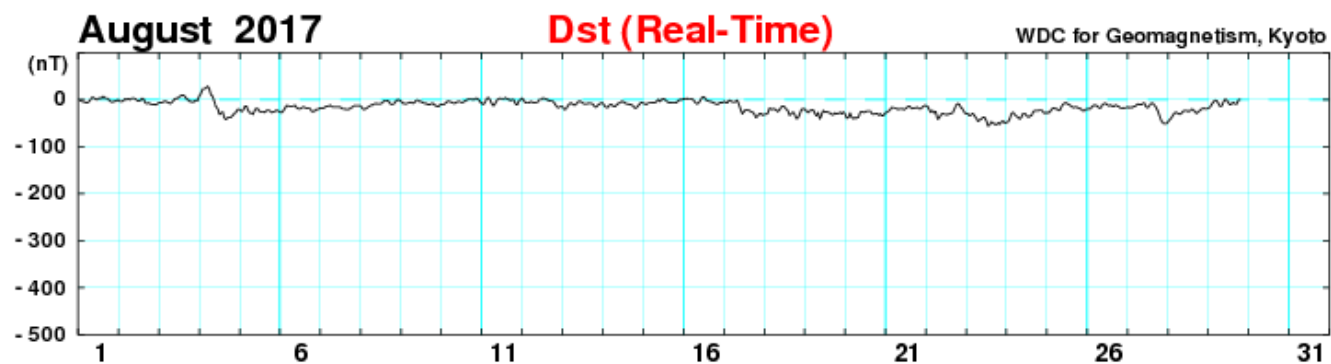
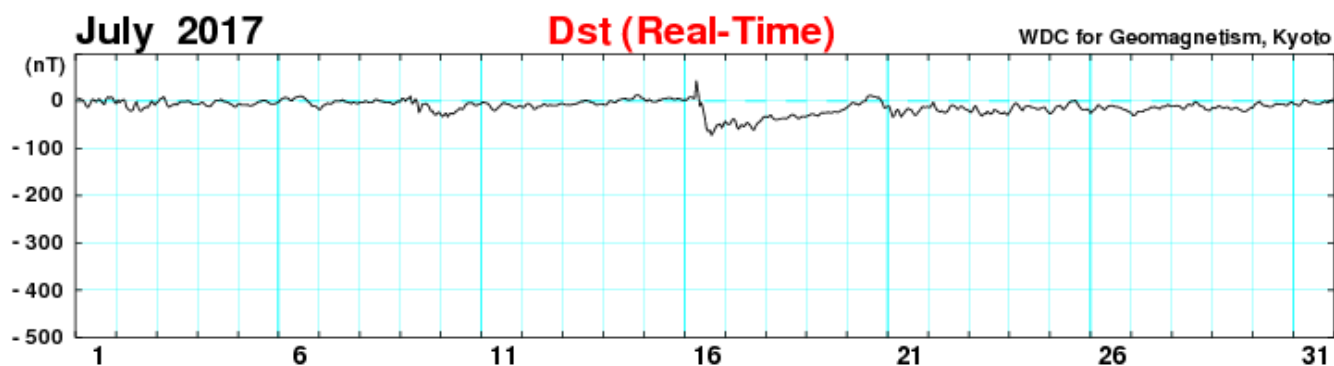
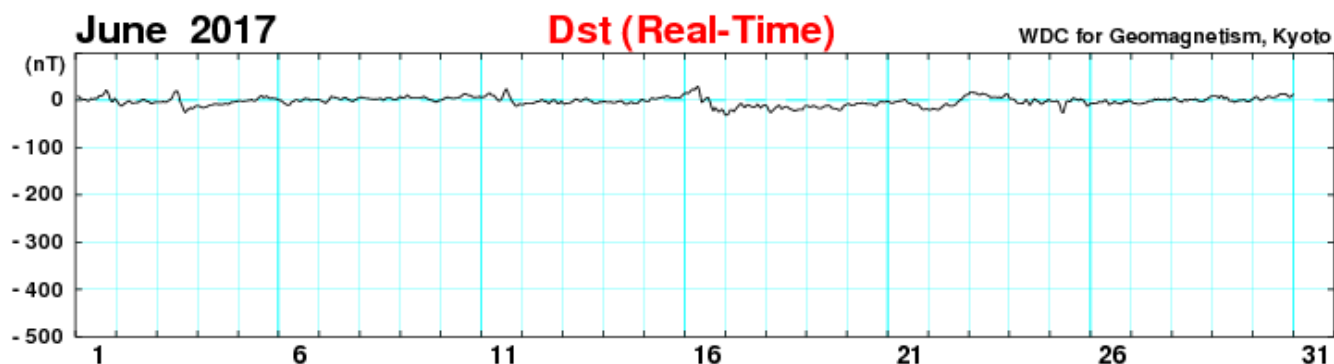
	Final	Provisional	Real-time
~2003	Done	←	
2004-2013	Done	←	←
2014		Done	←
2015		Done	←
2016			Done
2017/01-08			Done

- ✓ The Dst index is derived by cooperation with the following 4 stations.
 - ✓ Kakioka [JMA, Japan]
 - ✓ Honolulu and San Juan [USGS, USA]
 - ✓ Hermanus [SANS, South Africa]
- ✓ Final Dst for 2014 and 2015 will become available soon.
- ✓ Digital data and plots are now available from the WWW page.
<http://wdc.kugi.kyoto-u.ac.jp/dstdir/index.html>
- ✓ DOI is introduced. (doi:10.17593/14515-74000)

Provisional Dst index



Real-time Dst index



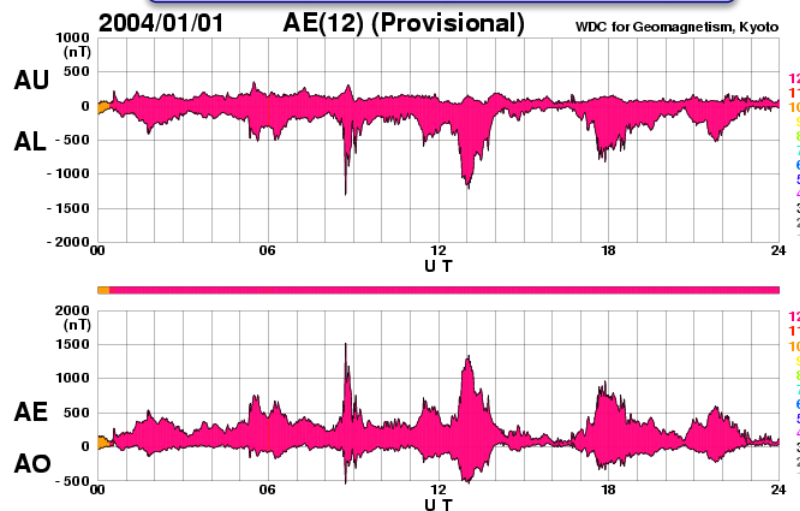
Current status of AE index derivation (as of August 2017)

	Final	Provisional	Real-time
1978-1995	Done as final (or provisional)		
1996-2016	Done as provisional (mostly final)		←
2017/01-2017/06	Done as provisional (mostly final)		←
2017/07-2017/08			Done

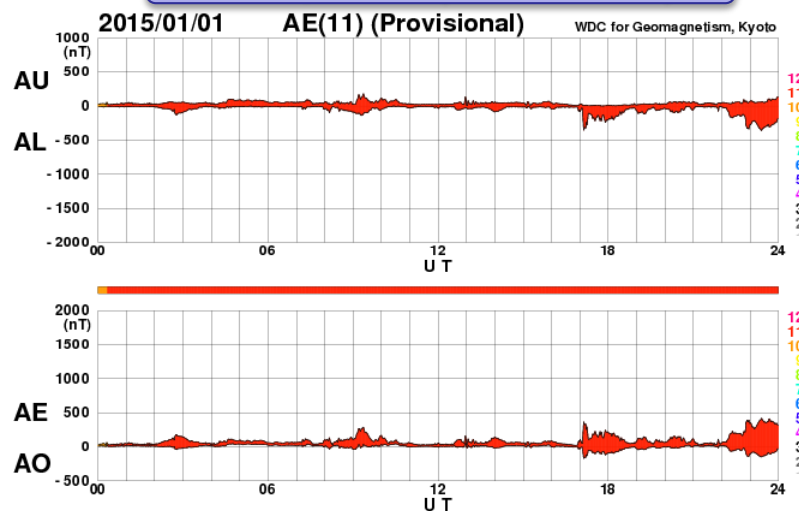
- ✓ The AE index is derived by cooperation with the following 12 stations.
 - ✓ Abisko [SGU, Sweden]
 - ✓ Dixon, Cape Chelyuskin, Tixie, Pebek, [AARI, Russia]
 - ✓ Barrow, College [USGS, USA]
 - ✓ Yellowknife, Fort Churchill, Sanikiluaq [CGS, Canada]
 - ✓ Narsarsuaq [DTU Space, Denmark]
 - ✓ Leirvogur [U. Iceland, Iceland]
- ✓ Provisional AE index for 1996-2017 is derived from data of less than 12 stations (mostly 8-12 stations).
- ✓ Digital data and plots are now available from the WWW page.
<http://wdc.kugi.kyoto-u.ac.jp/aedir/index.html>
- ✓ DOI is introduced. (doi:10.17593/15031-54800)

Provisional AE index

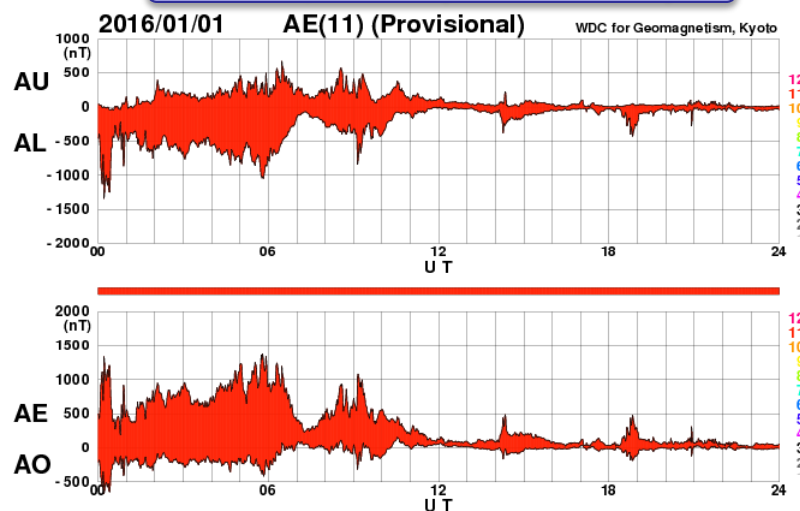
Jan 1, 2004 (12 stations)



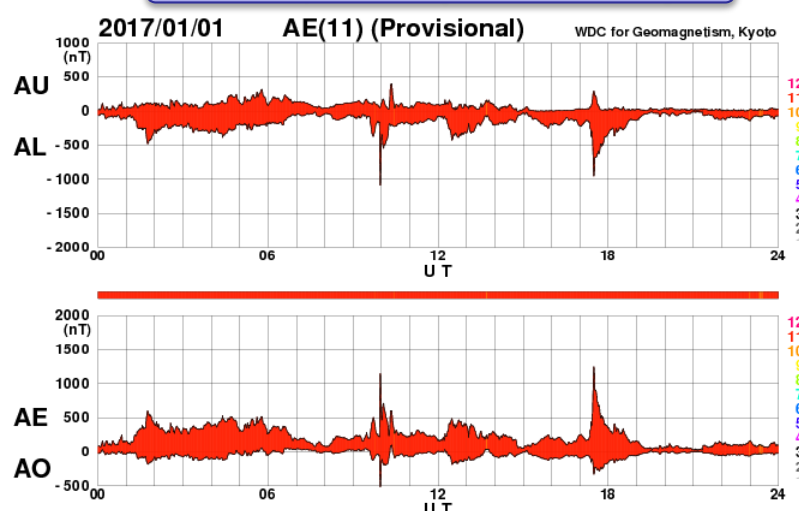
Jan 1, 2015 (11 stations)



Jan 1, 2016 (11 stations)

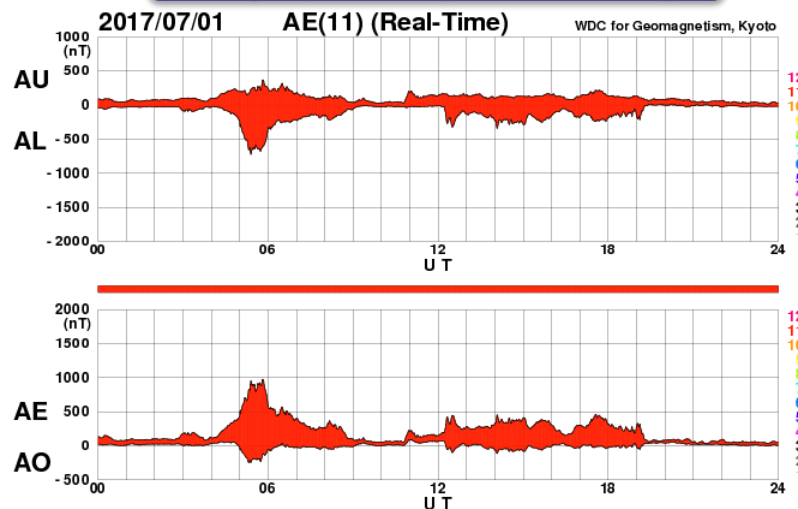


Jan 1, 2017 (11 stations)

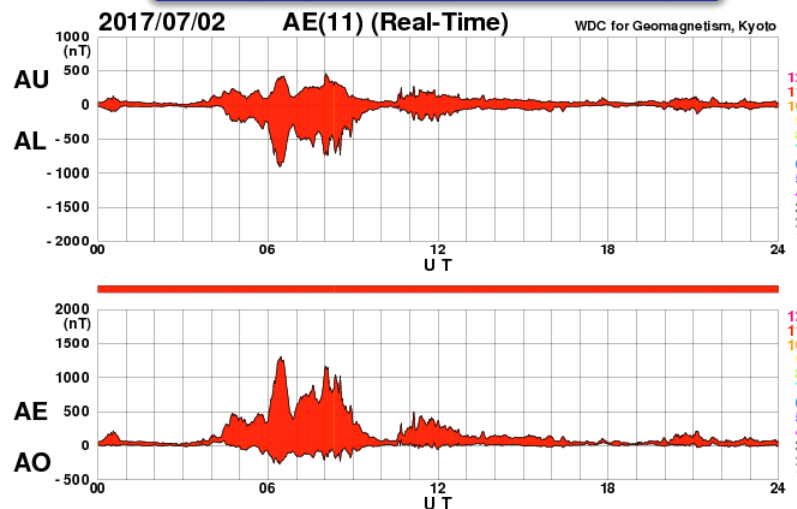


Real-time AE index

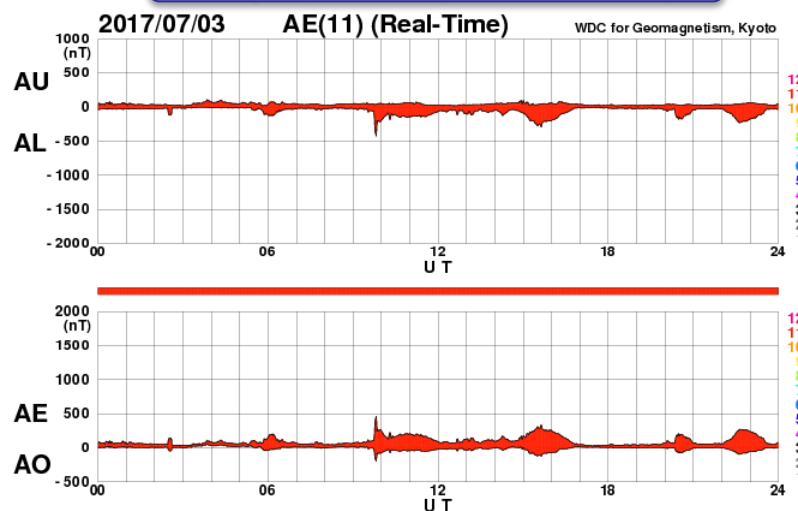
July 1, 2017 (11 stations)



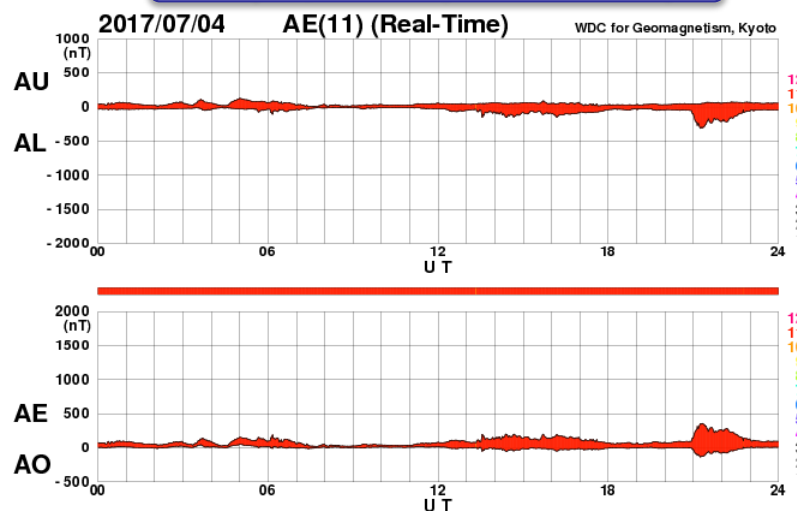
July 2, 2017 (11 stations)



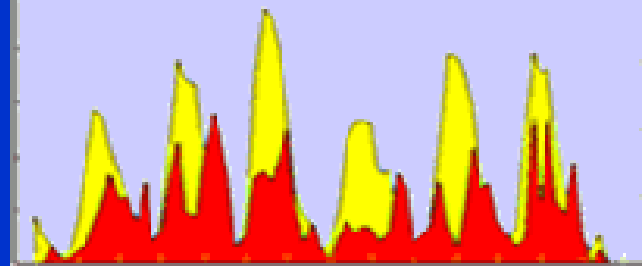
July 3, 2017 (11 stations)



July 4, 2017 (11 stations)



Working Group V-DAT: Geomagnetic Data and Indices



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On the PC (**P**olar **C**ap) index



WDC Geomagnetism Copenhagen is responsible for determination and distribution of the PCN index (PCN is Northern Polar cap index)

Rico Behlke

rico.behlke@space.dtu.dk



Anna Naemi Willer

anna@space.dtu.dk

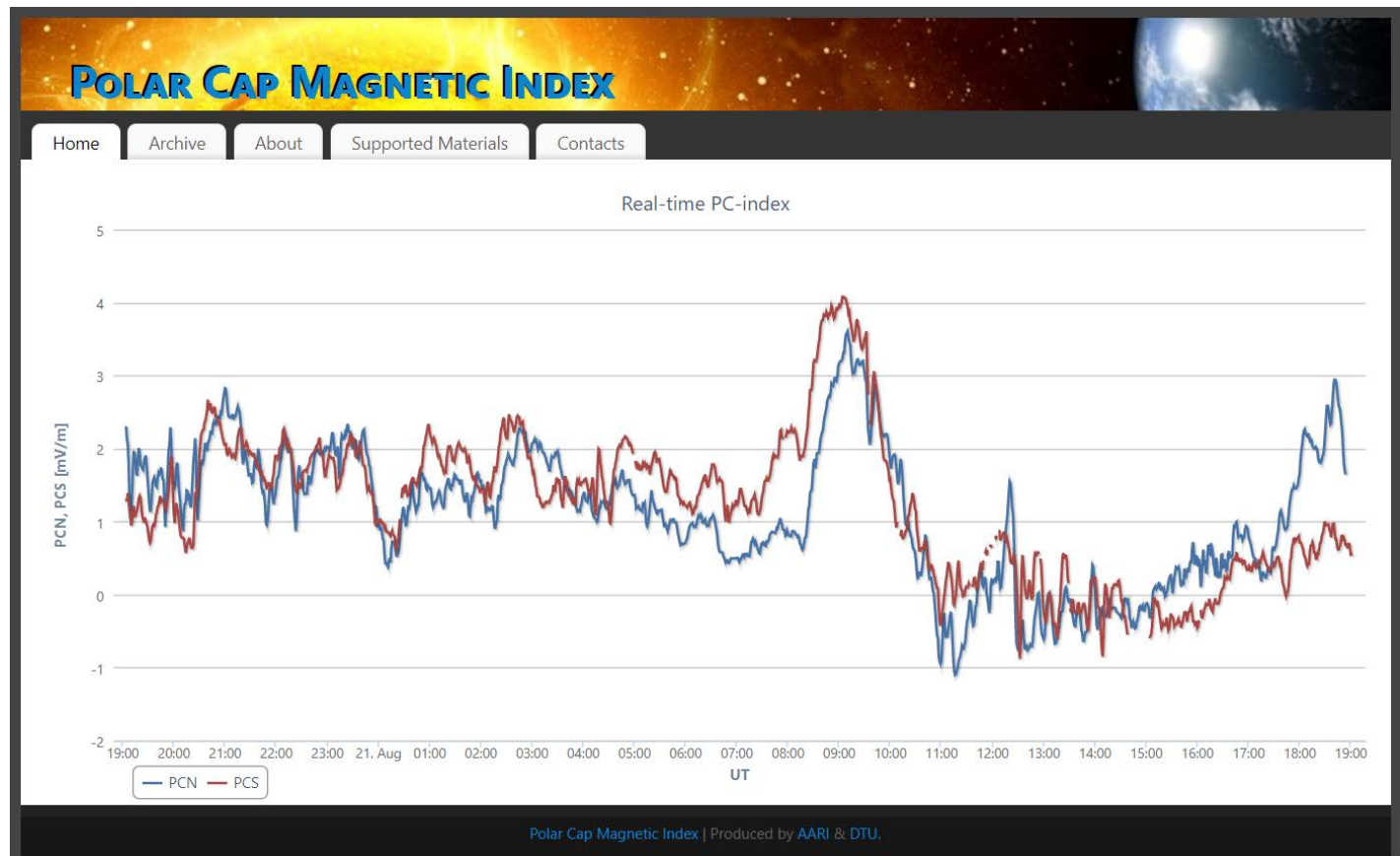


Slides kindly presented by Aude Chambodut

PC index - status

- PCN and PCS indices are routinely determined in collaboration between **DTU** and **AARI** using the algorithm endorsed by IAGA in 2013
- Documentation, data, prototype programs, and quick-look (QL) time plots are available at pcindex.org and at WDC Geomagnetism Copenhagen

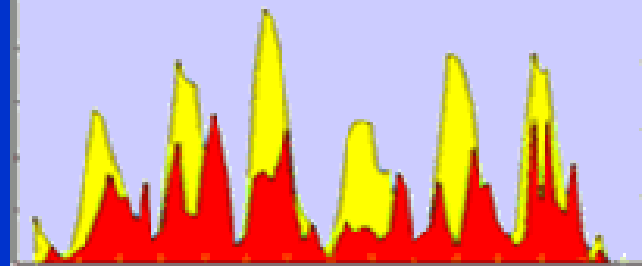
http://www.space.dtu.dk/English/Research/Scientific_data_and_models/World_Data_Center_for_Geomagnetism.aspx



PCN index – plans for near future



- DTU Space is working on
 - enhancing the presentation of the PCN index on the WDC homepage (in particular regarding quasi-definitive (QD) and definitive (D) data) in order to achieve consistency with other geomagnetic indices and to avoid confusion amongst the users regarding index level (QL, QD or D). The quick-look (QL) version of PCN (and PCS) is expected to continue to be provided through pcindex.org
 - establishing a new observatory at Thule Air Base located nearby Qaanaaq (THL), to ensure long term data record (in a few years the present Qaanaaq observatory will likely be magnetically disturbed due to near-by houses and ongoing construction)
 - obtaining a DOI and a license (probably Creative Commons) for the PCN index



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Report of the International Service of Rapid Magnetic Variations

J.J. Curto, L.F. Alberca

SC



- IAGA bulletins in ISGI:
- 2013.....17 events reported (8 SSC / 9 SI)
- 2014.....23 events reported (10 SSC / 13 SI)
- 2015.....17 events reported (13 SSC / 4 SI)
- 2016..... 6 events reported (6 SSC / 0 SI)
- Recovery of the original data of SC (amplitudes, rise times) from the 5 latitude observatories (1968-2017).
- We still use the manual method.
- Automatic method start-up time (1).

(1) Segarra, A., Curto, J.J., Automatic Detection of Sudden Commencements using Neural Networks, Earth Planets Space, vol. 65 no. 7 pp. 791-797, doi:10.5047/eps.2012.12.011, 2013.

SC 2016_Automatic detection_v2.txt

SC 2016

CONTRIBUTING OBSERVATORIES

SOD NUR LER ESK WNG NGK VAL HAD DOU BDV HRB NAG GCK MMB EBR SPT KAK KNY

GUI HYB GNG CNB LIV

YYYY	MM	dd	hh	min	Rise-time	Amplitude (nT)	Qualification	Observatories	Type	Automatic Detection
2016	01	18	21	57	7 7 5 8 5	16.8 13.5 19.1 15.2 10.9	2 2 2 2 2	HON SJG MBO HYB KNY	SSC	Y Y Y Y -
2016	03	14	17	14	6 7 6 7 6	8.6 9.8 13.9 15.2 13.8	0 0 2 2 2	HON SJG MBO ABG KNY	SSC	Y Y Y Y Y
2016	04	14	07	35	6 5 6 6 5	10.2 8.1 9.1 12.3 9.4	1 0 0 1 1	HON SJG MBO ABG KNY	SSC	Y Y Y Y Y
2016	07	19	23	51	4 4 4 5 4	37.2 35.2 56.0 39.3 32.9	2 2 2 2 2	HON SJG MBO HYB KNY	SSC	Y Y Y Y Y
2016	10	12	22	12	6 5 6 9 4	16.6 25.5 25.2 21.7 15.0	2 2 2 2 2	HON SJG MBO ABG KNY	SSC	Y Y Y Y Y
2016	11	09	06	43	5 6 6 6 6	9.7 8.6 13.0 17.4 13.6	0 0 2 2 2	HON SJG MBO ABG KNY	SSC	Y - Y Y Y

False positives

YYYY	MM	dd	hh	min	Rise-time	Amplitude (nT)	Qualification	Observatories	Type	Automatic Detection
2016	03	11	05	32	6 7 7 7 6	10.9 11.8 13.1 26.6 20.8	- - - - -	HON SJG MBO ABG KNY	---	Y Y Y Y Y

Sfe

- IAGA bulletins in ISGI:
- 2013.....27 events reported (6-1class, 16-2class, 5-3class)
- 2014.....31 events reported (10-1class, 20-2class, 1-3class)
- 2015.....20 events reported (7-1class, 11-2class, 2-3class)
- 2016..... 4 events reported 1-1class, 3-2class, 0-3class)
- We still use the manual method
- Promising results with an automatic method (1,2)
- Use of complementary information (AATR index)(Along Arc TEC Rate)

(1) Curto, J. J., Marsal, S., Creci, G., Domingo, G., Automatic detection of Sfe, a chimera? XVII IAGA Workshop on Geomagnetic Observatory instruments, data acquisition and processing, Dourbes (Belgium) [4-10 September 2016].

(2) Curto, J.J., Marsal, S., Creci, G., Domingo, G., Automatic detection of Sfe: a proposal", Annales Geophysicae, 35, 799-804, doi.org/10.5194/angeo-35-799-201, 2017.

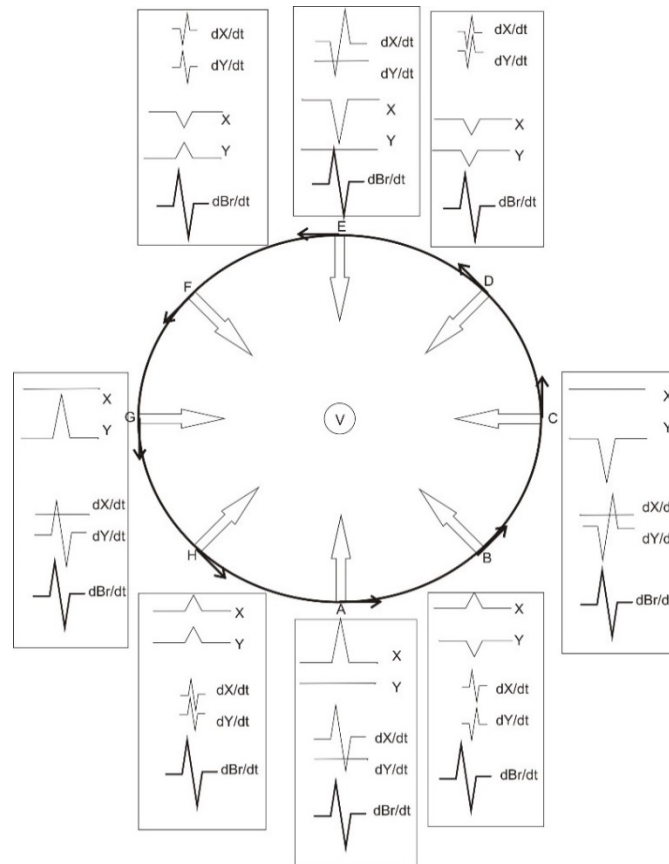
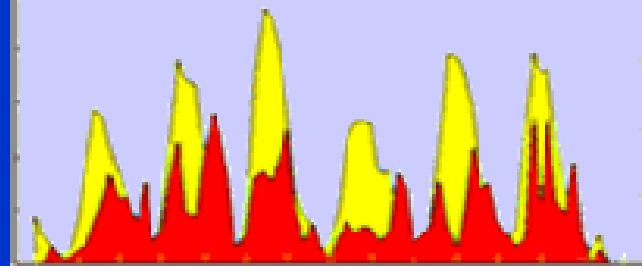


Figure: Sfe signatures of observatories under the electric current loop are very different depending on their location with respect to the vortex. However, after the coordinate transformation, the derivatives of the radial component of the Sfe vectors, Br , at different points of the circle (A-H) become coherent.

Future

- Automatic detection
- Integration of Magnetic Events in EPOS project (European Plate Observing System)
- Licensing (CC ?) (Creative Commons)
- Citation (DOI) (Digital Object Identifier)



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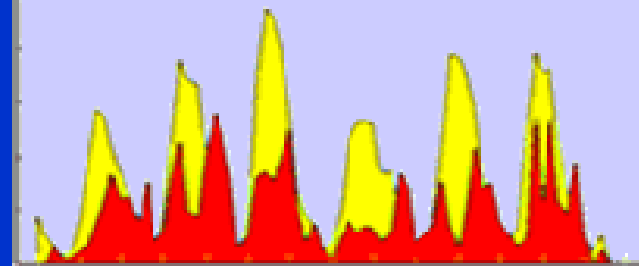
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Working Group V-DAT: Geomagnetic Data and Indices



2. Reports - Petition letter for USGS

- In response to the proposed cuts of USGS funds, a petition letter has been sent from the WG V-DAT of IAGA to the USGS director/deputy director and two Representatives.



World Data Center for Geomagnetism, Kyoto
Data Analysis Center for Geomagnetism and Space Magnetism
Graduate School of Science, Kyoto University
Bldg. 1, Room 555, Ohwake-cho, Kitashirakawa, Sakyo-ku
Kyoto 606-8502, JAPAN
Tel: +81-75-753-3959 Fax: +81-75-722-7884
E-mail: nose@kugi.kyoto-u.ac.jp

June 22, 2017

Dr. Dave Applegate,
Acting Deputy Director of the United States Geological Survey


Dear Sir,

I am writing on behalf of Working Group DAT of Division V (WG V-DAT) of the International Association of Geomagnetism and Aeronomy (IAGA), to urge the US authorities to rethink the 2018 Presidential Budget that eliminates the USGS Geomagnetism Program, a component of the multi-agency U.S. National Space Weather Program. This proposed budget change is very likely to result in the termination of all operations at the USGS magnetic observatories. The closure of the USGS magnetic observatories will also terminate international collaboration in the exchange of geomagnetic field data that has lasted for more than 60 years. It will also inflict serious damage on the availability of geomagnetic information that aids the oil drilling services industry, the geophysical surveying industry, space weather agencies, and electricity transmission utilities in both the U.S. and other countries.

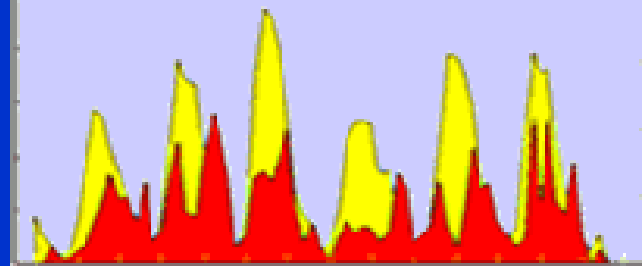
IAGA WG V-DAT has been working on quality standards for indices of magnetic activity, which are essential for space weather nowcasts and forecasts. The USGS magnetic observatory network provides key data that enables us to compute the Kp index, the AE (Auroral Electrojet) index, the Dst (Disturbance storm time) index and the am index. These indices are widely used by United States and international space weather agencies and by a large number of space scientists throughout the world. Continuation of these indices is a matter of the utmost importance.

Therefore, the WG V-DAT strongly petitions you to reconsider the proposed elimination of the budget of the USGS Geomagnetism Program.

Yours sincerely,



Masahito Noé
Chair of the WG V-DAT of IAGA



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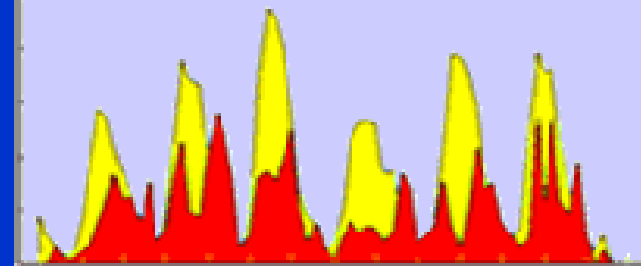
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Working Group V-DAT: Geomagnetic Data and Indices



2. Reports - Update of WG V-DAT web site

- Since the last major update of the WG V-DAT web site in 2007, some information becomes out-of-date.
- The web site was updated during 2016.
- Minutes of business meetings and topical sessions organized by V-DAT are also available.
- <https://www.ngdc.noaa.gov/IAGA/vdat/>

International Association of Geomagnetism & Aeronomy

International Union of Geodesy & Geophysics

Working Group V-DAT:
Geomagnetic Data and Indices

IUGG > IAGA > Division V > Working Group V-DAT

Privacy Policy

Home Page of IAGA Working Group V-DAT

[Minutes of Business Meetings](#) [IAGA Resolutions](#) [Topical Sessions organized at IAGA Scientific Assemblies](#)

This webpage provides information about the activities of the Working Group DAT of Division V (WG V-DAT) of the International Association of Geomagnetism and Aeronomy ([IAGA Div. V](#)). At the XXIII General Assembly of the International Union of Geodesy and Geophysics (IUGG) held at Sapporo, Japan from 30 June to 11 July, 2003, the Division V of IAGA was re-organized, and the current WG V-DAT, dealing with Geomagnetic data and indices, represents the former Working Group V-2. This working group defines formats for data exchange and sets quality standards for indices of magnetic activity. WG V-DAT encourages free exchange of scientific information. Your comments are welcome.

Data Exchange Format
[IAGA2002](#) is the latest format for observatory ASCII data dissemination. This format was originally released in August 2001, followed by modification in December 2001, July 2003, and August 2011. Detailed description of the IAGA2002 format is found [here](#).

Access to data from geomagnetic observatories

- [Kyoto, Japan](#)
- [Edinburgh, UK](#)
- [Mumbai, India](#)

The International Real Time Magnetic Observatory Network ([INTERMAGNET](#)) programme exists to establish a global network of cooperating digital magnetic observatories, adopting modern standard specifications for measuring and recording equipment, in order to facilitate data exchanges and the production of geomagnetic products in near real time. [WG V-QBS](#) coordinates issues related to the operation of geomagnetic observatories.

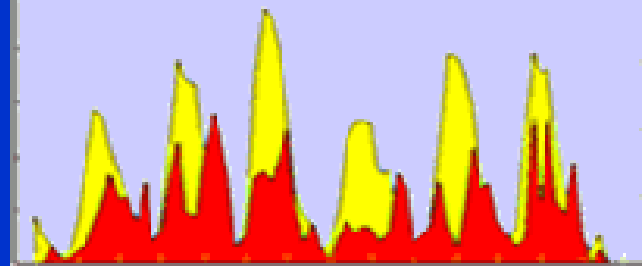
Information on ground, marine and airborne magnetic data and indices are available from the National Centers for Environmental Information ([NCEI](#)). The Space Physics Interactive Data Resource ([SPIDR](#)) offers geomagnetic data and indices and the ground based magnetometers service. Ground-based magnetometer data from stations providing absolute measurements as well as stations providing variation measurements are available from [SuperMAG](#).

Geomagnetic data is also available from the World Data Centers for Solar Terrestrial Physics in [Russia](#) and [China](#)

Old magnetograms that are converted to digital images, as part of ICSU supported project "Rescue of old Analogue Magnetograms by converting to Digital Images", are available for download from [Kyoto, Japan](#) or [Moscow, Russia](#). Additionally, scanned magnetograms going back to the 1840s are available from [Edinburgh, UK](#).

Geomagnetic Indices and Event Lists

There are numerous indices of geomagnetic activity. The International Association of Geomagnetism and Aeronomy ([IAGA](#)) officially recognizes magnetic indices: aa, am, kn, Dst, AE, and PC. IAGA also endorses lists of remarkable geomagnetic events such as SSC, SFE, and international quietest (Q-Days).



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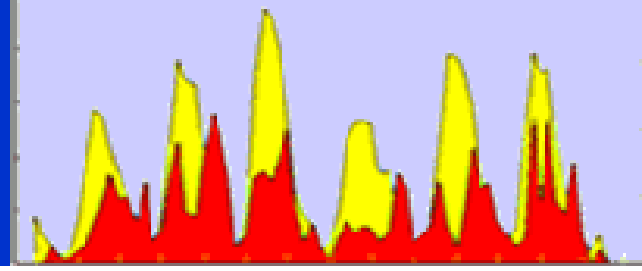
- Petition letter for USGS
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3. Data DOI Task Force

4. Data licensing

5. Sessions for IAGA 2019

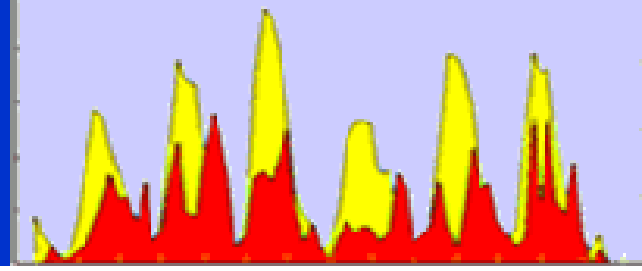
6. Any other businesses



3. Data DOI Task Force

- This Task Force was established at the Business Meeting in Merida in August 2013 to discuss **issues related to the DOI-minting to the geomagnetic data products** and to share the results of discussion with the WG V-DAT members.
- After a preliminary discussion by the original members for 2 years, the TF was reorganized with new members and continued the activity.
 - Masahito Nosé, Susan Macmillan, Erin Rigler, Manoj Nair, Brian Meyer, Aude Chambodut, Ellen Clarke, Kusumita Arora, Bhaskara Veenadhari, Renata Lukianova, Simon Flower, Jürgen Matzka, Gerhard Schwarz, Alena Rybkina, Vincent Lesur, Kirsten Elger, Heather McCreadie, Anatoly Soloviev (18 members)
- The TF made a survey about present status of DOI-minting to geomagnetic data or indices. Survey results are compiled in a report.

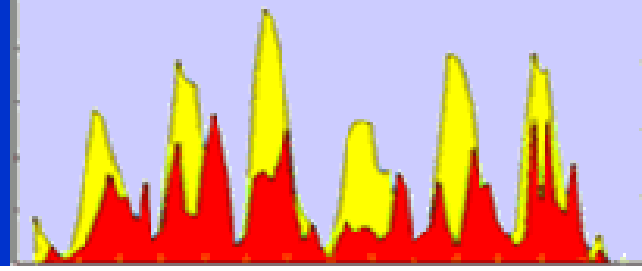
Working Group V-DAT: Geomagnetic Data and Indices



TF Report on

“Present Status of DOI-minting to Geomagnetic Data/Indices”

- **France** --- One single DOI ([doi:10.18715/BCMT.MAG.DEF](https://doi.org/10.18715/BCMT.MAG.DEF)) has been set for all definitive data derived from the BCMT observatories.
- **Germany** --- Research data repository of GFZ Data Services publishes DOI-referenced datasets. Preliminary hourly mean values from Geomagnetic Observatory St. Helena are published with [doi:10.5880/GFZ.2.3.2016.001](https://doi.org/10.5880/GFZ.2.3.2016.001).
- **Japan** --- DOIs are mint to the Dst index ([doi:10.17593/14515-74000](https://doi.org/10.17593/14515-74000)), the AE index ([doi:10.17593/15031-54800](https://doi.org/10.17593/15031-54800)), and induction magnetometer data at Muroto, Japan ([doi:10.17593/13882-05900](https://doi.org/10.17593/13882-05900)).
- **Russia** --- Database on historical recordings from 22 observatories in USSR/Russia over 1983-2009 and database on continuous recordings from 2 observatories are published with DOIs (e.g., [doi:10.2205/Mag-VOS-minute-values](https://doi.org/10.2205/Mag-VOS-minute-values), [doi:10.2205/SPG2012](https://doi.org/10.2205/SPG2012)).
- **ISGI, Russian-Ukrainian Geomagnetic Data Center** --- DOIs for data repository.
- [The report is available from the V-DAT homepage. https://www.ngdc.noaa.gov/IAGA/vdat/](https://www.ngdc.noaa.gov/IAGA/vdat/)
- DOI session --- JA2 13:30-15:15 on Thursday, Room 2.61-2.63



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Licensing in INTERMAGNET and the World Data Centres

Simon Flower

Simon Flower, INTERMAGNET Operations Committee Chair



Current INTERMAGNET license

Conditions of Use

The member institutes of INTERMAGNET invest considerable resources to operate their magnetic observatories to INTERMAGNET standards. It is important that the institutes producing the data have a measure of the scientific return on their investment. Accordingly, we have the following Conditions of Use.

Conditions of Use for data provided through INTERMAGNET

The data made available through INTERMAGNET are provided for your use and are not for commercial use or sale or distribution to third parties without the written permission of the institute operating the observatory. Publications making use of the data should include an acknowledgment statement of the form given below. A citation reference should be sent to

the INTERMAGNET

Acknowledgement

We offer two ackn

- Needs updating to reflect current ways of working (e.g. DOIs)
- Difficult to use with agencies such as EPOS
- Not globally recognised
- Not machine readable

ies have been used and it is not practical to list them all, or each of their operating institutes. The second is for cases where research results have been produced using a smaller set of observatories.

Suggested Acknowledgement Text (template 1)

The results presented in this paper rely on data collected at magnetic observatories. We thank the national institutes that support them and INTERMAGNET for promoting high standards of magnetic observatory practice (www.intermagnet.org).

Suggested Acknowledgement Text (template 2)

The results presented in this paper rely on the data collected at **observatory name**. We thank **institute name**, for supporting its operation and INTERMAGNET for promoting high standards of magnetic observatory practice (www.intermagnet.org).



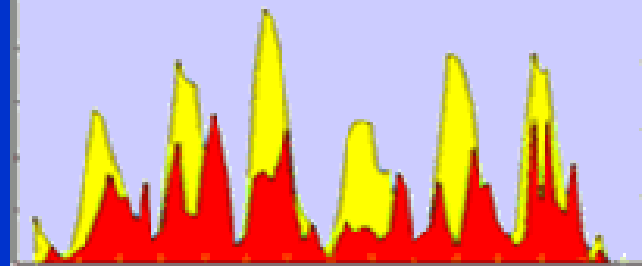
Current WDC license

- Defers to World Data System data policy
- Does not protect against commercial use



Possible licenses

License	Variant	Details
Creative Commons version 4.0		
★	CC BY	Does not protect against commercial use
	CC BY-SA	Mandates that the same license is applied to derived products Does not protect against commercial use
	CC BY-ND	Prevents new products being developed from the original data Does not protect against commercial use
★	CC BY-NC	Allows new products to be developed from the original data Protects against commercial use
	CC BY-NC-SA	Mandates that the same license is applied to derived products Protects against commercial use
	CC BY-NC-ND	Prevents new products being developed from the original data Protects against commercial use
Open Data Commons		
	ODC-BY	Does not protect against commercial use
	ODC-ODbl	Mandates that the same license is applied to derived products Does not protect against commercial use



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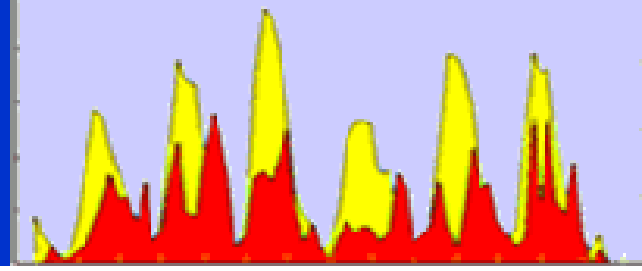
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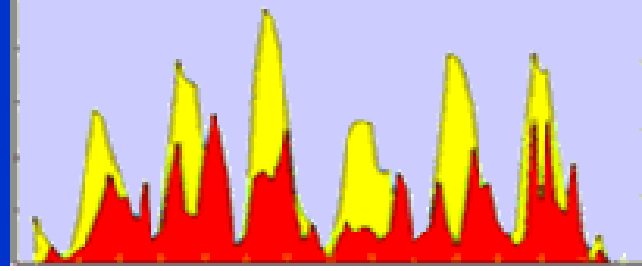
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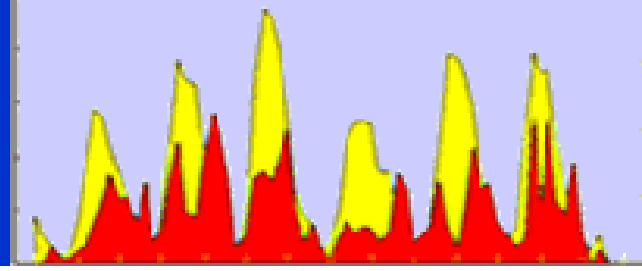
5. Sessions for IAGA 2019 (proposal)

- “Dependable, long-term geomagnetic indices and modern, index-based services: 70th anniversary of the Kp index”
 - The session celebrates 70th anniversary since the first proposal of the Kp index by Bartels in 1949. Also it expects papers discussing how to keep dependable and long-term service of the geomagnetic indices as well as proposing new services.
- “Data licensing, data publication, and data citation of geomagnetic/geophysical data products”
 - In response to recently growing interests in data licensing and data publication (data-DOI), the session expects papers that present practices of data licensing, data publication, and data citation in individual institutes.



5. Sessions for IAGA 2019 (Final)

- “Dependable, long-term geomagnetic indices and modern, index-based services: 70th anniversary of the Kp index” (V-DAT)
 - J. Matzka (Germany), Jeff Love (USA) (tentative), M. Nosé (Japan) (tentative)
 - The session celebrates 70th anniversary since the first proposal of the Kp index by Bartels in 1949. Also it expects papers discussing how to keep dependable and long-term service of the geomagnetic indices as well as proposing new services.
 - derivation and dissemination of geomagnetic indices; use of geomagnetic indices as proxy for energy input from solar wind; use of geomagnetic indices for geomagnetic field modelling data selection; use of geomagnetic indices for driving models (e.g. thermosphere, plasmasphere, magnetosphere); near-real time production and dissemination of geomagnetic indices; geomagnetic indices for space weather services; prediction of geomagnetic indices
- “Data licensing, data producing, data publication, and data citation of geomagnetic/geophysical data products” (Div. V, or inter-division, or inter-discipline)
 - M. Nosé (Japan), S. Flower (UK)
 - In response to recently growing interests in data licensing and data publication (data-DOI), the session expects papers that present practices of data licensing, data publication, and data citation in individual institutes.
- “Geomagnetic observations for space science and space weather applications” (with V-DAT and/or Div. IV and/or Div. V and IAGA Interdivisional Commission on Space Weather and/or WG VI)
 - E. Clarke (UK), P. Kotze/S. Lotz (RSA) (tentative)



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