Possible use in Space Weather of new geomagnetic activity indices based on minute values

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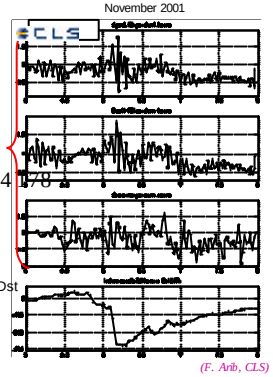
- **A need**
- **A proposed new family of indices**
- **Perspectives**

There is a need

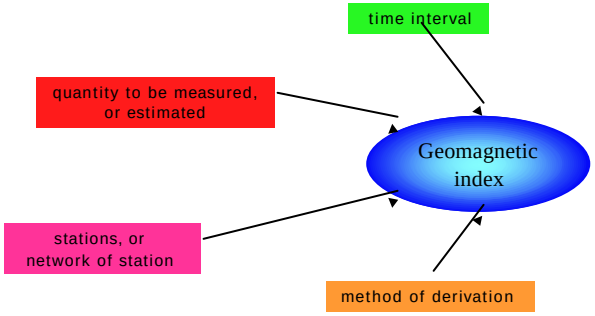


(F. Arib, CLS)

The drag coefficients can be estimated on a half-hour basis

The present geomagnetic indices are derived on a 1-hour (Dst) or 3-hour (planetary geomagnetic indices: am, aa, Kp) basis

How to build an index



The aa index

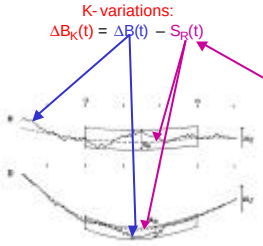
- **K indices**;
- **3-hour values**;
- Network: **2 antipodal** stations at subauroral latitudes;
- K codes are converted into range amplitude;
  aa is the average of the two amplitude values (unit: nT).

The K index

The K index is deduced from ranges in the K-variations during a given 3-hour interval, ...

... and it is a proxy of the magnetic energy density provided it is measured at sub-auroral latitudes.

K-variations:
$\Delta B_K(t) = \Delta B(t) - S_R(t)$



Analogue era

K-indices hand-scaled on analogue magnetograms.

Estimated on a 24-hour basis

The routine on-line availability of digital minute values makes it possible to compute the K-variations.

Present time

Which proxy of the magnetic energy density

Magnetic energy density

Unit: nT

Sum of the square roots of the K-variation components ...

$(\Delta B_x^2 + \Delta B_y^2)^{1/2}$

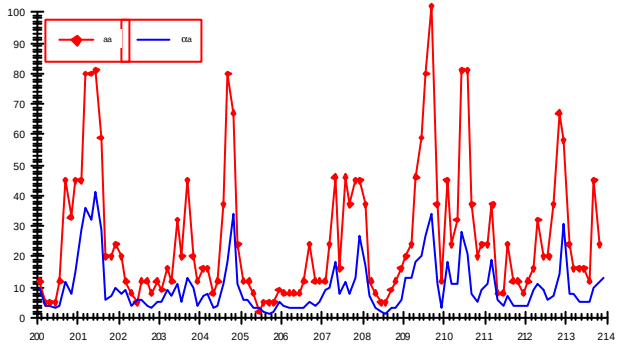
... averaged over a time interval of duration τ

$$\alpha(S_i, t) = \int_t^{t+\tau} \left(\Delta B_x^2(S_i, t) + \Delta B_y^2(S_i, t)\right)^{1/2} dt$$

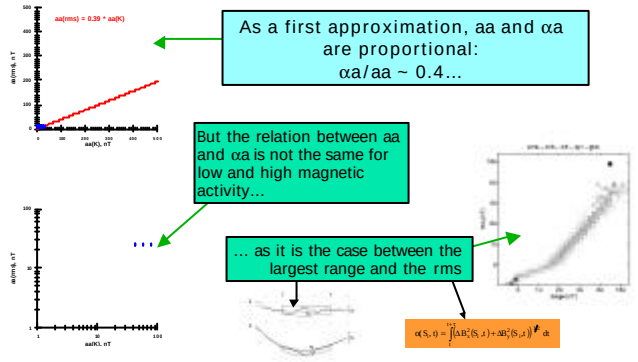
The αa index

- **rms;**
- **Values over any t-minute interval;**
- Network: **2 antipodal** stations at subauroral latitudes;
- αa is the average of the two rms (unit: nT).

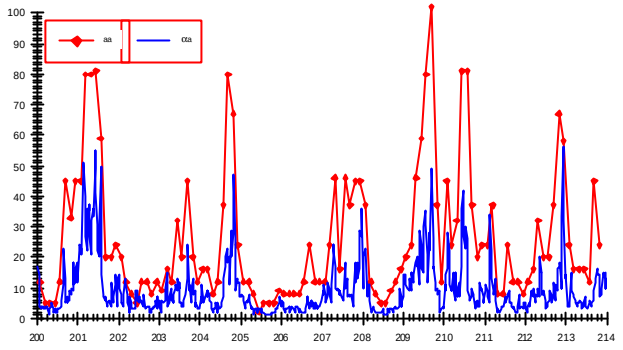
αa versus aa: τ = 180 min. (1)



αa versus aa: τ = 180 min. (2)



αa versus aa: τ = 30 min.



Perspectives

Statistical properties of rms-based indices should be investigated

Their efficiency should be assessed on relevant Space Weather situations
e.g.: thermosphere temperature disturbance related to geomagnetic activity;
operational orbitography
operational magnetic activity monitoring and prediction

rms-based indices can be derived on the basis of am and aλ schemes