

The MEDNET Program

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MEDNET is a network of very-broadband, high resolution seismographic stations primarily installed in countries of the Mediterranean area. Support for stations in developing countries comes from World Laboratory (Lausanne), a non-governmental international organisation. The project started in 1989 and now lists 15 active stations. It kept a special emphasis on the Mediterranean area, as its main target area, but also included stations in Nepal and Antarctica by following other Italian national initiatives. Three stations are in cooperation with University of Trieste (TTE), GEOSCOPE (SSB), and IRIS/GSN (TBT). Stations in Antarctica are installed and maintained in the framework of the Italian Antarctic Program (PNRA).

Objectives

Since its initial plan, MEDNET was meant to give a contribution to instrumental coverage of the Mediterranean area. This is indeed a region of high seismicity and a complex tectonic environment. Its interest for earth sciences, and seismology in particular, is high, but high quality, broadband instrumentation is not sufficiently widespread. MEDNET represents an effort to improve this situation. The project started with this main objective in mind, seeking active cooperation with seismological institutions in different countries. Because of the choice of instrumentation – very-broadband STS1-VBB sensors, and 24 bit Quanterra data loggers – priority was given to selection of seismically quiet sites. In many areas it was possible to identify, for instance, abandoned mining zones or tunnels in remote regions – a situation particularly difficult for logistics, which called for instance for power supply on solar systems and did not permit telephone connections. Data collection was then designed to be through magnetic tapes for continuous recording. Even though the contributions of MEDNET data are of course important for the study of earthquake sources in the region, in the original plan there was no design for rapid data transfer (a limitation imposed by the absence of telephone lines in remote areas). This situation is changing now, and more importance has been given to the possibility of rapid data retrieval from dial-up connections or continuous telephone or satellite telemetry.

The seismograph network

The Project has many cooperative ties with institutions in developing countries. These stations fall in fact within World Laboratory project PLATO-1 (which also covers other forms of cooperation in seismology and seismographic networks in this and other areas). There are 6 such stations (table I): MDT (Morocco), MEB (Algeria), GFA (Tunisia), KEG (Egypt), TIR (Albania), BGY (Serbia). Most of these stations do not currently have dial-up access because of unavailability

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Table I. Stations contributing to MEDNET.

<i>Existing – ING-operated (12)</i>					
AQU	Aquila, Italy	STS1-24bit	dial-up		
BGY	Belgrade, Serbia	STS1-24bit	dial-up		WL
GFA	Gafsa, Tunisia	STS1-24bit			WL
IDI	Idi, Greece	STS1-24bit	dial-up	telemetry	
KEG	Kottamya, Egypt	STS1-24bit			WL
MEB	Medea, Algeria	STS1-24bit			WL
MDT	Midelt, Morocco	STS1-24bit			WL
TIR	Tirana, Albania	STS1-24bit			WL
TNV	Antarctica	STS1-24bit			PNRA
VSL	Villasalto, Italy	STS1-24bit	dial-up	telemetry	
BNI	Bardonecchia, Italy	STS2-24bit	dial-up		
EVN	Everest, Nepal	CMG3-24bit			
<i>Existing – co-operated (3)</i>					
SSB	Saint-Sauveur, France	STS1-24bit	dial-up		GEOSCOPE
TBT	Taburiente, Spain	STS1-24bit	dial-up		IRIS/GSN
TTE	Trieste, Italy	STS1-24bit			Univ. Trieste
<i>Planned – ING-operated (4)</i>					
CAR	Carovilli, Italy	STS2-24bit	dial-up	telemetry	
CAL	Calitri, Italy	STS2-24bit	dial-up		
MAL	Marsashlok, Malta	STS2-24bit	dial-up		WL
VTS	Vitosha, Bulgaria	STS1-24bit	dial-up		WL
<i>Planned – co-operated (8)</i>					
ENN	Enna, Italy	STS1-24bit	dial-up	telemetry	POSEIDON ⁽¹⁾
POS1	Sicily, Italy	STS2-24bit			POSEIDON ⁽¹⁾
POS2	Sicily, Italy	STS2-24bit			POSEIDON ⁽¹⁾
MSS1	Calabria, Italy	STS2-24bit	dial-up	telemetry	ENEL ⁽²⁾
MSS2	Calabria, Italy	STS2-24bit	dial-up	telemetry	ENEL ⁽²⁾
MSS3	Calabria, Italy	STS2-24bit	dial-up	telemetry	ENEL ⁽²⁾
ESP	Esperanza, Argentina	CMG3-24bit			PNRA, OGS
DMC	Dome-C, Antarctica	STS2-24bit			PNRA, French Antar. Prog.

⁽¹⁾ A project for geophysical monitoring of Eastern Sicily.⁽²⁾ National energy commission.

of a reliable telephone line. There is a plan to improve this situation. Other stations planned in this framework are in Bulgaria (close to Sofia) and Malta (fig. 1).

Higher density of stations exists in Italy (fig. 2). Station TTE is installed and run by the University of Trieste, but it conforms to MEDNET specifications and contributes the data which is managed by our data center. Station BNI originally hosted a STS1-VBB set of sensors, now changed to STS2 because of the vicinity of site SSB, a GEOSCOPE station which also yields data on a MEDNET data logger. Sites in Carovilli and Calitri will also have STS2 sensors. The station close to Enna, Sicily – with STS1/VBB – is being installed in a project for seismic monitoring of Eastern Sicily (POSEIDON). A similar agreement holds for the three stations to be installed within 1994 in Calabria by the energy commission (ENEL).

Even if its activities started with a specific interest for the Mediterranean area, the staff managing MEDNET became involved in other initiatives in broadband seismology following national programs, an extension motivated by the objective of contributing to a better global seismograph coverage. Since 1989 a permanent VBB seismograph has been installed at Terra Nova Bay, Antarctica (TNV; fig. 3), with financial and logistic support from the Italian Antarctic program (PNRA). Within the same program, a station is planned for installation in the 1994-1995 austral summer by Osservatorio Geofisico Sperimentale (Trieste) at the Argentinian base Esperanza. Data will be made available through the same channel. In cooperation with the French Antarctic program, a broadband installation is planned for Dome C. A broadband station has been running since 1993 in a laboratory for high altitude research set up by the Italian National Research Council in Nepal.

The data center

The MEDNET Data Center collects continuous data on magnetic media from all the stations. After validation, data are permanently stored on an optical archival system. The data management system was originally developed at USGS Albuquerque Seismological Laboratory. Continuous SEED network volumes are written for distribution to users and other data centers. MEDNET contributes continuous data to the Federation Archive at the IRIS Data Management Center, where it is available to all users.

Currently only one station (VSL, Sardinia) is connected in continuous telemetry on a leased digital phone line. Other stations can be reached in dial-up mode for monitoring and data upload (BNI, AQU, VSL, BGY, SSB). Stations VSL and the MEDNET channels at SSB are included in the GOPHER/SPYDER system through ORFEUS. This situation will improve, in view of the importance of these data for rapid quantification of earthquakes. National stations will be connected in continuous telemetry.

The main obstacle still being the availability of telephone lines, we have planned satellite connections. Stations IDI in Crete, the one in Sicily (Enna), and one contributed by the Spanish Instituto Geografico Nacional (Madrid) will be telemetered to Rome using a VSAT system set up within a European Union supported project. However, as power requirements for such satellite terminals may still represent a complication for stations powered by solar systems, an existing low orbiting polar satellite (TEMISAT) is being proposed for data transmission on trigger.

Recent and future developments

With the Mediterranean distribution now reaching a good extension, the priority is shifting to a series of improvements on current sites. Stations in Albania and on Crete are the latest additions. Two other stations are planned for activation within the first months of 1995, close to Sofia and on Malta. Other extensions will possibly include one or two more sites, but this is not yet finalized and

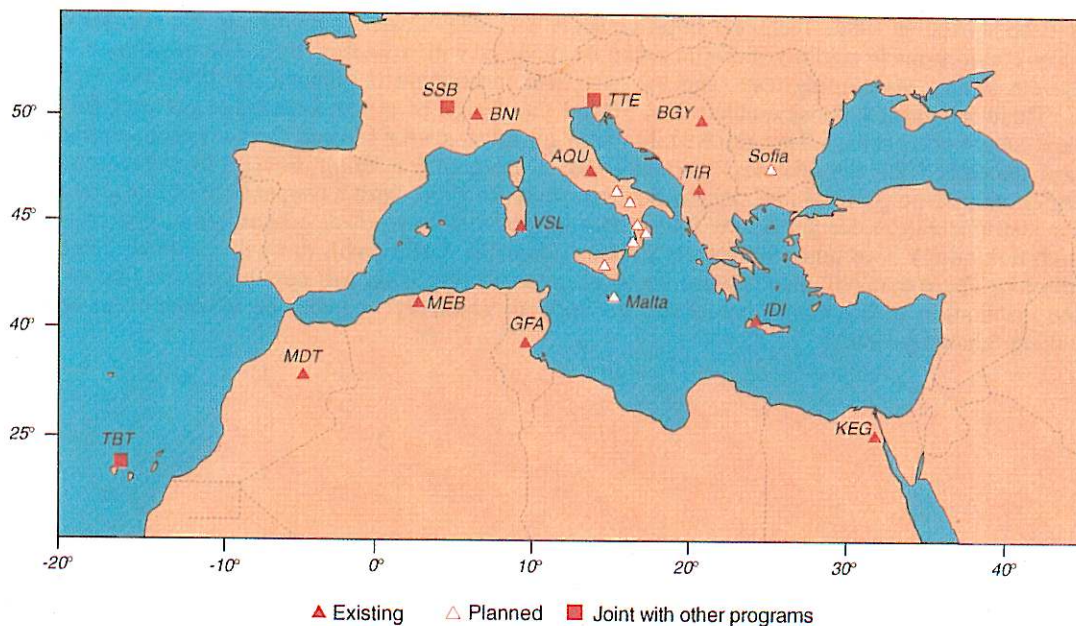


Fig. 1. Current station distribution of the MEDiterranean NETwork.

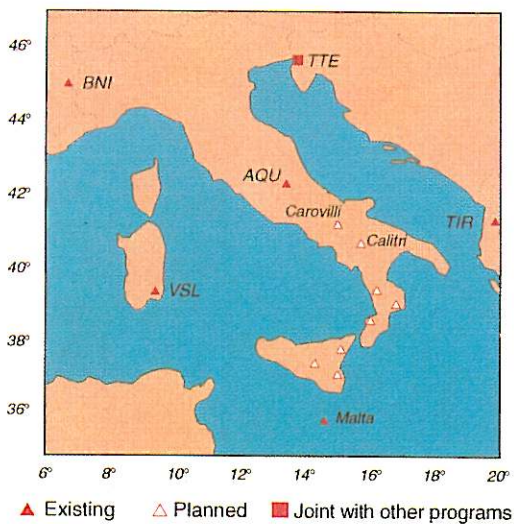


Fig. 2. Italian digital broadband and very-broadband stations operated or co-operated by the MEDNET Program.

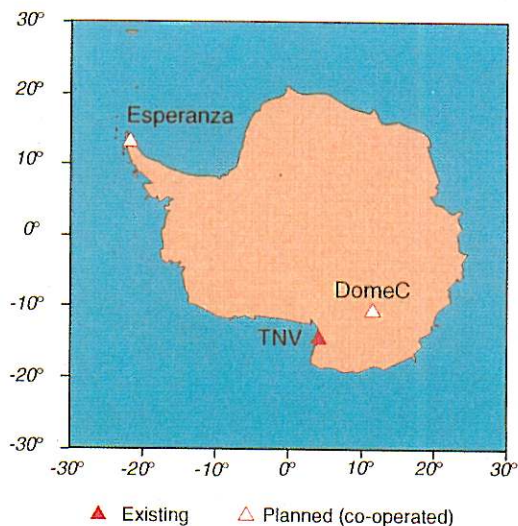


Fig. 3. Stations on the Antarctic continent.

will be shifted to 1995. Technical improvements will also consist of increasing the number of remote connections to stations, either in a dial-up mode or with a satellite link. The mentioned VSAT system is now undergoing tests, and the first field installation is planned for 1994.

There has been a considerable effort toward the design of a new broadband network for Italy (and neighboring areas). This resulted in a plan for multi-sensor stations (seismograph, strong motion, geodetic GPS) for seismically active areas. A group of 3 is being installed by the national energy commission (ENEL) in Calabria, Southern Italy, in 1994, with a cooperation of our group also for instrumentation design (a new 24 bit data logger with low power consumption, low cost, and high flexibility). Two other 6-channels stations (Carovilli, Calitri) will run with realtime data transmission. These data will also be used for seismic monitoring. This will possibly be the first step for the installation of a national broadband network, to gradually upgrade the existing short-period, analog-telemetry one.