The geomagnetic measurements at the Hurbanovo Geomagnetic Observatory in year 2006

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Abstract: In this paper we present the results of geomagnetic observations performed at the Geomagnetic Observatory GPI SAS at Hurbanovo in 2006. In 1998 the observatory obtained the status of the INTERMAGNET Magnetic Observatory (IMO). From this time we send the minute mean values of the geomagnetic components X, Y and Z to the Edinburgh and Paris GINs every day. Our final data have been included in the yearly INTERMAGNET CD-ROM.

Key words: geomagnetic field, geomagnetic measurements

1. Introduction

Geomagnetic observatories are the most important sources of observed geomagnetic data for the research of the Earth's magnetic field. Nowaday about 200 observatories are operating in the world, performing standard geomagnetic measurements described e.g. in *(Jankowski and Sucksdorff, 1996)*. This paper contains results of geomagnetic observations performed in year 2006 at the Hurbanovo Geomagnetic Observatory GPI SAS. Since 1998 the observatory has been operating in the international network INTERMAGNET. According to INTERMAGNET requirements the baselines have to change less then 10 nT/year *(Trigg and Coles, 1999)*. In the framework of INTERMAGNET, the one-minute mean values of the geomagnetic field elements X, Y and Z are sent every day, via e-mail, to data collecting centers in Edinburgh and Paris (`www.intermagnet.org/apps/dl_data_prel_e.php`).

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2. Location of the observatory

The Hurbanovo Geomagnetic Observatory (GO) is located in south Slovakia, 100 km east from Bratislava. The geographic and geomagnetic coordinates are in Table 1. It is the third oldest observatory in the world that from beginning of its operation,already more than 100 years, has been recording the components of the magnetic field at the same place.

Table 1. Location of the observatory

Geographic Latitude	47.9° N
Geographic Longitude	18.2° E
Geomagnetic Latitude	46.90° N
Geomagnetic Latitude	101.13° E
Altitude	112 m

The GO Hurbanovo is situated in the Danube Basin (Kolárovo formation) of Neogene age (Datian-Romanian). The thickness of Neogene sedimentary layers is about 1500 m, they consist of clays, sands and gravels. In its neighbourhood there was identified the so-called Hurbanovo fault running in SW-NE direction. The terrain around the Hurbanovo small town is lowland, used mainly for agriculture. The industry (Hurbanovo brewery) and municipal illumination are main sources of artificial geomagnetic disturbances of small level – they prevent registration of geomagnetic Pc pulsations. For occasional registrations of Pc pulsations there is used auxiliary geomagnetic pavilion situated in Šrobárová village (10 km eastern from Hurbanovo), linked with seismic station.

3. Observations

3.1. Absolute measurements

The absolute measurements are made in an absolute pavilion typically twice a week, activity of the geomagnetic field permitting. Absolute values of all geomagnetic elements are referred to observatory reference pillar No. 3. The following instruments were used:

Instrument	Observed elements
DI-Fluxgate magnetometer THEO 015, Elsec 810	D, I
DI-Fluxgate magnetometer LEMI 203	D, I
Proton precession magnetometer ELSEC 820M2	F, Z

The methods of observations with DI-flux magnetometer are described in *(Jankowski and Sucksdorff, 1996)*. For the measurement of the Z component with the proton magnetometer we used the compensation method *(Wienert, 1970)*. For processing the results we considered the fluxgate theodolite LEMI 203 and proton magnetometer ELSEC 820M2 to be the observatory standard. On the XIIth IAGA Workshop on Geomagnetic Observatory Instruments, Data Acquisition and Processing at Belsk we carried out comparative measurements with DI-fluxgate magnetometer LEMI 203. From this measurements corrections for declination $\Delta D = -3.5''$ and for inclination $\Delta I = 2.8''$ were added to absolute observations. A correction of 1.5 nT was subtracted from the values of the total field F, obtained with the Elsec magnetometer. The baselines for 2006 are shown in Fig. 1. The symbols represent the observed values and the full lines show the adopted baselines. The adopted baselines are derived from piecewise linear fit to observed values computed using the method of least squares. Deriving the baselines the points immediately before the beginning (from December 2005) and after the end of the year (to January 2007, included) were used, but they are not shown in the plots.

3.2. Observations of geomagnetic field variations

Two variation sets were operated at the observatory. The basic set was PSM-type portable torsion photoelectric magnetometer, the second was Magson fluxgate variometer. Both variometer sets were recording variations of components X, Y and Z of the geomagnetic field vector. (I) PSM-type portable torsion photoelectronic magnetometer, employing Bobrov-type quartz torsion variometer - sampling interval 5 s. (II) Fluxgate variometer MAGSON - sampling intervals 1 min and 1 s.

Both variometers were recording the data in their internal memory. A scheme of geomagnetic observations at Hurbanovo GO is shown in Fig. 2. The main observatory results are available in digital form (Table 2).

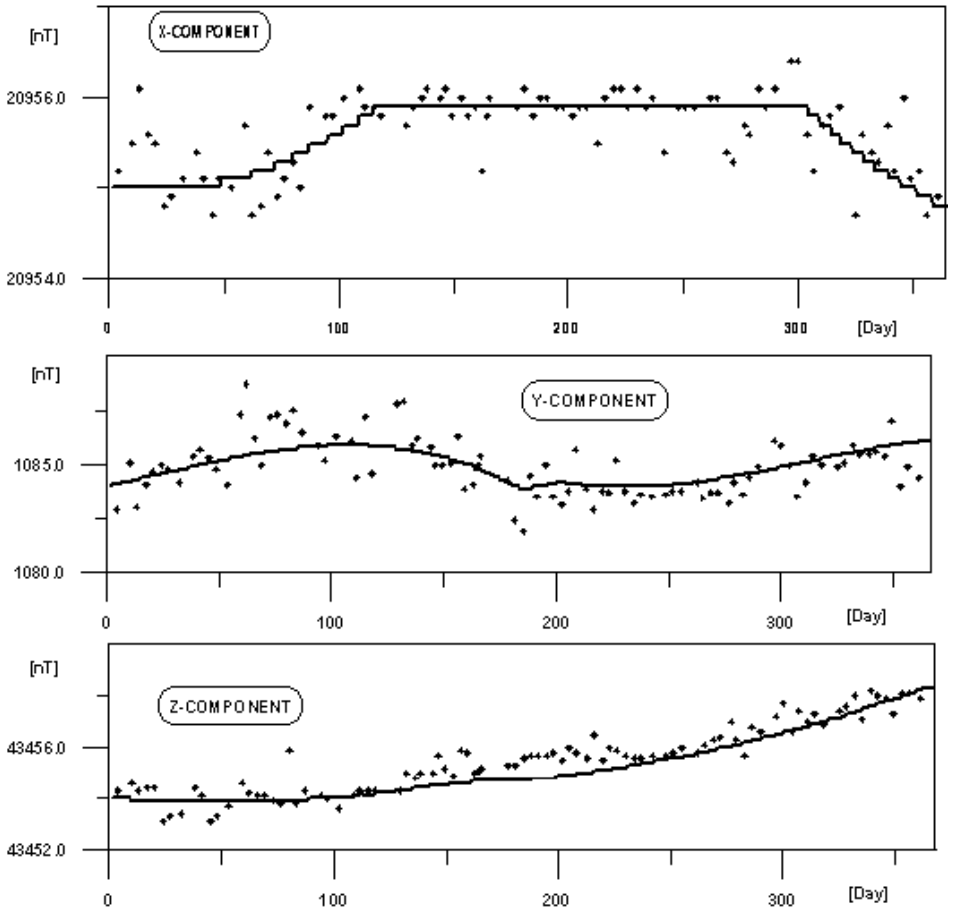

Fig. 1. Observed and allocated baselines at Hurbanovo GO.

Table 2. Data availability

Data	Available from. . .
1-min values of X, Y,Z	1997
1-sec values X, Y and Z	2000
Hourly mean values D, H and Z	1949
K-indices	1949
Annual mean values	1893

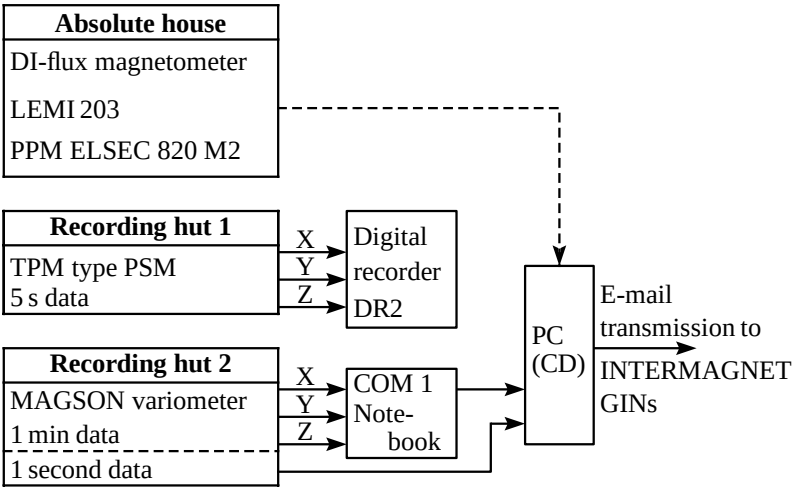

Fig. 2. Block diagram of geomagnetic data collection system at Hurbanovo GO.

4. Presentation of observatory results

The summarised results of the observatory have been presented as follows:

- one-minute values of X, Y and Z.
- hourly mean values of X, Y and Z – are computed from the one-minute values (Figs. 3–5)
- daily means of X, Y and Z – are calculated from the one-minute values.
- monthly mean values of X, Y and Z – are calculated from the daily mean values.
- K-indices – summarises geomagnetic activity at observatory, an integer from 0 to 9, to each 3-hour UT interval. The index values are determined from the ranges in X and Y (scaled into nT), with allowance made for the regular diurnal variation. For determining the K-indices we used FMI-method *(Menville et. al. 1995)* (Fig. 6).
- one-second values of X, Y and Z.
- annual mean values – are calculated from the monthly mean values.

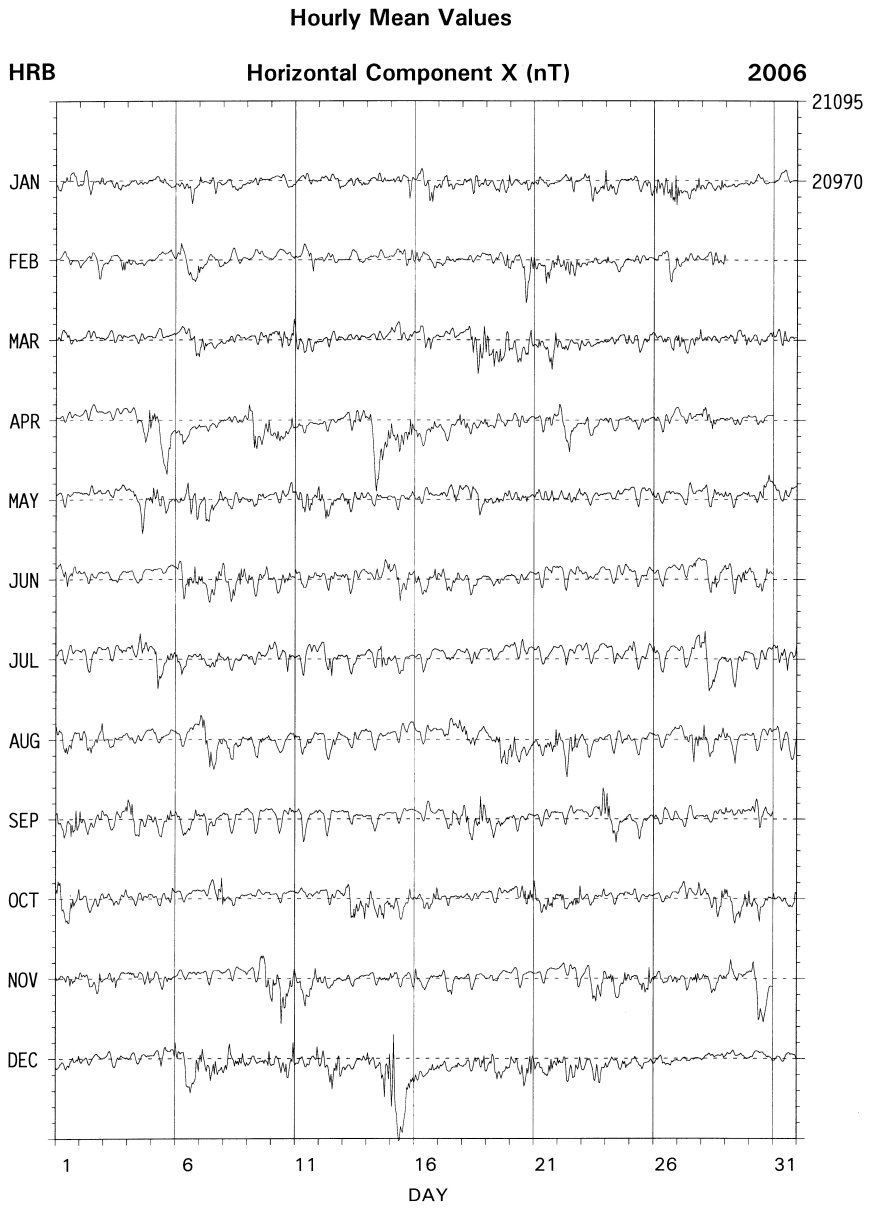

Fig. 3. mean values – X component of the geomagnetic field.

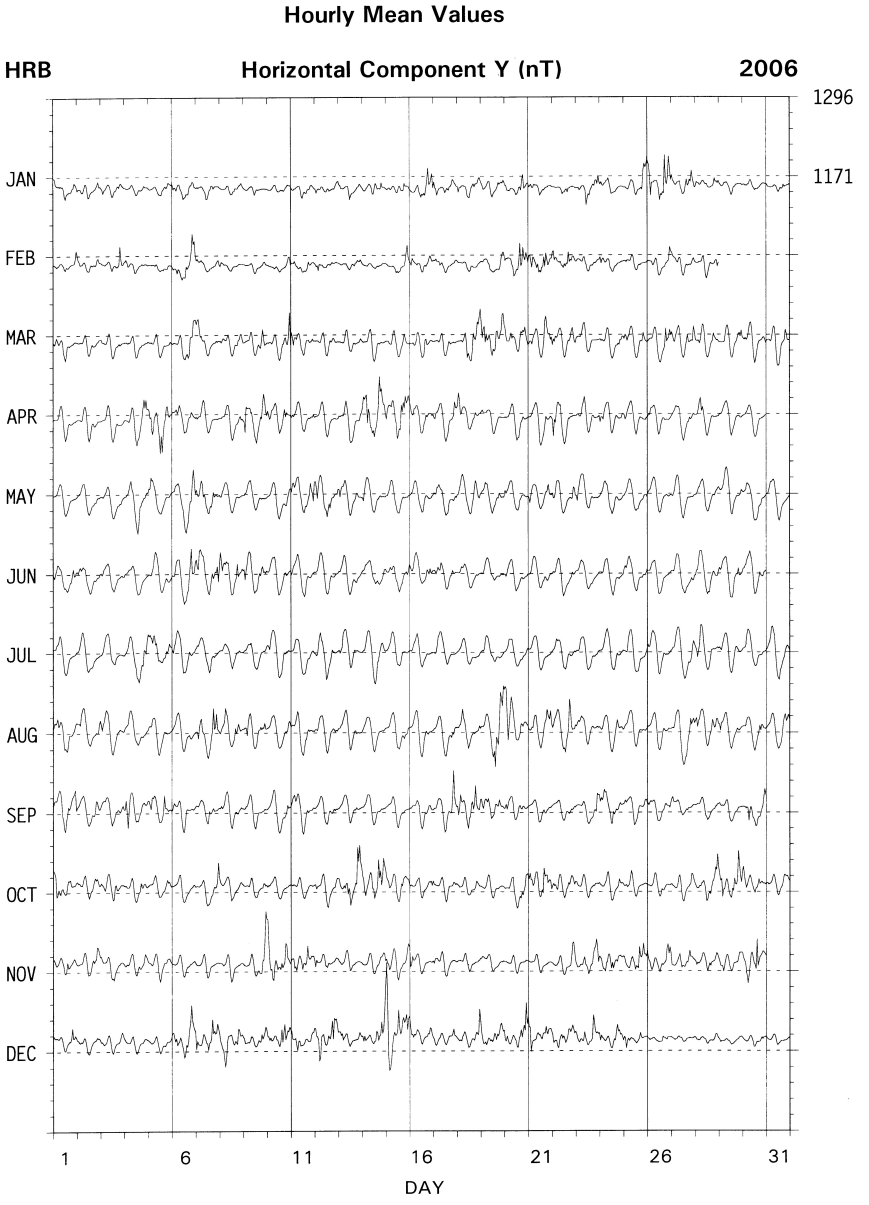

Fig. 4. Hourly mean values – Y component of the geomagnetic field.

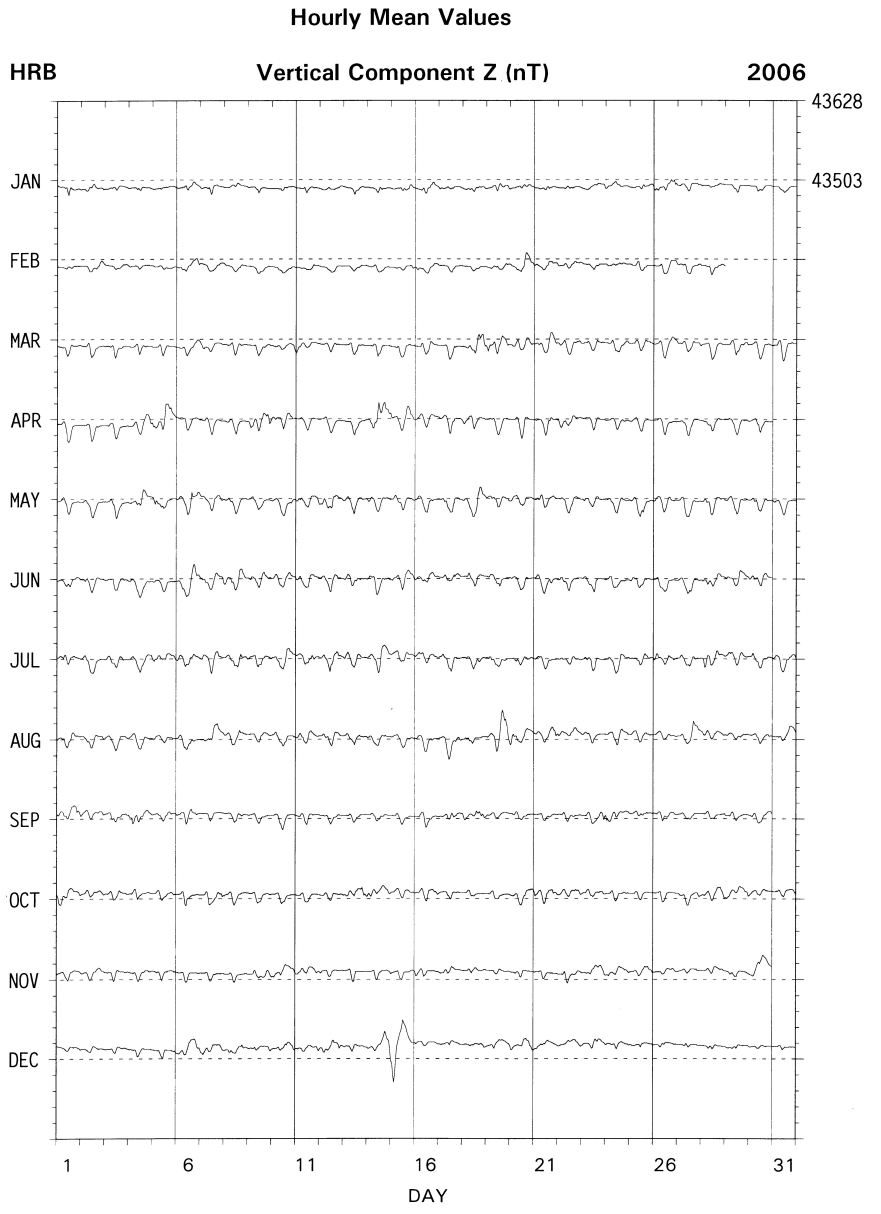

Fig. 5. mean values – Z component of the geomagnetic field.

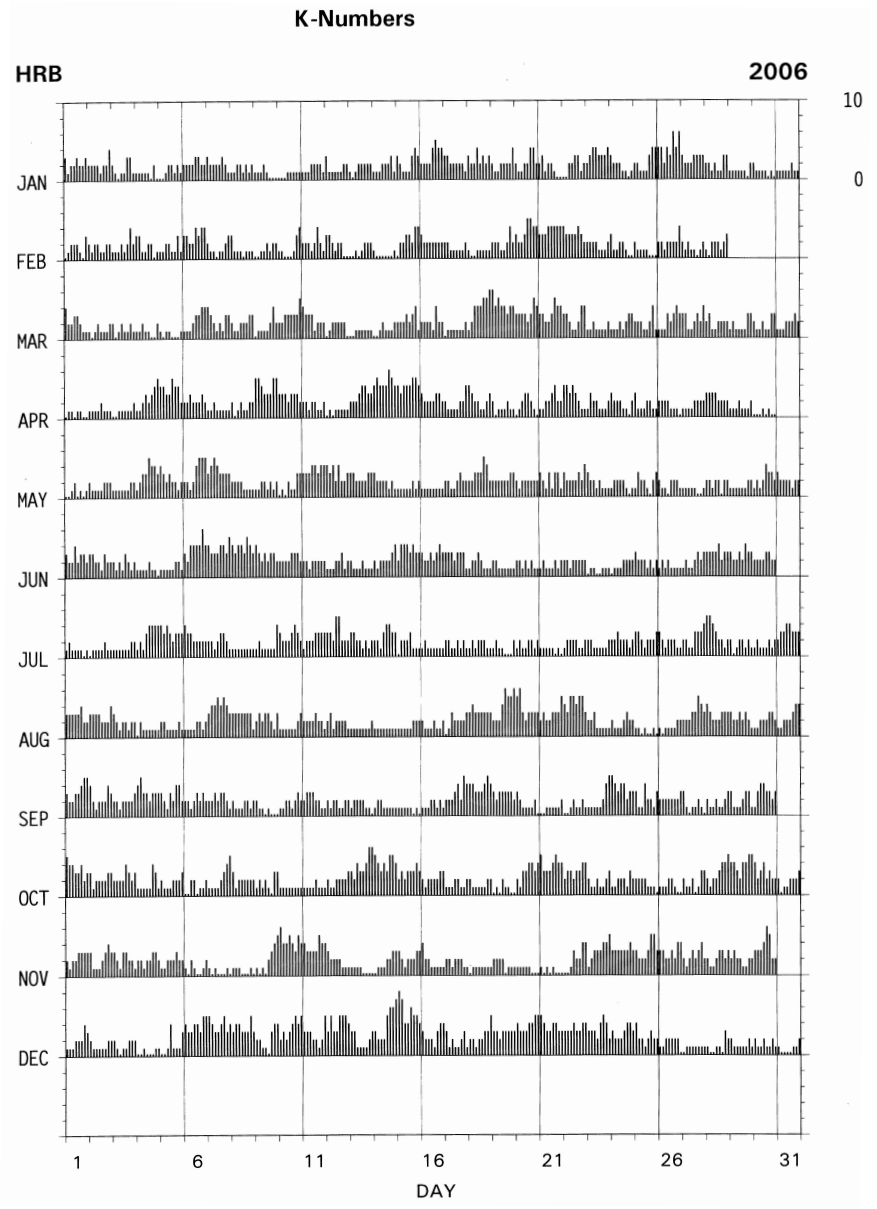

Fig. 6. K-indices.

5. Conclusion

This paper contains the basic results of geomagnetic observations at Hurbanovo GO in year 2006. These results are up to standard, which requires INTERMAGNET for the status of INTERMAGNET Magnetic Observatory (IMO). The current data from our observatory can be found in INTERMAGNET centers in Edinburgh and Paris on the pages:
– `http://intermagnet.org/apps/dl_data_prel_2.php`
– `http://obsmag.ipgp.jussieu.fr/cgi-bin/form_e`.

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References

Jankowski J., Sucksdorff CH., 1996: Guide for magnetic measurements and observatory practice, Warsaw.

Trigg D. G., Coles R. L., 1999: INTERMAGNET Technical Reference Manual.

Wienert K. A., 1970: Notes on geomagnetic observatory and survey practice. Unesco.

Menville M., Papitashvili L., Hakkinen L., Sucksdorff C., 1995: Computer production of K-indices: Review and comparison of methods. Geophys. J. International, 123, 866–886.