

ORFEUS Electronic Newsletter

This is the first issue of the Orfeus Electronic Newsletter following an initiative of the [Board of Directors](#) of Orfeus at the 1998 ESC meeting in Tel Aviv. The goal of this Newsletter is to disseminate rapidly and with minimal costs information relevant to the Orfeus community within the European-Mediterranean area. Orfeus invites contributions. Please, do not hesitate to vent your opinion, comments, ideas, etc. to Orfeus ([Torild van Eck](#)).

Articles and News

[ORFEUS Electronic Newsletter: Scope and authors guidelines](#): 2 (7 kB)

[Why an ORFEUS Electronic Newsletter?](#): 3 (6 kB)

Torild van Eck, Bernard Dost, Ota Kulhanek and Winfried Hanka

[The GEOFON Program](#): 4 (130 kB)

Winfried Hanka

A European BB network with global ambitions: station distribution and data access.

[New temporary broadband stations in the larger Mediterranean region](#): 5 (310 kB)

Suzan van der Lee, Domenico Giardini, Charles Estabrook, Anne Deschamps and Claudio Chiarabba
Project MIDSEA

[ORFEUS Working group 1: BB siting and station standards](#): 6 (6 kB)

Jan Zednik

The status and plans. Presentation of a.o. the station inventory and station book for the European-Mediterranean area.

Short notes

[Orfeus workshop](#): 8 (10 kB)

Nov 9-12, 1998 Prague. "Installation and operation of broad-band seismograph stations",

[First European Quanterra Users](#)

[Group meeting](#): 9 (10kB) Nov 12-13, 1998 Prague. Discussions on technical aspects, users applications, etc.

[Instrumentation: FDSN working group? workshop at IUGG99?](#): 10 (5kB)

Announcements

[ORFEUS announcements](#): 11 (5 kB)

ODC-Volumes for 1993 published and will be mailed ASAP to participants.

Near Real Time (NRT) SEED format waveform data for 1998 and 1999.

1998: 2 new corporate founders and 5 new participants.

[Inventory of Data from Seismographic Networks of the World: 7 \(7 kB\)](#)

John Lahr, Willie Lee and Torild van Eck

Call for European/Mediterranean Seismic Network Contributors

page 1

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Please contact [Torild van Eck](#) to (un)subscribe to the Orfeus Newsletter or request printed copies (only participants).

ORFEUS Electronic Newsletter: scope and authors guidelines

The [ORFEUS board of directors](#) decided to go ahead with an Electronic ORFEUS Newsletter as an experiment in low-cost and effective information dissemination. The first issue is planned to appear January 1999.

Concept: ORFEUS participants and interested people receive by e-mail one html page with links to the different articles, news items etc. These links refer to retrievable newsletter pages stored at the [ORFEUS web site \(Newsletter\)](#). This way the reader may retrieve only those pages he or she is interested in. Contributors are encouraged to include links to relevant additional material.

Goal and ambition: The ORFEUS Electronic Newsletter should have a similar quality as the IRIS newsletter. Articles will pass a review procedure, where the main items will be relevancy and informational quality. The [ORFEUS web site \(Newsletter\)](#) will be an archived, fully referenceable electronic publication. Original contributions with relevant practical and informational material on seismological observations are invited. We are presently aiming at four issues in 1999, but this can be changed if necessary.

Audience and distribution: Seismologists interested in ORFEUS activities and residing within the European-Mediterranean area (including the Middle East). Distribution globally is not intended, but anybody interested can be put on the mailing list. ORFEUS participants can, upon request, receive (color) printed hard copies. Others can order (on cost basis) individual printed copies of the Newsletter. This service will only be provided in limited form.

Editor(s): In its initial phase ORFEUS General Secretary, Torild van Eck (e-mail: vaneck@knmi.nl) assisted by Brian Baptie (e-mail: b.baptie@bgs.ac.uk), member of the ORFEUS ExeCom, will be editors. ORFEUS is soliciting for an **editor-in-chief** and an additional **editor**.

Contributions: Anybody within the ORFEUS related community is encouraged to submit contributions to the ORFEUS Electronic Newsletter and experiment with this electronic form. The editor will together with the ORFEUS ExeCom judge its relevance and practical implementation. Initially we will aim at publishing articles, news and announcements within the scope outlined above.

Articles. should preferably not exceed 3 A4 (single-spaced) pages (less than 1500 words) and contain not more than 4 figures. Articles should cover practical aspects of a relevant research topic or description of on-going observational activities.

News (or letters). should preferably not exceed one A4 (single-spaced) page (less than 500 words) and contain not more than 2 figures. News (or letters) would cover reports on workshops, work-meetings, on-going activities and items that deserve attention within the ORFEUS community, etc.

Announcements. should not exceed 1/2 A4 (single-spaced) page (less than 200 words) and contain only in exceptional cases figures. Announcements concern future workshops, new web pages, software, etc.

Text. should preferably be submitted in ASCII text files. These will be edited within an html template. Everything that simplifies editorial activities and promotes effective and low-cost publication is encouraged.

Figures. Figures need to be clear and have a width not exceeding 600 pixels and preferably be small in size. Preferred formats are GIF, JPG or TIF. PDF or EPS Postscript files may be considered after consultation.

Links. ORFEUS will not assume responsibility for keeping cited link permanently active. All newsletters will carry a disclaimer:

Note: Hyperlinks and email addresses are live and active at the time of publication, but cannot guaranteed by ORFEUS for indefinite future use.

Submittal Contributions to the ORFEUS Newsletter should be submitted to ORFEUS (Torild van Eck e-mail: vaneck@knmi.nl).

Why an ORFEUS Electronic Newsletter?

[Torild van Eck](#)¹, [Bernard Dost](#)¹, [Ota Kulhanek](#)² and [Winfried Hanka](#)³

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The last two years the ORFEUS activities have been expanding considerably due to, among others, a decision by the [ORFEUS board of directors](#) to invest in an additional half-time position and proposals by the [Executive Committee](#) to start a number of working groups.

Since 1996 ORFEUS has been investing on being accessible by internet. Presently, most of its activities can be followed on its [web site](#). Further, its working groups maintain inventories and other utilities for the benefit of the global seismological scientific community, and specifically for those within the European-Mediterranean area. Many **activities are organised within these working groups** and we plan to report on these in the Newsletter.

Although the web pages provide an ideal medium for rapid dissemination of both data and information it remains inefficient in keeping potential users informed about **recent changes and new information and/or data**. Keeping ORFEUS participants up-to-date is one argument for the announcements and news published in the electronic newsletter.

Most important are the rapid developments in the region with respect to data acquisition. Many seismograph networks are presently updated, a number of mobile seismograph projects have been initialised and the [International Monitoring System](#) (IMS) is installing the global verification network. Presently, no medium exists in which many of these developments are reported to the seismological community within our region. Therefore we plan to publish regularly articles about **new developments at the different networks in Europe, the Mediterranean and its surroundings**.

The Orfeus Data Center and other data centers are rapidly accumulating large amounts of waveform data. This requires **new methods of accessing, searching and processing the data**. Also here the Newsletter intends to publish relevant articles.

We have decided on an Electronic Newsletter to **reduce publishing cost and time to a minimum** and to **complement our www efforts**. A printed Newsletter would require additional funds for producing, printing and distribution, and usually introduces a delay between production and reader availability. We will distribute by e-mail only the first (html) page with the contents and leave it to the reader to retrieve and print the articles, news-items and announcements at their own convenience.

This electronic publication is experimental, therefore, we would appreciate your comments and suggestions. The intention is to publish four Newsletters this year and then evaluate its impact. Furthermore, in order to enable others to refer to articles, we: **a) number the volumes and 'virtual' pages and b) keep the complete volumes available and accessible on the [ORFEUS web site](#).**

page 3

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The GEOFON Program

Winfried Hanka

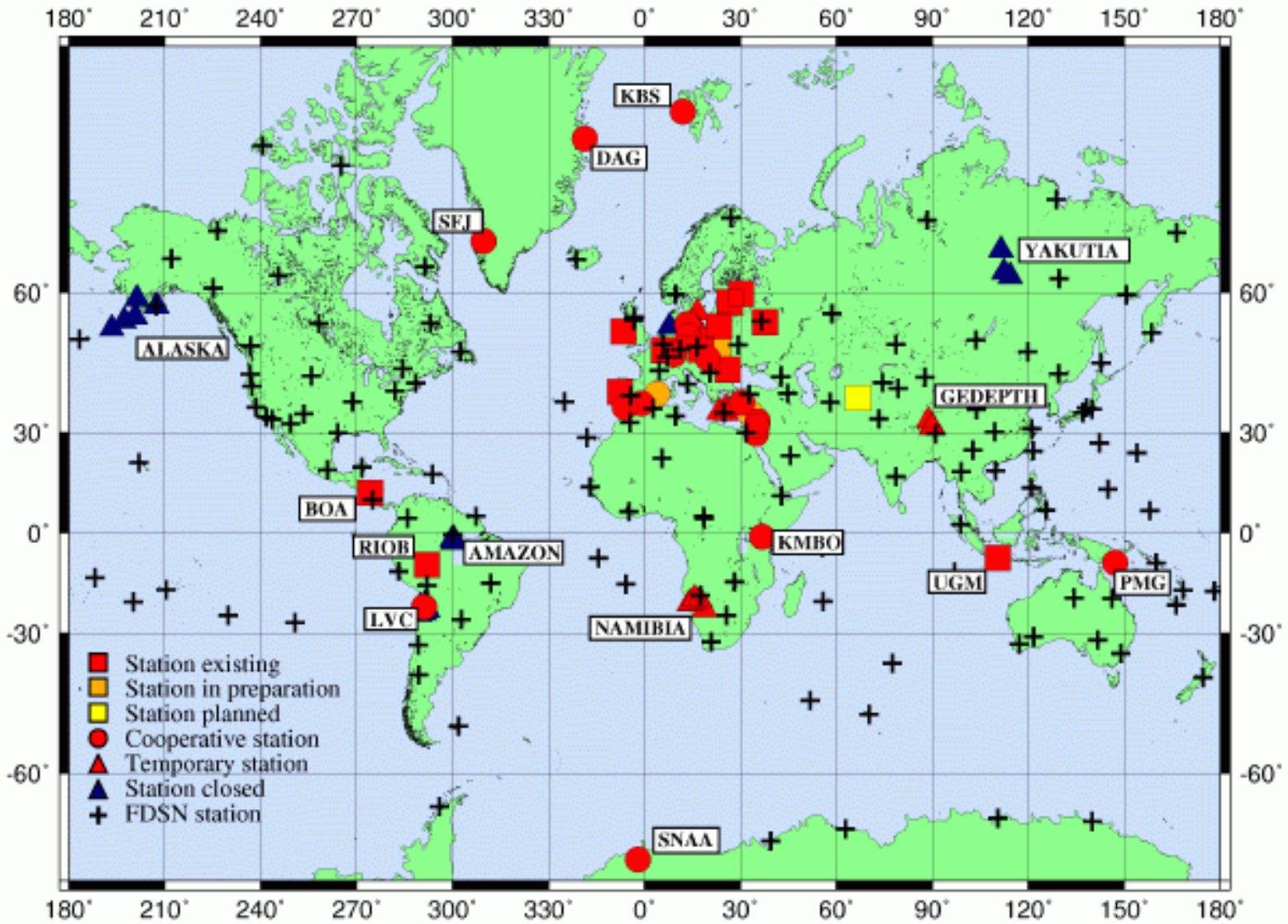
GeoForschungsZentrum (GFZ), D-14473 Potsdam, Germany

[Abstract](#) - [Introduction](#) - [Permanent Network](#) - [Temporary Network](#)
- [Data Center](#) - [Data Archive](#) - [Access Methods](#)

Introduction

Broadband seismology has a long tradition in Germany. The Graefenberg Array (GRF) was the world's first major broadband installation. It is operational since 1976 and many scientific studies demonstrated the benefit of broadband digital recording since then. Between 1991 and 1993, 12 stations of the German Regional Seismic Network (GRSN) were installed performing a modern national seismograph network. Following that tradition, [the GEOFON Program](#) has been founded by GFZ in 1992. The program consists of three major components: a permanent network, a mobile broadband network for longterm temporary installations and a data center. Presently (January 99) altogether 47 stations contribute to the GEOFON networks. Innovative and resources saving concepts and comprehensive cooperation with other programs and institutions allow the installation, operation and maintenance of these stations on a very cost and personel effective basis.

Global Distribution of GEOFON & FDSN Stations



Temporary Network

The [temporary GEOFON network](#) presently consists of 11 stations in Central Europe, Greece, and Namibia installed for periods between one and three years. Several projects in Chile, Southern and Northern Tibet, Alaska, Yakutia, Brazil and Germany were carried out already since 1993. In addition, a large scale American-German project [GEDEPTH II-INDEPTH III](#) is presently carried out in Northern Tibet. Common goal for these projects is the investigation of the structure of the lower crust and upper mantle preferably in subduction and collision zones with sparse networks of 3-5 stations only. Beside the STS-2, also Guralp CMG-3T and 40T seismometers are in operation. Depending on the site infrastructure, either [Quanterra Q4120 datalogger](#) with remote control by GSM or [Reftek 72A systems](#) with extra large disks and independent power supply by solar panels are used for longterm unattended operation. A [mobile data collection center](#) was developed on laptop basis for infrequent station visits. Other more short term experiments with larger number of instruments ([PISCO94](#), [GEDEPTH-INDEPTH II](#), Vogtland, [TOR](#), [Eifel Plume](#), [SVEKALAPKO](#)) were also supported

GEOFON Data Center

The [GEOFON data center](#) consists of four components: the near-realtime event oriented SPYDER online pool, the continuous near realtime online data base OnDB, the continuous GEOFON DIRTS data archive and the FARM event volumes. The GEOFON SPYDER node presently regularly retrieves the data from more than 30 stations e.g. nearly all permanent GEOFON stations and a set of other stations in Central Europe for all global events larger than mb 5.5. This system is a common effort with [IRIS DMC](#), [ORFEUS DC](#) and several other SPYDER nodes worldwide triggered by [NEIC](#) alerts. From GFZ, the GEOFON SPYDER data are distributed to ODC and IRIS DMC by Internet and their data are copied to Potsdam the same way. Therefore several hours after origin time the event data for up to over 100 stations become available at the GEOFON DC for all major global events. Moreover, in 1995 a regional EuroSPYDER system for smaller events ($5.0 < mb < 5.5$) in Europe and the Mediterranean was introduced triggered at first internally and since summer 1997 also by the EMSC alerts. This system, also operated in cooperation with ODC, provides data for the [regional source parameter determination](#) carried out [at GFZ](#) as a key node in the [European Mediterranean Seismological Center](#) (EMSC) framework. Access to SPYDER, EuroSPYDER and OnDB is provided by DRM and AutoDRM (presently OnDB only). More sophisticated web interfaces are under construction.

GEOFON Data Archive

The GEOFON data archive holds the continuous data of both GEOFON networks and a number of other European stations from other networks. An older version of the IRIS DIRTS data base system is used for the data of the permanent stations. Easy data access for external users is provided for this data set through telnet and WWW by a data request manager (DRM) providing xretrieve and sprout user interfaces and by [breq_fast](#) email based requests. Due to short personnel resources only the data base of the permanent GEOFON stations is presently well maintained. The data of the temporary GEOFON stations, the European IRIS stations, the GRSN and GRF networks and some other VBB stations are still incomplete and partly not easy accessible from outside. This is also true for the GEOFON FARM event data base. Presently only the IRIS FARM volumes are easy available through the GEOFON DRM.

Access Methods

WWW: <http://www.gfz-potsdam.de/geofon> (General Overview, access to OnDB, SPYDER, DIRTS, FARM)

Interactive: Data Request Manager Interface (drm.gfz-potsdam.de, login "drm", password "geofon", access to OnDB, SPYDER, DIRTS, FARM)

Email: [breq_fast](mailto:breq_fast@gfz-potsdam.de) (breq_fast@gfz-potsdam.de, access to DIRTS)

[netdc](mailto:netdc@gfz-potsdam.de) (netdc@gfz-potsdam.de, access to DIRTS) *

[AutoDRM](mailto:autodrm@gfz-potsdam.de) (autodrm@gfz-potsdam.de, access to OnDB, SPYDER*)

FTP: [ftp.gfz-potsdam.de](ftp://gfz-potsdam.de) (access to OnDB, DIRTS, FARM)

New temporary broadband stations in the larger Mediterranean region

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[Project MIDSEA](#) [[Present Situation](#) - [midsea](#) - [Data Assembly](#)] - [Scientific goals](#) [[Motivation](#) - [Realization](#)] - [References](#)

Project MIDSEA

Present situation

The present coverage of the Mediterranean region with broadband seismic stations is the result of individual efforts of many countries ([figure 1](#)). Well spread throughout the Mediterranean region are the stations from the Italian [MedNet](#). The German [Geofon](#) is well present in the eastern Mediterranean and is expanding in the western Mediterranean. Four American [GSN](#) stations extend from the western end of the Eurasia-Africa plate boundary at the Azores to the eastern end in Turkey. The global [Geoscope](#) network also has three stations in the region and the region hosts another dozen of local and national broadband stations and networks. The [ORFEUS](#) European-Mediterranean seismic station inventory for the region reflects this mosaic of stations. For furthering our geophysical knowledge about this plate boundary region we are interested in quality data from these seismic stations in the band between 0.01 and 10 Hz. This band provides key information about upper mantle structure and about the source mechanisms of intermediate and large events in the region. All presently existing stations of this mosaic that have the capacity to produce quality data in this broad frequency band are plotted together in [figure 1](#) (triangles). The availability of data from these stations is variable. Some managers of telemetered stations/networks in this mosaic make their data available through [Spyder](#)[®]. A more common way is to request the data of both telemetered and non-telemetered stations/networks at the managing authority's internet site. A widely used automated mechanism for such data requests is [AutoDRM](#). Numerous variants of requesting data over the internet exist, such as access through [World Wide Web](#) forms (e.g. [SPEED](#), [WILBER](#)), [FTP](#), [Gopher](#) or [E-mail](#) (e.g. [Breq-fast](#)). Most of these data request mechanisms provide the requesting party with data in

SEED Volumes. When the data is not available in SEED format, software to read the particular data format is generally freely available or provided with the requested data. Retrieving, processing and making available seismological data is a labor intensive process. Data from stations/networks that are in an experimental stage or that are managed by understaffed offices do not become available for analysis for long periods of time. ORFEUS data center provides a great service to the seismological community by activating the various data request mechanisms to assemble data sets of significant earthquakes in the European Mediterranean region. ORFEUS also provides help in data processing and quality control for the above mentioned understaffed or experimental networks. When ORFEUS has assembled all available data for a particular time period a CDROM is produced for distribution among seismologists. In the time between the significant earthquakes and the production of the CDROM the assembled data sets are available through their web site. While assembled data sets with as dense a coverage in certain parts of the Mediterranean region as the large number of stations (fig 1) suggests are becoming available though the data services just described, data from possible new stations are needed to fill up the few remaining gaps in data coverage of the larger Mediterranean region.

MIDSEA

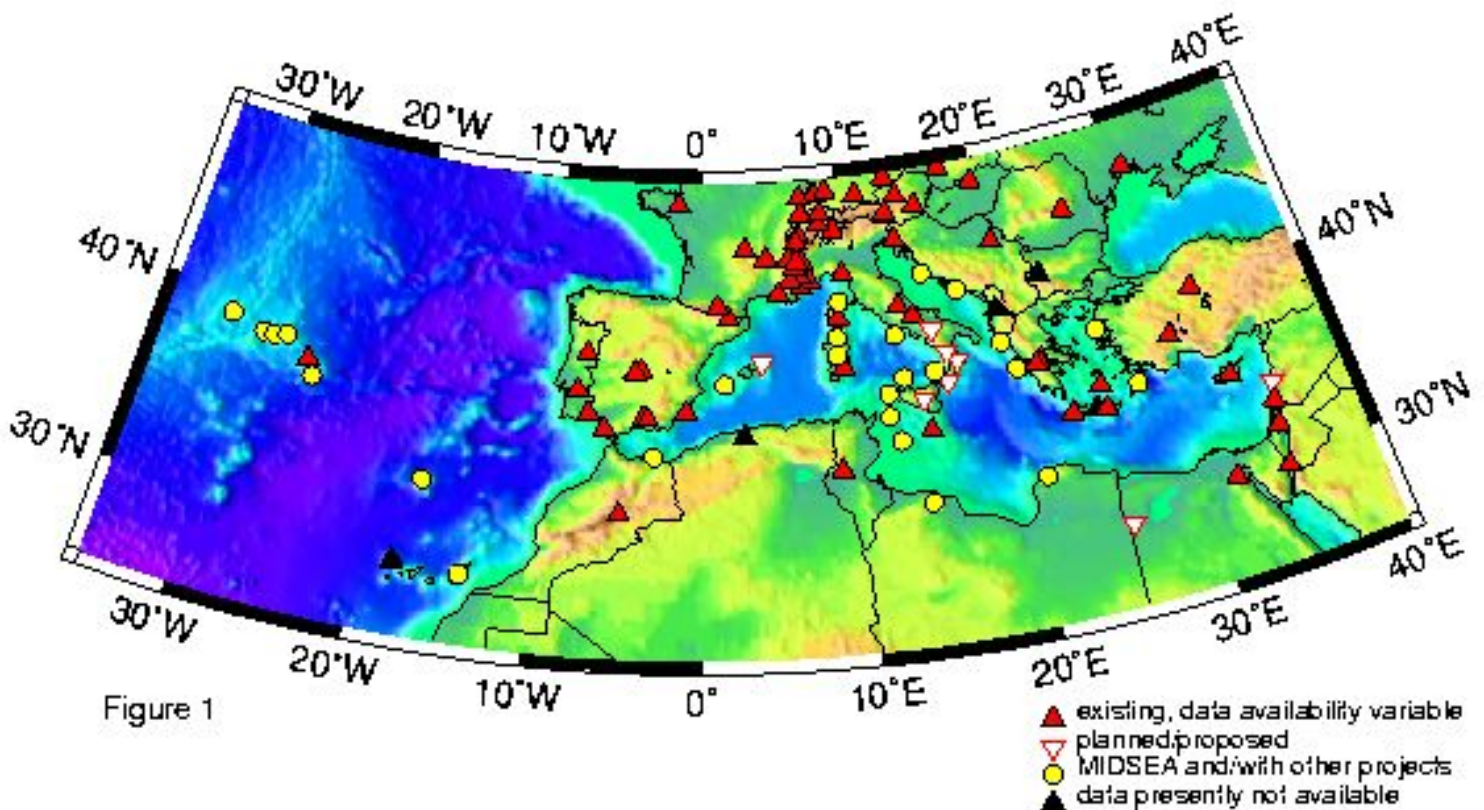


Figure 1. Existing and planned stations in and around the Mediterranean

MIDSEA

To date, studies of upper mantle structure have been relatively poorly resolved in large parts of the Mediterranean region due to sparse station coverage in important parts such as the Mediterranean Sea itself. To optimize the station coverage in this broad frequency band of interest we have initiated the project [MIDSEA](#), Mantle Investigation of the Deep Suture between Europe and Africa. MIDSEA proposes the installation of additional broadband stations in key locations, which are mostly islands, in the Mediterranean Sea. The proposed locations are plotted in figure 1 (yellow circles). The ETH part in MIDSEA will consist of a dozen or half seismic stations each consisting of an [STS2](#) seismometer and a MARS88 data logger. The UNSA part consists of Guralp CMG3 and STS2 seismometers and Agecodagis data loggers. The ING part consists of Guralp CMG3 seismometers and RefTek data loggers. For the proposed locations in Greece we have received a positive answer for collaboration from seismologists of the University of Athens. Our major collaborators in Croatia are seismologists of University of Zagreb. Two stations are scheduled to be installed on Croatian islands in March 1999. A meeting to discuss possible sites in Lybia has been scheduled with the general director of the Libyan Center for Remote Sensing and Space Sciences. Corsica already has one stations of the [TGRS-Nice](#) and a second is scheduled for installation in February 1999. Installations on Sardinia and the other Italian islands (e.g. Ustica, Panarea, Filicudi) are still being planned. We collaborate with Geofon seismologists on plans for installation on Ibiza and in Melilla. Geofon has scheduled the installation of a station on Menorca and plans to install a stations in Melilla sometime in 2000. Until then MISDEA will provide the instrumentation for the latter site. Seismologists on the Canary Islands have worked to revive the GSN station [TBT](#), and have provided significant information about a possible installation on a more easterly island of the group. Seismologists of DASE (Departement d'Analyse et de Surveillance de l'Environnement) in France and of the Univeristy of Lisbon are running an LDG station on Madeira of which they are making the data available. Last, but not least, a group of seismologists of the University of Lisbon, the Carnegie Institution of Washington and IPG in Paris are discussing the possibilities of installation several broadband stations on the Azores islands. Such an installation would overlap in time with MIDSEA and the data of the projects together enable a study of the Eurasia-Africa plate boundary further west than was previously possible.



Figure 2. Wielandt-Streckeissen STS-2 seismometer

Data assembly

The timing of MIDSEA as a means to fill in gaps in broadband data coverage in the larger Mediterranean region is good in view of the present broadband station coverage, which is better than ever and, together with current plans for new installations, covers the land masses very well. By the year 2000 it will be possible, in principle, to assemble *one* broadband data set out of the mosaic of individual broadband stations and networks in the larger Mediterranean region. This data set will have optimal station coverage for what would be possible using land stations. Better coverage could be achieved in the future by combining land data with data from Ocean Bottom Seismometers. An amalgamated data set of land seismograms might actually come to exist if as many as possible broadband station and network managers make their data available as timely as possible. We look forward to working towards this goal with the [ORFEUS](#) data center.

Summary of scientific goals of MIDSEA

Motivation

The plate boundary region between Africa and Eurasia is unusual on account of it being a zone of slow convergence between continents. This leads to complex deformational patterns at the surface and an equally complex structure of the underlying upper mantle, as evidenced for the Mediterranean region by the work of, for example, Panza (1985), Snieder (1988), Nolet (1990), Spakman et al. (1993), De Jonge et al. (1994), Zielhuis and Nolet (1994), Marquering et al. (1996), Yegorova et al. (1997). In project MIDSEA we wish to study of the upper mantle structure in the entire Africa-Eurasia plate-boundary region in improved detail using surface and body waves to improve the geodynamic understanding of the area as well as to characterize the deformational and thermal consequences of this long-term, slow convergence. We plan to use the data from the optimized station coverage to image the 3-dimensional (3-D) S-velocity structure and radial anisotropy using surface wave tomography and to characterize the transverse anisotropy and discontinuity structure using body waves.

Realization

The 3-D imaging and the measuring of radial anisotropy will be based on partitioned waveform inversion (Nolet, 1990; Van der Lee and Nolet, 1997) of regional fundamental and higher mode Rayleigh and Love waves. The characterization of transverse anisotropy will be based on the analysis of teleseismic *SKS* wave splitting measurements (Silver and Chan, 1991), and discontinuity structure on receiver function type analyses (Ammon et al., 1990; Van der Lee et al., 1994; Bostock, 1996; Vinnik et. al, 1997; Estabrook, 1996; Bethoux et al., 1999; Kosarev et al., 1999). Moreover, increased availability of Mediterranean data together with better knowledge on Mediterranean uppermost mantle structure allows a more accurate determination of source mechanisms of Mediterranean earthquakes as well as the determination of source mechanisms of smaller magnitude events in the region (Giardini et al., 1993a, 1993b).

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ORFEUS Working Group 1: BB siting and station standards

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The [ORFEUS working group 1](#) (WG1) was formed in 1996 in the effort to help the ORFEUS Data Center (ODC) to keep up with the growing load and the number of installed and proposed broadband (BB) stations in the European-Mediterranea area. WG1 maintains an [inventory of permanent and semi-permanent digital BB seismograph stations in the region](#). Other issues discussed in the WG 1 are common standards for site, instrumentation and recording equipment; access to broad-band waveform data; defining an ORFEUS network; encourage "hidden" stations to open their data to the ORFEUS user community; propose new stations in areas with low BB coverage; support of local and national efforts to fill existing gaps with official scientific arguments and practical hints.

WG1 is chaired by Jan Zednik. [Members of the WG 1](#) represent at the moment 18 European countries and major networks in the region. [IRIS](#) nominated an observer in order to coordinate the activities. The WG1 members meet every year usually during ESC or IASPEI assemblies. **The next WG1 meeting will be held at IUGG'99 in Birmingham.** We encourage people involved in BB activities in the region to come to the meeting and give a short presentation about current and planned BB installations.

The main effort of the WG1 is concentrated in [inventory for Europe and the Mediterranean](#) and the [EuroMed stationbook](#). The inventory table includes relevant information about permanent and semi-permanent stations, deployed seismometers and data acquisition systems. [Seismometer](#) and [data acquisition](#) manufactures with institutions operating the system are provided as well as detailed station information in the [EuroMed stationbook](#).

The [EuroMed stationbook](#) for broadband seismograph stations in the European-Mediterranean area complements the [FDSN station book](#), created by [IRIS DMC](#). The EuroMed stationbook lists at present basic information about the station equipment, siting, administration and data access (see for example [station HGN](#)). We hope to add soon the data quality section. Information is provided by the individual stations or networks. A station book contains separated lists of FDSN and non-Federation BB stations in the European- Mediterranean area. A new station can be submitted through a [station information entry form](#). For convenience we provide instructions and a [filled in example](#).

What are the station basic requirements? The Federation of Digital Seismograph Networks (FDSN) proposed in 1986 [Minimum requirements and development goals for digital broad-band seismic systems](#). Presently, both within ORFEUS WG1, [WG2 \(Technical Support\)](#) and the FDSN related and relevant issues are being discussed.

Inventory of Data from Seismographic Networks of the World

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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 centra 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.

ORFEUS workshop

Geophysical Institute, Prague, Czech Republic. November 9 - 12, 1998

[Torild van Eck](#)

[ORFEUS](#), Royal Netherlands Meteorological Institute, De Bilt, Netherlands

[Introduction](#) - [Program and Items](#) - [Future workshops](#)

Introduction

[ORFEUS](#) organized and sponsored in November 1998 a workshop in Prague at the [Geophysical Institute](#) of the Academy of Sciences of the Czech Republic (ASCR): "**Installation and operation of broad-band seismograph stations**". The workshop was an initiative from ORFEUS's [Working Group 1](#) and [Working Group 2](#). Jan Zednik, Axel Plesinger and Hana Kochova, all from the Geophysical Institute, stood for the local organisation. 41 [participants and lecturers](#) from 18 countries met during four days. Below follows a (very) short summary of the lectures in the program [program](#). A number of [these lectures](#) will or are already available. Much of the practical information presented will be made available within [Working Group 2](#).

Program and items

- Winfried Hanka ([Geofon](#)), *VBB systems and networks - introductory overview*
Broad-band seismometer developments: SRO-derivatives - KS26000 and KS54000 ; STS2 ; 6MG-3T. New developments: FBS-3 (SSB Beijing) ; JCZ-1 (SSB Wuhan) ; [PMD Scientific Inc](#) (USA).
Dataloggers: gain ranging (12 bits) real 24 bit technology and 24 bit Delta-sigma technology. New developments: Earth Data PR2400 (real 24 bit technology)
Federation of Digital Seismograph Networks (FDSN), GEOSCOPE, IRIS, GRSN, USNSN, GEOFON, etc.
Seismometer installation. with Geofon's and GRSN's shielding techniques. Vaults.
Datalogger and communication aspects.
SeisComP (see software) concept

- Damiano Pesaresi ([MedNet](#)), *Installation & maintenance of VBB station*
Seismometer installation, noise and temperature isolation.
Data Acquisition (DAQ) Systems - MedNet, like GEOFON operates Quanterra - GPS (Satelite) communication, mobile phone and wireless Internet: VSAT, INMARSAT
Practical operational procedures and station examples.
- Erhard Wielandt ([Stuttgart](#)), *Force-balance seismometers - theory & calibration*
Principle of inertial seismometers (for example the STS-1 and STS-2).
Poles and Zeros description of the system response
Relative (electrical) calibration - software available at Stuttgart University
Absolute (mechanical) calibration - presentation of effective (poor man's) method. Software available.
- Reinoud Sleeman ([ORFEUS](#)), *AutoDRM: concept and implementation*
presentation of AutoDRM for potential operators and users.
- Axel Plesinger ([GI ASCR, Prague](#)), *Transfer functions, system responses & calibration headers*
Theory of transfer functions, the Poles and Zeros description of the transfer function.
Fourier, Laplace transform, Z-transforms. Amplitude and phase response, Minimum-phase systems.
IIR (Infinite Impuls Response) and FIR (Finite Impuls Response) filters, causal and acausal filters.
Calibration, MatLab based software available.
- Frank Scherbaum ([Potsdam](#)), *High resolution AD conversion & FIR filters*
FIR filters, principles of Sigma-Delta modulators, relevancy of accurate filtering (deconvolution) procedures, i.e. ground motion recovery.
Stable deconvolution using minimum and maximum phase filters.
Filtering and educational software available.
- Roderick Stewart ([CTBTO/IMS](#)), *CTBTO: International Monitoring System and Global Communication*
Presentation and explanation of the CTBT Organisation.
Presentation activities of the IMS, discussions about the interaction between IMS (who bears the responsibility for verifying the systems) and the station/network operators.
- Bernard Dost ([ORFEUS](#)) and Jan Zednik ([GI ASCR, Prague](#)), *Data archiving and exchange, formats & format conversion*
Overview SEED (Standard for the Exchange of Earthquake Data), Data exchange facilities (AutoDRM, ftp, Internet).
Format conversion (available software) overview.
- Klaus Stammler ([Gräfenberg](#)), *Basic data handling and analysis software*
Presentation of and hands-on training with Seismic Handler (SH), an (array) data analysis package used at Gräfenberg.
- Neil Spriggs ([Nanometrics](#)), *Satelite communication in seismology*
The potential of satelite communication: Ku-band technologies, presentation of Libra (Nanometrics), VSAT.

- Dan Harvey (Boulder Real Time Technologies, Inc.), *The Lodore Broadband Array*
Practical aspects of the (Kinematics) installation of a BB array with different remote data users. Presentation of the Antelope Seismic Information System (ASIS - a further development of DataScope).
- Rhett Butler ([IRIS](#)), *A Broadband Seismic Station on the Sea Floor: The Hawaii-2 Observatory*
Interesting 15 minutes summary video of the installation of a Deep Sea station connected to an old Pacific telephone cable for communication.
- Genevieve Rault ([GEOSCOPE](#)), *MOISE, an Experiment of Sea Floor Observatory*
Presentation on the French Ocean Bottom Observatories.

Future ORFEUS workshops

ORFEUS is planning a similar workshop with emphasis on **"Installation, operation, data processing in experiments involving mobile (broad-band) seismic equipment"** for autumn 1999. The planning of another workshop **"Seismological software development with emphasis on Java"** will be discussed at the IUGG99 in Birmingham. Any suggestions with regard to these plans are appreciated.

ORFEUS received much more applications for the 1998 ORFEUS workshop, however, only a limited number of people could be admitted. Please, let us know if you are interested in a repeat of the ORFEUS 1998 workshop. (**send an email to [Torild van Eck](#)**).

Quanterra Users Group (QUG) meeting

Geophysical Institute, Prague, Czech Republic. November 12 - 13, 1998

[Damiano Pesaresi](#)^{1, 2}

1 [ING](#), Via di Vigna Murata 605, Roma, Italy

2 [CTBTO](#) / IMS Division / Seismic Section, PO Box 1200, A-1400 Vienna, Austria

[Historical Background](#) - [Agenda / Major items](#) - [Next QUG meeting](#)

Historical Background

There are a lot of Quanterra seismic digital acquisition units used all around the world. From the members of the [Federation of Digital Broad-Band Seismograph Networks](#) (FDSN) the China Digital Seismographic Network, the Czech Republic, [GEOFON](#), [IRIS GSN](#), [MedNet](#), [Pacific21](#), and Russia.

Common systems have common problems, so in the past it has been felt the need to have a common way to solve such a kind of problems and/or to address future developments and needs. A few people decided finally to meet and start what become afterwards the Quanterra Users Group (QUG). They were initially Joe Steim from Quanterra, Sue McLafferty, Caryl Peterson and Bob Hutt from [Albuquerque Seismological Laboratory](#) (ASL), Doug Neuhauser from [U.C. Berkeley](#), Phil Maechling from [Caltech](#), and Tim Ahern from [IRIS DMC](#) in Seattle, Washington. After the first one, the QUG meetings have been scheduled once a year, every institution organizing in turn:

- 1993 Quanterra
- 1994 IRIS DMC, Seattle, WA, USA
- 1995 ASL, Albuquerque, NM, USA
- 1996 Caltech, Los Angeles, CA, USA
- 1997 ASL, Albuquerque, NM, USA
- 1998 Geophysical Institute, Prague, Czech Republic

With time, the Group got bigger and bigger, involving institutions from all over the world (Japan, Mexico, etc.). It has also established the QUG official [FTP site](#) at Berkeley. Last meeting was a special one, because it was the first time that such a kind of meeting was held outside the US. As the organizer, I can tell it was difficult to convince people from the US to travel overseas! But, of course, this has been on occasion to gather people not only from the US, but also from Europe. Let me quote from Joe Steim

The major point of the QUG, in my opinion, is to share information among users and Quanterra with the purpose of operating networks and stations optimally. This implies a flow of information both to and from Quanterra on what's needed from the data gathering organizations' perspectives. We also try to explain what we've implemented to try to achieve these goals. By not spreading our support effort too thinly, and searching for common ground among everyone's desires (inasmuch as that's possible) we all end up with a better product to make and use. I firmly believe that the needs of most organizations are not as divergent as it might appear.

The first 4 or 5 meetings have been in the US, and for each, European users have been in some cases able to attend, but it has been difficult for some. Although our business is dominated by US organizations, there are certainly a number of groups in Europe for whom the goals above are also true. Italy, Germany, France, Austria, Czech Rep., Spain, to name a few. It seemed like a positive suggestion to have at least one QUG meeting to incorporate these folks' ideas and benefit from their participation. We all benefit from good ideas that may be broadly applicable. Bear in mind that the current generation of equipment populating the GSN is the fruit of a Czech idea, developed by US, Swiss, and German scientists, with Italian support! Broad participation in the QUG, wherever it may be, is squarely in the best interest of IRIS and all groups using our equipment.

Agenda / Major items

A more detailed version of the items discussed is available on request.

Day 1 - Thursday November 12, 1998

1. Introduction 8:30-8:45
A "Welcome to Prague" speech was given by Jan Zednik, the representative from the Institute where the meeting was held. Damiano Pesaresi presented the agenda and coordinated the meeting.
2. Presentation of Quanterra's Products by Joe Steim 8:45-10:15AM
Currently in Production: Q680, Q4120, Q730
PCDSRW - Simple Personal Data Acquisition and Terminal Emulation Package.
Comserv - Open standards client-server suite for real-time acquisition of seismological data which was developed in collaboration with network operators. It is public domain code maintained by Quanterra.
MultiShear
3. IP protocol in Quanterra Systems: Present and Future.
4. Comserv-Linux demonstration by Winfried Hanka - 10:15-11:00
5. Communications Technology
 - A. Nanometrics Libra System - Neil Spriggs 11:00-11:50
 - B. Kinometrics VSAT - KMI VSAT: John Fort 11:50AM-12:00
 - C. Integration with Quanterra Systems - Joe Steim 12:00-12:30PM
 - D. Spread Spectrum Radios - Bob Busby - 12:30 - 1:00PPM
Freewave spread spectrum radios used at Cal Tech

6. New Systems and Software/State of the Art: - Joe Steim, Danny Harvey, John Fort - 3PM-4:15PM

7. CTBTO/IMS

A. IMS stations - Bob Hutt - 4:30PM- 4:45PM

Auxiliary IMS stations contribute data to help define an event

Most Auxiliary stations are single stations rather than arrays

Authentication of data

B. CTBTO - Rod Stewart 5PM-6:20PM

Maps of Stations, count of stations were presented

C. Data Authentication - Pres Herrington 6:20- 7:00PM

D. Discussion of Scientific Networks and the IMS - Rhett Butler 7:00PM - 7:30PM

GSN welcomes the use of its stations by the IMS because dual use can benefit both parties. However, there are concerns:

1. IMS requirements and Operations Manual (Draft)
2. Sensors
3. Dynamic Range
4. Calibration
5. Operational paperwork
6. GCI Interface
7. Authentication
8. Future upgrades
9. Network Stabilization

Day 2 - Friday November 13, 1998

8. 8. Y2K - Millennial Woes, GPS Epoch, and FIR Filter Delays- Joe Steim 8:30AM-9:30AM
MultiShear, FIR Filter Delays

9. Geodetic GPS data Acquisition under MultiShear - Doug Neuhauser 9:30-10:30AM

10. MultiShear configuration workshop - "keys", "keymacros" - Bob Busby 11:00-1:PM
Key system file structure

Types of Q680 Systems:

- * LV - Internal GSP clock and 4 serial ports
- * DV - External GPS clock and 8 serial ports
- * LT - 68000 systems
- * LX - 68000 systems

MultiShear Status Screen comments

11. Potential Problems and Real Problems with seismic systems - Joe Steim 3PM-4:30

12. Remote Update Procedure - Bob Busby

13. Network Operator Updates

Geofon (Winfried Hanka), - about 30 stations world wide

Austria (Peter Melichar) - Oldest Quanterra telemetered network. He has hardware solutions to severe lightning problems. He uses a cascaded lightning protection system.

Next QUG meeting

Next QUG meeting will be hosted by Berkeley ([Doug Neuhauser](#)), possibly after the AGU meeting. (December 1999)

Intrumentation: FDSN working group? workshop at IUGG99?

[Bob Hutt](#)¹, [Damiano Pesares](#)² and [Torild van Eck](#)³

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87115-5000, USA*

2 [CTBTO](#) / IMS Division / Seismic Section, PO Box 1200, A-1400 Vienna, Austria

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

The FDSN Instrumentation Working Group has been dismantled due to lack of interest. Still, however, within the FDSN community there exist a considerable interest in non-commercial, but professional, support and advise. The interest in the web site of [ORFEUS Working Group 2 on Technical Support](#) and in recent workshops on these subjects, organised by a.o. IRIS and ORFEUS, indicate this.

We feel that relevant information within the seismological community can be disseminated even more efficiently. For example, expertise, software and technical documentation can be made available through the web. (i.e. [the electronic publication list](#) at ORFEUS). Discussions about new developments can be initialized at workshops at international meetings (i.e. A joint FDSN WG1 / ORFEUS WG2 meeting on instrumentation at the IUGG99).

Consequently, we would like to invite you to submit (otherwise difficult to access) technical reports in electronic form, ideas and suggestions for the planned FDSN/ORFEUS instrumentation meeting, and any other suggestions to us at either [ORFEUS](#) or [ASL](#).

To start a discussion, one of us, ([Bob Hutt](#)), would like to receive comments on his report [Standards for Seismometer Testing](#)

Announcements

- **ODC-Volumes 1993 published**

7 CD-ROMs (volumes 20-26) have been published with data from December 29, 1992 - December 30, 1993. They are being distributed to participants. For details see our [Product catalogue](#).

- **Near Real Time (NRT) SEED data**

Orfeus Data Center (ODC) is aiming at providing recent (1998 and 1999) SEED Volumes and work on automatized data transfer and conversion schemes to enable data transfer from networks to the ODC. Presently available is [1998](#) and [1999](#). A complete data overview can be found on [odc-online](#).

- **New corporate founders 1998**

Two new countries became corporate founders of ORFEUS:

Greece, through the Hellenic Republic Earthquake Planning & Protection Organisation (E.P.P.O), who appointed [Dr. George Stavrakakis](#) (Director National Observatory of Athens) as National representative in the ORFEUS Board of directors.

Denmark, through the Danish National Survey and Cadastre (K.M.), who appointed [Dr. Sören Gregersen](#) (Director Department of Geodynamics K.M.) as National representative in the ORFEUS Board of directors.

- **New ORFEUS participants 1998**

ORFEUS registered five new ORFEUS participants:

Seismological Division, Geophysical Institute of Israel Holon, Israel. contact: Dr. Avi Shapira

Mathematical Institute of the Russian Academy of Sciences St. Petersburg, Russia. contact: Prof. T.B. Yanovskaya

Department of Geophysics, University of Athens Athens, Greece. contact: Dr. Papianou Papadimitriou

Department of Geodynamics, Kort & Matrikelstyrelsen Copenhagen, Denmark. contact: Dr. Sören Gregersen

Department of Seismology, Geophysical Institute, Slovak Academy of Sciences Bratislava, Slovak Republic. contact: Dr. Peter Moczo