Centre Sismologique Euro-Méditerranéen
European-Mediterranean Seismological Centre

Newsletter

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EDITORIAL

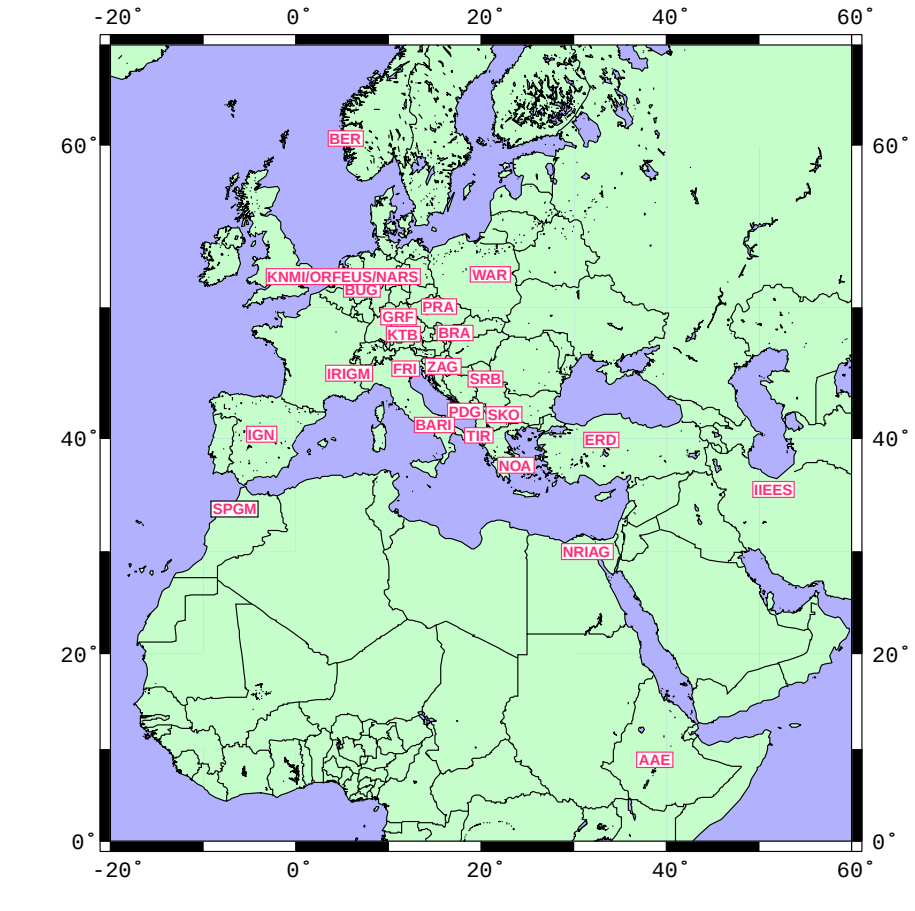
On the back page of this issue we have published our annual list of EMSC members which comprises 41 institutions in 25 Countries. Two new admissions, NORSAR in Norway, and Universidad Politecnica de Madrid in Spain, at the Assembly in Tel Aviv have continued the gradual expansion of our community. For readers still on the outside, there is time to request membership at the IUGG assembly in Birmingham on 21 July, this year. The Secretary General must receive your application by the end of May and the good news is that the annual membership subscription continues to be held at the low level of 5,500 FFr.

The theme of this Newsletter is data acquisition and datasets and, includes information from members and data providers in some of the most distant parts of the European-Mediterranean region. There is also a call for contributions to the "Inventory of Data from Seismographic Networks of the World" which we welcome and to which we encourage your responses.

At the end of last year, the EMSC-led, EU project, "A Rapid Warning System for Earthquakes in the European-Mediterranean Area", was brought to a successful conclusion with the submission of the final report to Brussels by Bruno Feignier. We congratulate him on behalf of all participants and members for the additional capability which it brings to the EMSC alert system and, particularly, for his magnificent personal effort in pulling together the final submission. The project has extended, geographically, the automated collection of data within minutes, out to the north-west, the far south and the east of the EMSC region. It has achieved a reduction in the magnitude threshold for triggering an alert, from 5.5 to 5.0 and has provided a rapid means of determining moment tensor solutions.

Chris Browitt
President

Contributing institutes to EMSC Newsletter #14



Albanian Seismological Network (TIR), Albania

The Albanian Seismological Network (ASN) started operating in 1968 with the first seismological station being located in Tirana. The implementation of the other stations of ASN was initiated in 1975. However, the year 1976 must be considered as the beginning of this network that includes 12 stations throughout Albania and one master station in Tirana. All the stations are equipped with three-component short-period seismographs, analog, drum record DDJ-1 type (made in China). The Tirana station also has another set of analog, short-period Kinemetric instruments and an intermediate-period instrument of Spregnether type. In 1994, a VBB station was installed in Tirana station into the framework of MEDNET project. This station did not work continually during these years and it is considered closed by the project coordinators. A telemetered seismological network of eight stations began to be implemented since 1995. Currently, only two stations from this network are in operation. Other stations are damaged very often by lightening. During the political events of 1997, damages were caused to the stations of the Albanian network. Three stations were out of operation up to now and there are considerable shortages with spare parts in others. We have to emphasize that ASN is morally and physically exhausted and needs an urgent rehabilitation and upgrading. Actually, Albania has one seismological station per 2150 square kilometers and this network is able to record and locate all seismic events of M>2.0 with epicenters inside the country. Normally, every month, the ASN records 150-200 local seismic events, 30-40 of which have determined hypocenters. The error of accepted hypocenters is up to 15 km for the latitude and longitude and 10 km for the depth. Our seismological dataset is of bulletin type. We publish and distribute a preliminary, ten-days bulletin and the Monthly Seismological Bulletin of ASN where are included the arrival phases for the stations of ASN for local earthquakes, the hypocentral solutions and macroseismic data. Only the first onsets are given for teleseismic earthquakes. In year 1999, we are planning to distribute our bulletins via e-mail.

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Seismological Station in Zagreb (ZAG), Croatia

The strong development of science in Europe by the turn of the 19th century was also felt in Croatia, mainly in its capital Zagreb. That was the time when Croatia had a strong political autonomy in Austro-Hungarian empire and was able to revitalize and establish a lot of national institutions as university, academy, theater, Society for Natural Sciences and particularly the Meteorological Observatory (1861). The first seismographs in Croatia were installed in Pula in 1900 and Rijeka in 1901, respectively. Unfortunately, both of the stations came to an end with the breakdown of Austro-Hungarian Empire and the seismograms archive disappeared. Although the seismological station in Zagreb was the third one in Croatia, it is in the seismological sense the most important one in the region. It is operational since 1906 and the whole archive of seismograms still exists.

The seismological station at Zagreb was established within the Meteorological Observatory (founded in 1861) by A. Mohorovicic, who took over the duty of the director of the Observatory in January 1892 (Skoko and Mokrovic, 1982). At that time he started to determine the time corrections of observatory clocks, measuring the moment of passage of the stars through the local meridian. To improve the accuracy of the timing needed in both seismology and meteorology, he acquired a good quality "Riefler" pendulum clock in 1905. The macroseismic research was alredy well established by the Commitee for the Observation of Seismic Phenomena, founded by National Academy for Science and Arts, three years after the strong eaqrthquke occurred in Zagreb in 1880. A famous day was the April 06, 1906 when the first seismograph constructed by Vicentini started to record the earthquakes in Zagreb and the Meteorological Observatory grew into the Geophysical Institute. It was on time to record the great earthquake in San Francisco as its 4th recorded earthquake.

About two years later Mohorovicic prepared the concrete fundaments, 1.5 m deep, anchored 3 m under the floor. In 1908 he installed on it the horizontal astatic Wiechert seismograph with 80 kg pendulum mass and a year later the famous Wiechert horizontal astatic seismograph with pendulum mass 1000 kg. Again, it was on time to record the well-known Kupa valley earthquake of 1909, the analyses of wich led to discovery of the discontinuity surface between the Earth's Crust and mantle.

The most unfortunate period for the Zagreb seismological station was from 1919 to 1925. The laboratory diary reads: "January 22, 1919 - There is no coal in the gasworks, so the smoking on the seismograms is poor". In the august there was no alcohol for preparing the seismograms. Finally in 1920 the instruments stopped to record, because there was no more paper and even less money to buy it. A few months later the instruments began to record again. In 1922 the director Dr. A. Mohorovicic was retired. It got better in 1932. when the vertical Wiechert seismograph with pendulum of 1300 kg was installed. All of the Wiechert seismographs at the Station Zagreb were in operation until 1983, when they were restored and removed to the new building of the Geophysical Department of the Faculty of Sciences and Mathematics.

At the new site, the recording of the earthquakes continues from 1982 with Sprengnether seismographs (series S-5100 H and V) with analogue recorders. Now, the digital recorder (PDAS-100) is connected parallel to the analog. The observatory clocks were synchronised to the Omega Navigation System, German DCF-77 radio signal and now to the GPS.

The results of ninety years of recording make a rich seismological archive of the Zagreb seismological station. Along with seismograms, most of the laboratory notes are also preserved, containing time corrections and data on the instruments calibration that was performed on the average three times a year.

Available datasets :

- Vicentini seismograms 1906-1909,
- Wiechert (80 kg hor.) seismograms 1908-1983,
- Wiechert (1000 kg hor.) seismograms 1909-1983,
- Wiechert (1300 kg vert.) seismograms 1932-1983,
- Bulletins :
  - macroseismic data 1880 -
  - microseismic data 1906 -

Mode of access: Specific request by letter.

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Geophysical Institute of the Academy of Sciences (PRA), Czech Republic

Here is a short description of the datasets which are available at the Department of Seismology of the Geophysical Institute of the Academy of Sciences of the Czech Republic.

Monthly bulletins

- Pruhonice (PRU), Kasperske Hory (KHC), Praha (PRA) : January 1976 - present
- Ostrava/Krasne Pole (OKC) : January 1994 - present
- Dobruska/Polom (DPC) : January 1997 - present

Accessible on the Web at the address: ftp://www.ig.cas.cz/pub/bulletin
Printed version until 1988
Contact persons:
Jan Zednik, Jiri Pospisil

Waveforms

Pruhonice (PRU) - event-oriented archive on CD-ROMs,
1988 - present, SP+BB, Lennartz ESSTF binary format or GSE2.0 CM6 format
Stronger events are included in ORFEUS CD-ROMs in SEED format

Kasperske Hory (KHC) - event-oriented archive on CD-ROMs
1973 - 1986, VBB data, full SEED at IRIS DMC on request
1988 - present, SP+BB, Lennartz ESSTF binary format or GSE2.0 CM6 format
Stronger events are included in ORFEUS CD-ROMs in SEED format

Dobruska/Polom (DPC) - continuous BB data (Quanterra + STS-2) on CD-ROMs,
1992-1998, full SEED available at IRIS DMC on request;
we store miniSEED Steim 2 compression in 1 hour files for all streams/components
Access mode: e-mail (jzd@ig.cas.cz)

Vit Karnik's archive

A text describing the status of Vit Karnik's valuable archive can be found on our Web pages at the following address:
http://www.ig.cas.cz/seismo/archive.html
Contact persons:
Dr.Karel Klima,
Dr.Libuse Ruprechtova

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Web	http://www.ig.cas.cz			

National Research Institute of Astronomy and Geophysics (NRIAG), Egypt

The following data are available:

- Description of the data set (Parametric data, Bulletins)
- Mode of access (Fax, E-mail)
- Retrieval support medium (E-mail, CD ROM)

Contact	Dr. S. El-Hadidy
Address	National Research Institute of Astronomy and Geophysics - Seismology Dept. - Helwan- Cairo- Egypt
Phone	No.(Home) 202-2530924
E-mail	salah.el-hadidy@mailcity.com Gad@frcu.eun.eg

Geophysical Observatory, university of Addis Abeba (AAE), Ethiopia

The Addis Abeba seismic station is an IRIS/GSN station with dialup connection. The phone number is : 251-1-553781

The other four stations are anologue stations. Seismograms from these stations are read several weeks later after receiving them by post. These stations are planned to be upgraded to digital stations in 1999 and ultimately will have telephone access.

Contact	Laike M. Asfaw
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E-mail	observatory.aau@telecom.net.et

Laboratoire de Géophysique Interne et Tectonophysique (IRIGM), France

Waveforms from the permanent accelerometric network are available. They can be reviewed on the Web site.

Data may be requested by sending an e-mail to Denis.Hatzfeld@obs.ujf-grenoble.fr or Philippe.Blanchard@obs.ujf-grenoble.fr

and retrieved on an anonymous ftp site or on other data medium if necessary.

Contact	Denis Hatzfeld
Address	Laboratoire de Géophysique Interne et Tectonophysique - IRIGM-UJF, BP 53 - F-38041, Grenoble Cedex 9, France
Phone	+33.(0)4.76.82.80.64
Fax	+33.(0)4.76.82.81.01
E-mail	Denis.Hatzfeld@obs.ujf-grenoble.fr
Web	http://www-rap.obs.ujf-grenoble.fr/RAP/HTML/page/accueil.htm

Seismological Observatory, University of Skopje (SKO), FYROM

Seismological Observatory (SKO), of the Faculty of Natural Sciences and Mathematics, University of Skopje, R. Macedonia, owns a dataset which includes :

- copies of analog seismograms of :
  - short-period Leghner-Griffits and Vegik,
  - "medium-period" SKD, Mainka and Conrad,
  - long-period Press-Ewing, seismographs,
- digital records (waveforms) of SSR-1 (Kinemetrics) aq. system with short-period (SS-1) and wide-range (WR-1) seismometers.
- Weekly and Monthly seismological Bulletins.

The mode of access should be by : letter, fax, e-mail, Web.
Retrieval media are : e-mail, ftp, floppy disk, paper copies.

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Seismological Observatory of Ruhr-University Bochum (BUG), Germany

The Ruhr-University Bochum is situated in the south of the Ruhr coal mining district where mining has been active since centuries. Underground coal mining causes induced seismicity (e.g., Gibowicz and Kijko, 1994) that damages man-made structures although the magnitudes of the events are generally comparatively small (less than ML < 3). Hence, the local seismicity of the Ruhr district has been one area of active research by our institute (e.g. Hinzen, 1982; Hinzen and Krummel, 1985;Boehmer et al, 1989; Gibowicz et al, 1990; Joswig, 1995) and a yearly bulletin has been prepared by A. Cete (1981-1997).
About 60 km to the north of the Ruhr area, in the coal mine district near the city of Ibbenbueren, two comparatively large events occurred in 1981 (ML=4.1) and 1991 (ML=4.3), which were thoroughly investigated by our institute (Harjes et al., 1983; Cete et al., 1996).
The instrumentation operated by Ruhr-University has been installed along these lines of scientific challenges.
Bochum University Germany (BUG; 51.4406 N, 7.2693 E, elevation 85 m) is a 3-component station located in an abandoned mining adit on-campus. Streckeisen STS-2 sensors are sampled at 80 Hz. BUG is part of the German Regional Seismic Network (GRSN) and served as beta-station during the Group of Scientific Experts Technical Test 3 (GSETT-3) in 1995-1996 in preparation for the Comprehensive Nuclear Test Ban Treaty (CTBT). Waveform and detector data are available via autodrm from the central seismological observatory GRF (autodrm@szgrf.uni-erlangen.de).
BUG also stands for a 5-element, short-period network of vertical Geotech S-13 sensors, sampled at 100 Hz. Three stations of this network define a short-period, small aperture array on campus (aperture of about 2 km). One of these array stations is co-located with the GRSN station BUG. The other two S-13s are operated as satellite stations on-campus (TEZ 51.45058 N, 7.27968 E, 112 m; SHA 51.44825 N, 7.24530 E, 148 m. The station names of the network are for internal usage and not part of the world-wide stations of the NEIC list.). Data are transmitted continuously to the data center, where an automatic processing (e.g., detector) is performed. Finally, 2 remote stations of the 5-element network are situated underground in active mines (Mine Heinrich-Robert near the city of Hamm HRH 51.6234 N, 7.7527 E, -888 m; Mine Rheinpreussen near the city of Moers RPM 51.4723 N,6.6343 E, -412 m). Their data are automatically polled after the array has detected an event.
Event waveform data of the 5-element network are available on CD-ROM from April 1986 to December 1997 (to be updated). Data format conversion routines to read the specific data format are available. Since July 1997, continuous data of the small aperture array are available on tapes (CSS2.8 data format, conversion e.g. to MiniSeed is possible). Also, abbreviated Bulletins are available via e-mail upon request.
Since November 1998, our institute has started to operate the station IBBN (52.3072 N, 7.7566 E, 140 m) near the city of Ibbenbueren. IBBN was formerly associated to the GRSN. Waveform and detector data are available via autodrm from the central seismological observatory GRF (autodrm@szgrf.uni-erlangen.de).
Requests should be sent to: jost@geophysik.ruhr-uni-bochum.de.

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Note: The complete version of this article is available on the EMSC Web site at http://www-csem.bruyeres.cea.fr/Html/NEWS_main.html

The Seismological Network Database (KTB), Germany

A local broadband seismic network of four observatory-quality stations (KTB-NET) was operated by the University of Munich within the framework of the interdisciplinary German Continental Deep Drilling Program (KTB).
The network was in operation from September 1989 to November 1995. It consisted of four permanent stations, one close to the drillhole (NOTTersdorf) and three at 10 kilometers distance azimuthally distributed (ROTZenmuehle, NAPFberg, FALKenberg).

Station	Lat. Degree N	Lon. Degree E	Alt. M a.s.h	datalogger	seismometer
ROTZ	49.76778	12.20836	430	MARS88	LE3D/STS2
NAPF	49.89467	12.05193	695	MARS88	LE3D/STS2
FALK	49.86058	12.22483	465	MARS88	LE3D/STS2
NOTT	49.81100	12.12278	470	MARS88	LE3D/STS2

It was operated mainly in a network-wide event triggered mode. During some field experiments in the surroundings of the KTB drill site (ISO 89, MVE 90, GRANU 95, INSTRUCT, fluid injections and other experiments) the network operation was altered from triggered to continuous recording mode and sometimes several mobile stations were added to the permanent network.

Most triggered data are from local and near earthquakes and quarryblasts. Only relatively few teleseismic P-wave arrivals have been recorded.

To facilitate access by further potential users the waveform database has been converted and written to CD-ROMs using GSE1 format.

Mode of access: request by letter, fax or email. Retrieval support medium: anonymous ftp, floppy disk or CD-ROM.

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Note: The complete version of this article is available on the EMSC Web site at http://www-csem.bruyeres.cea.fr/Html/NEWS_main.html

The Regional Data Center at the Seismological Central Observatory Graefenberg (GRF), Germany

The SZGRF is the data center for data of the Graefenberg-Array (GRF) and the German Regional Seismic Network (GRSN). GRF and GRSN are the two major broadband station systems within Germany. The 13 stations of the GRF array are located within an area of about 50 x 100 km east of the city of Nuremberg. It became operational in April 1980, although continuous recordings of the first subarray are available since 1976. The array is operated by the Seismological Central Observatory (SZGRF) which is part of the Federal Institute for Geosciences and Natural Resources (BGR). It is supported by the Deutsche Forschungsgemeinschaft (DFG). The GRSN project started in 1991 as a joint research project of BGR and geophysical institutes of German universities and was funded by the DFG. It was planned as an extension of the GRF array. In addition, the GRSN can be regarded as the German contribution to international initiatives aimed at the establishment of modern digital seismic broadband networks on a regional and global scale.

The 13 GRSN stations plus 3 associated stations are distributed quite evenly over Germany. Digital data of GRF and GRSN are recorded and archived continuously since installation up to now.

GRF/GRSN Stations and Instrumentation

GRF/GRSN Data Archive

All data are recorded and archived continuously since installation. The first digital stations of the GRF array were installed in 1976, the array was completed in 1980. The GRSN was started in August 1991 with 8 stations and was extended 1993, 1994 and 1996 to the current number of stations.

The data are archived on CD-Recordables, some are on tape (DAT, Exabyte). Most of the CD-Recordables are in two 500-CD-Jukeboxes and permit automated access from inside and outside of the SZGRF. The available data streams are:

Stream	time span	continuous	Jukebox
GRF 20 Hz	Jul.1976 - Dec.1979	yes	not yet
GRF 20 Hz	Jan.1980 - now	yes	yes
GRSN 1 Hz	Jan.1992 - now	yes	yes
GRSN 20 Hz	Aug.1991 - now	yes	yes
GRSN 80 Hz	Jan.1997 - now	no	yes
GRSN 80 Hz	Aug.1991 - now	yes	no

All 20Hz and 1Hz data are continuously on CD and available for automated access (except GRF from 1976-1979, currently). The continuous 80 Hz data of the GRSN are mostly on tape, some more recent on CD, but only a few selected events of local events in Germany are in a jukebox. So data requests on these 80Hz data can be processed only in a few cases. The data are transmitted to the SZGRF via digital dial-up lines (ISDN) and the GRSN data also by tapes. The GRF data are copied several times a day, so the most recent are between 1 and 6 hours old. The complete GRSN data set including the 80Hz streams comes after 2-4 weeks on tapes.

GRF/GRSN Access Methods to Waveform data

The SZGRF runs two automated interfaces for waveform data requests. One is the, the other is a request form on WWW. The e-mail address of our AutoDRM is 'autodrm@szgrf.uni-erlangen.de'. The homepage of the SZGRF 'http://www.szgrf.uni-erlangen.de' allows requests via WWW. Available output formats are currently SEED, Mini-SEED (data records only), GSE1.0, GSE2.0 and SAC. CSS3.0 is in preparation.

Of course, we also accept request lists by e-mail. Please send it to Uta Mundl 'mundl@szgrf.uni-erlangen.de' or Klaus Stammler 'klaus@szgrf.uni-erlangen.de'.

The data of GRF and GRSN are scanned by automatic detection algorithms. The resulting long-period and short-period detections lists are made available on the Web-Site of the SZGRF (address above).

All detected and recorded local and teleseismic events are manually analyzed on a daily basis. Phase readings, preliminary locations, periods, amplitudes and different magnitudes are stored in a database. The homepage of the SZGRF allows requests to this database creating listings of various types over a specified time window. Additionally, manually revised local and teleseismic bulletins are available.

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National Observatory of Athens (NOA), Greece

The Institute of Geodynamics (NOA) is in continuous operation since 1893 when the first "Brassart" seismograph was installed in Athens. In 1897 the first national seismic network consisting of 5 "Agamemnon type seismographs" began its operation and in 1910 a Mainka seismograph was installed in Athens. In 1924 and 1928 respectively, a horizontal and a vertical Weichert seismograph began operating in Athens, followed by the installation of a vertical-component Benioff seismograph in 1957.
Athens became a WWSSN station in 1962, comprised of a three-component Benioff seismographs and 3 long-period Sprengneter seismographs, and in 1964 NOA began issuing a seismic bulletin while a Wood-Anderson seismograph was installed in Athens and has been operating to the present.
The national seismological network operated by NOA begun expanding its stations in 1965 using Sprengheter three component, short-period instruments and in 1983 the first national telemetric network began its operation. This marks the beginning of real-time data flow from the remote stations equipped with Teledyne's S-13 sensors to the drum recorders at NOA via leased telephone lines.
In 1994, the first digital, three-component, short-period network (Lennartz, Mars88/MC, LE3D/1sec) was installed in Greece, for the monitoring of regional seismicity and is still operated by dial-up telephone telemetry.
In 1995, in cooperation with the MEDNET broadband array the station IDI was installed at Anogia, Crete and in 1996, in cooperation with the GEOFON broadband array, two more stations were installed in Crete at Skordalos and Kristalenia (SKD, KRSG) and one on the volcanic island Santorini (SANT).
In 1998, the installation of the national broadband network operated by NOA was completed and this network now consists of 12 stations equiped with Teledyne DR24 digitizer coupled with the Lennartz LE3D/ 20 sec three-component sensor. The data from this network reaches Athens by leased telephone line and in the near future NOA will be linked with the ORFEUS database in real-time .
In addition to the above mentioned real-time digital data, 6 stations transmit continuous real-time analog short-period data to Athens by leased line telephone telemetry and 9 more stations use radio telemetry for real-time transmission of their analog short-period data.
Complementary to the real-time seismic data, NOA operates a 40 station analog strong motion network and a 10-digital station strong motion network since 1973 and recently 5 Reftek (DAS) and 3 Lennartz (MARSLite) digital mobile stations equipped with Guralp (CMG-40T) and Lennartz (LE3D) three-component sensors are also being deployed for microseismic investigations.
NOA also provides a real-time seismicity catalog of Greece as well as other relevant information and links through its world wide web page found at http://www.noa.gr. For access to the above data sets, a request can be sent to the site administrator G.Chouliaras (by e-mail at g.choul@egelados.gein.noa.gr) and further instructions will be given accordingly as to the mode of access (FTP, auto-DRM, Web, E-mail).

Contact	G. Chouliaras
E-mail	g.choul@egelados.gein.noa.gr
Web	http://www.noa.gr

Note: The complete version of this article is available on the EMSC Web site at http://www-csem.bruyeres.cea.fr/Html/NEWS_main.html

International Institute of Earthquake Engineering and Seismology (IIEES), Iran

Information about IIEES data can be obtained through the web site (see address below). As some parts of website is under construction at this time, you can contact us by e-mail.

Contact	Amir Mansour Farahbod
Address	Seismology Research Center International Institute of Earthquake Engineering and Seismology P.O. Box 19395/3913 - Tehran, Iran
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Fax	+98 (21) 229-9479
E-mail	Iiees@dena.iiees.ac.ir
Web	http://www.iiees.ac.ir/larzeh/index.html

Observatory of Geophysics and Cosmic Physics (BARI), Italy

The "Osservatorio di Geofisica e Fisica Cosmica" (Observatory of Geophysics and Cosmic Physics) is a research institute of the Science Faculty of the University of Bari. It runs a local seismic network including 6 seismological short-period single-component (vertical) stations, and one located in the Apulian region (Italy).
The data from 4 stations located outside of the Institute are radio-transmitted to the acquisition and recording centre of the Observatory, where a fifth station is located. The sixth station, which is not tele-metered, is located at Sannicandro Garganico and its recordings are monthly retrieved by the technical staff.
For all the stations the recording is analogic and timing is checked through radio-signal.
A seismic bulletin is compiled monthly; it includes data concerning seismic wave time arrival, phase identification, onset polarity, maximum amplitude and seismogram duration. The bulletin is recorded on magnetic supports (disk and tape) and is sent by e-mail to the Istituto Nazionale di Geofisica of Rome and to E.M.S.C., as well as in paper form to institutions that make a request for it.
Besides the analogic data acquisition, a digital acquisition is carried out: it employs a triggering system based on the STA/LTA ratio and adopts a timing system (GTS) that exploits GPS satellite signals.
Furthermore, at the Observatory centre is located a long period seismic station provided with both analogic and digital acquisition system. An annual bulletin is compiled for it as well.
Access modality : The access is allowed through a written request sent by mail, fax or e-mail

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Note: The complete version of this article is available on the EMSC Web site at http://www-csem.bruyeres.cea.fr/Html/NEWS_main.html

Friuli Accelerometric Network (FRI), Italy

During 1993-95 the Friuli Accelerometric Network (RAF) has been installed in the Friuli (NE Italy) seismic area in the framework of two "EPOCH" and "Environment" EC projects. The network is operated by the Dipartimento di Scienze della Terra of the University of Trieste (DST) in co-operation with the National Electrical Company of Italy (ENEL-DCO, Rome) and the Swiss Seismological Service (ETH, Zurich, Switzerland). The network has been installed to study in detail, especially in the low-frequency (below a few Hz) range, the source properties associated with the recorded seismic events, the propagation and the site effects.

The network has 10 digital accelerometers, which have large frequency response and high dynamic range, coupled with 12, 16 and 24 bits acquisition systems. In the first five years about 120 high-quality signals of events with 1.2 < Ml < 5.9 have been recorded, and a database containing the waveforms, Fourier spectra, response spectra and other related engineering parameters has been compiled. A report of the network activity is published annually, which contains the corrected signals together with the computed Fourier spectra and response spectra. The characteristics of the recording station, the parameters of the related seismic event, and the map with the epicentre and the station are also reported. The data and the reports can be requested trough the WWW DST site www.dst.univ.trieste.it where more detailed information about the RAF network can be found.

The Friuli Network Database and annual network report.

The original data recorded by the different instruments are pre-processed at DST and their format is changed to the standard GSE format, which contains all the information extracted from the station history and instrument response databases and from the earthquake catalogue. The data are, then, processed and the corrected signals, the Fourier spectra and the response spectra, are computed and added to the database. At the end graphic procedures are used to plot the data and create the annual report of the network. Other procedures extract from the database some selected engineering parameters of ground-motion (PGA, PGV, PGD, Energy, Arias intensity, etc.).

In the annual report the corrected signals are given together with the computed Fourier spectra and response spectra. The characteristics of the recording station, the parameters of the related seismic event, and the map with the epicentre and the station are also reported.

In the database and in the annual report, all waveforms are shown that correspond to an event in the area of the network localised by the local OGS seismic network. Waveforms of some particularly interesting events not fulfilling these conditions (e.g. swarms, etc.) are added to the database. The database contains also the waveforms recorded by the stations of PRAD and MOGG during the Umbria event of September 1997, Ml=5.9 (distance about 300 km).

A special issue of the bulletin containing the waveforms recorded during the Bovec (Slovenia) April 12, 1998 Ml=5.6 event, about 50 km far from the network, has been published. The corresponding computed velocities and displacements are reported as well. More detail on the Bovec event and on the RAF network can be found in the WWW DST page www.dst.univ.trieste.it. From this page it is also possible to request data and the annual reports.

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Phone	+39-040-6762264	
Fax	+39-040-6762111	
E-mail	costa@geosun0.univ.trieste.it	suhadolc@geosun0.univ.trieste.it
Web	www.dst.univ.trieste.it	

Département de physique du globe (SGPM), Morocco

The 'Département de Physique du Globe' assures the operation of a sismological network for the monitoring of Morocco seismic activity as well as the the recording of the earth magnetic field at two observatories (Tiouine and Averroes). Data collection from the seismological network and their analysis allow the publication and distribution of seismological bulletins on a weekly and monthly basis.

Data available at this institute cover the period from 1938 up to now. These data are analog recordings available only at the institute. However, copies of specific events can be requested and send either by fax or by e-mail.

Contact	Pfr. Ben Aissa Tadili
Address	Département de Physique du Globe, Institut scientifique - B.P. 703 - Rabat Agdal - Rabat, Maroc
Phone	+212 (7) 774543
Fax	+212 (7) 774540
E-mail	Tadili@yahoo.com
Web	http://www.israbat.ac.ma/acceuil.htm

Seismological data in the Netherlands (KNMI, NARS, ORFEUS)

Networks

Two institutes in the Netherlands operate seismograph networks to record earthquakes. The Dutch National Seismograph Network is run by the Seismological Division of the Royal Netherlands Meteorological Institute (KNMI) in de Bilt. The national network provides both parametric data, which are sent

to the EMSC, NEIC and ISC and waveform data, which is sent to ORFEUS and IRIS. Both datasets are available through these international organisations. Routine data exchange with German, Belgium and British network operators has been established through EC funded projects like "Transfrontier" and "Rapid Warning System". The Department of Geophysics, Utrecht University, operates on a (often long-term) basis a mobile seismograph network called NARS. Waveform data becomes available at ORFEUS after the usual time delay, which enables project members to obtain first results.

stations	parametric data	waveform data	Web information	Comments
HGN, WIT,WTS	EMSC, NEIC, ISC, KNMI	ORFEUS, IRIS, KNMI	KNMI, ORFEUS	Near real-time open access
DBN	KNMI	KNMI	KNMI	Historical data (on request)
13 SP stations	KNMI	KNMI	KNMI	Data only on request
NARS	no	ORFEUS	NARS	

ORFEUS

The KNMI hosts the non-profit organisation ORFEUS (Observatories and Research Facilities for European Seismology), which archives high quality broadband waveform data from large global events recorded at stations in the European-Mediterranean area. Furthermore, ORFEUS provides near real-time access to waveform data from global and regional broadband stations for large earthquakes through Spyder(. Data are available through the Internet, AutoDRM and FTP. Details on ORFEUS extensive data services can be found on its web site.

Contact	Reynoud Sleeman (KNMI) [1]	Bernard Dost (ORFEUS) [1]	Hanneke Paulssen (NARS) [2]
Address	[1] Seismological Division Royal Netherlands Meteorological Institute - P.O.Box 201, 3730 AE De Bilt, Netherlands [2] Department of Geophysics Utrecht University - P.O. Box 80.021, 3508 TA De Bilt, Netherlands		
Phone	+31 (0)30 2206343	+31 (0)30 2206340	+31 (0)30 2535089
Fax	+31 (0)30 2201364	+31 (0)30 2201364	+31 (0)30 2535030
E-mail	sleeman@knmi.nl	dost@knmi.nl	paulssen@geo.uu.nl
Web	www.knmi.nl/onderzk/seismo	orfeus.knmi.nl	www.geof.ruu.nl/~nars
AutoDRM	autodrm@orfeus.knmi.nl	autodrm@orfeus.knmi.nl	
FTP site		orfeus.knmi.nl	

Norwegian National Seismic Network (BER), Norway

The University of Bergen operates the Norwegian National Seismic Network of about 22 stations covering the whole country, Spitzbergen, Bear Island and Jan Mayen. Of these stations, 5 are broad band. The data base contains hypocenter data since 1745, located events with phase reading since 1980 and digital data since 1982. Phase data are from the National Network stations as well as relevant data from NORSAR and the British Geological survey (BGS). Waveform data are available from 1982 and all waveform data recorded by the University of Bergen and some waveform data from NORSAR and BGS are available online. Data is collected automatically from most stations 4 times a day and the raw unedited data is also available online. Currently the data base contains information about 40 000 events of which 32 000 are in and around Scandinavia and the rest are teleseismic events. There are 27000 waveform files available. Paper seismograms are available since 1905.

The digital data is available on ftp at address ftp.ifjf.uib.no, directory pub/seismo/DATA or web pages http://www.ifjf.uib.no/seismo/index.htm. The parameter data are stored in a directory tree with yearly and monthly directories as single event files and in monthly event files. The parameter files are written in Nordic format (in Ascii) and can therefore be viewed with a browser. Each event parameter data set gives names of waveform files if available. The waveform files are also stored in a directory tree with yearly and monthly directories. The waveform files are all stored in SEISAN format. Conversion programs from SEISAN to other formats are available on the above ftp address.

The waveform data are also stored on CD-ROM and copies can be obtained on request.

Contact	Jens Havskov
Address	Institute of Solid Earth Physics, University of Bergen - Allegaten 41 - 5007 Bergen, Norway
Phone	+47 55583420
Fax	+47 55589669
E-mail	Jens.Havskov@ifjf.uib.no ; seismo@ifjf.uib.no
Web	http://www.ifjf.uib.no/seismo/index.htm

Institute of Geophysics, Polish Academy of Sciences (WAR), Poland

Polish local seismological bulletin :

This bulletin is devoted to the mining-induced events from Upper Silesian Coal Basin and Lubin Copper Basin, and comprises of phase readings, source locations and magnitudes determined at observatories OJC, RAC, KSP, NIE. For the period before 1991 KRA station worked in place of OJC. The bulletin is available for the period 1986-1997. For the period before 1986 the bulletin is not available on any magnetic medium and only in the form of booklet published annually by Publications of the Institute of Geophysics, Polish Academy of Sciences.

It is available by a specific request by letter to Barbara Guterch.

It is available in form of a paper printout, or on floppies in the form of Symphony's .WR1 files. This bulletin is discontinued effective January 1, 1998. The volume of the .WR1 data is approximately one floppy per year.

New Polish local seismological bulletin :

This bulletin is the continuation of the bulletin described in point 1, but in a Paradox database system. It is available for the period 1998-present, with about 4 months delay. It is available by a specific request by letter to Prf. Janusz Niewiadomski.
It is available in form of a printout or on floppies in the form of Paradox database files.

Contact	Barbara Guterch	Prf. Janusz Niewiadomski	Mr. Jan Wiszniowski
Address	Institute of Geophysics, Polish Academy of Sciences - Ks. Janusza 64 - 01452 Warszawa, Poland		
Fax	+48-22-6915915		
E-mail		janusz@igf.edu.pl	jwisz@igf.edu.pl

Digital waveform data from KSP and OJC :

These data are short period data from GS-13 seismometers of the mining events from Upper Silesian Coal Basin or the Lubin Copper Basin. The data is trigger-based, so it may be partially incomplete. The data runs 1991 to present, and it is in the form of mss-format files with 100 Hz sampling rate. The mss is a block-multiplexed format. Each data block consists of 1024 bytes, the first byte is channel identificator, followed by 23 bytes of header and 500 Integer*2 samples from the channel. Complete description of the format is available from Mr. Jan Wiszniowski.
The data is kept at the stations. In case of KSP please contact Mr. Jerzy Speil, Dolnoslaskie. In case of OJC please contact Mr. Jan Kozlakiewicz. The data is available on floppies. Individual data files can be sent as attachments to email messages. The total volume of all the data is about 3 GB in case of OJC and about 1 GB in case of KSP.

Station	KSP	OJC
Contact	Mr. Jerzy Speil, Dolnoslaskie	Mr. Jan Kozlakiewicz,
Address	Obserwatorium Geofizyczne - 58-306 Walbrzych, Poland	Obserwatorium Sejsmologiczne 32-047 Ojcow, Poland
Phone	+48-74-401708	+48-12-3892094
E-mail	kspobs@zeto.swidnica.pl	nlkozlak@kinga.cyf-kr.edu.pl

Local bulletin of the station of Niedzica :

It is available only for the period July 1997 to present, with a four month delay. It consists of just phase data of very local seismic activity within several kilometers of a dam on Dunajec River, Southern Poland. The data is available in printed form from the observatory OJCow. Contact Ms. Ewa Zarzycka, or you may email Mr. Kozlakiewicz (nlkozlak@kinga.cyf-kr.edu.pl) as well.
Some waveforms from NIE (SP, 100 Hz, mss-format) can be also available from the same address for the period 1996 to present, however due to trigger problems these are far from complete.

Contact	Ms. Ewa Zarzycka
Address	Obserwatorium Sejsmologiczne - 32-047 Ojcow - Poland
Phone	+48-12-3892094

Geophysical Institute (BRA), Slovak Republic

Description of datasets available in Geophysical Institute, Slovak Academy of Sciences, Bratislava, Slovak Republic.

Analog seismic records :

Station	Period	Record type	Instrument	Components
Hurbanovo (HRB)	1943-1999	smoked paper	medium period	Z,N,E
Bratislava (BRA)	1957-1976	photo paper	short period	Z
Skalnaté Pleso (SPC)	1956-1998	photo paper	short period	Z
Srobárová (SRO)	1963-1998	photo paper	short period	Z
Bratislava (ZST)	1977-1990	termo paper	short period	Z
	1990-1999	termo paper	short period	Z,N,E
	1997-1999	termo paper	broadband	Z,N,E

Digital seismic records :

Station	Period	Format	Instrument	Components
Srobárová (SRO)	1997-1999	ESSTF, GSE2.0	short period	Z,N,E
Bratislava (ZST)	1990-1997	ESSTF, GSE2.0	short period	Z,N,E
	1997-1999	ESSTF, GSE2.0	broadband	Z,N,E

Stations not registered by ISC :

Station	Period	Format	Instrument	Components
Koöice	1992-1999	ESSTF, GSE2.0	short period	Z,N,E
Vyhne	1991-1999	ESSTF, GSE2.0	short period	Z,N,E
Modra	1992-1996	ESSTF, GSE2.0	short period	Z,N,E

Bulletins:

Bulletin of the Slovak Seismological Stations 1966-1991
Bulletin of the Czechoslovak Seismological Stations 1949-1981 1986-1987
Prager Seismische Ver(ffentlichungen.....1940-1943
Bulletin seismique des stations seismologiques de Praha et de Cheb.....1944-1945 1947-1948
Erdbebenbeobachtungen in der Slowakei und in Ehen. Karpatenrussland 1923-1938

Mode af access:

on request letter, fax, e-mail, autoDRM for ZST station at autodrm@seis.savba.sk

Support medium:

analog: original, xerocopy, letter, e-mail
digital: floppy disk, zip disk, CD-rom, e-mail

Contact	Andrej Cipciar
Address	Geophysical Institute Slovak Academy of Sciences Dúbravská cesta 9 - 842 28 Bratislava, Slovak Republic
Phone	+421-7-5477 5280
Fax	+421-7-5941 0611
E-mail	geofanci@savba.sk

Instituto Geografico Nacional (IGN), Spain

Summary of the most significant products available at the sub-direction 'Geodesia y Geofisica del I.G.N. (Seismology)

	Description	Periodicity	Available periods	Formats	Access way	Support	Contact person
Seismic information (Alert)	Regional seisms: Parameters: location, origen time, magnitudeand Intensity of the near seisms, includes a small scale situation map.	Last 20 seisms	Available 10 minutes after happening	HTML	http://www.geo.ign.es/servidor/sismo/cnis/proximo/proximo.html	Web	JUAN RUEDA Email:juan@tectonica.ign.es Phone: 34 91 597 97 44
	Teleseisms: Parameters: location, origen time, magnitude and Intensity of far seisms, includes a large scale situation map.	Last 10 seisms	Available 10 minutes after happening	HTML	http://www.geo.ign.es/servidor/sismo/cnis/lejano/lejano.html	Web	JUAN RUEDA Email:juan@tectonica.ign.es Phone: 34 91 597 97 44
Weekly Bulletin	Phase reading of all seismic activity registered.	weekly	year before	GSE 2.0	http://www.geo.ign.es/servidor/sismo/cnis/semanal/semanas.html	Web	GREGORIO PASCUAL Email:grego@ign.es Phone: 34 91 597 95 18
Monthly Bulletin	Phase reading of all near field seismic activity registered.	Monthly with 9-month delay	Contact responsable	TELETYPE	e-mail after request to the responsable	E-MAIL	GREGORIO PASCUAL Phone: 34 91 597 95 18 Email:grego@ign.es
Annual Bulletin	Phase reading of all near field seismic activity registered and summary of the localized seisms.	Annual with 16-month delay	1993-1994-1995 [1]	hypo 71, SSIS	http://www.geo.ign.es/servidor/sismo/cnis/terremotos.html	+Book, +diskette...	GREGORIO PASCUAL Email:grego@ign.es Phone: 34 91 597 95 18
Seismic Catalog Exploitation	Seisms included in the IGN Seismic catalogue	Under petition	300 a.C..- week before date	SSIS	request to C.N.I.G. by E.mail: consulta@cnig.ign.es [2]	diskette, E-mail, fax....	GREGORIO PASCUAL Email:grego@ign.es Phone: 34 91 597 95 18
Waveforms	Digital segmented series of the events registered by the R.S.N. since 1986 both near as well as teleseisms	Under petition	1986-1993 1993-1997 1997-------	DATA6 Kinemetrics USGS-VAX ASCII SAIC-CSS3.0, ASCII	request to C.N.I.G. by E.mail: consulta@cnig.ign.es [2]	diskette, E-mail, fax....	MIGUEL TOMÉ Email:tome@ign.es Phone: 34 91 597 97 31
Strong-motion record bulletin	Station data with strong-motionrecords	Bi-annual	1° o 2° semester	HTML	http://www.geo.ign.es/servidor/sismo/insis/basac/basac.html	Web	AGUSTÕN SUAREZ Email:agustin@ign.es Phone : 34 91 597 95 00
Strong-motion records	Strong-motion data base.	Under petition	1984-1997	ASCII	request to C.N.I.G. by E.mail: consulta@cnig.ign.es [2]	CD-ROM	AGUSTÕN SUAREZ Email:agustin@ign.es Phone :34 91 597 95 00

[1] *Other years in official publications* [2] *Public prices* *B.O.E. num 195, 15 August 1997*

Earthquake Research Department (ERD), Turkey

The Earthquake Research Department of the Turkish Ministry of Public works and settlement operates the National Strong Earthquake ground motion network of Turkey. The network has 69 Analog and 45 Digital instruments. Digital instruments are connected to the central computer in Ankara by telephone lines and modem. The digitized strong motion data of Turkish earthquakes are available on the web.

Contact	Engin Ynan
E-mail	einan@angora.deprem.gov.tr
Web	angora.deprem.gov.tr

Seismological Survey of Serbia (SRB), Yugoslavia

We can provide:

1. Waveforms
Period: 1991- present;
E-mail: *.gif format; specific digital format; in six months files in some of the standard computer formats will be available;
Paper (A-4).

2. Parametric data of Serbian earthquakes including border regions
Period: 1900-1970 I>4;
E-mail: ASCII format; *.dbf;
Paper.
Period:1970-1995 Ml>3; available in six months, some years available now;
E-mail: ASCII format; *.dbf;
Paper.

3. Preliminary monthly bulletins
E-mail;
Paper.

4. Focal mechanism
Period: 1972- present;
E-mail: ASCII format;
Paper.

Contact	Slavica Radovanovic
Address	Seismological Survey of Serbia - Park Tasmajdan b.b. - P.O. BOX 16 - 11000 Belgrade - Serbia, Yugoslavia
Phone	+381 11 3227 013 +381 11 3222 208
Fax	+381 11 3233 534
E-mail	seismoyu@eunet.yu ; seisrsz@eunet.yu

Montenegro Seismological Observatory (PDG), Yugoslavia

The Montenegro Seismological Observatory has created a web site http://www.seismo.cg.yu in which we offered our seismic bulletin data and other data via e-mail.

Contact	Dr Branislav Glavatovic
Address	Director of the Montenegro Seismological observatory - R. Burica 2 P.F. 196 - 8100 Podgorica, Montenegro, Yugoslavia
E-mail	seismocg@cg.yu
Web	http://www.seismo.cg.yu

The ORFEUS page

NETWORKS OF THE WORLD

John Lahr[1], Willie Lee[2] and Torild van Eck[3]

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[3] ORFEUS, Royal Netherlands Meteorological Institute, PO Box 201, 3730 AE De Bilt, Netherlands.

Academic Press will publish an International Handbook of Earthquake and Engineering Seismology (Paul Jennings, Hiroo Kanamori and Willie Lee, Editors) as an IASPEI Centennial volume in 2001. One chapter will be devoted to An Inventory of Data from Seismograph Networks of the World with John Lahr and Randy White as the coordinators, and Steve Malone, Carlos Redondo, Torild van Eck and others as regional coordinators. Specifically, this chapter will be a compilation of instrumental earthquake catalogs or "station bulletins" or pointers to these archives for each seismic network. Seismologists may contribute either by submitting instrumental earthquake catalogs or "station bulletins" from their networks or by providing information on how to access their archives.

Call for European/Mediterranean Seismic Network Contributors

We solicit contributions of European-Mediterranean seismic networks. If you agree to contribute we would appreciate if you send the following information at your earliest convenience to John Lahr (e-mail: lahr@usgs.gov):

1. Your name, mailing address, telephone number, fax number, & email address.
2. Name of your seismic network and an approximate number of stations.
3. The approximate location of your seismic network and areal coverage in square kilometers.
4. The time period of your data, and approximate number of earthquakes.
5. Approximate size (in megabytes) of your earthquake catalog.
6. Approximate size (in megabytes) of your phase data used in deriving your earthquake catalog.
7. Approximate size (in gigabytes) of your digital waveform data of significant earthquakes that you would like to archive at the IRIS DMC or ORFEUS.
8. Your choice of deadline for manuscript/data submission: March 31 or September 30, 1999. Please select the first if possible, so that we can start the reviewing process.

For each participating network there will be a 1/2 page abstract within the printed volume of the Handbook. For the bulletin, phase and possibly waveform, which will be stored on one or more attached CD-ROM's, we propose two alternatives.

Alternative 1: Provide the following information for the CD-ROM:

1. A description of the seismic network, including station history, coordinates, and instrumentation.
2. A description of the data processing and limitations of the data, including velocity structure model(s), method(s) for computing hypocenter parameters, magnitude(s), etc.
3. An earthquake catalog in the form of computer readable ASCII file(s), with explanations of the format.
4. A copy of the source code for the program(s) used to locate and determine the magnitude of the events. Include a copy of any auxiliary files used, such as for station coordinates and calibration.
5. The phase data files (arrival times, amplitudes, coda durations, etc.) used in deriving the earthquake catalog with an explanation of the format(s).
6. Seismic waveform data of significant earthquakes (e.g., magnitude 6 or greater events within 100 km) in SEED format.

Alternative 2: Include within the 1/2 page abstract of the Handbook clear references to where the above data can be obtained or is available (for example a local web address or archive with access description, mailing address or archival centre like IRIS, NEIC, ORFEUS, EMSC, etc.). **In case you choose this second alternative, please, have look at seismo-data at the ORFEUS web site** and check for completeness.

FORUM

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Other matters			csem@ldg.bruyeres.cea.fr

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National Survey and Cadastre, Copenhagen	Denmark	Dr. S. Gregersen
National Research Inst. for Astr. and Geophysics	Egypt	Dr. E. Ibrahim
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Bureau de Recherches Géologiques et Minières	France	Dr. C. Martin
Laboratoire Central des Ponts et Chaussées	France	Dr. P.-Y. Bard
BGR Seismologisches Zentralobs. Gräfenberg	Germany	Dr. H. Aichele
British Geological Survey	Great Britain	Dr. C. Browitt
National Observatory of Athens	Greece	Dr. G. Stavrakakis
University of Thessaloniki	Greece	Dr. M. Scordilis
ITSAK	Greece	Dr. N. Theodulidis
Icelandic Meteorological Office	Iceland	Dr. R. Stefansson
Dublin Institute for Advanced Studies	Ireland	Prof. B. Jacob
Geophysical Institute of Israel	Israel	Dr. Y. Gitterman
Osservatorio Geofisico Sperimentale	Italy	Dr. M. Russi
Storia Geofisica Ambiente srl	Italy	Dr. E. Guidoboni
Geophysics Centre at Bhannes	Lebanon	Dr. C. Tabet
Centre National de la Recherche	Morocco	Prof. E. Iben Brahim
NORSAR	Norway	Dr. J. Fyen
University of Bergen	Norway	Dr. J. Havskov
Instituto de Meteorologia	Portugal	Dr. M.L. Senos
Instituto Superior Tecnico	Portugal	Dr. J. Fonseca
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Istituto di Ricerca sul Rischio Sismico	Italy	Dr. M. Stucchi
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European Seismological Commission (ESC)		Ms. A. Walker
ORFEUS Data Centre		Dr. B. Dost
International Seismological Centre (ISC)		Dr. R. Willemann

Next EMSC Assembly General

The next Assembly will take on July 21, 1999 in Birmingham, UK, during the IUGG meeting.

Council of Europe

The EMSC is a Specialized European Centre for the Open partial Agreement

Synop6 Nancy