The contribution of a Geophysical Data Service: the International Service of Geomagnetic Indices

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Outline

- Geomagnetic activity and geomagnetic indices
- The International Service of Geomagnetic Indices
- Digital data + Internet \(\Rightarrow\) on-line data dissemination policy needed
- The IAGA policy for on-line dissemination of geomagnetic indices
- Conclusions
The Sun and the Earth

Solar wind parameters at the magnetosphere boundaries
Values measured in situ at L1

Magnetosphere-ionosphere filter
auroral latitudes: currents, convection…
sub-auroral latitudes
low latitude: ring current, …
Pulsations
$S_R$ variation
…

Magnetic signatures at the Earth surface
AE, PC indices
K-derived indices
Dst, SYM indices
The geomagnetic indices

IAGA recognized indices: AE, aa, am, Kp, Dst
Geomagnetic indices: summary

• Geomagnetic indices are “added value products”

• Geomagnetic indices are basic data:
  – for operational Space Weather activities ⇒ the shortest possible dissemination delay.

• The derivation of reliable geomagnetic indices requires:
  – To get data from a worldwide network of stations;
  – To assess the quality of these data;
  – To use these data to derive new products – in the present case geomagnetic indices – using the ‘official’ published derivation schemes;
  – To assess the quality of the new products before their on-line dissemination.
The International Service of Geomagnetic Indices

- **ISGI is a “consortium” of institutes** – the ISGI Collaborating Institutes – each of them being:
  - In charge of the derivation, dissemination, and archiving of IAGA recognized indices, using the ‘official’ published derivation schemes;
  - Responsible for the quality of the geomagnetic indices it is in charge of; it pays particular attention to the long term homogeneity of the indices data series;
  - Entrusted to propose any initiative whenever it finds it necessary to ensure the highest possible quality level for the geomagnetic indices it is in charge of.

- **ISGI was a FAGS service, and will apply to become part of WDS.**

*The ISGI Collaborating Institutes are: GFZ (Potsdam, Germany), LATMOS (Guyancourt, France), Observatori de l’Ebre (Roquetes, Spain), WDC-C2 for Geomagnetism (Kyoto, Japan)*
Statement of the issue: the context

• During the last decades, crucial changes occurred in geomagnetic observatory practice and data dissemination:
  – Digital magnetometers,
  – Internet and computer developments,
  – Users strongly required to have preliminary values of geomagnetic indices available on line within delays as short as possible.

• The development of electronic networks made it possible for Institutes which are not part of ISGI to make available on-line preliminary values of geomagnetic indices that are not computed using the ‘official’ derivation scheme.
The geomagnetic activity

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The geomagnetic activity
Statement of the issue: the concern

• During the nineties, non-ISGI institutes started to make available on-line estimated values of IAGA geomagnetic indices, without any control on, nor stamping of the quality of their products. In almost all cases, the used derivation schemes were not clearly published, while they may differ from one site to the other, and from the derivation scheme of the ‘official’ index.

• From the user’s point of view, the crucial question became: How to be sure of the quality of geomagnetic indices that are made available on-line through Internet?
The solution ‘stamped’ by IAGA

- Each ISGI Collaborating Institute decided to make quick-look values available online within the shortest possible delay.
- The reference values of geomagnetic indices are those produced by the ISGI Collaborating Institutes, and they are first made available online at the ISGI and ISGI Collaborating Institutes homepages.
- During its 1997 Scientific Assembly, IAGA urged 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 5, IAGA News 38 1998, p. 42
Data flagging

**Definitive**
- Keep the present level of quality
- Ensure the homogeneity of existing long series.
- Available within a delay of a few weeks;
  - Based upon data provided by the observatories at the time of derivation;
  - Similar statistical properties as the definitive values.

**Provisional**
- Available on line within short delays;
- Based upon network stations data (minute values) available on line at the time of derivation;
- Similar statistical properties as the definitive values.
- Larger confidence interval on each individual estimate.

**Quick-look**
- Missing data might be replaced by estimates;
- Estimated values of IAGA indices should be named by adding ‘est’ to the name of the index (e.g. $K_{pest}$ for $Kp$ estimates) [IAGA Resolution, 1997].

**Estimated**
Conclusion

• The example discussed here makes clear the need for:
  – Reference(s) scientific organization(s) in charge of the definition of the policy dissemination of the “added value products” – geomagnetic indices in the present case, and of the labelling of the reference places: IAGA in the present case;
  – Reference places where users are sure to find reliable “added value products”: ISGI and ISGI Collaborating Institutes in the present case;
  – A deep involvement of the producers in related research activities: Solar Terrestrial physics and Space Weather in the present case ⇒ they understand user needs, and propose the best possible solution.

One of the major WDS challenges is to keep this ability to find out solutions enabling the satisfaction of new requests from users without losing the present quality of “added value products” and the homogeneity of long term data series.
Thank you for attention