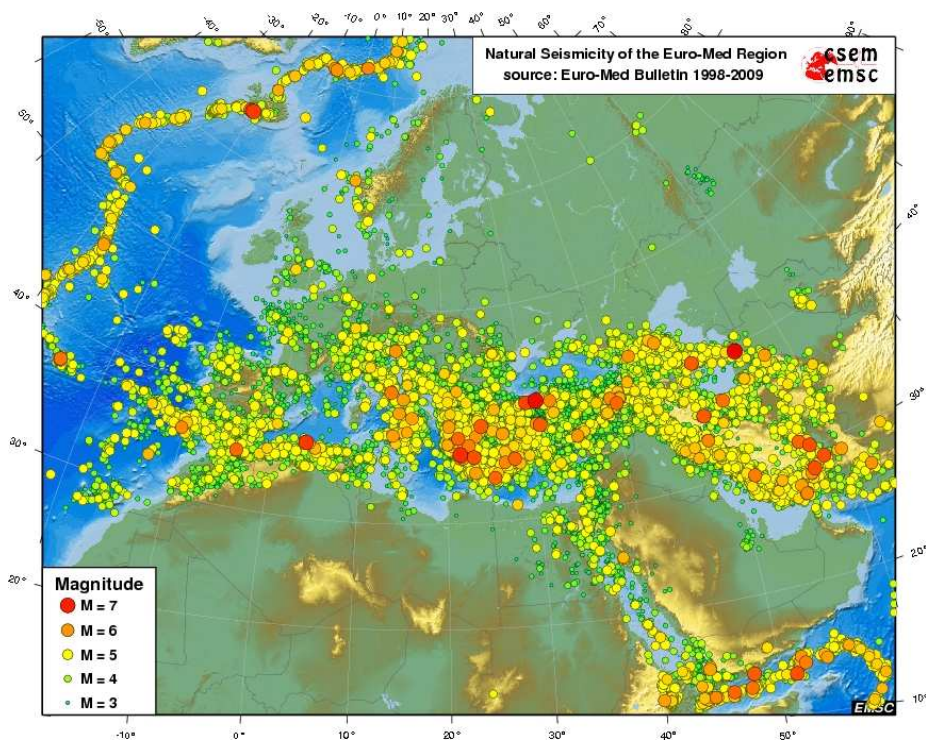




European-Mediterranean Seismological Centre

<http://www.emsc-csem.org>

Procedures for the Euro-Med Bulletin computation



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I INTRODUCTION

The European Mediterranean Seismological Centre (EMSC), hosted by the LDG (*Laboratoire de Détection et de Géophysique*, Bruyères-le-Châtel, France), is a non-profit scientific international NGO which provides rapid earthquake information in coordination with the national seismological institutes in the Euro-Med region. Currently, 84 seismological institutes are members from 55 countries spanning over the whole Euro-Med region. The main scientific activities of the EMSC are the real time information services and the production of the Euro-Med Bulletin.

The Euro-Med Bulletin is a seismological product developed during the EPSI project (Earthquake Parameters and Standardised Information for a European-Mediterranean Bulletin, 2002). It is based on the comprehensive collection of origins and arrivals provided by networks operators of the region. By merging data from the contributing networks and by computing locations in a homogeneous way, the EMB provides a reference catalogue of the seismicity since 1998.

This report presents the technical procedures followed by the EMSC for the production of the Euro-Med Bulletin, from the data collection to the production and publication.

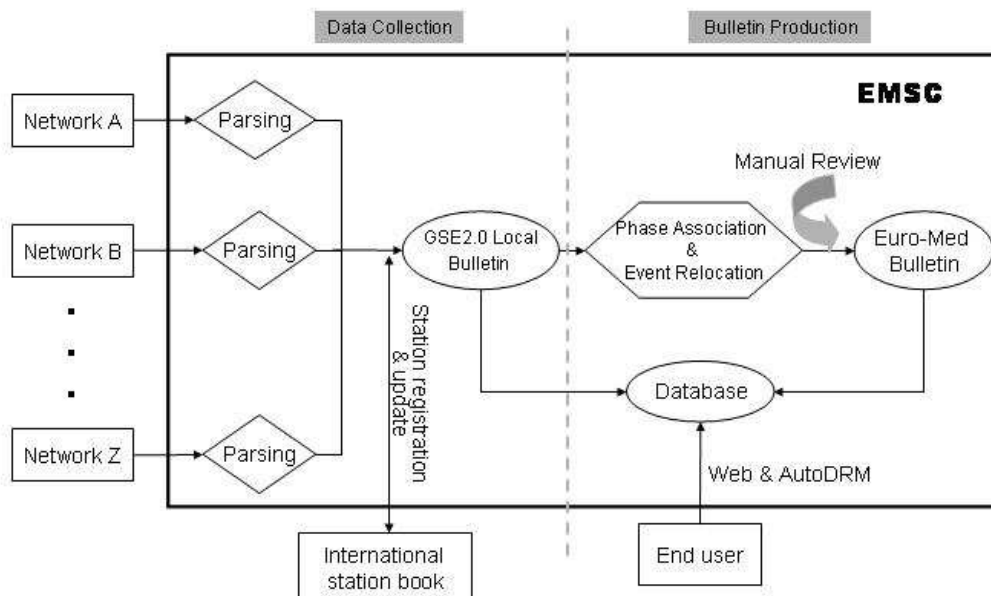


Figure 1: Production of the EMB from the network contributions to the final product.

II DATA DESCRIPTION

Since the beginning of the Euro-Med Bulletin production in 2003, the number of seismological institutes providing data has been steadily increasing to reach 78 contributors from 65 countries in 2011. Efforts are realized to invite new contributors, especially in areas where coverage is poorer. It is a critical process to contact the local networks, to start the collaboration and to set up a specific data exchange procedure. Several guidelines should be followed to provide the most useful data to the EMSC.

II.1 Stations

The collected data originate from about 2,750 different stations in the Euro-Med region (Figure 2). Each station must have a specific code at the International Registry. The EMSC is collaborating with the ISC and NEIC for registration and location update of seismic stations.

<http://www.isc.ac.uk/IR/index.html>



Figure 2: Geographical distribution of stations contributing to the Euro-Med Bulletin. The situation in 1998 is depicted by blue triangle. Stations represented by green triangles joined the data exchange afterwards.

Each network uses different stations codes which are relevant within their system. In general a station code is unique within a network. However, to use this station internationally, it is necessary to describe it uniquely. Therefore a mapping between locally used codes and international codes is essential. The EMSC provide guidance to the contributor to register and choose an international code if necessary.

Some networks provide data to the EMSC which includes temporary deployment stations or stations which they do not want to register. Unfortunately those stations readings can not be used and are discarded in the computation of the EMB.

II.2 Data scientific content

The Euro-Med Bulletin is computed from **manually reviewed parametric data**. They are therefore considered as final seismic information. The bulletin data can include any or all of the following information:

- Event origin information (origin time, epicenter, depth, and magnitudes) and their associated arrivals
- Groups of phases for which no location was computed
- Isolated picks
- Amplitude/period
- Event type information

At present time 80% of the contributing networks provide detailed bulletins (i.e. including locations). However, the groups and arrivals data are important for the EMSC bulletin calculation as they can be associated to a known event reported by other networks and help constraining the hypocenter.

For all data types, the arrivals should include:

- station code (local or international)
- phase type (e.g. P, Pn, Pg, S, Sn, Sg, pP, ...)
- arrival pick time
- amplitude/period information when available.

The networks can provide magnitude for located events and if available, calibrated amplitude/period station information. **The amplitude measurement is expected to be given as zero to peak in nanometers and periods in seconds.**

Amplitude/period information is important to ensure the calculation of a homogeneous “EMSC” magnitude throughout the whole Euro-Med area. At present time, this is not possible for all earthquakes.

II.3 Event type information

Event type information is crucial information to provide proper discrimination of non tectonic events in the EMB. Thanks to discussion with the data contributors, we now collect a significantly higher amount of event type information. Since 2008, one third of the networks provide information on non tectonic events, against only one tenth in 1998.

The EMSC follows the GSE2 nomenclature as provided in table 1 for event type description.

code	Event type
Uk	unknown,
Ke	known earthquake
Se	suspected earthquake
Kr	known rockburst
Sr	suspected rockburst
Ki	known induced event
Si	suspected induced event
Km	known mine expl.
Sm	suspected mine expl.
Kx	known experimental expl.
Sx	suspected experimental expl.
Kn	known nuclear expl.
Sn	suspected nuclear explosion
ls	landslide

Table 1: Event type definition according to GSE2 description

If other bulletin format is used by the data provider, the EMSC applies a mapping of the event type code (cf § III.2).

II.4 Phases

The EMB is produced using all phase types provided by the contributors and available in the ak135 velocity model. The EMSC follows the IASPEI nomenclature for seismic phase names (Storchack et al., 2003). The distribution of used phases in the EMB is given in Figure 3. More than 90% of the phases are first arrivals P and S.

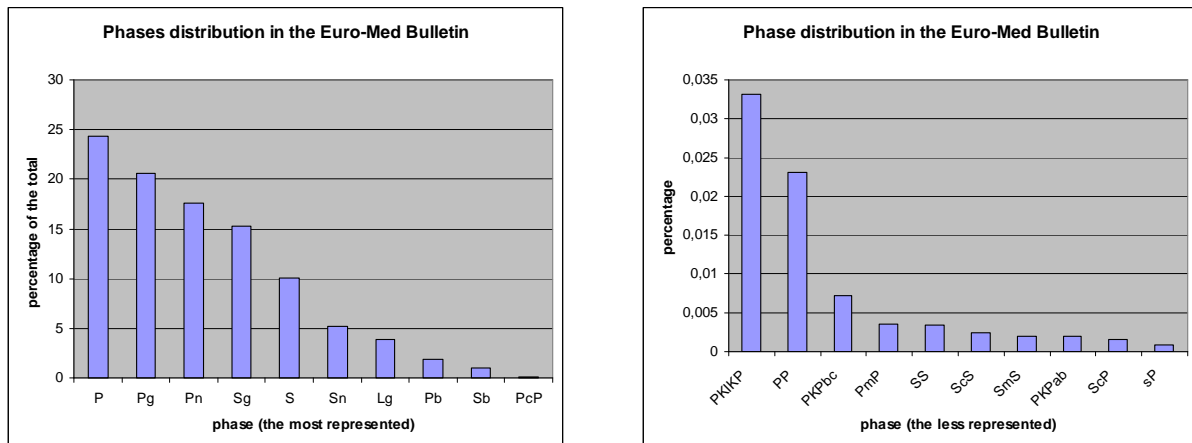


Figure 3: Phase distribution used in the Euro-Med bulletin.

The phase identification provided by the contributing network is stored in the database. However when no specific P or S phases is defined, the phase is re-identified according to the velocity model used in the location algorithm (Figure 4).

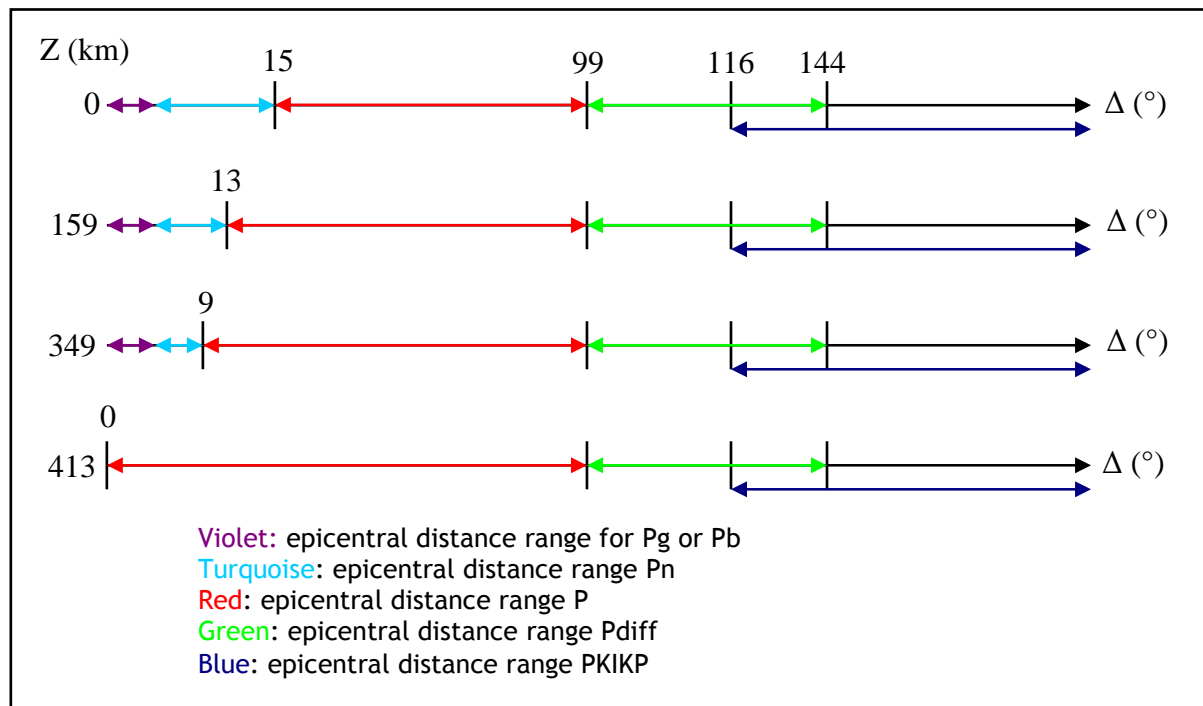


Figure 4: Distance range of different P phases in ak135 according to depth.

III DATA COLLECTION AND FORMATTING

III.1 Data reception

The parametric data are preferably provided by email. Other data can be collected from ftp/http sites (such as done by NEIC, UPP, ROM). The preferred format is ASCII text to allow automatic parsing. Other formats (pdf, excel) can lead to important misinterpretation in the data content.

Delay time in contributors' data availability is a key parameter for the operational production of the EMSC bulletin. To ensure that all contributions are fully integrated, the EMSC recommends that the local bulletins are provided as soon as possible (on a weekly or monthly basis). Several networks only disseminate data once or twice a year which can not be integrated in the EMSC bulletin. **The EMSC encourages the regional networks to provide data with less than 3 months delay.** The weekly content of the local bulletin database is available online, for example in 2009: <http://www.emsc-csem.org/Bulletin/database.php?year=2009>

III.2 Collected bulletins format

The EMSC recommends the data providers to use international formats to ensure the best interpretation of their data. The most common international formats are GSE2.0 (Figure 5), Nordic and IMS. One third of the contributors provide data in their own format, while 50% of them use GSE2.0 or Nordic formats. The output format of the EMB is also GSE2.0.

```

BEGIN GSE2.0
MSG_TYPE DATA
MSG_ID 2003/09/03_15:38 LDG
REF_ID 2003/09/03_15:38 LDG
DATA_TYPE BULLETIN GSE2.0

EVENT 0000
Date      Time      Latitude Longitude  Depth  Ndef Nsta Gap  Mag1 N  Mag2 N  Mag3 N  Author  ID
rms      OT_Error  Smajor Sminor Az  Err  ndist Mdist  Err  Err  Err  Err  Quality
2003/08/27 01:02:34.0  53.2883  14.1501  1.0 f  11  9 349  M1 3.8  7
0.79 +- 0.66  60.8  9.8 135  6.54  9.92 +-0.2  LDG 0000
m i sr

POLAND
Sta  Dist  EvAz  Phase  Date      Time      TRes  Azim  AzRes  Slow  SRes Def  SNR  Amp  Per  Mag1  Mag2  ID
CDF  6.54  224.5 m e Pn  2003/08/27 01:04:08.5 -0.6  T  21.7  0.80 M1 3.7  LDG
CDF  6.54  224.5 m e Sg  2003/08/27 01:05:58.9  0.2  T  34.1  0.98 M1 3.6  LDG
HAU  7.25  226.3 m e Pn  2003/08/27 01:04:18.2 -0.4  T  17.8  0.74 M1 3.7  LDG
HAU  7.25  226.3 m e Sg  2003/08/27 01:06:20.6 -0.2  T  42.1  1.07 M1 4.1  LDG
LOR  8.92  231.7 m e Pn  2003/08/27 01:04:42.4  0.9  T  9.1  0.73 M1 3.7  LDG
SSF  9.24  231.9 m e Pn  2003/08/27 01:04:45.6 -0.2  T  18.6  1.04 M1 3.9  LDG
HINF 7.18  223.2 m e Sg  2003/08/27 01:06:17.4 -1.3  T  5.9  0.60 M1 3.7  LDG
CBF  6.46  221.1 m e Sg  2003/08/27 01:06:59.6  0.8  T
SHF  9.39  229.1 m e Sg  2003/08/27 01:07:29.0  1.3  T
AVF  9.51  231.2 m e Sg  2003/08/27 01:07:30.4 -0.9  T
BGF  9.92  231.8 m e Sg  2003/08/27 01:07:42.8 -1.3  T

```

Figure 5: Example of GSE2.0 bulletin format

III.3 Format conversion

For each contributing network, a parser is developed to automatically process the data after their reception by email. The bulletins are first identified and converted to GSE2.0 format before being stored in the EMSC database. This can be a long procedure as many networks have specific formats and/or may change formats frequently. All original data are kept in our filers as flat file.

The local station codes are converted into the international ones and the event type code is also converted into GSE2.0 standard.

The homogeneously formatted data are then an entry point to the EMSC database of local bulletins. Free and full access to the catalogue via autoDRM is given for non commercial uses through our web site, after registration. The data are provided in GSE2.0 format.

http://www.emsc-csem.org/Bulletin/Request_data/

IV DATA PREPARATION

IV.1 Filtering duplicated bulletins

Before producing the EMB, we perform several checks on the database of local bulletins to ensure the most accurate and updated input for the data merging and event location.

Some events can appear twice in the database with strictly similar information (duplicated processing due to parsing issues) or with different content (updated event location submitted later to the EMSC) provided a single network. Routines are set up to identify them in the database and to select the proper bulletin after manual verification. This procedure allows us to identify possible problems and eases the following production step.

IV.2 Data verification with the agencies

Local networks may perform reviews of their data after submitting them to the EMSC; they may also add new events, mostly of smaller magnitudes.

To ensure that we use the most accurate data available, an email is sent to each contributor in order to collect final updates or additional data before data merging. This email contains a review of the data available in our database for a monthly time period. It allows the contributors to check and update their data before we start the EMB production.

This procedure has proven to be useful:

- To ensure that a maximum of data is available for the computation of the Euro-Med bulletin
- To identify missing or misinterpreted information which helps us to update the data parsers
- To identify non tectonic events which were previously labeled as earthquakes
- To verify stations information

After reception of corrections, the database is updated.

- Several networks provide usual data file with updated values (including phases) and we then rerun the same formatting tool and scan for duplicated events again.
- Other networks provide specific files with updates. Generally, they concern event type updates. In this case, several scripts are applied, though manual interaction is always necessary.

This procedure has proven to be useful with 30% of the networks providing valuable updates particularly for event type modification.

IV.3 Search for authoritative locations

Authoritative locations are reliable and accurate. A location is considered accurate if it fits geophysical criteria derived from the Ground Truth (GT) criteria of Bondar et al. (2009) and is considered reproducible if the relocated event falls within 15km using the same dataset.

The local bulletins database is scanned to identify authoritative locations. Events satisfying the criteria are flagged in the database and are shown during the EMB production to facilitate the work of the analyst.

V DATA MERGING

V.1 Phases association and event location

The bulletin production relies on the association of independent data from several networks and the computation of event hypocenters using the associated readings. The complete procedure follows two steps. An automatic location is first computed for each unique event after phases from different networks have been associated. The location is then evaluated and ordered in terms of geophysical coherence before a manual review is performed.

The software to perform the association and event location was developed by the LDG and was incorporated in the Euro-Med Bulletin automatic production in the framework of the EPSI European Project.

- A preliminary epicenter location is computed using an improved version of the Geiger algorithm (Geiger, 1910). A triangulation method is applied for local events and a classical Husebye method is performed for teleseismic events. The selected location is based on the smallest root mean square value.
- Then the data enter the inversion step based on arrival times (azimuth and slowness are not taken into account in the EMB). The solution is obtained after successive iterations and minimizes in the least squares sense, the difference between observed and calculated data. The location takes into account the chosen velocity models.

A detailed description of the method is given in Godey et al. (2007).

V.2 Parameters

- Magnitude

The magnitude threshold, previously set at 3.0, has been completely removed for bulletin of 2007 onward. The magnitude content of the Euro-Med Bulletin now reflects the full range of data contributions provided by the local networks. This has led to a striking increase of the number of events included in the Bulletin, with an average number of events per day of more than 200. The previous period 1998-2006 will be processed in the same manner.

- Velocity model

The ak135 velocity model is now used for all phases and at all distances, in agreement with the IASPEI recommendations. The EMB was previously computed using Jeffreys-Bullen global velocity model associated with local crustal model. The full period since 1998 has been recomputed with ak135 and the currently computed EMB is available only using ak135.

VI EMB OUTPUT DESCRIPTION AND REVIEW

VI.1 Event classes

Three classes of events are defined for the Euro-Med Bulletin according to the type of location related to them.

- Associated event: when an event is recorded by several networks. In this case, an EMSC location is computed.
- Reported event: if the event is recorded by a single but local network. In this case, the network location is reported (Figure 6).
- Deprecated event: if the event is recorded by a distant network or if the number of recording stations is lower than 4. In this case, the network location is reported and the bulletin is not disseminated online but is available only upon request.

```

MSG_TYPE DATA
MSG_ID 100301005053 EMSC
DATA_TYPE BULLETIN GSE2.0
REPORTED

EVENT 20100301005053
Date      Time      Latitude Longitude  Depth  Ndef Nsta Cap  Mag1 N  Mag2 N  Mag3 N  Author  ID
rms      OT_Error      Smajor Sminor Az  Err  mdist Mdist  Err  N  Err  N  Err  N  Quality
2010/03/01 00:50:52.7  38.6100  22.9700  13.0  16  10 101  MD 2.5
0.50
2010/03/01 00:50:52.7  38.6100  22.9700 f 13.0 f 16  10 101  MD 2.5
0.70 9999.9 9999.9 -99 0.05 0.83  EMSC  000200044
m i uk

( Data from stations operated by : ATH, THE, UPSL, UPSL )

GREECE
Sta  Dist  EvAz  Phase  Date      Time      TRes  Azim  AzRes  Slow  SRes  Def  SNR  Amp  Per  Mag1  Mag2  ID
LKR  0.05  29.6  e Pg   2010/03/01 00:50:55.2 -0.1  T
AXAR 0.29 302.8 e Pg   2010/03/01 00:50:58.8 0.0  T
AXAR 0.29 302.8 e Sg   2010/03/01 00:51:03.5 0.7  T
SMIA 0.33 34.7 e Pb   2010/03/01 00:50:59.4 0.0  T
SMIA 0.33 34.7 e Sb   2010/03/01 00:51:04.5 0.6  T
DSF  0.40 240.4 e Pg   2010/03/01 00:50:59.7 -1.1 T
DSF  0.40 240.4 e Sb   2010/03/01 00:51:06.0 -0.2 T
MRKA 0.49 78.6 e Pb   2010/03/01 00:51:02.8 -0.4 T
MRKA 0.49 78.6 e Sb   2010/03/01 00:51:08.7 -0.6 T
LTK  0.59 180.2 e Pb   2010/03/01 00:51:03.3 -1.6 T
LTK  0.59 180.2 e Sb   2010/03/01 00:51:13.5 0.6  T
AGG  0.65 309.7 e Pb   2010/03/01 00:51:05.2 -0.7 T
NEO  0.72 15.8 e Pb   2010/03/01 00:51:06.5 -0.7 T
NEO  0.72 15.8 e Sb   2010/03/01 00:51:16.4 -0.6 T
XOR  0.77 12.8 e Pb   2010/03/01 00:51:07.5 -0.6 T
GUR  0.83 216.5 e Pb   2010/03/01 00:51:09.0 -0.2 T
31392020
31392021
31392022
31392023
31392024
31392025
31392026
31392027
31392028
31392029
31392030
31392031
31392032
31392033
31392034
31392035

STOP

```

Figure 6: Example of Reported event

VI.2 Manual review

After the merging procedure, a manual revision is necessary to ensure the geophysical accuracy of the results. All events are analyzed to control their validity. Specific review is performed if the result displays one of the following discrepancies:

- the final hypocenter diverges of more than 10 km in the crust and of more than 30% from the initial location (dz/z);
- the magnitude difference compared to the local network magnitude is larger than one;
- the RMS variation is greater than 0.01 or the RMS is greater than one;
- the location variation compared to the local network is greater than 10km;
- the azimuthal gap variation compared to the local network is larger than 15° ;
- the error ellipse surface is greater than $5,000 \text{ km}^2$.

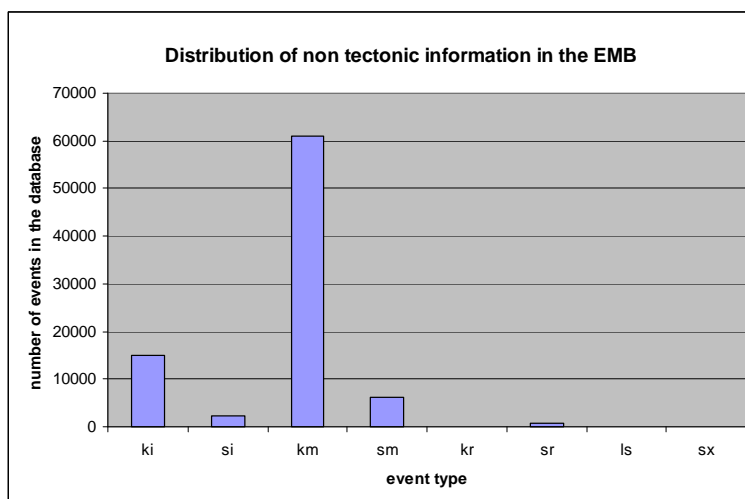


Figure 8: Number of non tectonic events in the Euro-Med Bulletin according to their event type for the period 1998-2009

Example of event type assignment in the EMB:

2007/11/02 09:12:53.8	49.3650	6.8370	1.0	ML 2.2	BGR	ki
2007/11/02 09:12:53.1	49.3800	6.7600	1.0 f	ML 2.6	STR	ke
2007/11/02 09:12:53.8	49.3510	6.8160	1.0	ML 2.9	NEIC	uk
2007/11/02 09:12:53.8	49.3514	6.8164	1.0 f	ML 2.9	LDG	sr
2007/11/02 09:12:53.6	49.3528	6.8332	1.0 f	ML 2.9	EMSC	ki

The description of each event type is given in §II.3

VI.5 Redundant phases processing

If phase pickings for a specific station and a specific event are reported by several networks, the redundant data are discarded. The pick is chosen according to the smallest residual time for the selected location. Priority is given to detailed phases. Are considered redundant phases:

- Same phase identification and pick times varying of less than 0.3s
- Different phase identifications of the same branch (P, Pg, Pn) and pick times varying of less than 0.3s
- Lg and S phases with pick times varying of less than 0.3s

Example of redundant phases' selection:

Input data:

RLS	0.43	300.2	e Pb	2010/02/28 02:59:08.3	-0.5	T	31391506
RLS	0.43	300.2	P	2010/02/28 02:59:08.5	-0.1	T	33553740
RLS	0.43	300.2	e Sb	2010/02/28 02:59:15.1	0.4	T	31391507
RLS	0.43	300.2	S	2010/02/28 02:59:15.5	1.1	T	33553741
KALE	0.57	16.2	e Pn	2010/02/28 02:59:10.8	-0.5	T	31391508
KALE	0.57	16.2	P	2010/02/28 02:59:10.9	-0.4	T	33553742
KALE	0.57	16.2	e Sn	2010/02/28 02:59:19.7	0.8	T	31391509
KALE	0.57	16.2	S	2010/02/28 02:59:20.3	1.3	T	33553743

Output data:

RLS	0.43	300.9	P	2010/02/28 02:59:08.5	-0.1	T	33553740
RLS	0.43	300.9	e Sb	2010/02/28 02:59:15.1	0.4	T	31391507
RLS	0.43	300.9	S	2010/02/28 02:59:15.5	1.1	T	33553741
KALE	0.58	16.1	P	2010/02/28 02:59:10.9	-0.4	T	33553742
KALE	0.58	16.1	e Sn	2010/02/28 02:59:19.7	0.8	T	31391509
KALE	0.58	16.1	S	2010/02/28 02:59:20.3	1.3	T	33553743

This procedure is applied during the manual review step and according to the geophysical meaning of the information.

VII EMB STORAGE AND DISTRIBUTION

VII.1 Database

After a month period of EMB data is processed, they are stored in the dedicated database. Final checks are performed before (data formatting, comparison with real time information) and after storage (event type information). The database is an Oracle relational structure, based on the multi-origin GSE2.0 format information. Identification numbers for arrivals and origins are kept allowing back tracking to the input data provider.

VII.2 Distribution

The Euro-Med bulletin is automatically provided to the ISC (International Seismological Centre) as soon as a monthly period is available. Once the data have been stored in the database, they are accessible on the EMSC website: <http://www.emsc-csem.org/Bulletin/index.php> Only the natural seismicity in the Euro-Med region is available online. Non tectonic events are discarded on the web and can be requested to the EMSC directly. Deprecated events are also discarded as their occurrence is doubtful.

Access to the seismic catalogue (solely locations) is provided for the general public interested in making maps or collecting simple lists of events directly on the web. In addition, collected local data (raw data) are available online.

EMB data can be requested online after simple registration. It is based on an autodrm form with the output sent by email. Redistribution or uses for commercial purposes are prohibited.

Search for Euro-Med Bulletin events

How to use this page?

Enter any criteria in the following form to retrieve specific events.
All parameters are optional, for range value you can specify only lower or upper limit.

Period (YYYY-MM-DD) to

Location (in degrees) < latitude <
 < longitude <

Depth (in kms) Min Max

Magnitude Min Max

Region Name

Quick access: [mag>=4](#) | [mag>=5](#)

[Export to CSV](#) (max: 5000 rows)
[Export to ASCII](#) (max: 5000 rows)
[Export to KML](#) (max: 5000 rows)
[Export to Google maps](#)

Sorting by column is performed on the data of the current page.

Results found : 255

Date & Time UTC	Latitude degrees	Longitude degrees	Depth km	Region name	1	Mag. 2	3	Loc type
1998-01-10 08:45:18.1	37.63 N	15.21 E	5.0	SICILY, ITALY	-	ML 4.1	-	L
1998-01-17 12:32:47.2	38.46 N	12.70 E	10.0	TYRRHENIAN SEA	mb 4.4	-	-	L
1998-01-20 14:15:27.2	38.84 N	15.55 E	100.0	SICILY, ITALY	mb 4.1	-	-	L
1998-02-08 01:12:36.4	38.12 N	15.81 E	10.0	SOUTHERN GREECE	-	ML 3.6	-	L
1998-05-18 17:19:05.1	39.29 N	15.11 E	283.9	SOUTHERN ITALY	mb 5.0	-	-	L
1998-05-20 09:55:57.2	38.37 N	12.85 E	10.0	SICILY, ITALY	mb 3.5	-	-	L
1998-06-17 12:42:02.3	38.46 N	12.94 E	10.0	SICILY, ITALY	-	ML 3.6	-	L
1998-06-20 02:25:48.8	38.37 N	12.90 E	10.0	SICILY, ITALY	mb 4.6	-	-	L
1998-06-20 11:15:19.6	38.54 N	12.77 E	53.3	SICILY, ITALY	-	mb 3.9	-	L
1998-06-21 09:00:49.3	38.37 N	12.85 E	5.0	SICILY, ITALY	mb 4.0	ML 3.7	-	L
1998-06-21 12:59:05.8	38.51 N	12.96 E	10.0	SICILY, ITALY	mb 4.4	-	-	L
1998-08-28 10:41:54.7	37.46 N	16.37 E	10.0	IONIAN SEA	mb 3.9	-	-	L
1998-09-14 05:24:47.5	38.50 N	13.52 E	10.0	SICILY, ITALY	mb 4.5	-	-	L
1998-11-03 20:26:36.9	38.43 N	12.83 E	10.0	SICILY, ITALY	-	ML 3.5	-	L

Figure 9: The Euro-Med Bulletin on the internet

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IX ANNEX

CODE	INSTITUTE	COUNTRY
ALG	Centre de Recherche en Astronomie, Astrophysique et Géophysique, Algiers	Algeria
ATH	National Observatory of Athens, Athens	Greece
AZER	Republic Center of Seismic Survey, Azerbaijan Academy of Science, Baku	Azerbaijan
BARI	Osservatorio Sismologico Universita di Bari	Italy
BELR	Center for Geophysical Monitoring, Minsk	Belarus
BEO	Seismological Survey of Serbia, Beograd	Serbia
BER	University of Bergen, Bergen	Norway
BGR	Bundesanstalt fur Geowissenschaften und Rohstoffe, Hannover	Germany
BGS	British Geological Survey, Edinburgh	United-Kingdom
BRA	Seismology Division, Slovak Academy of Sciences, Bratislava	Slovakia
BUC	National Institute for Earth Physics, Bucharest	Romania
BUD	Hungarian Seismic Network, Budapest	Hungary
CNRM	Centre National de la Recherche Scientifique et Technique, Geophysics Laboratory, Rabat	Morocco
DBN	Observatories and Research Facilities for EUropean Seismology, De Bilt	The Netherlands
DHMR	National Seismological Observatory Center, Dhamar	Yemen
DIAS	Dublin Institute for Advanced Studies, Dublin	Ireland
DDA	Directorate of Disaster Affairs, Lodumlu, Ankara	Turkey
DSN	Dubai Municipality, Dubai	United Arab Emirates
DNK	Geological Survey of Denmark and Greenland, Copenhagen	Denmark
DUSS	Damascus University Seismological Station, Damascus	Syria
GBZT	Earth Sciences Research Institute, Tubitak	Turkey
GEN	Rete Sismica Igg, Genova	Italy
GFU	Geophysical Institute of Academy of Sciences, Prague	Czech Republic
GII	Geophysical Institute of Israel, Tel Aviv	Israel
GRAL	National Center for Geophysical Research, Beirut	Lebanon
HEL	Institute of Seismology, Helsinki	Finland
HLW	National Research Institute of Astronomy and Geophysics, Cairo	Egypt
INMG	Instituto de Meteorologia, Seismologia, Lisbon	Portugal
IPEC	Institute of Physics of the Earth, Brno	Czech Republic
ISK	Kandilli Observatory and Earthquake Research Institute, Istanbul	Turkey
ISN	Iraqi Seismological Network, Bagdad	Iraq
JSO	Jordan Seismological Observatory, Amman	Jordan
KISR	Kuwait Institute for Scientific Research, Kuwait	Kuwait
LDG	Laboratoire de Détection et de Géophysique, Bruyères-le-Châtel	France
LDSN	Libyan Centre for Remote Sensing and Space Science, Tripoli	Lybia
LVSN	Latvian Seismic Network, Latvian Environment, Geology and Meteorology Agency	Latvia
LGS	Geological Survey of Lithuania, Vilnius	Lithuania
LJU	Environmental Agency of the Republic of Slovenia, Seismological Office, Ljubljana	Slovenia
MDD	Instituto Geografico Nacional, Madrid	Spain
MOLD	Institute of Geophysics and Geology, Chisinau	Moldova
MRB	Instituto Cartografico de Catalunya, Barcelona	Spain
NAO	Norwegian Seismic Array, Kjeller	Norway
NEIC	National Earthquake Information Center, USGS, Denver	USA
NIC	Geological Survey Department, Nicosia	Cyprus
NNC	Kazakhstan National Data Center, Almaty	Kazakhstan
NSSC	National Syrian Seismological Centre, Damascus	Syria
NSSP	National Survey of Seismic Protection, Yerevan	Armenia
OBN	Geophysical Survey. Russian Academy of Sciences, Obninsk	Russia
OMAN	Earthquake Monitoring Center, Sultan Qaboos University, Muscat	Sultanate of Oman
PAB	Observatorio de Toledo, Toledo	Spain
PDA	Instituto de Meteorologia, Azores University, Ponta Delgada, Azores	Portugal
PDG	Montenegro Seismological Observatory, Podgorica	Montenegro

ROM	Italian National Seismic Network, Roma	Italy
REY	Department of Geophysics, Icelandic Meteorological Office	Iceland
RYD	King Saud University, Riyadh	Saudi-Arabia
SBS	Institut National de la Météorologie, Tunis	Tunisia
SFS	Real Instituto y Observatorio de la Armada, San Fernando	Spain
SKO	Seismological Observatory, Skopje	Macedonia
SNSN	Saudian National Seismological Network, Riyadh	Saudi-Arabia
SOF	Bulgarian Academy of Science, Bulgarian Academy of Sciences, Sofia	Bulgaria
SORS	Republic Hydrometeorological Institute, Banja Luka	Bosnia-Herzegovina
SPGM	Département de Physique du Globe, Rabat	Morocco
STR	Réseau National de Surveillance Sismique, Strasbourg	France
TEH	Institute of Geophysics, University of Tehran, Tehran	Iran
THE	Department of Geophysics, University of Thessaloniki, Thessaloniki	Greece
THR	International Institute of Earthquake Engineering and Seismology, Tehran	Iran
TIF	Georgian National Survey of Seismic Defence, Tbilissi	Georgia
TIR	Institute of Seismology, Academy of Sciences, Tirana	Albania
TRI	Osservatorio Geofisico Sperimentale, Trieste	Italy
UCC	Observatoire Royal de Belgique, Brussels	Belgium
UPP	Uppsala station, Uppsala	Sweden
UPSL	University of Patras Seismological Laboratory	Greece
UZBK	Institute of Seismology, Uzbekistan Academy of Sciences, Tashkent	Uzbekistan
WAR	Warsaw Seismic Network, Warsaw	Poland
ZAG	Seismological Survey, University of Zagreb, Zagreb	Croatia
ZAMG	ZentralAnstalt für Meteorologie und Geodynamik, Vienna	Austria
ZUR	Swiss Seismological Service, Zurich	Switzerland

Table 2: List of data contributors to the Euro-Med Bulletin. In bold, new data providers for the year 2010 onward.