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Introduction of the CD-ROM publication of the Report of the Kakioka Magnetic Observatory

by

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Abstract

The Report of the Kakioka Magnetic Observatory, which is the annual report on geomagnetic and geoelectric observations conducted by the Kakioka Magnetic Observatory, Japan Meteorological Agency, was re-issued on CD-ROM media starting from issue 2001. The CD-ROM version, in addition to the contents of the former printed publication, also contains the following contents: (1) 1-minute values of the geomagnetic, geoelectric and atmospheric electric fields, (2) observation remarks, and (3) Data Viewer, a software application to visualize the recorded data in order to make it easier to use them.

In this paper, we describe the aforementioned contents of the CD-ROM and the basic functions of Data Viewer. Our new data format used in the CD-ROM is briefly shown as well.

1. Introduction

The Report of the Kakioka Magnetic Observatory (hereafter called "annual report") describes the results of geomagnetic and geoelectric observations conducted at the Kakioka Magnetic Observatory of the Japan Meteorological Agency. It was issued as a bound volume every year during the period from 1924 to 2000. In 2001, Ishii studied the viability of converting the annual report into digital form with consideration of the trends in the ongoing computerization and information technology, stated that it was important to make the observational data available as electronic data, and proposed that the annual report should be issued as a CD-ROM. He also pointed out that this electronic observational data should be attached with a software program that allows the user to retrieve and view data easily and efficiently. Given this background, it was decided that the annual report be issued as a CD-ROM, starting with the 2001 issue, and that a data-viewing software program be developed and included in the CD-ROM. Before we convert the observational data to digital form to be written on the CD-ROM, we reviewed the data format being used at the Kakioka Magnetic Observatory. This document describes the contents of the annual report written on the CD-ROM, the changes made in the contents of the annual report as the CD-ROM was introduced, and the functions of the data-viewing software program.

2. Contents of the Annual Report on the CD-ROM

The annual report describes the results of geomagnetic and geoelectric observations conducted during the period from Jan. 1 to Dec. 31 every year. Table 1 shows a comparison between the contents of the annual report issued as a bound volume and those of the annual report issued as a CD-ROM. (See the appendix for information on the directory structure of the CD-ROM, as well as the homepage of the Kakioka Magnetic Observatory, http://www.kakioka-jma.go.jp,

for information on the program used to write data on the CD-ROM.) The annual report issued as a bound volume contains the data on hourly values of geomagnetic, earth-current, and atmospheric -electricity measurements, the table of annual means, the K-index table, the table of magnetic rapid variations (for magnetic storms and other phenomena), and the dynamic spectra for magnetic pulsations. In addition to all these contents in the annual report issued as a bound volume, the CD-ROM contains the data on 1-minute values and detailed information on each observation. The annual report issued as a bound volume contains the time-series diagram showing the three components of geomagnetic vectors and the total geomagnetic force measured at Kakioka during a one-year period, as well as the time-series diagram showing geomagnetic-field data collected when magnetic storms occurred.

In the annual report issued as a CD-ROM, these time-series diagrams are stored as electronic data, not as image files, so that the user is able to retrieve and display geomagnetic, earth-current and atmospheric-electricity data on the screen of a personal computer with the data-viewing software bundled in the CD-ROM.

Table 1 Contents of the annual report on the CD-ROM

In addition to the contents of the data in the annual report issued as a bound volume, the CD-ROM version contains 1-minute-value data, detailed information on each observation, and the data-viewing software.

Category	Data item		Report as a bound volume	Report as a CD-ROM
General information in the annual report	Introduction		●	●
Observed value	1-minute value	Geomagnetism		●
		Earth current		●
		Atmospheric electricity		●
	Hourly value	Geomagnetism	●	●
		Earth current	●	●
		Atmospheric electricity	●	●
	Monthly mean	Geomagnetism	●	●
		Earth current	●	●
		Atmospheric electricity	●	●
	Annual value	Geomagnetism	●	●
		Earth current		
		Atmospheric electricity		
Table	K-index table		●	●
	Table of rapid magnetic variations	Magnetic storm	●	●
		Earth-current storm	●	●
		bay	●	●
		sfe	●	●
		si	●	●
		pi	●	●
		pc	●	●
Figure	Summary plot of annual means of geomagnetic values		●	●
	Summary plot of magnetic storms		●	
	Dynamic spectra of magnetic pulsations		●	●
	Summary plot of hourly means of atmospheric electricity		●	
Softw are	Data view ing softw are			●
Other information	Detailed information on observation conditions	Geomagnetism		●
		Earth current		●
		Atmospheric electricity		●
	Information on missing magnetic data	Hourly value		●
		1-minute value		●
		1-second value	●*1	●
		0.1-second value	●*2	●
	Errata		●	●
	Explanations about the data format			●

Notes

*1: Only for Chichijima Island

*2: Applicable to observatories at Kakioka, Memanbetsu, and Kanoya, excluding the one in Chichijima Island

For the CD-ROM version, the HTML format was adopted because it allows the user to browse data irrespective of the operating system used, Windows, UNIX, etc. To view data in the CD-ROM, click on index.html, shown in the CD-ROM folder (see Figure 1). You will find that index.html contains nine items: "Introduction," "Data," "Format," "Data Viewer," "Tables & Figures," "Data Missing," "Errata," "Directory," and "Notice." By selecting and double-clicking on each of these items, you can view data contained in each item. (See Table 2.)

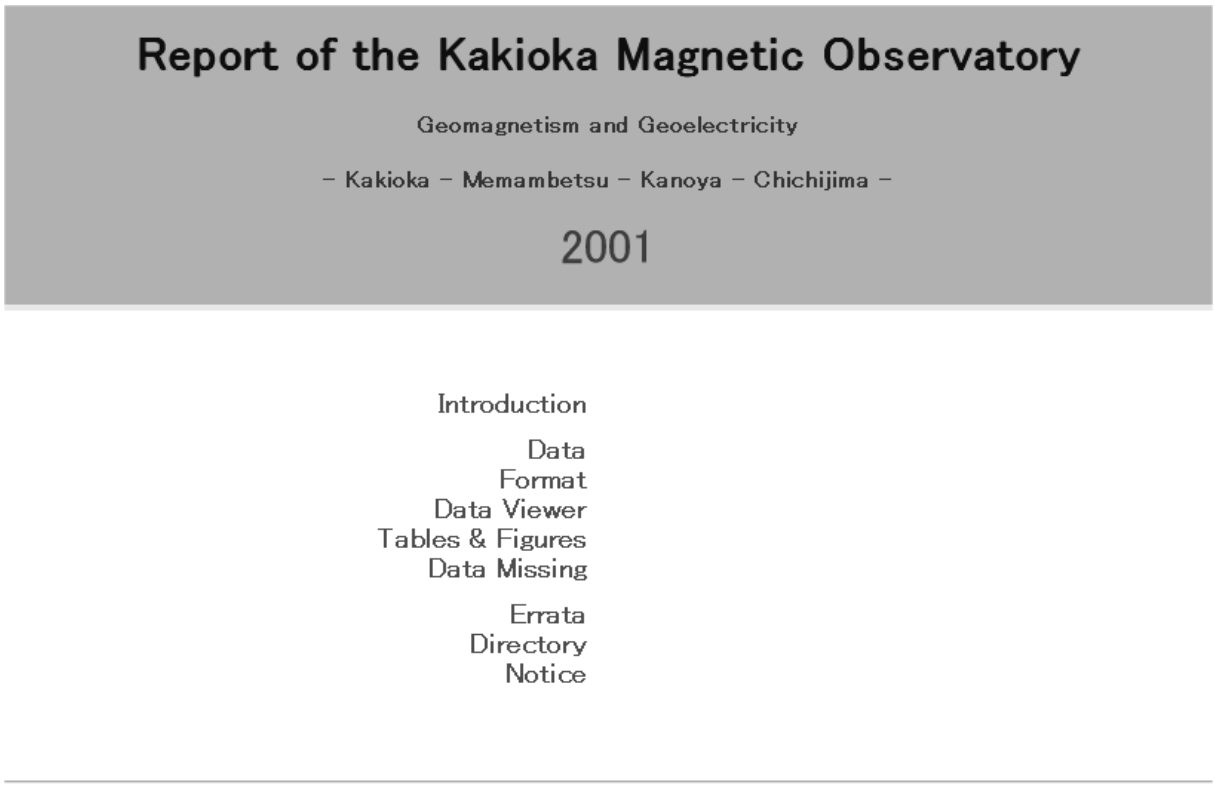


Figure 1 Menu page (index.html) in the CD-ROM version of the annual report

index.html is at the top of the hierarchy of data contained in the CD-ROM.
Use the Internet browser to access index.html, and then select one from the options shown on the menu page.

Table 2 Contents of the CD-ROM version of the annual report

Menu	Contents
Introduction	General information on the annual report
Data	Observational data
Format	Information on the formats of each item of observational data
Data Viewer	Data viewing software
	User's manual
Tables & Figures	Tables and figures that appear in the annual reports issued as bound volumes
Data Missing	Information on missing geomagnetic data
Errata	Information on the corrections or revisions made in the annual reports issued in the past
Directory	Directory structure of the CD-ROM
Notice	Points to note before starting to use the CD-ROM

3. Data Format

The data format used at the Kakioka Magnetic Observatory is an originally developed data format. In various types of data being handled at the Observatory, 1-minute-value data was in binary form. Before we wrote 1-minute-value data and hourly-value data on the CD-ROM as digital data, we examined the appropriateness of using the existing data format or introducing a new data format in order to make the CD-ROM easy to use. We decided to introduce an extended format (IAGA-2002x, extended IAGA2002 format), specifically the IAGA2002 format that may be more popular has a column in which the QA/QC (Quality Assurance/Quality Control) flags are to be added. Figure 2 shows examples of geomagnetic, earth-current and atmospheric-electricity data. Four letters for each component were assigned to the QA/QC flag, and this flag was added to the column established right after the Observational data. For geomagnetic field data that have four components, D, H, Z and F, a space for 16 letters was assigned. For geoelectric field data that have two components, X and Y, a space for eight letters was assigned. For atmospheric-electric field data that have one component, Z, a space for four letters was assigned. In the annual report for 2001, however, the QA/QC flags were not used yet, and therefore the column was left blank. Furthermore, because the names of files in the IAGA2002 format do not show specific observation categories, the IAGA-2002x format was established by placing an observation category code (geomagnetic field: _m, geoelectric field: _e, and atmospheric electric field: _p) at a position right before the period in the IAGA2002 format. Therefore, the file name given to hourly geomagnetic data collected in January 2001 at the Kakioka Magnetic Observatory was designated as kak200101d_m.hor.

4. Data Viewing Software

The data-viewing software prototype was developed by the Kakioka Magnetic Observatory in 2000. Based on the results of surveys that we conducted on people concerned to collect their requests and opinions about the CD-ROM version of the annual report, we improved the software, conducted revision of the model and systematic error checks, and completed it as a data-viewing program to be included in the CD-ROM.

Microsoft Visual Basic was used to develop the software (source codes are shown on our homepage at http://www.kakioka-jma.go.jp). To use this data-viewing program, a personal computer running Windows 95, 98, Me, 2000 or XP and a monitor with 1024 x 768 pixels or higher resolution are required (Figure 3). This software program allows the user to display summary plots of hourly values measured at one observation point in one month, summary plots of hourly values measured at four observation points in one season, summary plots of 1-minute values measured at one observation point in one day, data on hourly values measured at one observation point in one day, K indexes, and the list of magnetic storms. All these data displayed on the screen of a monitor can be saved as image files (Figure 4a-e). It also allows the user to specify observation points, components and a period, to extract geomagnetic data based on specified observation points, components and a period, and to save extracted data in CSV format. Data saved this way can be used in Microsoft Excel and other software programs (Figure 4f).

5. Various Tables and Figures

Tables and figures can be viewed by clicking on "Tables & Figures" in the menu page or the "Tables & Figures" button provided in the data-viewing program. Tables and figures can be browsed using the Internet browser. The formats and contents of tables are the same as those in the annual report issued as a bound volume. Figure 5 shows examples of tables and figures that you can retrieve and display on your monitor.

On the "Table & Figures" page, you find "GEOMAGNETISM," "GEOELECTRICITY," "MAGNETIC PULSATION," and "DATA VIEWER" at the top of the page. By clicking on "GEOMAGNETISM," "GEOELECTRICITY," and "MAGNETIC PULSATION," you can display tables and figures related to geomagnetism, geoelectric data, and geomagnetic pulsations, respectively. By clicking on "DATA VIEWER," you can start the data-viewing software program. A table or figure that you select from the menu is shown in the window at lower right. Table 3 shows all data items that you can select and display.

(a) Geomagnetic field data

```
 Format                IAGA-2002x (Extended IAGA2002 Format)
 Source of Data        Kakioka Magnetic Observatory, JMA
 Station Name          Kakioka
 IAGA CODE             KAK
 Geodetic Latitude     36.232
 Geodetic Longitude    140.186
 Elevation             36.0
 Reported              DHZF
 Sensor Orientation    absolute:DIF, variation:XYZF
 Digital Sampling      1 second
 Data Interval Type    Filtered 1-minute (00:30 - 01:29)
 Data Type             Definitive
 # Element             Geomagnetic field
 # Unit                D(eastward+):minute, H:nT, Z(downward+):nT, F:nT
 # Issued by           Kakioka Magnetic Observatory, JMA
 # URL                 http://www.kakioka-jma.go.jp/index.html
 # Last Modified       Feb 14 2003
DATE       TIME         DOY     KAKD      KAKH      KAKZ      KAKF
2001-01-01 00:00:00.000 001      -420.78  30007.00  35369.60  46383.50
2001-01-01 00:01:00.000 001      -420.77  30006.80  35369.50  46383.30
2001-01-01 00:02:00.000 001      -420.77  30006.70  35369.40  46383.10
2001-01-01 00:03:00.000 001      -420.77  30006.50  35369.30  46382.90
2001-01-01 00:04:00.000 001      -420.76  30006.40  35369.10  46382.70
```

← 16 digits →
(4 components × 4 digits)

(b) Geoelectric field

```
 Format                IAGA-2002x (Extended IAGA2002 Format)
 Source of Data        Kakioka Magnetic Observatory, JMA
 Station Name          Kakioka
 IAGA CODE             KAK
 Geodetic Latitude     36.232
 Geodetic Longitude    140.186
 Elevation             36.0
 Reported              XY
 Sensor Orientation    XY
 Digital Sampling      1 second
 Data Interval Type    Filtered 1-minute (00:30 - 01:29)
 Data Type             Definitive
 # Element             Geoelectric field
 # Unit                X(northward+):mV/km, Y(eastward+):mV/km
 # Issued by           Kakioka Magnetic Observatory, JMA
 # URL                 http://www.kakioka-jma.go.jp/index.html
 # Last Modified       Feb 14 2003
DATE       TIME         DOY     KAKX      KAKY
2001-01-01 00:00:00.000 001      -125.60    357.90
2001-01-01 00:01:00.000 001      -124.80    358.20
2001-01-01 00:02:00.000 001      -125.30    357.70
2001-01-01 00:03:00.000 001      -125.00    358.30
2001-01-01 00:04:00.000 001      -124.90    357.70
```

←8 digits→
(2 components × 4 digits)

(c) Atmospheric-electric field data

```
 Format                IAGA-2002x (Extended IAGA2002 Format)
 Source of Data        Kakioka Magnetic Observatory, JMA
 Station Name          Memambetsu
 IAGA CODE             MMB
 Geodetic Latitude     43.910
 Geodetic Longitude    144.189
 Elevation             42.0
 Reported              Z
 Sensor Orientation    Z
 Digital Sampling      1 second
 Data Interval Type    Filtered 1-minute (00:30 - 01:29)
 Data Type             Definitive
 # Element             Atmospheric electric field
 # Unit                Z(upward+):V/m
 # Issued by           Kakioka Magnetic Observatory, JMA
 # URL                 http://www.kakioka-jma.go.jp/index.html
 # Last Modified       Feb 14 2003
DATE       TIME         DOY     MMBZ
2001-01-01 00:00:00.000 001        55.30
2001-01-01 00:01:00.000 001        59.70
2001-01-01 00:02:00.000 001        58.50
2001-01-01 00:03:00.000 001        63.60
2001-01-01 00:04:00.000 001        62.00
```

←→4 digits
(1 component × 4 digits)

Figure 2 Examples of observational data: (a) geomagnetic field, (b) geoelectric field, and (c) atmospheric electric field

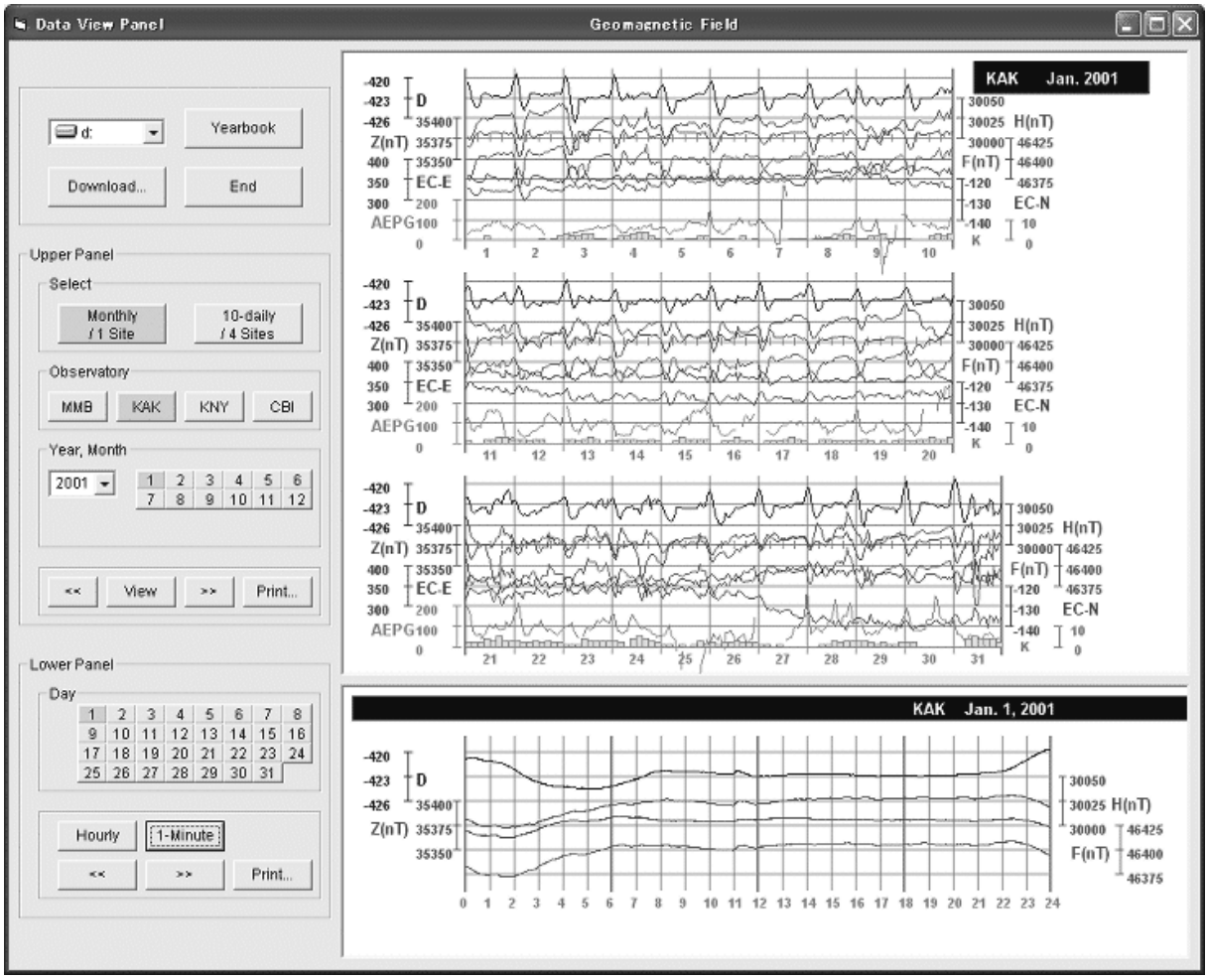
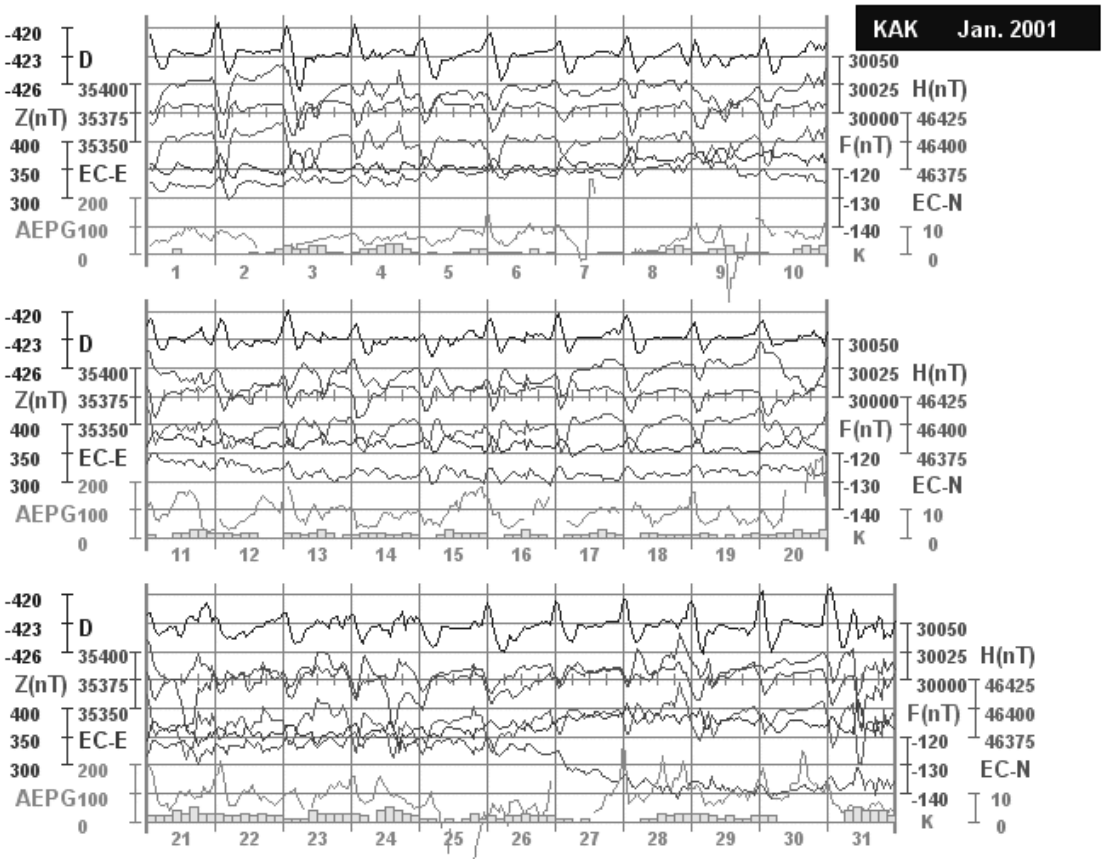
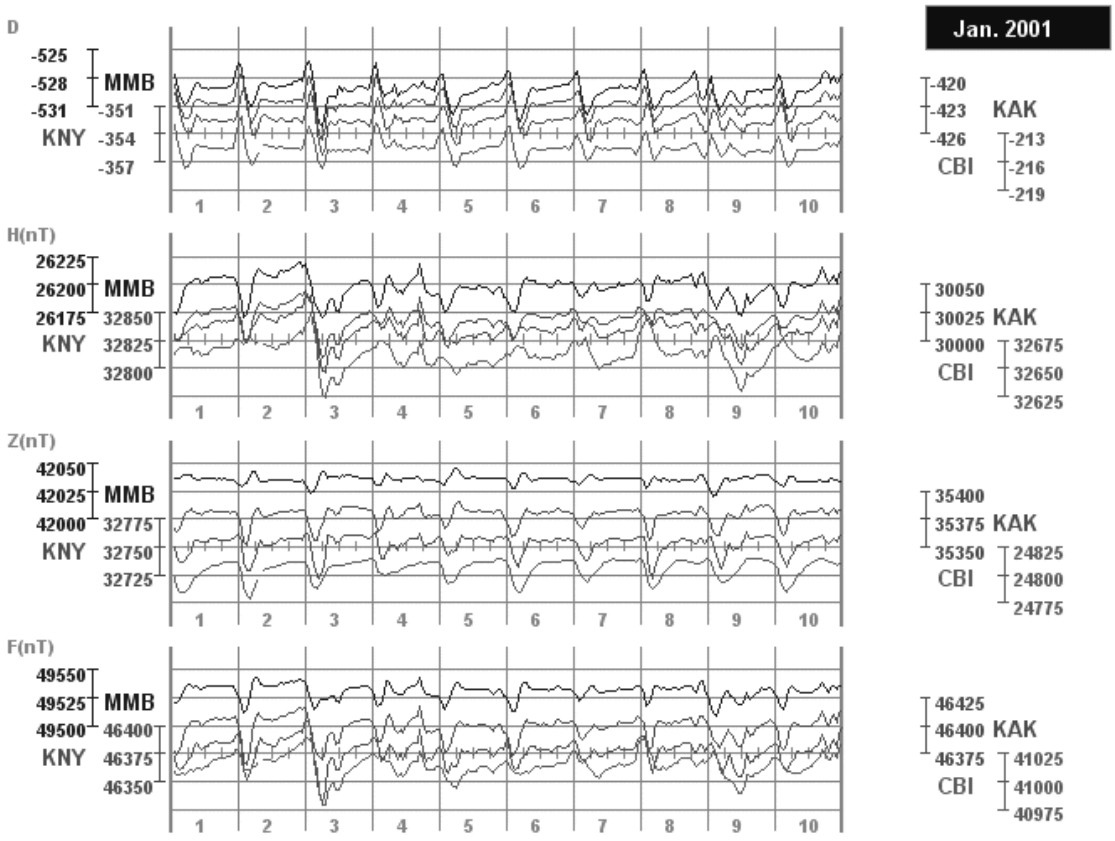


Figure 3 Example of how the data-viewing software (Data Viewer) is used

(a) Summary plot of hourly values (measured at one observation point in one month)



(b) Summary plot of hourly values (measured at four observation points in one season)

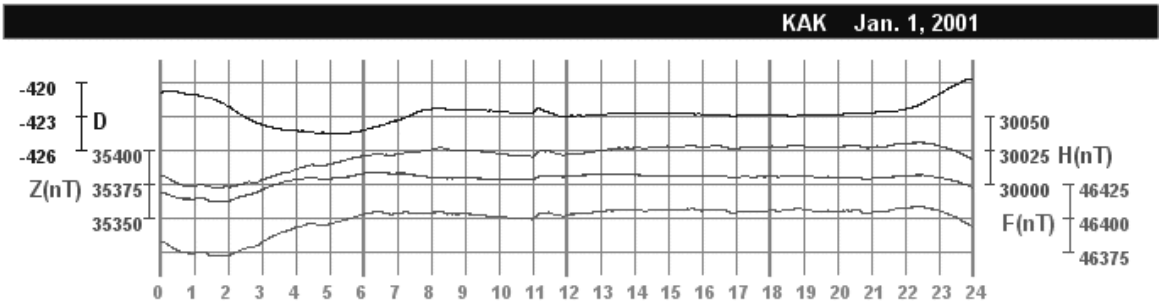


(c) Hourly values and K indexes

KAK Jan. 1, 2001

Hr	D	H(nT)	Z(nT)	F(nT)	EC-E	EC-N	AEPG	K	Hr	D	H(nT)	Z(nT)	F(nT)	EC-E	EC-N	AEPG	K
0	-420.8	30002	35366	46377	360.6	-124.4	34		12	-422.9	30024	35382	46404	354	-126.1	83	
1	-421.5	29999	35364	46374	359.5	-124.8	37		13	-422.7	30027	35383	46406	352.8	-126.3	97	
2	-423	30001	35367	46378	353.3	-126.3	51	0	14	-422.7	30028	35382	46406	352.9	-126	89	0
3	-424	30008	35376	46389	346.7	-127.7	46		15	-422.7	30028	35382	46407	349.4	-126	99	
4	-424.3	30014	35380	46396	345.3	-127.6	47		16	-422.8	30028	35381	46406	350.1	-126.4	91	
5	-424.4	30019	35381	46400	341.6	-127.4	48	0	17	-422.8	30028	35381	46406	350.5	-126	75	0
6	-423.7	30022	35384	46404	341.6	-126.2	43		18	-422.8	30029	35382	46407	349.3	-126.1	60	
7	-422.7	30024	35382	46404	342	-124.8	53		19	-422.8	30028	35381	46406	350.2	-126.1	74	
8	-422.3	30026	35380	46404	348.8	-125.1	68	0	20	-422.7	30028	35380	46405	350.1	-126.2	63	0
9	-422.4	30024	35380	46403	358.2	-125.6	66		21	-422.5	30029	35381	46407	345.3	-126.5	53	
10	-422.6	30022	35379	46400	362.4	-125.2	79		22	-421.7	30031	35382	46408	345.6	-125.9	48	
11	-422.7	30024	35381	46403	357.5	-125.8	70	2	23	-420.1	30024	35377	46400	356.8	-124.7	80	0

(d) Summary plot of 1-minute values (measured at one observation point in one day)



(e) List of magnetic storms

Geomagnetic Storm Catalog KAK Mar. 2001

Obs	---Date---- y m d	Begin h m	Main d h	Last d h	End d h	Type	Q	----H---- A	D	----D---- A	D	----Z---- A	D	DA	--Max.Activity-- d	3h-period	K	----Range---- H	D	Z
KAK	2001-03-19	11 13	19 12.5	20 13.0	20 24	ssc*	B	+14	7	-0* +6	1 6	+8	6	ms	20	5	7	201	134	121
KAK	2001-03-28	06.8			28 20	...								ms	28	5	6	102	42	59
KAK	2001-03-31	00 52	31 05.0	31 08.6	01 15	ssc*	A	+67	3	-2* +64	0 2	+30	3	s	31	23	8	477	319	169

(f) Extracting data and saving data in CSV format

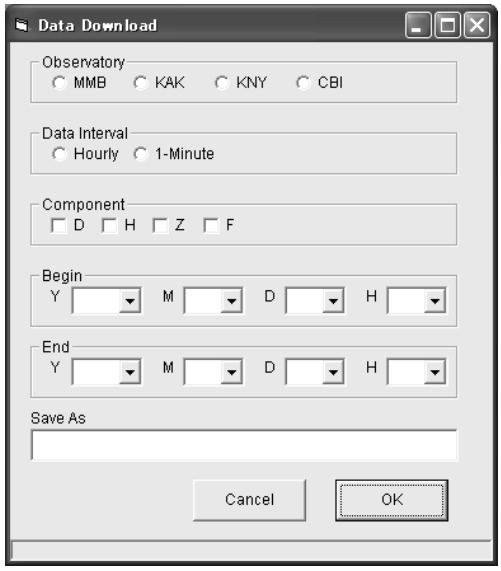
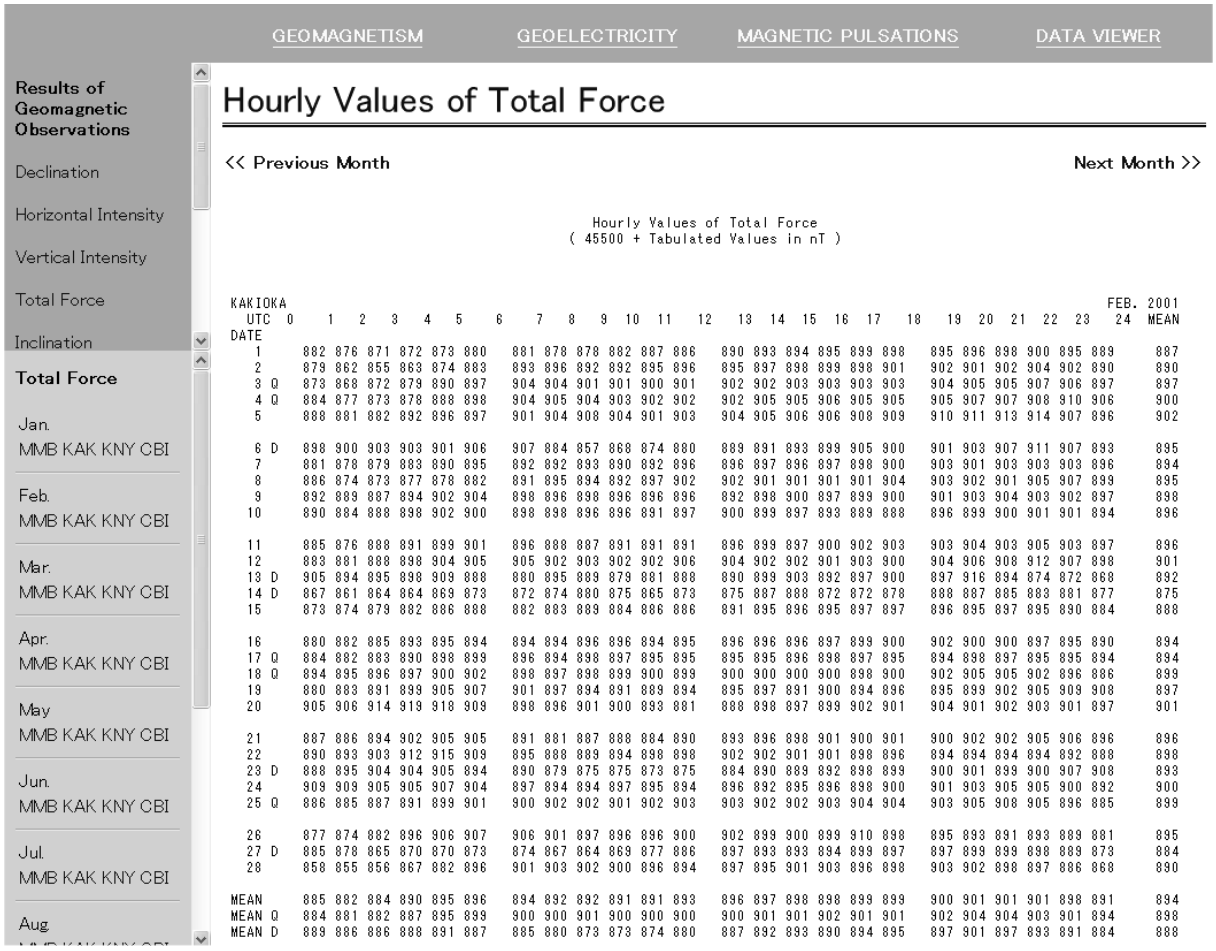


Figure 4 Functions of the data-viewing software

(a) Table of hourly geomagnetic data



GEOMAGNETISM GEOELECTRICITY MAGNETIC PULSATIONS DATA VIEWER

Results of Geomagnetic Observations
Declination
Horizontal Intensity
Vertical Intensity
Total Force
Inclination

Total Force
Jan. MMB KAK KNY CBI
Feb. MMB KAK KNY CBI
Mar. MMB KAK KNY CBI
Apr. MMB KAK KNY CBI
May MMB KAK KNY CBI
Jun. MMB KAK KNY CBI
Jul. MMB KAK KNY CBI
Aug.

Hourly Values of Total Force

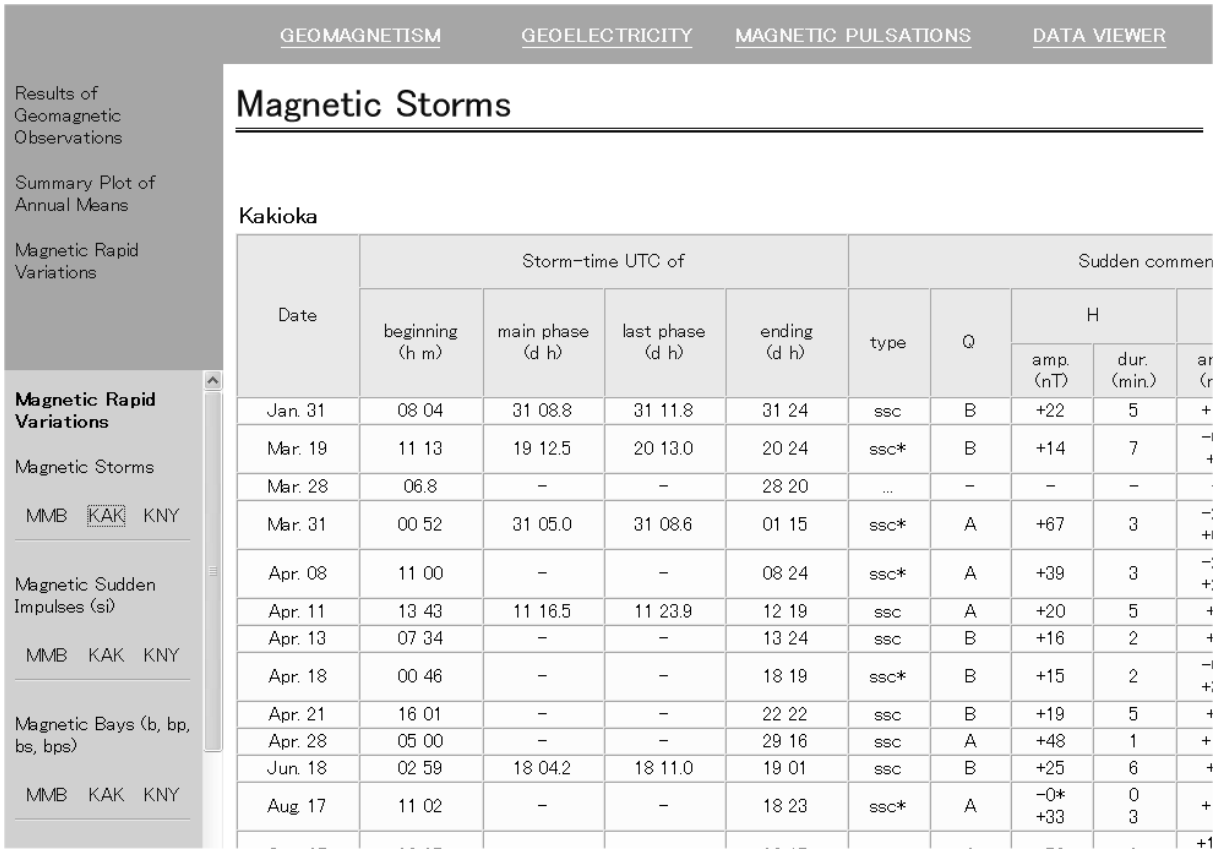
<< Previous Month Next Month >>

Hourly Values of Total Force
(45500 + Tabulated Values in nT)

KAKIOKA FEB. 2001

UTC / DATE	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	MEAN
1		882	876	871	872	873	880	881	878	878	882	887	886	890	893	894	895	899	898	895	896	898	900	895	889	887
2		879	862	855	863	874	883	893	896	892	892	895	896	895	897	898	899	898	901	902	901	902	904	902	890	890
3	Q	873	868	872	879	890	897	904	904	901	901	900	901	902	902	903	903	903	903	904	905	905	907	906	897	897
4	Q	884	877	873	878	888	898	904	905	904	903	902	902	902	905	905	906	905	905	905	907	907	908	910	906	900
5		888	881	882	892	896	897	901	904	908	904	901	903	904	905	906	906	908	909	910	911	913	914	907	896	902
6	D	898	900	903	903	901	906	907	884	857	868	874	880	889	891	893	899	905	900	901	903	907	911	907	893	895
7		881	878	879	883	890	895	892	892	893	890	892	896	896	897	896	897	898	900	903	901	903	903	903	896	894
8		886	874	873	877	878	882	891	895	894	892	897	902	902	901	901	901	901	904	903	902	901	905	907	899	895
9		892	889	887	894	902	904	898	896	898	896	896	896	892	898	900	897	899	900	901	903	904	903	902	897	898
10		890	884	888	898	902	900	898	898	896	896	891	897	900	899	897	893	889	888	896	899	900	901	901	894	896
11		885	876	888	891	899	901	896	888	887	891	891	891	896	899	897	900	902	903	903	904	903	905	903	897	896
12		883	881	888	898	904	905	905	902	903	902	902	906	904	902	902	901	903	900	904	906	908	912	907	898	901
13	D	905	894	895	898	909	888	880	895	889	879	881	888	890	899	903	892	897	900	897	916	894	874	872	868	892
14	D	867	861	864	864	869	873	872	874	880	875	865	873	875	887	888	872	872	878	888	887	885	883	881	877	875
15		873	874	879	882	886	888	882	883	889	884	886	886	891	895	896	895	897	897	896	895	897	895	890	884	888
16		880	882	885	893	895	894	894	894	896	896	894	895	896	896	896	897	899	900	902	900	900	897	895	890	894
17	Q	884	882	883	890	898	899	896	894	898	897	895	895	895	895	896	898	897	895	894	898	897	895	895	894	894
18	Q	894	895	896	897	900	902	898	897	898	899	900	899	900	900	900	900	898	900	902	905	905	902	896	886	899
19		880	883	891	899	905	907	901	897	894	891	889	894	895	897	891	900	894	896	895	899	902	905	909	908	897
20		905	906	914	919	918	909	898	896	901	900	893	881	888	898	897	899	902	901	904	901	902	903	901	897	901
21		887	886	894	902	905	905	891	881	887	888	884	890	893	896	898	901	900	901	900	902	902	905	906	896	896
22		890	893	903	912	915	909	895	888	889	894	898	898	902	902	901	901	898	896	894	894	894	894	892	888	898
23	D	888	895	904	904	905	894	890	879	875	875	873	875	884	890	889	892	898	899	900	901	899	900	907	908	893
24		909	909	905	905	907	904	897	894	894	897	895	894	896	892	895	896	898	900	901	903	905	905	900	892	900
25	Q	886	885	887	891	899	901	900	902	902	901	902	903	903	902	902	903	904	904	903	905	908	905	896	885	899
26		877	874	882	896	906	907	906	901	897	896	896	900	902	899	900	899	910	898	895	893	891	893	889	881	895
27	D	885	878	865	870	870	873	874	867	864	869	877	886	897	893	893	894	899	897	897	899	899	898	889	873	884
28		858	855	856	867	882	896	901	903	902	900	896	894	897	895	901	903	896	898	903	902	898	897	886	868	890
MEAN		885	882	884	890	895	896	894	892	892	891	891	893	896	897	898	898	899	899	900	901	901	901	898	891	894
MEAN	Q	884	881	882	887	895	899	900	900	901	900	900	900	900	901	901	902	901	901	902	904	904	903	901	894	898
MEAN	D	889	886	886	888	891	887	885	880	873	873	874	880	887	892	893	890	894	895	897	901	897	893	891	884	888

(b) List of magnetic storms



GEOMAGNETISM GEOELECTRICITY MAGNETIC PULSATIONS DATA VIEWER

Results of Geomagnetic Observations
Summary Plot of Annual Means
Magnetic Rapid Variations

Magnetic Rapid Variations
Magnetic Storms
MMB KAK KNY
Magnetic Sudden Impulses (si)
MMB KAK KNY
Magnetic Bays (b, bp, bs, bps)
MMB KAK KNY

Magnetic Storms

Kakioka

Date	Storm-time UTC of				Sudden commen			
	beginning (h m)	main phase (d h)	last phase (d h)	ending (d h)	type	Q	H	
							amp. (nT)	dur. (min.)
Jan. 31	08 04	31 08.8	31 11.8	31 24	ssc	B	+22	5
Mar. 19	11 13	19 12.5	20 13.0	20 24	ssc*	B	+14	7
Mar. 28	06.8	–	–	28 20	...	–	–	–
Mar. 31	00 52	31 05.0	31 08.6	01 15	ssc*	A	+67	3
Apr. 08	11 00	–	–	08 24	ssc*	A	+39	3
Apr. 11	13 43	11 16.5	11 23.9	12 19	ssc	A	+20	5
Apr. 13	07 34	–	–	13 24	ssc	B	+16	2
Apr. 18	00 46	–	–	18 19	ssc*	B	+15	2
Apr. 21	16 01	–	–	22 22	ssc	B	+19	5
Apr. 28	05 00	–	–	29 16	ssc	A	+48	1
Jun. 18	02 59	18 04.2	18 11.0	19 01	ssc	B	+25	6
Aug. 17	11 02	–	–	18 23	ssc*	A	−0* +33	0 3

(c) Dynamic spectra for magnetic pulsations

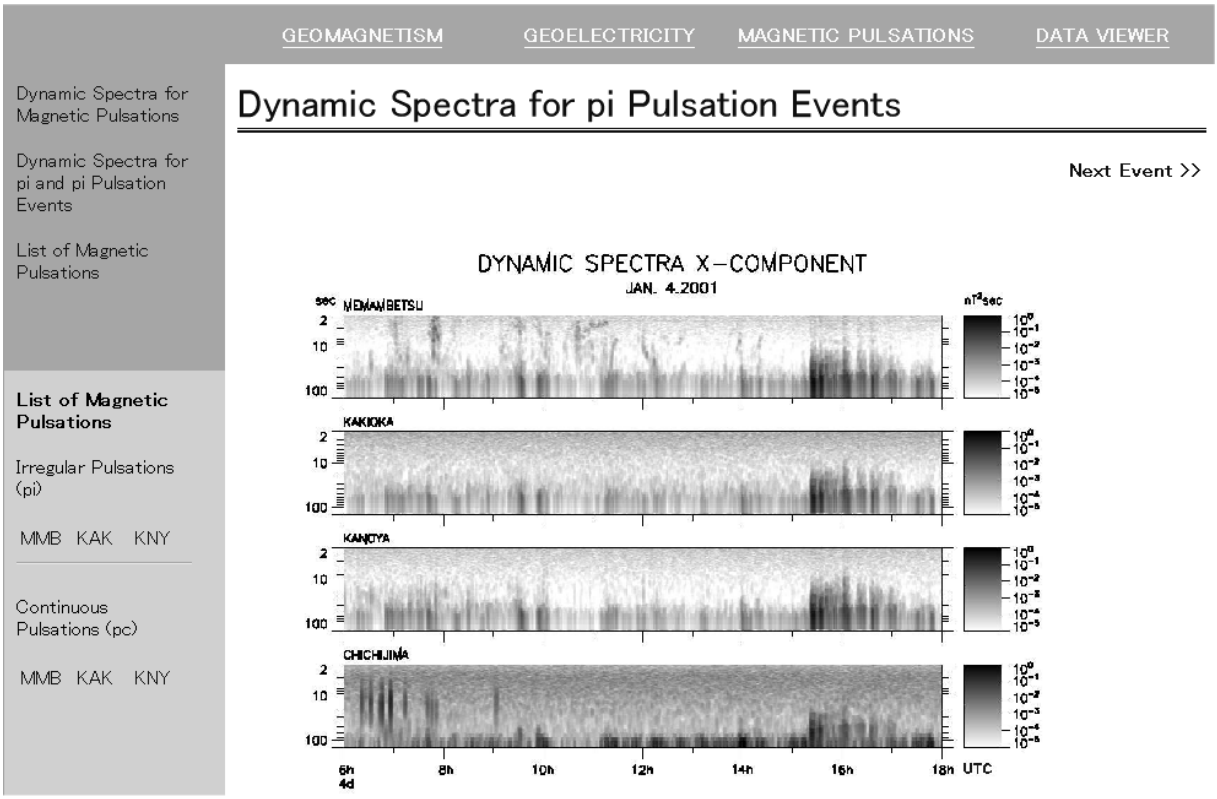


Figure 5 Example of how "Tables & Figures" are shown

Table 3 Contents of "Tables & Figures"

- **GEOMAGNETISM**
  - Results of Geomagnetic Observations ····· Table of hourly geomagnetic values
    - Declination ····· Hourly declination values
    - Horizontal Intensity ····· Table of hourly horizontal-component values
    - Vertical Intensity ····· Table of hourly vertical-component values
    - Total Force ····· Table of hourly total geomagnetic force
    - Inclination ····· Table of hourly inclination values
    - North Component ····· Table of hourly north- and south-component values
    - West Component ····· Table of hourly east- and west-component values
    - Summary of Annual Mean ····· Table of annual means
    - Three-Hour-Range Indices, K ····· K-index table
  - Summary Plot of Annual Mean ····· Summary plot of geomagnetic secular variations
    - Declination ····· Summary plot of declination secular variations
    - Horizontal Intensity ····· Summary plot of horizontal-component secular variations
    - Vertical Intensity ····· Summary plot of vertical-component secular variations
    - Total Force ····· Summary plot of secular variations of geomagnetic force
  - Magnetic Rapid Variations ····· List of magnetic rapid variations
    - Magnetic Storms ····· List of magnetic storms
    - Magnetic Sudden Impulses (si) ····· List of sudden impulses (si)
    - Magnetic Bays (b, bp, bs, bps) ····· List of bays
    - Magnetic Solar Flare Effects (sfe) ····· List of solar flare effects (sfe)

- **GEOELECTRICITY**
  - Summary Results of Earth-Current Potential Gradient ····· Table of hourly earth-current values
    - EW Component ····· Table of hourly east- and west-component values
    - NS Component ····· Table of hourly north- and south-component values
  - Summary Results of Atmospheric Electric Potential Gradient ····· Table of hourly atmospheric-electricity values
    - Mean Diurnal Variations of Quiet Days ····· Table of daily means of diurnal variations on quiet days

- **MAGNETIC PULSATIONS**
  - Dynamic Spectra for Magnetic Pulsations ····· Dynamic spectra obtained by analyzing magnetic pulsations
  - Dynamic Spectra for pi and pc Pulsation Events ····· Dynamic spectra obtained by analyzing pi and pc pulsation events
    - pi ····· Spectra obtained by analyzing pi pulsation events
    - pc ····· Spectra obtained by analyzing pc pulsation events
  - List of Magnetic Pulsations ····· List of magnetic pulsations that occurred
    - Irregular Pulsations (pi) ····· List of irregular pulsations (pi)
    - Continuous Pulsations (pc) ····· List of continuous pulsations (pc)

- **Data Viewer** ····· To start the data-viewing software

6. Summary

The Report of the Kakioka Magnetic Observatory, which describes the results of geomagnetic and geoelectric observations conducted at the Kakioka Magnetic Observatory, was issued as a bound volume. It is now issued as a CD-ROM, starting with the 2001 issue. With this change in the medium for the annual report, the data format was reviewed and the extended IAGA2002 format was introduced. Furthermore, to increase the user convenience by providing a function for presenting data as visual information, the data-viewing software program was developed and included in the CD-ROM

.

Acknowledgments

We received very valuable opinions from Mr. Kamei at the Data Analysis Center for Geomagnetism and Space Magnetism, the Graduate School of Science, Kyoto University, regarding the development of the CD-ROM prototype. We also had many pieces of advice from Mr. Maki at the Meteorological Research Institute regarding the development of the data-viewing software prototype. We would like to express our sincere appreciation for their kind support and cooperation.

We created the CD-ROM version of the 2001 annual report through collaboration with Mr. Koide, director of the Research Division and all personnel of this division. We would like to thank you very much for your cooperation.

References

Ishii, Y., 2001. "Survey concerning the project to issue the annual report of the Kakioka Magnetic Observatory in the form of a CD-ROM" and Gijutsu Hokoku, 40(2), 49-57, 2001. (in Japanese)

Appendix: Directory structure of the CD-ROM version of the Report of the Kakioka Magnetic Observatory

```
root
├── documents
│   ├── doc ..... Preamble and HTML file
│   ├── errata ..... Errata concerning the annual reports issued in the past
│   ├── format ..... Data format
│   └── missing ..... Information on missing data
├── geomag
│   ├── mh
│   │   └── mhYYYY ── OBSYYYYMMd_m.hor ..... Data on hourly geomagnetic values
│   ├── mm
│   │   └── mmYYYY── OBSYYYYMMDDd_m.min ..... Data on 1-minute geomagnetic values
│   ├── eh
│   │   └── ehYYYY ── OBSYYYYMMd_e.hor ..... Table of hourly geoelectric field values
│   ├── em
│   │   └── emYYYY── OBSYYYYMMDDd_e.min ..... Table of 1-minute geoelectric field values
│   ├── ph
│   │   └── phYYYY ── OBSYYYYMMd_p.hor ..... Table of hourly atmospheric electric field values
│   ├── pm
│   │   └── pmYYYY── OBSYYYYMMDDd_p.min ..... Table of 1-minute atmospheric electric field values
│   ├── k
│   │   └── kYYYY── kYYYYMM.dat ..... K-index table
│   ├── rv
│   │   ├── mstormYYYY ── mstormYYYYMM.dat ..... List of geomagnetic storms
│   │   ├── estormYYYY ── estormYYYYMM.dat ..... List of geoelectric storms
│   │   ├── bayYYYY── bayYYYYMM.dat ..... List of bays
│   │   ├── sfeYYYY── sfeYYYYMM.dat ..... List of sfe
│   │   ├── siYYYY── siYYYYMM.dat ..... List of si
│   │   ├── piYYYY ── piYYYYMM.dat ..... List of pi
│   │   └── pcYYYY── pcYYYYMM.dat ..... List of pc
│   └── rm
│       ├── mkYYYY── mkYYYYMM.OBS ..... Detailed information on geomagnetic observations
│       ├── ekYYYY ekYYYYMM.OBS ..... Detailed information on geoelectric observations
│       └── pkYYYY── pkYYYYMM.OBS ..... Detailed information on atmospheric-electricity observations
├── viewer ..... Executable file in the data-viewing software
│   └── man ..... Manual for the data-viewing software
└── yearbook
    ├── doc ..... HTML file
    ├── fig
    │   ├── am ..... Summary plot of geomagnetic secular variations
    │   └── mp
    │       ├── all ..... Dynamic spectra obtained by analyzing data (during the whole period)
    │       └── event ..... Dynamic spectra obtained by analyzing data (when magnetic pulsations occur)
    └── tab
        ├── am ..... Table of geomagnetic secular variations
        ├── ec ..... Table of observed geoelectric field values
        ├── k ..... K-index table
        ├── mag ..... Table of observed geomagnetic values
        ├── pg ..... Observed atmospheric electric field values
        └── rv ..... Table of geomagnetic rapid variations
```

Configuration of the CD-ROM version of the Report of the Kakioka Magnetic Observatory
YYYY = year (4 digits), MM = month (2 digits), DD = day (2 digits)
OBS = kak (Kakioka), mmb (Memanbetsu), kny (Kanoya), chi (Chichijima Island)