

Magnetic Data at WDC Kyoto—Services Under International Collaborations

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BIENVENIDA
TERVETULOA
ROM
TALOFA
WELKOMMEN
ISTEN HOZTA!
VÍTEJTE



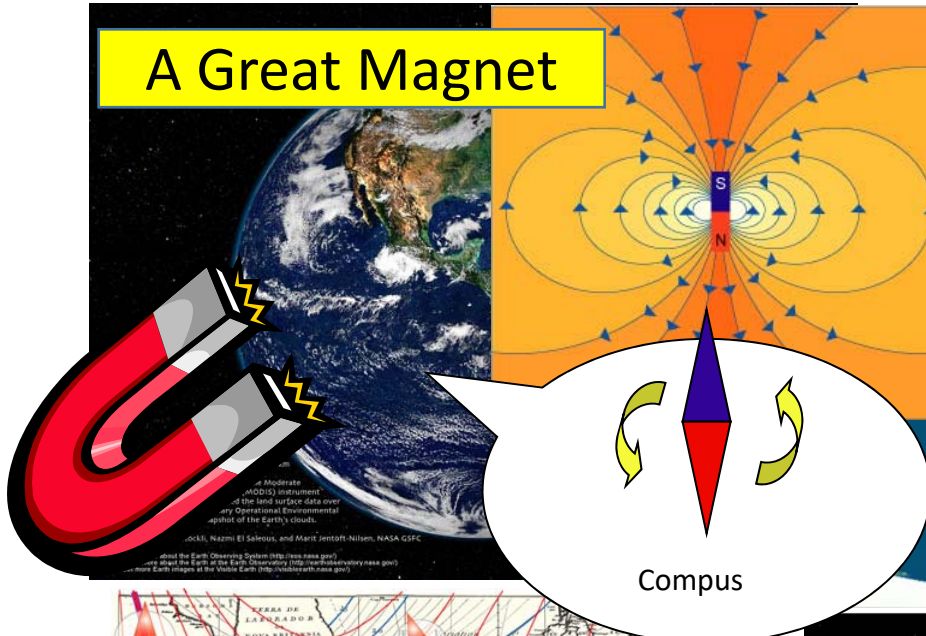
WELCOME
Добро
пожаловать

WILLKOMMEN
NAMASKAR
VÍTAJTE
BEM VINDO
歡迎
WITAMY
KINH CHAO
አንኳን ደህና ወለዎ!
VÄLKOMMEN
BIENVENUE

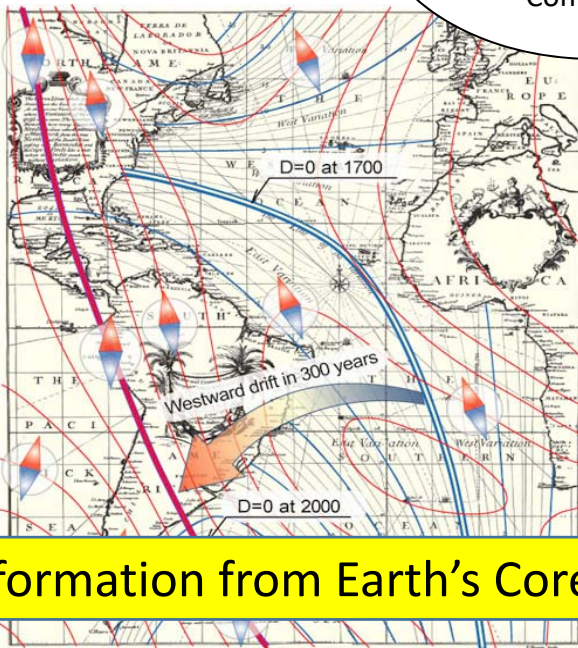
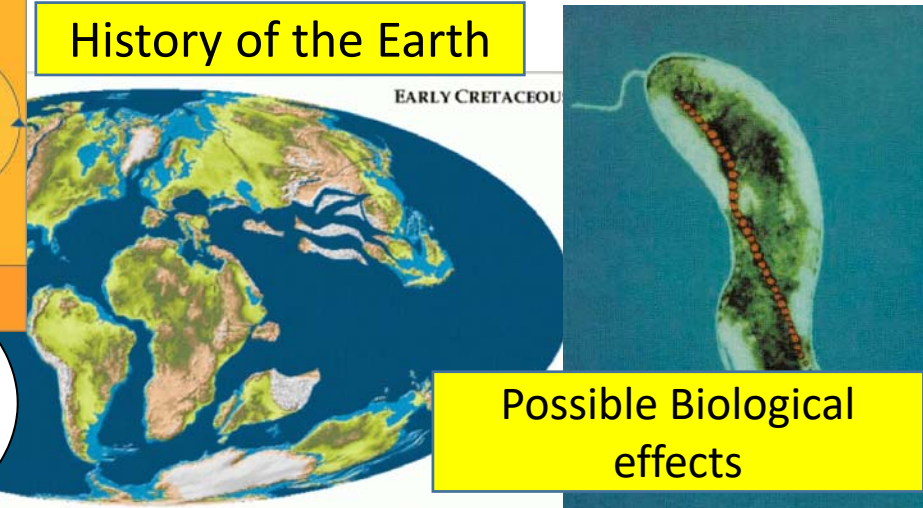


Geomagnetic Data - One of the basic parameters in Geoscience

A Great Magnet

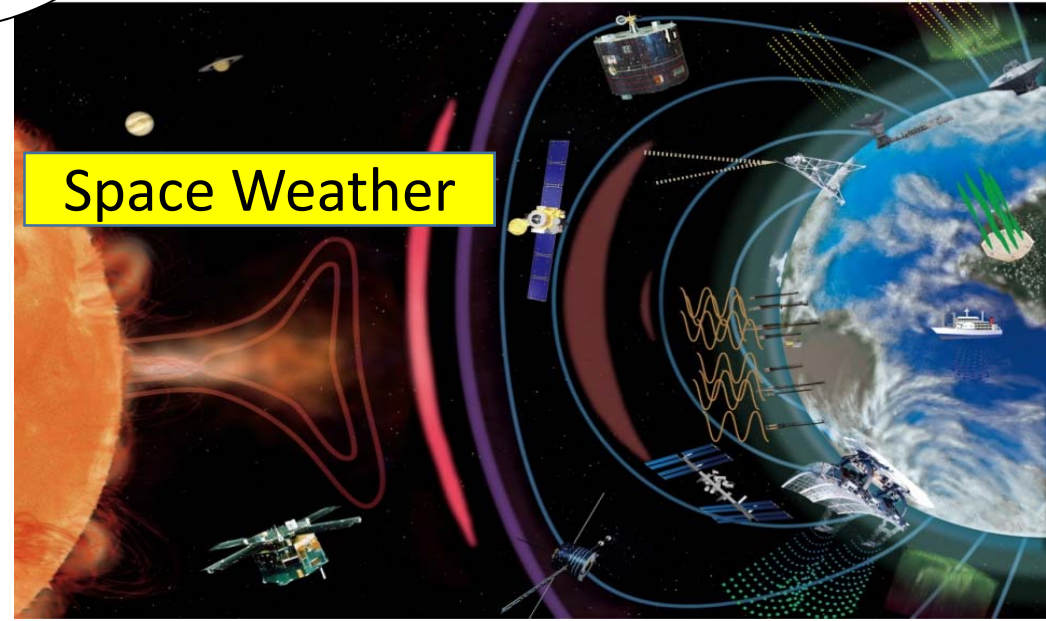


History of the Earth

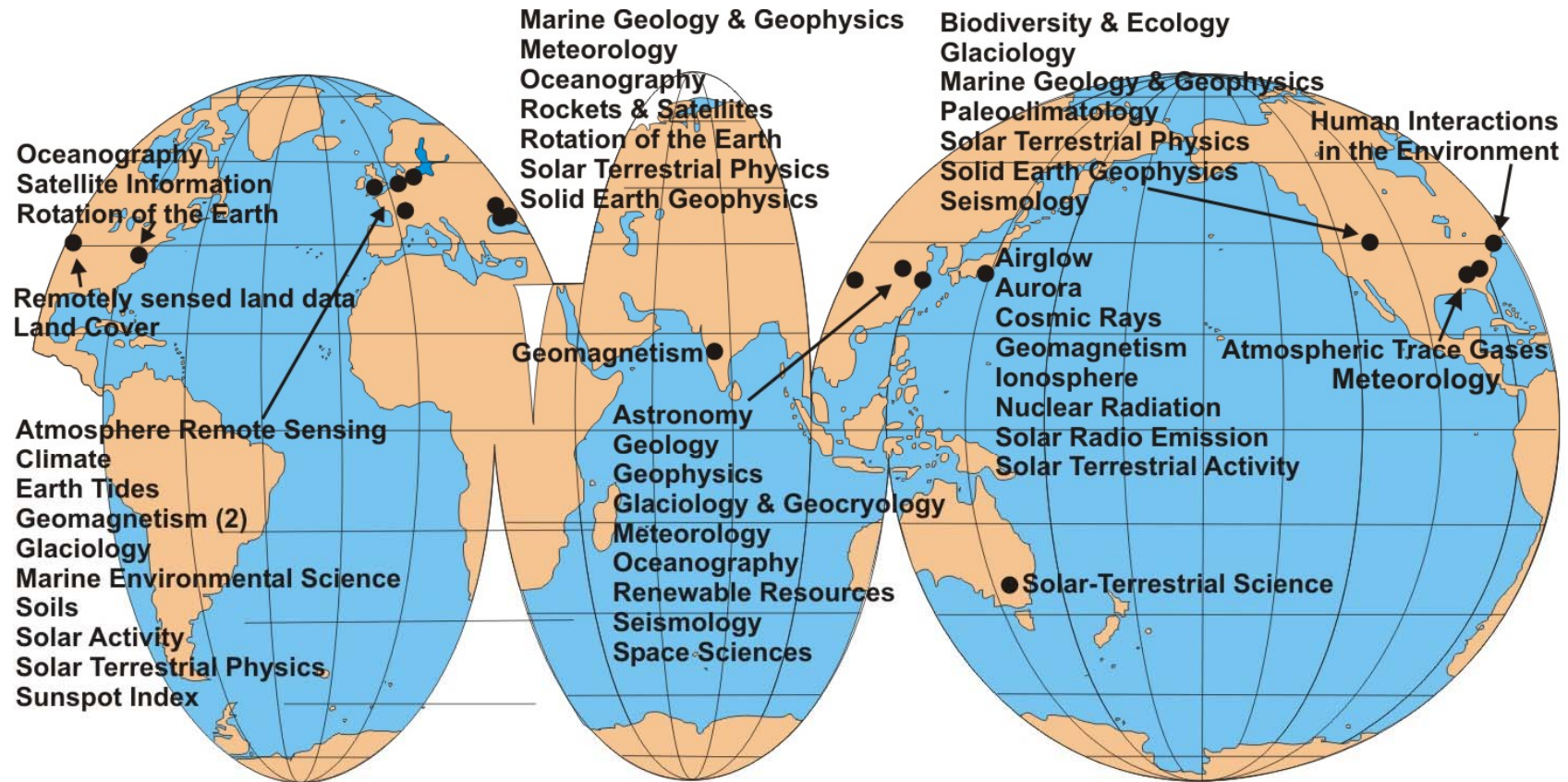


Information from Earth's Core

Space Weather



International Geophysical Year (1957 – 1958)



World Data Centers

February 2004

- Data **exchange** and **preservation** under the “**Cold War**”
WDC-A (USA), **WDC-B**(USSR), **WDC-C1**(Europe) and **WDC-C2**(Asia)
- Earth science needs **inter-disciplinary** data collection

World Data Center for Geomagnetism, Kyoto

(Originally established inside university library in 1957 without permanent staff)

Operated by: Data Analysis Center for Geomagnetism and Space Magnetism, Graduate School of Science, Kyoto University (1978~)

Summary of Data Held: Magnetograms (normal-run, rapid-run), geomagnetic hourly values, Tellurigrams (normal-run, rapid-run), Earth current hourly values, geomagnetic indices and lists of special events. Digital data of geomagnetic hourly, 1 minute and 1 sec values and geomagnetic indices.

Products: AE, Dst ASY and SYM, and Wp indices, various services through web page, data catalogue.

Special Projects: Real-time geomagnetic data service

- Near real-time Dst index derivation

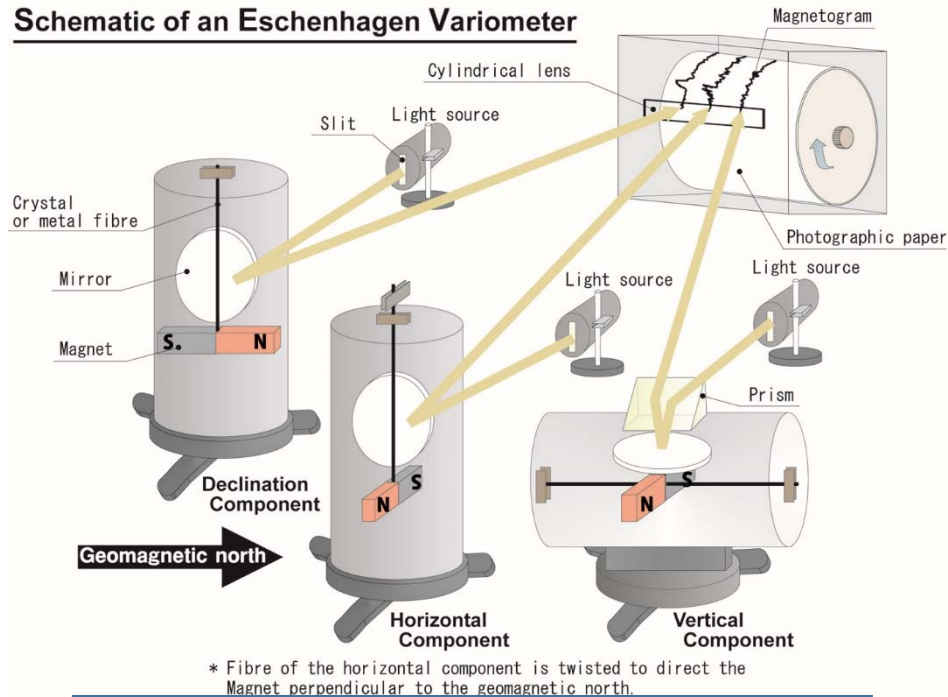
- Near real-time AE index derivation

- Conversion of analogue magnetograms to digital image files

- Construction of geomagnetic portal site

~35 years ago ...

Schematic of an Eschenhagen Variometer



Analogue Record



Magnetogram

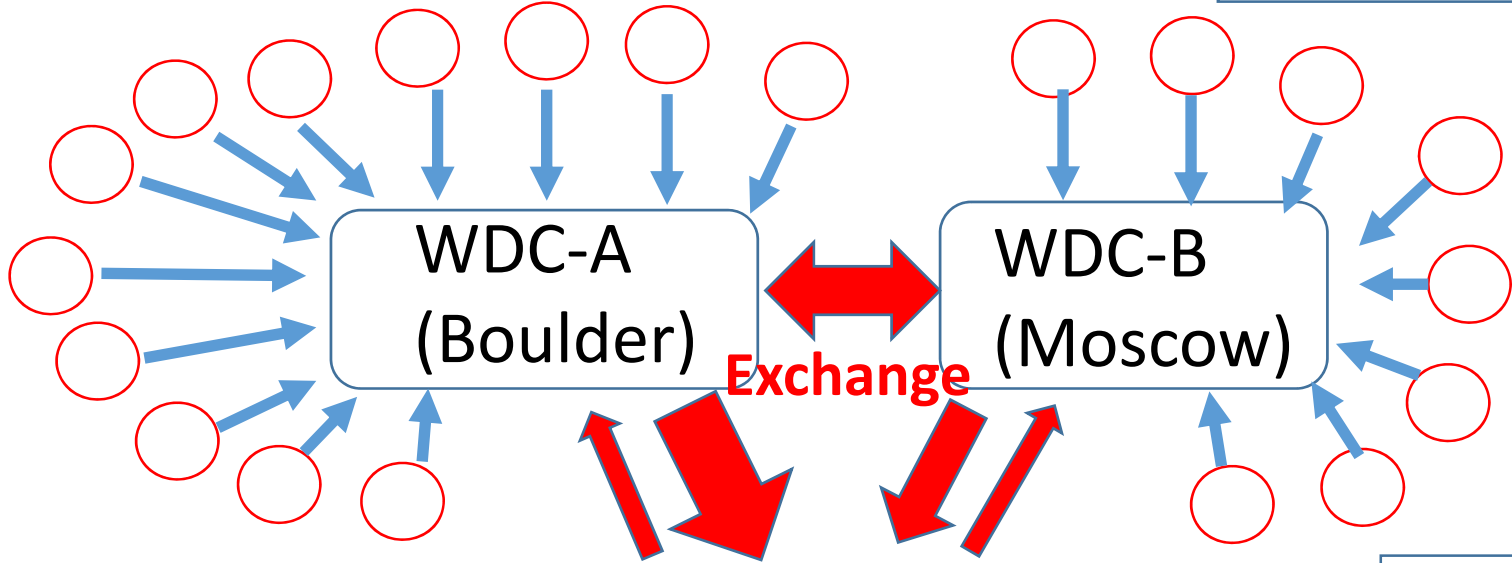


Data flow from geomagnetic observatories

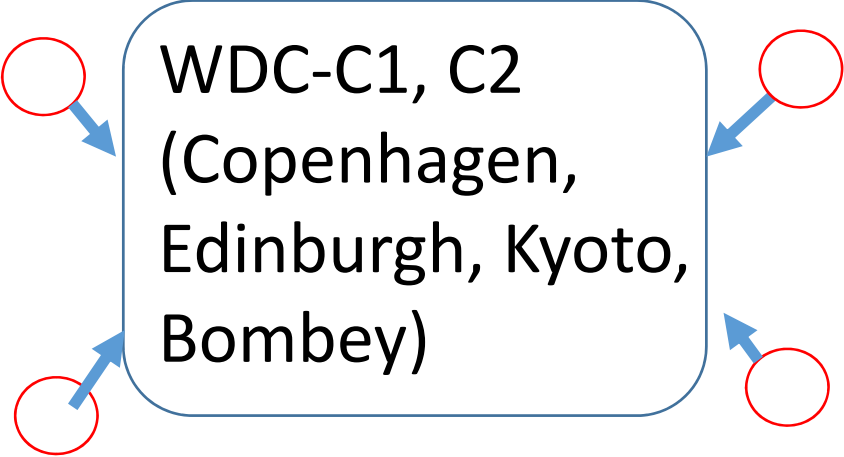
Before ~1990

Mostly for academic use

○ Geomagnetic observatories



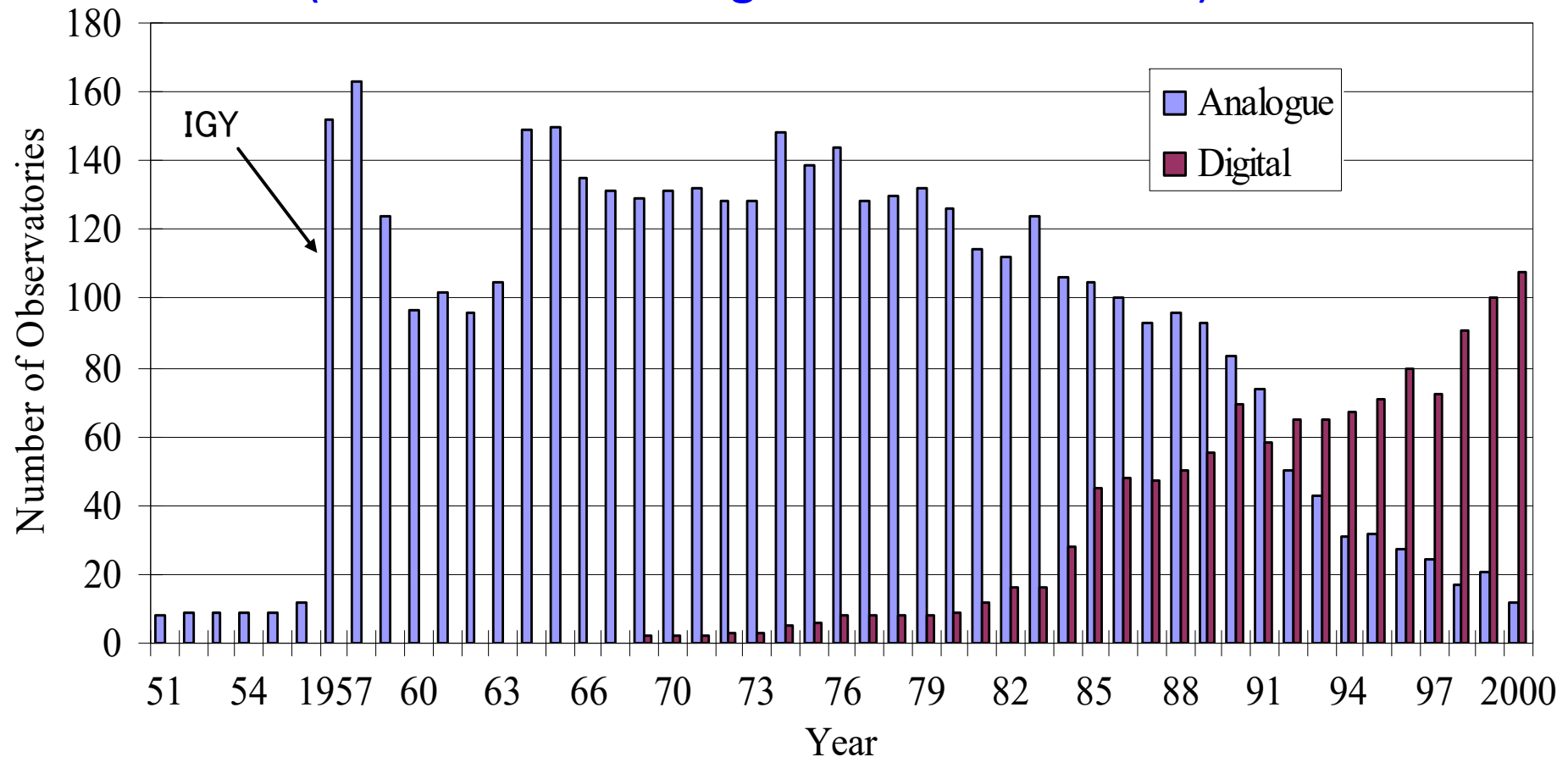
IAGA
(International Association for Geomagnetism and Aeronomy)



ICSU WDC Panel
↓
World Data Centers (WDCs)

Transition from Analogue to Digital (and Real-Time) data

Analogue and digital data collection at WDC-Kyoto
(Number of Geomagnetic Observatories)



Analogue: Normal-run magnetograms,

Digital: 1-minute resolution data

Service by post



Service by network

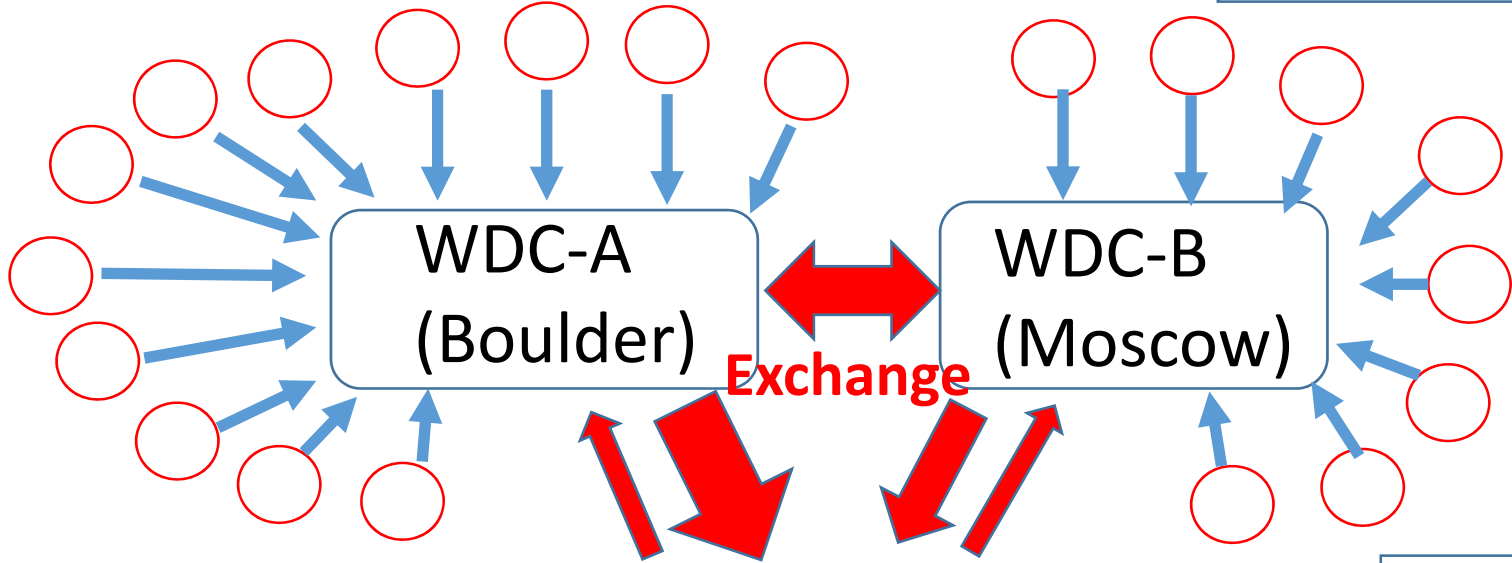


Data flow from geomagnetic observatories

Before ~1990

Mostly for academic use

○ Geomagnetic observatories



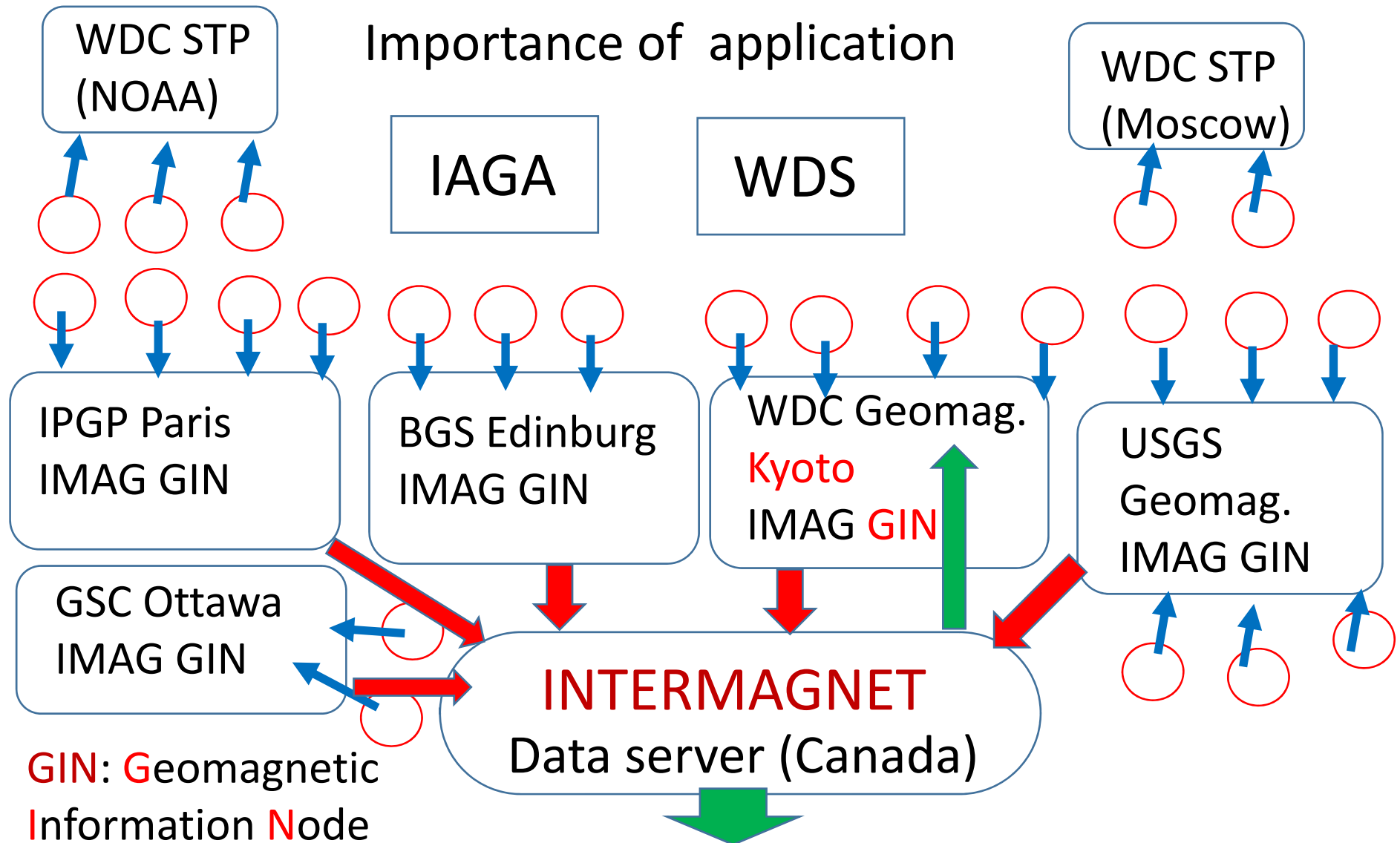
IAGA
(International Association for Geomagnetism and Aeronomy)

WDC-C1, C2
(Copenhagen, Edinburgh, Kyoto, Bombay)

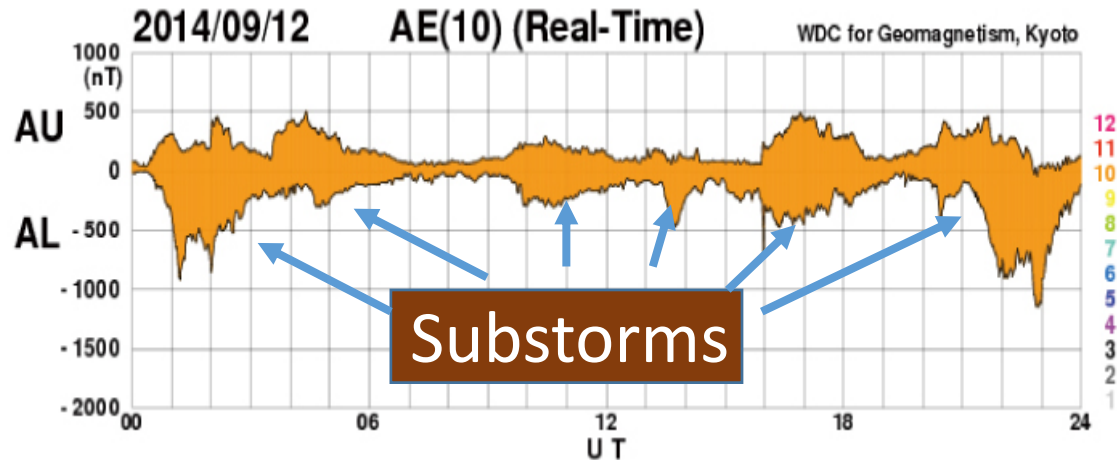
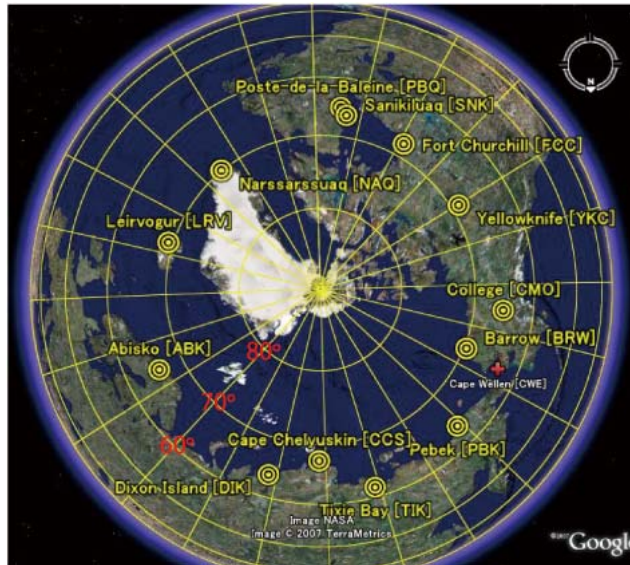
ICSU WDC Panel
↓
World Data Centers (WDCs)

Data flow from geomagnetic observatories

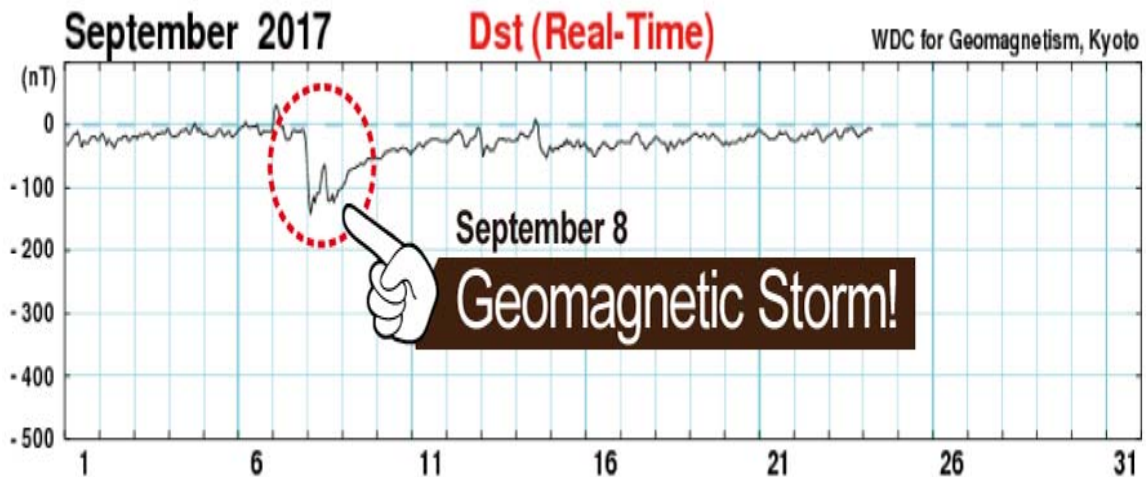
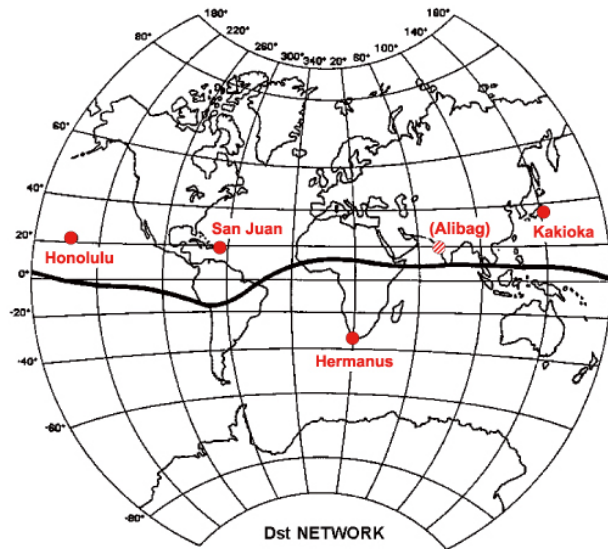
After ~2000s



Real-Time Derivation of geomagnetic indices under international collaborations: AE and Dst indices



For space weather research



[Created at 2017-09-24 05:30UT]

Support resolutions from international societies

XVII IUGG General Assembly, Canberra, December 1979

IAGA News, February 1980, No. 18

Resolution No. 14 (1979) *Digital data for AE derivation*

IAGA, **recognising** the immense value to the scientific community of the publication of AE-indices by World Data Center A, **urges** all contributing northern hemisphere observatories to use **digital recording** and further recommends all World Data Centers to participate; particularly of importance is **the digitisation of magnetograms by WDC-C2 (Kyoto, Japan)**.

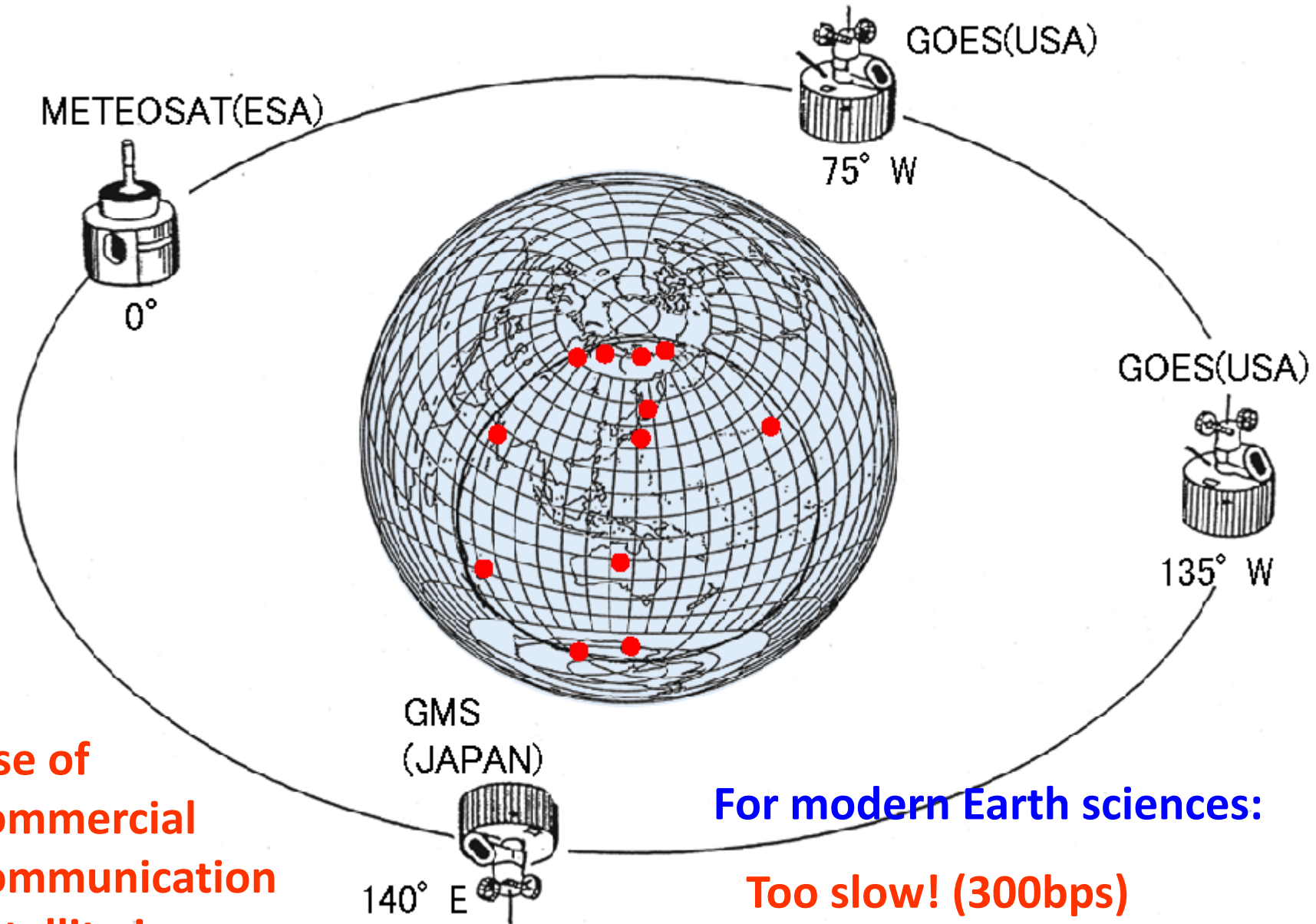
6th IAGA Scientific Assembly, Exeter, UK, 1989

IAGA News, March 1990, No. 28

Resolution No. 7 (1989) *Real-time geomagnetic data for the Dst and AE indices*

IAGA, **noting** the importance of making the Dst and AE magnetic indices available to the scientific community **as promptly as possible** and **recognising** that the production of these indices on short time scales can be greatly assisted by transmitting data via satellite links **recommends** the use of such a system and **encourages those magnetic observatories providing data to the World Data Center C2 for Geomagnetism for the calculation of these indices** to use real-time data transmission systems such as that planned under the INTERMAGNET project.

Use of the GMS satellite for real-time AE and Dst indices



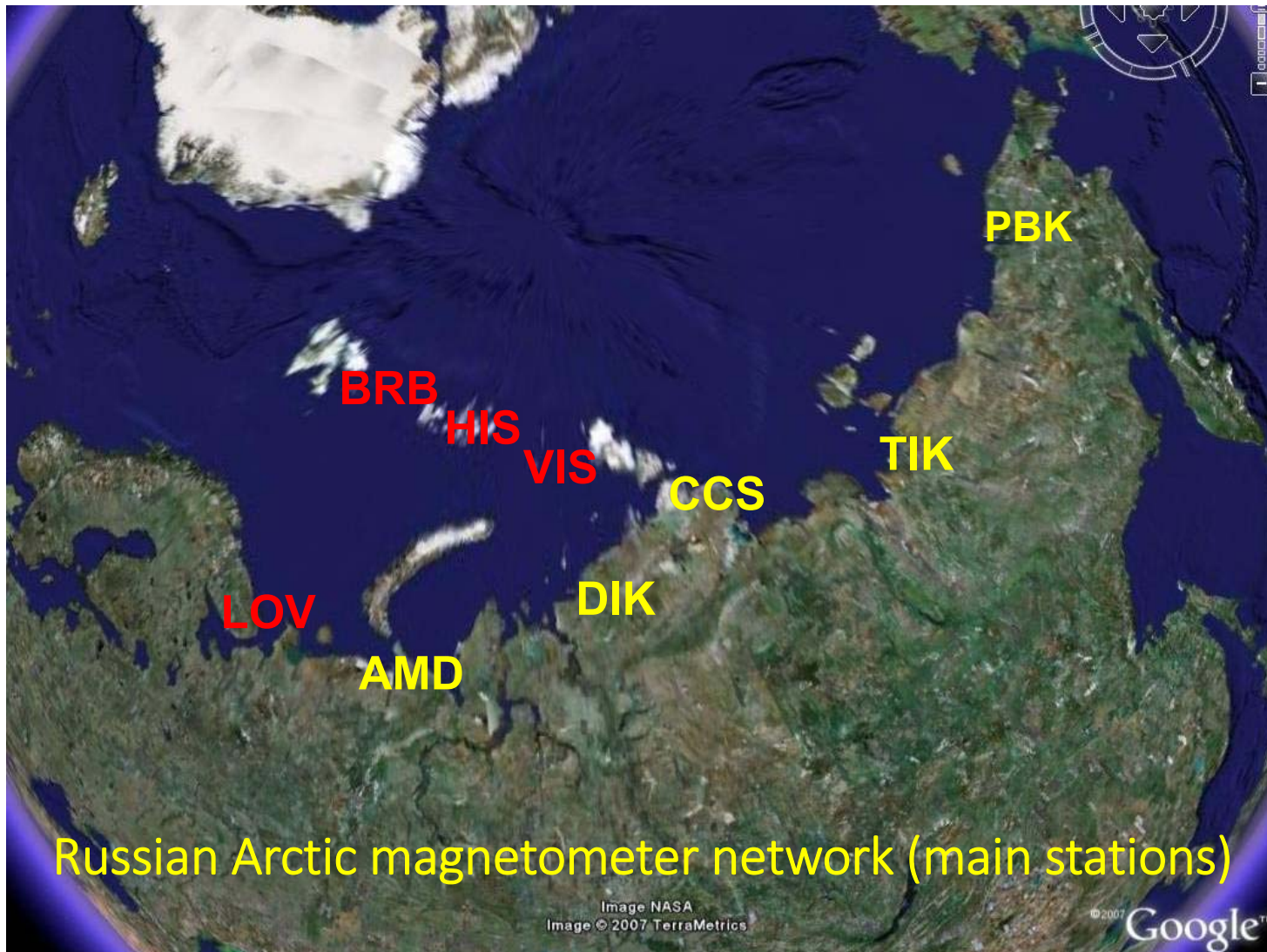
Use of commercial communication satellite is expensive

For modern Earth sciences:

Too slow! (300bps)

For JMA related service

The **RapidMag** project : An *US-Russia-Japan* collaboration for provide the magnetometer data for production of the *AE* indices and for studies of high latitude phenomena.



Russian Arctic magnetometer network (main stations)

The RapidMag project

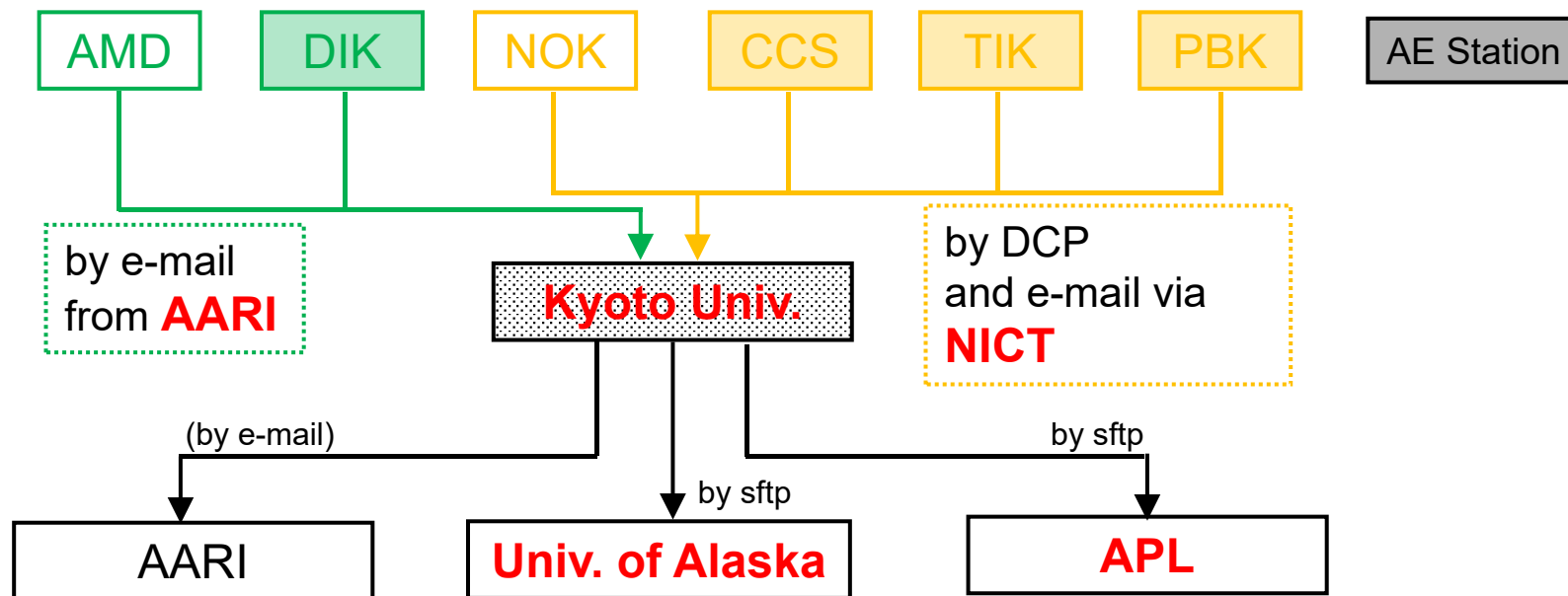
Data Import and Export (~2009)

Import

- NOK, CCS, TIK, PBK
 - Data is transferred with DCP and e-mail via NiCT.
 - Only TIK data is transferred in realtime at present.
- AMD, DIK
 - Data is transferred with e-mail from AARI.
 - Both data are not coming to Kyoto at present. (AMD was active in 2009/03-04.)

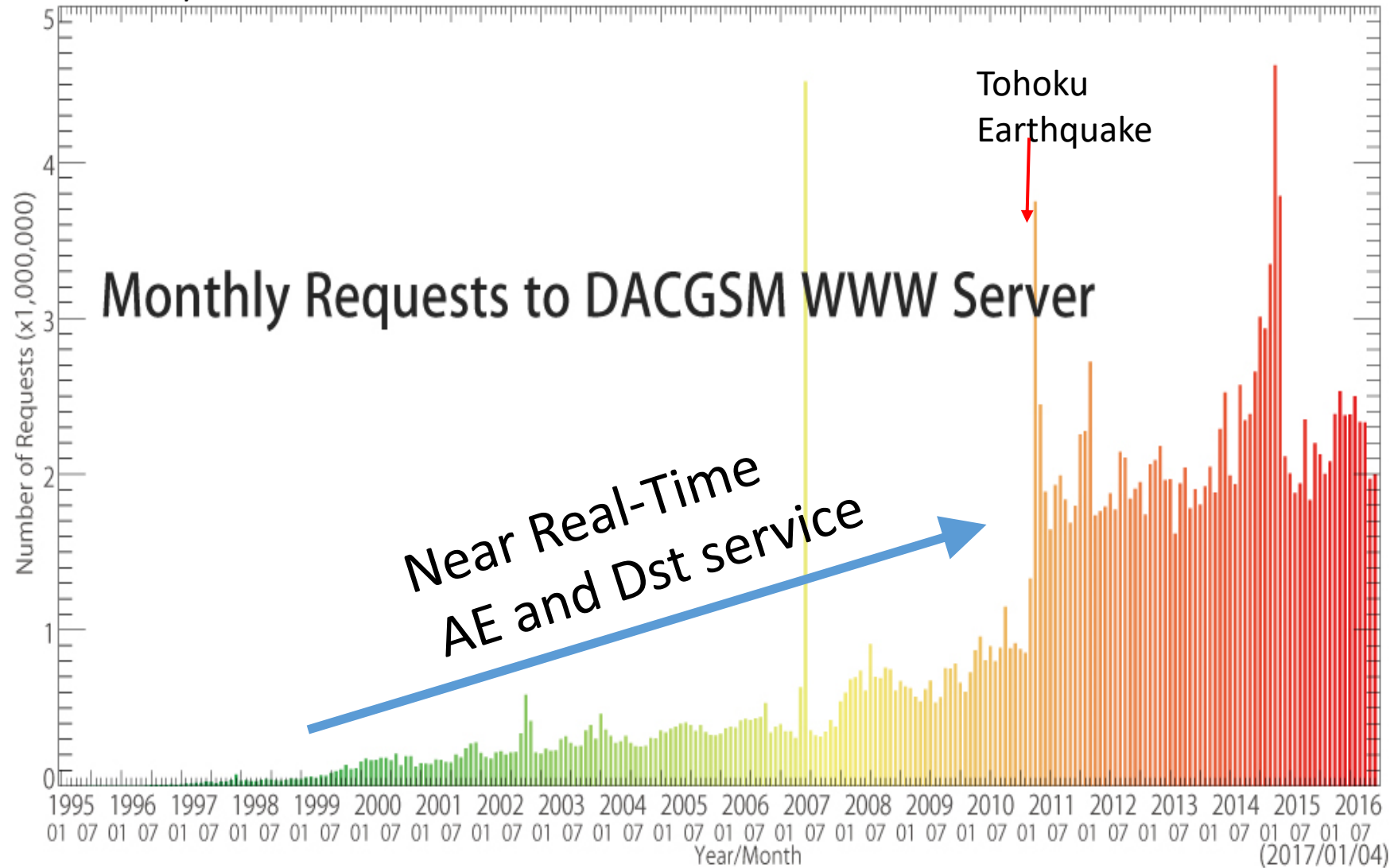
Export

- NOK, CCS, TIK, PBK, AMD, DIK
 - Available data are forwarded to AARI, UoA, and APL.

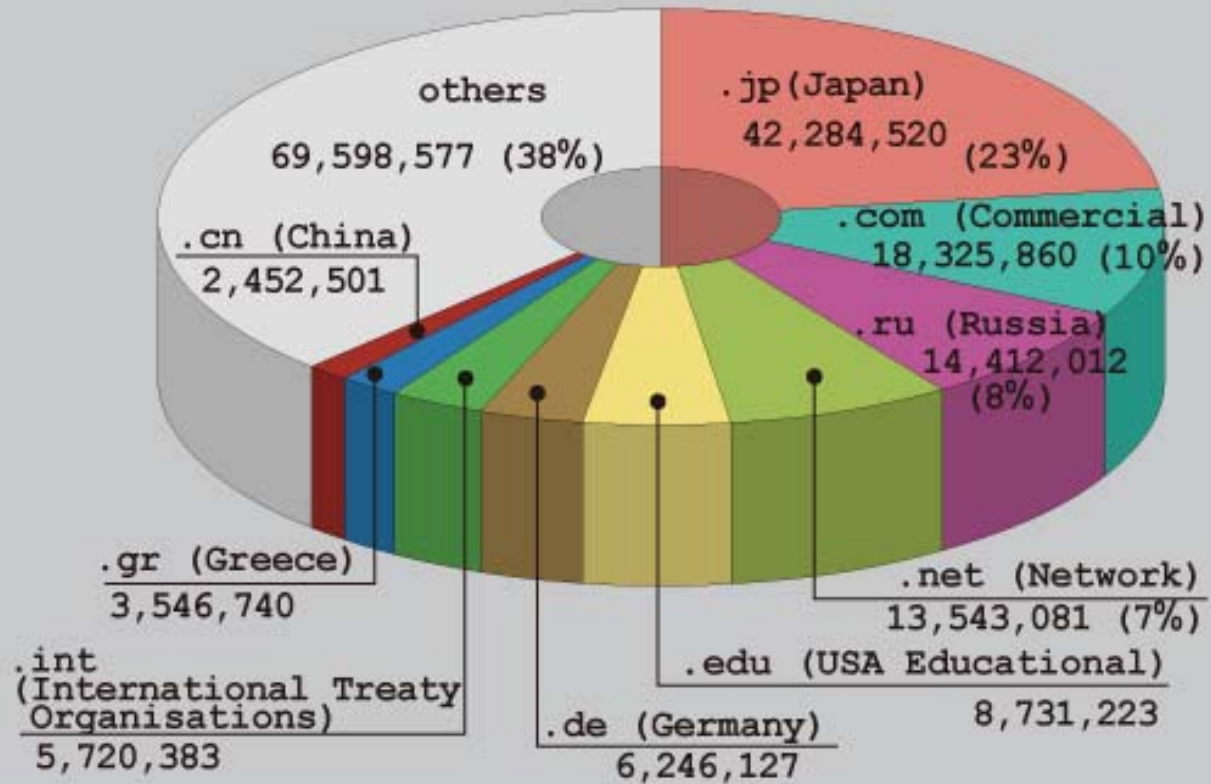


Service and needs

$\times 10^6$ access /month

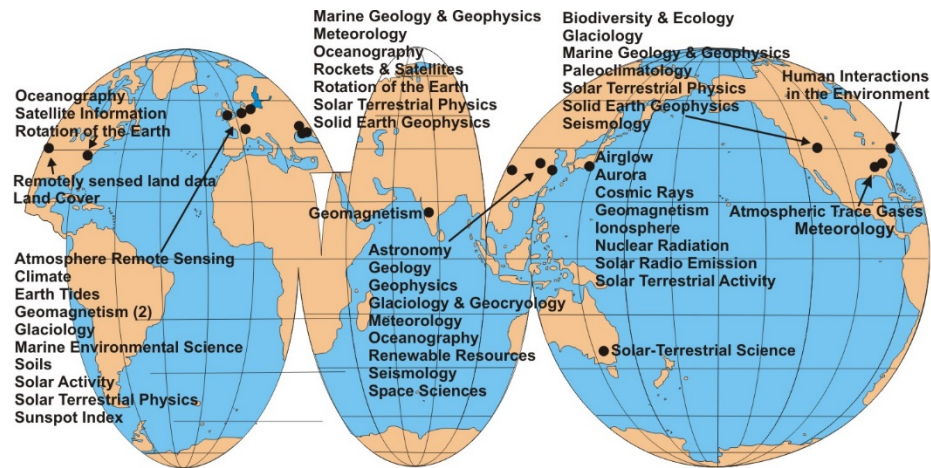


International use of geomagnetic data service from WDC Kyoto



Number of Access Based on Country

1998/01-2016/12



+

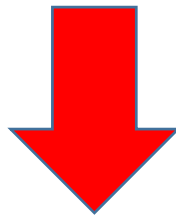


World Data Centers

February 2004



2008
INTERNATIONAL
COUNCIL
FOR SCIENCE

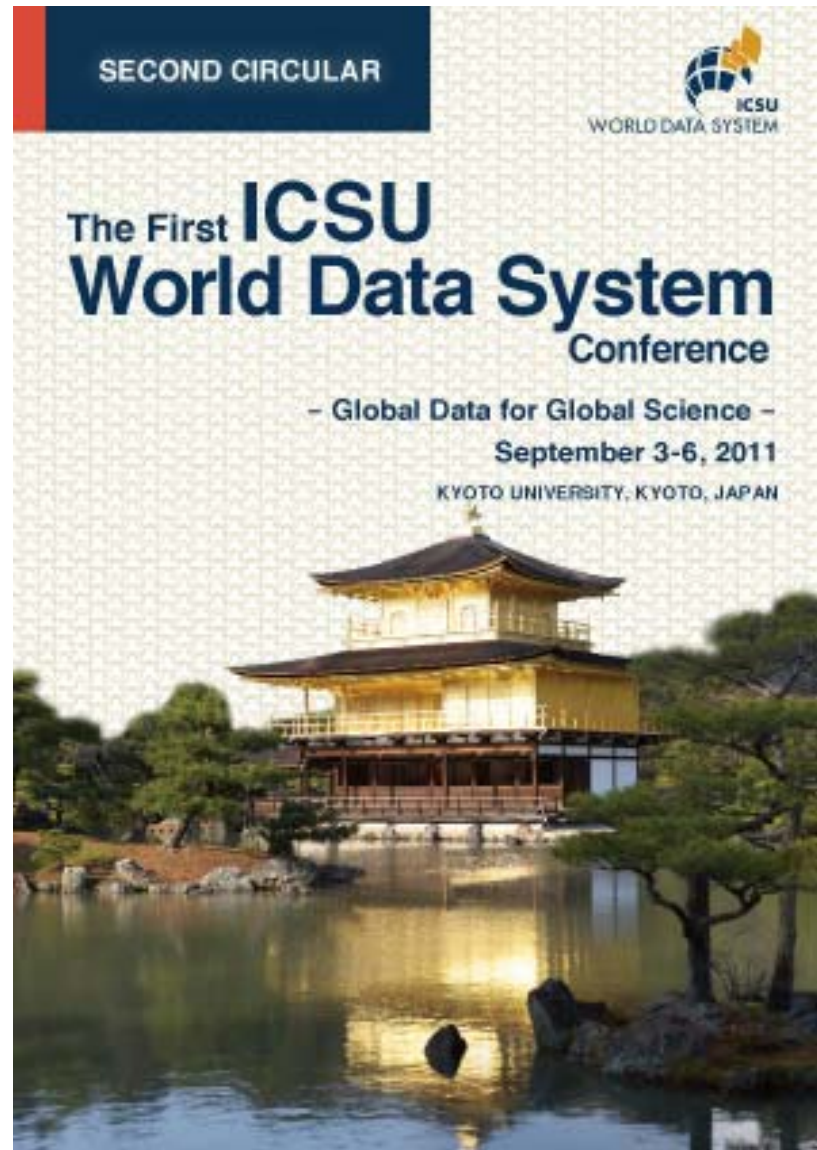


- More wide disciplines
- Networking among data centers



ICSU
WORLD DATA SYSTEM

Hosting the First ICSU/WDS Conference (2011)



ICSU
WORLD DATA SYSTEM

The 1st ICSU World Data System Conference

- Global Data for Global Science -
September 3-6, 2011
Kyoto University, Kyoto, Japan

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HOME

New Announcements

(26 October 2012)

Preprints of papers submitted to the Proceedings of 1st ICSU WDS Conference can be seen [here](#).

The PDF file of the program and abstracts of papers presented in the Conference can be seen [here](#).

Here is a group photo

On September 4, 2011

(Click on the thumbnail to view the actual size of the photo.)

The 1st ICSU World Data System Conference
- Global Data for Global Science -

September 3-6, 2011
[Kyoto University, Kyoto, Japan](#)

The screenshot shows the website's homepage. At the top, there's a navigation bar with links to Home, Committees, Sponsors, Important dates, Contact us, and Links. Below that is a 'Menu' section with links to Third Circular (updated), Second Circular, Program (updated), Registration, Presentation & Publication, Access and Hotels, and Call for Exhibitions. A 'Sponsors' section features the ICSU logo. The main content area has a 'HOME' heading, followed by 'New Announcements' dated 26 October 2012. Two red text announcements provide links to preprints and the conference program. Below this is a 'Here is a group photo' section with a date of September 4, 2011, a thumbnail image of a large group of people, and a note to click for the full-size photo. At the bottom, the conference title and dates are repeated.

Driver for international collaboration in geomagnetic data service at WDC Kyoto

Before 1990s: World wide data collection and dissemination for academic purpose

After ~1990s: Projects in Earth science to solve global problems (research)

- International programs, e.g., STEP, eGY, ...
- Real-time data request for Space Weather

After ~2010s: For inter-disciplinary research, and real use in general society

- Collaboration among distributed data centers with common metadata, e.g., IUGONET

Role of international collaborations for data service (from our experience)

Before 1990s: Collaboration and support **in each discipline** for science, e.g., projects and support resolutions by international communities such as IAGA, IUGG, mainly **for academic use**

After ~2000s: Collaboration for data collection and analysis of global problems for general society such as global warming, huge disaster and space weather, e.g., GEOSS (← governmental, UN etc.), i.e., **for global problems in Earth science**

After ~2010s: Data system network of trust data repositories over wide disciplines including humanity (← WDS, CODATA, RDA etc.) **for various applications in general society**