REPORT SE-45

WORLD DATA CENTER A
for
Solid Earth Geophysics

A REPORT ON
GEOMAGNETIC OBSERVATORY OPERATIONS,
1990

February 1992

NATIONAL GEOPHYSICAL DATA CENTER

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A REPORT ON
GEOMAGNETIC OBSERVATORY OPERATIONS,
1990

by

K. L. Svendsen
W. M. Davis
S.J. McLean
H. Meyers

In cooperation with
IAGA/IUGG, Division V, Magnetic Observatories, Instruments, Surveys, and Analysis

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
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A REPORT ON GEOMAGNETIC OBSERVATORY OPERATIONS, 1990

by
K.L. Svendsen, W.M. Davis, S.J. McLean, and H. Meyers

How effective is the present geomagnetic observatory network in meeting the current needs of the research community? This is a matter of some interest to the research community, as evidenced by their expression of concern to the International Association of Geomagnetism and Aeronomy (IAGA). It is also of interest to many of the observatory operators who look to the needs of international science for additional justification for their programs. Each country necessarily maintains its magnetic observatories for its own national programs, but since the International Geophysical Year of 1957-1958, there has been increased awareness of the global value of the data. Most of the world's observatories have been very generous and cooperative in making their data available to the research community, generally through the World Data Center system.

Historically, magnetic observatories were established to monitor the secular change of Earth's magnetic field, and this remains one of their most important functions. In the strictest sense, the term "geomagnetic observatory" or simply "magnetic observatory" implies an installation that is producing data suitable for studies of secular change. This generally involves absolute measurements sufficient in number to monitor instrumental drift and finally, the production of annual means. It is in this context that the effectiveness will be examined.

Probably the greatest weakness in the data base comes from the uneven geographical distribution of observatories. Until magnetometers are perfected that can operate as observatories on ocean bottom, location of observatories is limited to land areas, and this means only on continents and islands. But there are other limiting factors. Table 1 lists observatories in operation as of 1990, and Maps 1a and 1b show their locations on the globe. It is clear that, although there are a large number of observatories (195), they are not balanced geographically. Europe has many; Africa has few. The Southern Hemisphere has far less than the Northern Hemisphere. More about this problem later.

Next to be considered is availability of data. The deficiencies resulting from geographical distribution are compounded when the data are not available quickly. Most users of secular change data would be satisfied if they could obtain all observatory annual means from the previous year by July—for example, 1989 annual means by July 1990. Actually, for the International Geomagnetic Reference Field (IGRF) modelers, there is a real need for this

degree of speed. Unfortunately, this can never be totally achieved. Instruments malfunction, observers depart leaving operations crippled, observatories have changing priorities, and other problems occur. However, as a test to see how close we could come to this objective, in 1989 WDC-A made a special appeal to the observatories to supply annual means as quickly as possible. Table 2 lists the annual means for 1987 and 1988 that were available by April 1990. Of these, more than 95% were collected by July 1989—130 providing 1988 means and 31 more providing 1987 means (the best they could do). These observatories are plotted on Maps 2a and 2b. This represents 83% of the total number of observatories, which in our opinion is an outstanding performance for which the observatories deserve commendation. Observatories unable to provide 1987 or 1988 data, with explanations, are listed in Table 3.

Is the present observatory product what the community needs? Traditional products have been magnetograms (analog records) and hourly values (digital records)—the latter derived from the former by hand-scaling, curve-followers, or more recently by digital magnetometers. Hourly values then become available in the form of monthly tables in publications (commonly called "yearbooks"), in computer printouts, on microfilm or microfiche, on magnetic tapes, or most recently, computer disks. Annual means are usually provided separately, as a mean of all the hourly values, but can be approximated from the monthly means. Yearbooks or other published formats are valuable for archival purposes, but where speed is desired machine-readable formats are preferred. "Floppy" disks (5.25" or 3.5", IBM-PC compatible) are currently the preferred exchange format. One disk can hold as much as six years of hourly values, with four elements. Some secular change studies are being made using "annual means" computed from a selection of the hourly values (during only quiet intervals, for example), so that there is continued interest in the more detailed hourly data.

Today, most digital magnetometers sample the field each minute, some several times a minute, and these high-resolution recordings are of interest for other purposes than secular change. Because of other important uses, and the ease with which the traditional means can still be obtained by computer, IAGA has recommended that observatories adopt one-minute values as the current standard output. One floppy disk will hold one-minute data for one year, with four elements. Many observatories which now have these digital systems and which consider these systems their primary records have abandoned classical recording of magnetograms. If wanted, analog records can be synthesized by computer from the digital recordings—by the observatory, by the data user, or by the World Data Centers.

As of this writing, digital systems have been installed at 99 observatories—more than half of the total number of observatories (see Table 4, Map 3a, and Map 3b). Thus, the easy availability of reliable, stable digital systems has truly caused a second revolution in magnetic observatory operation. The first was, of course, the earlier revolution in absolute instrumentation, whereby the proton magnetometer and the flux-gate theodolites replaced the

Gaussian magnetometer, the Earth inductor, the BMZ, and the QHMs—though some of the last-named are still finding good use.

The speed with which derived means can be computed is inferred from Table 2. Most of the observatories in the first group (1988) have digital systems. But there are other advantages of digital magnetometers, not the least of which is eliminating some of the tedious handwork, such as scaling of hourly values. Moreover, these systems can become the core of an automatic, unstaffed system, and are used in this manner by the United Kingdom, Canada, the USA, and perhaps others. The advantages of these systems are so great that, since 1986, IAGA has sponsored several instrument workshops to stimulate competition in development, to demonstrate the advantages, and just to "spread the word." The latest workshop was at Tihany, Hungary, in September 1990. Any observatories not already operating these systems are urged to read the published proceedings of the workshops. Information on these may be obtained from the Chairman of IAGA's Division 5, David Kerridge, Geomagnetism Group, Murchison House-West Mains Road, Edinburgh EH9 3LA, Scotland, United Kingdom.

The UK and the USA are cooperating in the promotion of a global network delivering near real-time observatory data to selected ground receiving stations, through the use of satellites. This project is called Intermagnet and will be especially useful in real-time monitoring and forecasting magnetic conditions on the ground and in space. Several countries are planning to join the network as soon as practicable. If you are interested in becoming part of Intermagnet, or if you would like information about the project, you may write to Dr. David Kerridge at the above address, or Dr. A.W. Green, U.S. Geological Survey, Federal Center, Box 25046, Stop 968, Denver, Colorado 80225, USA.

Not all the news about magnetic observatories is positive. There are many problems confronting some members of the family of observatories. The struggle for financial support for geomagnetic programs is not restricted to Third World countries. (Witness the recent closing of Witteveen in the Netherlands.) But Third World countries certainly have the more difficult situation. Problems in obtaining photo paper and chemicals for the old la Cour and Ruska magnetographs are widespread, and staffing and financial support can be very difficult.

In recent years a number of observatories have closed, leaving some very important geographical gaps. These names come to mind: Plaisance (Mauritius), Moca (Equatorial Guinea), Ksara (Lebanon), Orcadas del Sur (Argentina), Easter Island (Chile), Paramaribo (Suriname), Lwiro (Zaire), and Chittagong (Bangladesh). In most cases these were closed because of lack of local financial support. A few other observatories, Sao Miguel (Azores), and Ibadan and Zaria (Nigeria), appear to be in some sort of limbo. We have been unable to determine their exact status, but the fact is that they are not presently making any contributions to the data base. There also are observatories fighting to stay open: Apia

(Western Samoa), Huancayo (Peru), and Maputo and Nampula (Mozambique). Appeals have been made to the international community for various kinds of assistance.

In the meantime we try to limp along, seeking help for each ailing observatory when informed of their need. When help is found, it usually comes from sympathetic colleagues who are willing to donate an emergency supply of paper, assist in training a technician, or offer a spare part or instrument. Such appeals for assistance should be coordinated through the office of the Chairman of IAGA's Division 5, currently Dr. David Kerridge, Geomagnetism Group, Murchison House-West Mains Road, Edinburgh EH9 3LA, Scotland, United Kingdom.

The observatories of western Europe have found advantages in close cooperation. For many years they have been comparing daily values of the midnight field, which serves as an excellent check on the stability of their instruments. Such regional cooperation is encouraged.

A list of names and addresses for organizations managing observatories is given in Appendix I and may be useful to readers of this report.

In closing we make one final appeal. We hope that the level of cooperation in the test effort conducted in 1989 will become a habit and the observatories will now continue each year to send their annual means promptly to WDC-A in Boulder, or to WDC-B2 in Moscow (for inclusion in the annual *Thesaurus of Annual Means*). The modelers for the IGRF are always anxiously awaiting the new data.

TABLES

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TABLE 1
Geomagnetic Observatories in Operation During 1990

Abisko	Changchun	Hermanus
Addis Ababa	Charters Towers	Honolulu
Alert	Chichijima	Hornsund
Alibag	Chiripa (Tilaran)	Huancayo
Alma Ata	Coimbra	Hurbanovo
Almeria	College	Hyderabad
Amatsia		
Ankara	Dalat	Irkutsk (Patrony)
Annamalainagar	Davis	Istanbul-Kandilli
Apia	Del Rio	
Arctowski	Dixon Island	Jaipur
Argentine Islands (Faraday)	Dombas	
Arkhangelsk	Dourbes	Kakioka
Arti	Dumont d'Urville	Kanoya
Ashkhabad (Vannovskaya)		Kanozan
Averroes	Ebro	Karachi
	Eskdalemuir	Karaganda (Bereznyaki)
Baker Lake	Etaiyapuram	Karavia
Bangui	Eyrewell	Kazan (Raifa)
Bar Gyora		Kiev (Dymer)
Barrow	Fort Churchill	Kiruna
Bay St. Louis (NORDA)	Fredericksburg	Kodaikanal
Bear Island (Bjornoya)	Fresno	
Beijing (Peking)	Fuquene	L'Aquila
Beijing (Ming Tombs)	Furstenfeldbruck	La Quiaca
Belsk		Lanzhou
Binza	Glenlea	Las Acacias
Borok	Gnangara	Learmonth
Boulder	Godhavn	Leirvogur
Brorfelde	Grocka	Leningrad (Voyeykovo)
Budkov	Guam	Lerwick
Bunia	Guangzhou (Canton)	Lhasa
		Lovo
Cambridge Bay	Hartebeesthoek	Luanda
Canberra	Hartland	Lunping
Cape Chelyuskin	Hatizyo	Lvov
Casey	Havana	
Castello Tesino	Heiss Island (Druzhnaya)	M'Bour
Chambon-la-Foret	Hel	Macquarie Island

TABLE 1—*continued*

Magadan (Stekoliniy)
Manhay
Maputo
Martin de Vivies
(Amsterdam Island)
Mawson
Meanook
Memambetsu
Minsk (Pleshenitzi)
Mirny
Misallat
Mizusawa
Mo He
Molodezhnaya
Moscow (Krasnaya Pakhra)
Mould Bay
Muntinlupa
Murmansk (Loparskoye)

Nagycenk
Nairobi
Narssarssuaq
New Aalesund
Newport
Niemegk
Novokazalinsk
Novolazarevskaya
Novosibirsk (Klyuchi)
Nurmijarvi

Odessa (Stepanovka)
Ottawa

Pamatai (Tahiti)
Panagyurishte
Patacamaya
Pendeli
Petropavlovsk (Paratunka)
Pilar
Podkammenaya Tunguska
Port Alfred (Crozet)
Port-aux-Francais
Port Moresby
Poste-de-la-Baleine

Quetta

Resolute Bay

Sabhawala
Saint John's
San Fernando
San Juan
San Pablo (Toledo)
Sanae
Santa Cruz de Tenerife
(Canarias)
Sapa (Cha-Pa)
Scott Base
Sheshan (Shanghai) (Zo-Se)
Shillong
Sitka
Sodankyla
Surlari
Syowa

Tamanrasset
Tananarive
Tangerang
Tashkent (Yangi-Bazar)
Tatuoca
Tbilisi (Dusheti)
Tehran
Teoloyucan
Thule
Tihany
Tiouine
Tixie Bay
Trelew
Trivandrum
Tromso
Tsumeb
Tucson
Tulsa
Tuntungan (Medan)

Ujjain
Urumqi

Valentia
Vassouras
Victoria
Vladivostok
(Gornotayezhnaya)
Vostok

Wellen (Cape Wellen)
Wien-Kobenzl
Wingst
Wuhan

Yakutsk
Yellowknife
Yuzhno-Sakhalinsk

TABLE 2
Annual Means Available (as of April 1990)

1988

Argentina: La Quiaca, Pilar, Trelew

Australia: Canberra, Casey, Charters Towers, Davis, Gnangara, Learmonth, Macquarie Island, Mawson

Austria: Wien-Kobenzl

Belgium: Dourbes

Brazil: Vassouras

Canada: Alert, Baker Lake, Cambridge Bay, Fort Churchill, Glenlea, Meanook, Mould Bay, Ottawa, Poste-de-la-Baleine, Resolute Bay, St. John's, Victoria, Yellowknife

China: Beijing, Lanzhou, Sheshan, Urumqi

Costa Rica: Chiripa

Czechoslovakia: Budkov

Denmark: Brorfelde, Godhavn*, Narssarssuaq*, Thule*

Finland: Nurmijarvi, Sodankyla

France: Chambon-la-Foret, Dumont d'Urville, Martin de Vivies, Port Alfred, Port-aux-Francais

German Federal Republic: Furstenfeldbruck, Niemegk,Wingst

Hungary: Nagycenk, Tihany

Iceland: Leirvogur

India: Alibag, Trivandrum

Indonesia: Tangerang

Ireland: Valentia

Italy: L'Aquila

Japan: Hatizyo, Kakioka, Kanoya, Memambetsu, Syowa

New Zealand: Apia, Eyrewell, Scott Base

Norway: Bear Island, New Aalesund, Tromso

Pakistan: Quetta

Papua New Guinea: Port Moresby

Peru: Huancayo

Poland: Belsk, Hel

Portugal: Coimbra

Romania: Surlari

South Africa: Hermanus, Sanae, Tsumeb

* Preliminary, estimated values

TABLE 2—*continued*

Spain: Almeria, San Pablo, Santa Cruz de Tenerife

Sweden: Abisko, Kiruna, Lovo

Taiwan: Lunping

Turkey: Ankara, Istanbul-Kandilli

United Kingdom: Eskdalemuir, Hartland, Lerwick

U.S.A: Barrow, Bay St. Louis, Boulder, College, Del Rio, Fredericksburg, Fresno, Guam, Honolulu, Newport, San Juan, Sitka, Tucson,Tulsa

U.S.S.R: Alma Ata, Arti, Ashkhabad, Borok, Cape Chelyuskin, Dixon Island, Heiss Island, Irkutsk, Karaganda, Kazan, Kiev, Leningrad, Lvov, Mirny, Molodezhnaya, Novokazalinsk, Novosibirsk, Odessa, Podkammenaya Tunguska, Tashkent, Tbilisi, Tixie Bay, Vladivostok, Vostok, Wellen, Yuzhno-Sakhalinsk

Yugoslavia: Grocka

1987

Argentina: Las Acacias

China: Changchun, Guangzhou, Wuhan

Egypt: Misallat

Ethiopia: Addis Ababa

France: Bangui, M'Bour, Pamatai

India: Hyderabad, Jaipur, Sabhawala, Shillong, Ujjain

Indonesia: Tuntungan

Israel: Amatsia

Italy: Castello Tesino

Japan: Chichijima, Kanozan, Mizusawa

Norway: Dombas

Phillippines: Muntinlupa

Poland: Arctowski

South Africa: Hartebeesthoek

United Kingdom: Argentine Islands

U.S.S.R: Arkhangelsk, Magadan, Minsk, Moscow, Novolazarevskaya, Petropavlovsk

TABLE 3
Notes on Observatories (as of April 1990)

Annamalainagar (India). Latest means: 1986. Normal delay.

Averroes (Morocco). Latest means: 1976. Last report (1990) spoke of continued operation since January 1989; intermittent previously.

Baghdad (Iraq). Intended new observatory (AMOS). Last report: 1986. Not believed to be in operation yet. No reply to 1989 inquiry. Dropped from list.

Baguio (Philippines). Annual means for H only.

Bar Gyora (Israel). New digital observatory. Began January 1989.

Beijing [Ming Tombs] (China). New observatory. No data yet.

Binza (Zaire). One of three observatories in Zaire. Latest means available: 1977. Last report: 1990. Operational problems, but promised data soon.

Bunia (Zaire). No data. See "Binza," above.

Characato (Peru). No data. No recent information. May be recording variations only. No reply to 1989 inquiry. Dropped from list.

Dalat (Vietnam). Letter of June 1990 provided data through 1989, but too late for inclusion in Table 2.

Davao (Philippines). Annual means for H only.

Ebro (Spain). Latest means: 1983. Latest report: 1989. Instrumental difficulties.

Etaiyapuram (India). Latest means: 1983. Latest report: 1989, promising later means.

Fuquene (Colombia). Latest means: 1983. Believed to have personnel problem, but did not reply to 1989 inquiry.

Gulmarg (India). No data. New observatory with slow start-up.

Havana (Cuba). Latest means: 1984. Letter of July 1990 reported change of site and delay in data processing. Annual means promised.

TABLE 3—*continued*

Hornsund (Poland). Latest means: 1986. Reason for delay unknown.

Hurbanovo (Czechoslovakia). Latest means: 1986. Letter of July 1990 reported change of site and delay in data processing. Annual means promised.

Husafell (Japan). Japanese station in Iceland. No data. Does not produce annual means. Dropped from list.

Ibadan (Nigeria). Latest means: 1962. Present operational status unknown, but has a history of many problems. Dropped from list.

Isafjordur (Japan). Japanese station in Iceland. Same type of operation as "Husafell," above. Dropped from list.

Karachi (Pakistan). New observatory. Issuing current hourly values, but no annual means. Promised to include computation of annual means.

Karavia (Zaire). Latest means: 1961. See "Binza," above.

Kodaikanal (India). Latest means: 1986. Reason for delay unknown.

Lauder (New Zealand). Ceased operation in 1987.

Lhasa (China). Latest means: 1983. Reason for delay unknown.

Luanda (Angola). Latest means: 1986. Some data for 1987. No reply to 1989 inquiry.

Lycksele (Sweden). Station reported to be in operation since 1986. Does not produce annual means. Dropped from list.

Manhay (Belgium). Latest means: 1985. Beginning 1990, operation assumed by Dourbes.

Maputo (Mozambique). Latest means: 1986. Operational difficulties. Negotiations in progress for outside assistance.

Mo He (China). New observatory. No data yet.

Murmansk (USSR). Latest means: 1985. Reason for delay unknown.

Nairobi (Kenya). Latest means: 1980. Last report: 1989. Several operational difficulties.

Nampula (Mozambique). Latest means: 1984. Operation ceased May 1987 due to lack of supplies. See "Maputo," above.

Panagyurishte (Bulgaria). Latest means: 1983. Report in 1989 promised means through 1988 by late 1989.

Patacamaya (Bolivia). New observatory with slow start-up. First means (1983-1984) received in 1989.

Pendeli (Greece). No annual means. Reported in 1989 that processing of annual means has begun with 1989.

Riyadh (Saudi Arabia). Intended new observatory. Last report: 1986. Not believed to be in operation yet. No reply to 1989 inquiry. Dropped from list.

Roburent (Italy). Latest means: 1973. Reported in 1989 that operation ceased in 1986.

San Fernando (Spain). Latest means: 1978. Site seriously disturbed. Digital system at new site beginning 1990.

San Miguel (Azores). Latest means: 1977. Not in operation at present. Report in 1990 states there are plans for a replacement in mainland Portugal.

Sapa [Cha-Pa] (Vietnam). Latest means: 1983. Letter of June 1990 reported delay in data processing.

Tamanrassset (Algeria). Latest means: 1984. Last report: 1989. Later data expected soon.

Tananarive (Madagascar). Latest means: 1983. Last report: 1988. Reason for delay unknown.

Tatuoca (Brazil). Latest means: 1985. Last report: 1989. Later data expected soon.

Tehran (Iran). Latest means: 1973. Letter of December 1990 expressed interest in digital system.

Teoloyucan (Mexico). Latest means: 1986. Last report: 1989. Reason for delay unknown.

TABLE 3—*continued*

Tiouine (Morocco). No data. See "Averroes," above.

Tjornes (Japan). Japanese station in Iceland. No data. Same type of operation as "Husafell," above. Dropped from list.

Tucuman (Argentina). Erroneously listed as observatory; records variations only.

Ulan Bator (Mongolia). Latest means: 1977. No response to inquiries. Dropped from list.

Yakutsk (USSR). Latest means: 1985. Reason for delay unknown.

TABLE 4
Digital Geomagnetic Observatories, 1990

Abisko	Fredericksburg	Misallat*
Alert	Fresno	Mizusawa
Alibag	Furstenfeldbruck	Mould Bay
Arctowski	Glenlea	Nagycenk
Argentine Islands	Gnangara	Narssarssuaq
Baker Lake	Godhavn	New Aalesund
Bangui*	Guam	Newport
Bar Gyora	Hartebeesthoek	Niemegk
Barrow	Hartland	Nurmijarvi
Bay St. Louis	Hatizyo	Ottawa
Bear Island	Hel	Pamatai
Beijing*	Hermanus	Port Alfred
Belsk	Honolulu	Port-aux-Francais
Boulder	Hornsund	Poste-de-la-Baleine
Brorfelde	Hurbanovo	Resolute Bay
Budkov	Hyderabad	St. John's
Cambridge Bay	Kakioka	San Fernando
Canberra	Kanoya	San Juan
Casey	Kanozan	Sanae
Castello Tesino	Karachi	Sitka
Chambon-la-Foret	Kiruna	Sodankyla
Charters Towers	L'Aquila	Syowa
Chichijima	Learmonth	Tamanrasset*
College	Leirvogur	Tananarive*
Davis	Lerwick	Thule
Del Rio	Lovo	Tihany
Dombas	Lunping	Tromso
Dourbes	M'Bour	Tucson
Dumont d'Urville	Macquarie Island	Valentia
Ebro*	Martin de Vivies	Vassouras
Eskdalemuir	Mawson	Victoria
Eyrewell	Meanook	Wingst
Fort Churchill	Memambetsu	Yellowknife

* Equipment obtained, but not yet operational

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MAPS

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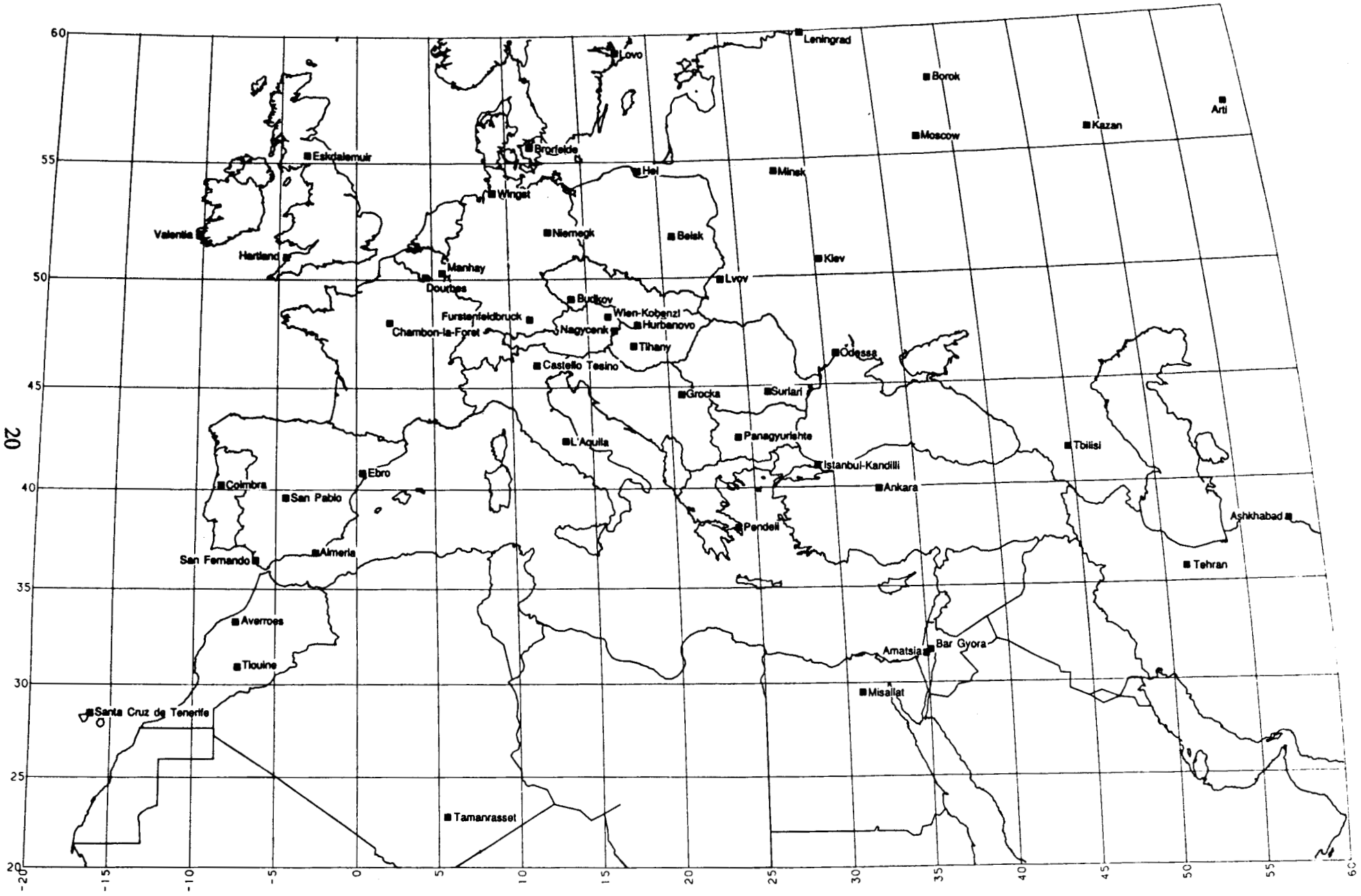
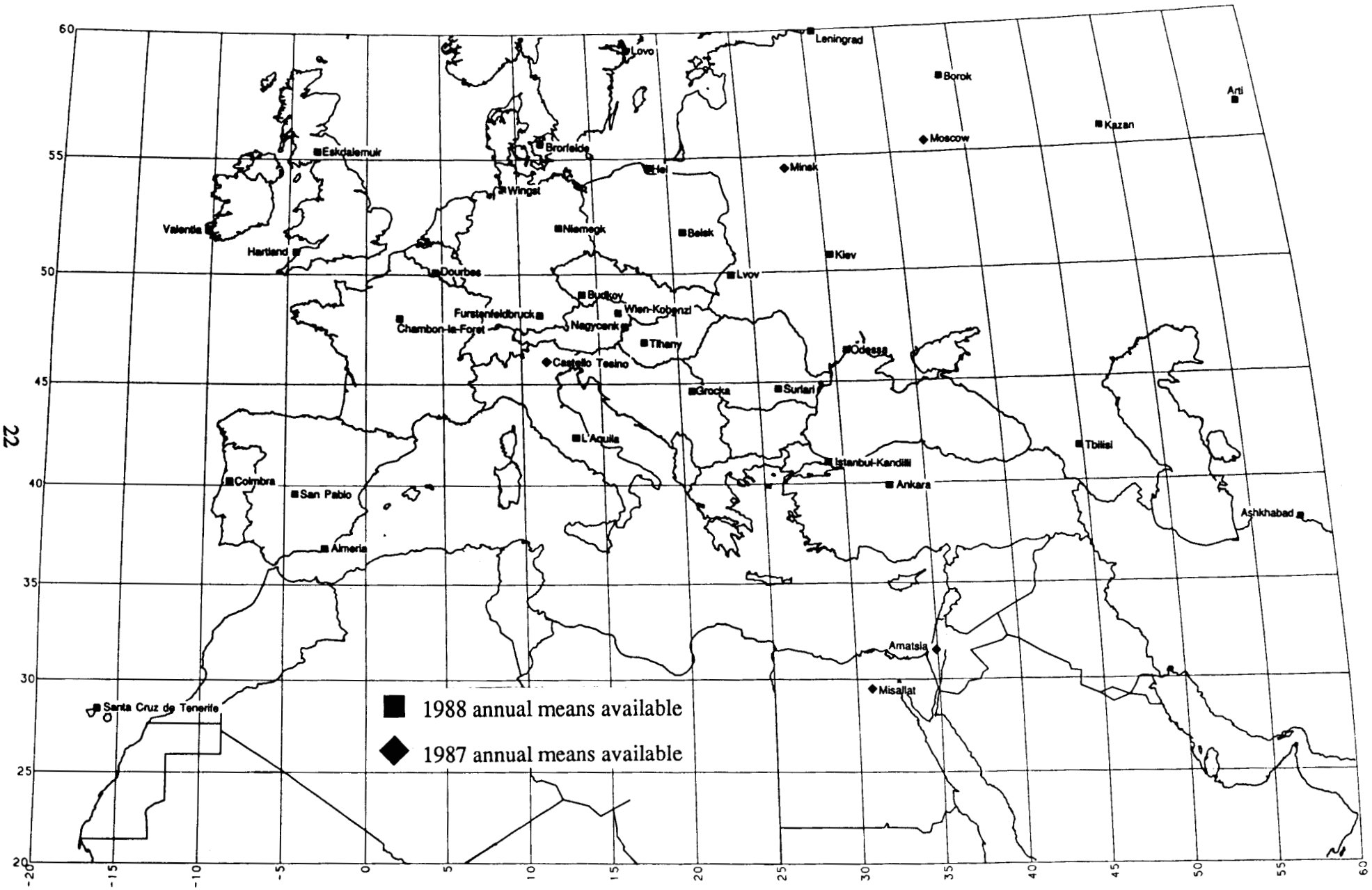
MAP 1a.
Geomagnetic Observatories in Operation During 1990



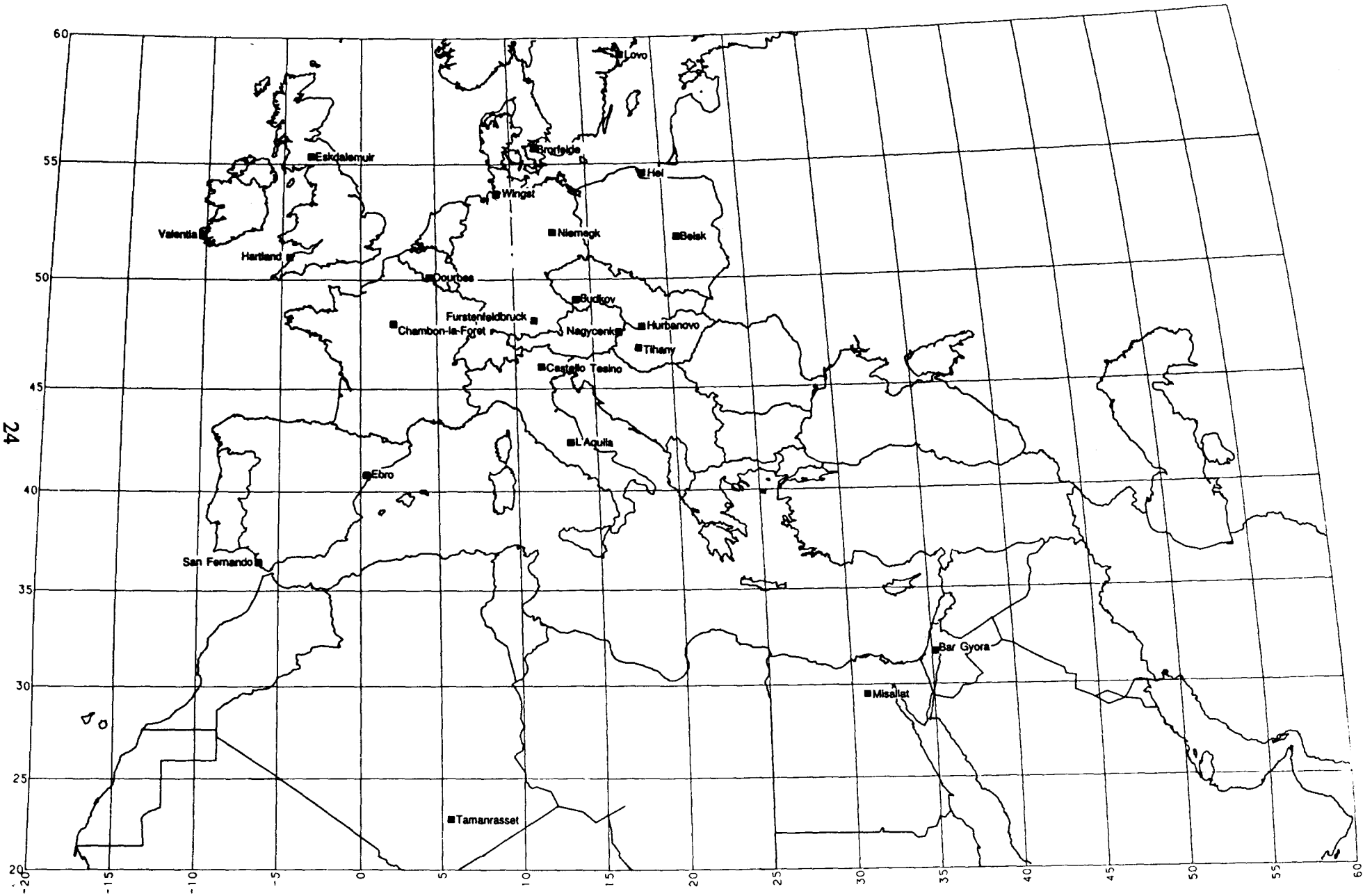
MAP 1b. Geomagnetic Observatories in Operation During 1990 (area enlarged)

MAP 2a.
Observatories Providing Timely Results as of April 1990



MAP 2b. Observatories Providing Timely Results as of April 1990 (area enlarged)

Map 3a.
Digital Geomagnetic Observatories, 1990



MAP 3b. Digital Geomagnetic Observatories, 1990 (area enlarged)

APPENDICES

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APPENDIX I
Addresses to Use in Requesting Data or Information

WORLD DATA CENTERS

For more information about the World Data Center system, please refer to Appendix II.

World Data Center A
NOAA/NGDC
325 Broadway
Boulder, Colorado 80303
USA
Tel: (303) 497-6521
Telex: 592811 NOAA MASC BDR
Fax: (303) 497-6513
Internet: info@ngdc1.colorado.edu

World Data Center B2
Soviet Geophysical Committee
Academy of Sciences of the USSR
Molodezhnaya 3
Moscow 117 296, USSR
Tel: 930-0546
Telex: 411 478 SGC SU
Fax: 930-5509

World Data Center C1
Division of Geophysics
Danish Meteorological Institute
Lyngbyvej 100
DK-2100 Copenhagen, Denmark
Tel: 45 31 29 21 00
Telex: 15835 GEOMI DK
Fax: 45 31 29 34 00
Grams: METOBS

World Data Center C1 for Geomagnetism
Geomagnetism Group
British Geological Survey
Murchison House-West Mains Road
Edinburgh EH9 3LA, Scotland
United Kingdom
Tel: (031) 667-1000
Telex: 727343 SEISED G
Fax: (031) 688-4368

World Data Center C2 for Geomagnetism
Data Analysis Center for Geomagnetism
& Space Magnetism
Kyoto University
Kyoto 606, Japan
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Telex: 5422302 SCIKYU J
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JUNET: iyemori%kugi.kyoto-u.ac.jp@JPNSUT00.BITNET

World Data Center D for Geophysics
Institute of Geophysics
Academia Sinica
Beijing, China
Tel: 2012497
Telex: 22040 BAOAS CN

OBSERVATORIES AND SPONSORING INSTITUTIONS
(alphabetically by country)

A. Fares (Tamanrasset)
Service Magnetisme
Centre de Recherche en Astronomie, Astrophysique et Geophysique (CRAAG)
B.P. 63 Bouzareah
Algiers, Algeria
Tel: 79-14-43
Telex: 53 337 CRAAG DZ

M. Akacem Nourredine, Director (Tamanrasset)
Observatoire de Tamanrasset
B.P. 32
Tamanrasset, Algeria

Dr. Carlos Alberto Ferreira Monteiro, Chefe (Luanda)
Departamento de Geofisica
Instituto Nacional de Hidrometeorolgia e Geofisica
Caixa Postal 1228-C
Luanda, Angola
Tel: 3003778

Sra. Mercedes B. de O'Neill (La Quiaca, Pilar)
Centro de Geofisica
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Av. de Los Constituyentes 3454
(1427) Buenos Aires, Argentina
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APPENDIX II
The World Data Center System

DESCRIPTION OF WORLD DATA CENTERS

The World Data Centers (WDCs) were created in 1957 to provide archiving for the observational data resulting from the International Geophysical Year (IGY). In the years following the IGY, the International Council of Scientific Unions (ICSU) recommended that the WDCs continue to collect, archive, and redistribute data. This new system for exchanging geophysical data was found to be very effective, and the operations of the WDCs were extended by ICSU on a continuing basis to other international programs. The WDCs were under the supervision of the Comité International de Geophysique for the period 1960 through 1967 and are now supervised by the ICSU Panel on World Data Centres.

World Data Centers have been established in a variety of countries: WDC-A is located in the USA; WDC-B in the USSR; WDC-C in western Europe, Australia, and Japan; and WDC-D in the People's Republic of China. The Centers collect and distribute data for a number of disciplines:

- meteorology
- oceanography
- astronomy
- rockets and satellites
- solar-terrestrial physics: solar and interplanetary phenomena, ionospheric phenomena, flare-associated events, geomagnetic phenomena, aurora, cosmic rays, airglow
- nuclear radiation
- glaciology (snow and ice) and geocryology
- marine geology and geophysics: gravity, magnetics, bathymetry, seismic profiles, marine sediment, rock analyses
- solid earth geology and geophysics: seismology, tsunamis, gravimetry, Earth tides, recent movements of Earth's crust, Earth's rotation, magnetic measurements, paleomagnetism and archeomagnetism, volcanology, geothermics
- renewable resources and environment

In each discipline, the scientific community determines the nature and form of data exchange, based on research needs. Thus, the type and amount of data in the WDCs differ from discipline to discipline. However, each WDC is responsible for:

- collecting data in the field or discipline for which it is responsible
- protecting the incoming data

- copying and reproducing data, maintaining adequate standards of clarity and durability
- supplying copies of data to other WDCs
- preparing catalogs of data
- making data available to the scientific community.

All the Centers are staffed, funded, and maintained exclusively by the countries in which they are located. The WDCs catalog the data and make them available to scientists in all countries upon written request or personal visit. Minimal charges may be requested to cover costs of processing the requested data.

WORLD DATA CENTER A

World Data Center A was established in the United States under the auspices of the National Academy of Sciences. WDC-A is operated with national resources, but follows ICSU guidelines. The National Academy of Sciences has overall responsibility through the Geophysics Research Forum and its Committee on Geophysical Data. WDC-A consists of a Coordination Office and nine subcenters at scientific institutions in various parts of the United States. Most WDC-A subcenters are at corresponding national data centers, whose large national collections are available through the WDC-A subcenters.

Organizations wishing to contribute data or establish exchange agreements should contact the appropriate World Data Center A.

WORLD DATA CENTER A
COORDINATION OFFICE
National Academy of Sciences
2101 Constitution Avenue, NW
Washington, DC 20418, USA
Telephone: 202-334-3368

WORLD DATA CENTER A: GLACIOLOGY (SNOW AND ICE)
Cooperative Institute for Research in Environmental Sciences
University of Colorado
Boulder, Colorado 80309, USA
Telephone: 303-492-5171

WORLD DATA CENTER A FOR MARINE GEOLOGY AND GEOPHYSICS
National Geophysical Data Center
NOAA, E/GC3
325 Broadway
Boulder, Colorado 80303-3328, USA
Telephone: 303-497-6487

WORLD DATA CENTER A: METEOROLOGY
National Climatic Data Center
NOAA, E/CC
Federal Building
Asheville, North Carolina 28801, USA
Telephone: 704-259-0682

WORLD DATA CENTER A: OCEANOGRAPHY
National Oceanographic Data Center
NOAA, E/OC
1825 Connecticut Avenue, NW
Universal Building, Room 406
Washington, DC 20235, USA
Telephone: 202-673-5594

WORLD DATA CENTER A: ROCKETS AND SATELLITES
NASA/Goddard Space Flight Center
Code 630.2
Greenbelt, Maryland 20771, USA
Telephone: 301-286-7354

WORLD DATA CENTER A: ROTATION OF THE EARTH
U.S. Naval Observatory
Washington, DC 20392-5100, USA
Telephone: 202-653-1529 or 1527

WORLD DATA CENTER A: SEISMOLOGY
U.S. Geological Survey
Branch of Global Seismology and Geomagnetism
Box 250436, Mail Stop 967
Denver Federal Center
Denver, Colorado 80225, USA
Telephone: 303-236-1500

WORLD DATA CENTER A FOR SOLAR-TERRESTRIAL PHYSICS
National Geophysical Data Center
NOAA, E/GC2
325 Broadway
Boulder, Colorado 80303-3328, USA
Telephone: 303-497-6324

WORLD DATA CENTER A FOR SOLID EARTH GEOPHYSICS
National Geophysical Data Center
NOAA, E/GC1
325 Broadway
Boulder, Colorado 80303-3328, USA
Telephone: 303-497-6521

WDC-A FOR SOLID EARTH GEOPHYSICS: REPORTS

World Data Center A for Solid Earth Geophysics has a variety of reports related to its activities. This publication, SE-45, *A Report on Geomagnetic Observatory Operations*, is one in a series. To obtain ordering information about the other publications (listed below), call 303-497-6277, fax 303-497-6513, telex 592811 NOAA MASC BDR, or write to:

WORLD DATA CENTER-A FOR SOLID EARTH GEOPHYSICS
NATIONAL GEOPHYSICAL DATA CENTER
NOAA, CODE E/GC1
325 BROADWAY
BOULDER, COLORADO 80303-3328, USA

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SE-2 Geodynamics International-9
SE-3 Summary of Earthquake Focal Mechanisms for the Western Pacific-Indonesian Region, 1929-1973
SE-4 Catalog of Tsunamis in Hawaii
SE-5 Geodynamics International-10

SE-6 Catalog of Seismograms and Strong-Motion Records
SE-7 Directory of Seismograph Stations
SE-8 Survey of Practice in Determining Magnitudes of Near Earthquakes, Part 2: Europe, Asia, Africa, Australia, the Pacific
SE-9 Survey of Practice in Determining Magnitudes of Near Earthquakes, Part 1: North, Central, and South America
SE-10 Geodynamics International-11

SE-11 The Information Explosion and Its Consequences for Data Acquisition, Documentation, and Processing: An Additional Aspect of the Limits to Growth
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SE-33 Historical Seismogram Filming Project: Fourth Progress Report
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