believe that this project is important and timely as the integration process of the European seismological community is going on. We will keep you informed on the future developments and the complete proposal and the list of participants can be found on the EMSC web site (www.emsc-csem.org/Html/BALKANS.html)

On the use of EMSC alert service

A survey has been performed to analyse the use of EMSC alert service. Three hundred and ten users completed the questionnaire (among 1,300 recipients). Half of the users first visited EMSC web site to get information on a specific event or on seismology (Figure 1). Forty eight percent find the site using search engines and 33% following get the address by a friend or a colleague (Figure 2). The majority of our users are driven by their personal interest (56%), a quarter of them by scientific purpose and 10% uses the alert for rescue or civil defence purposes (Figure 3). The are two main types of users of EMSC web site: a third are regular visitors with at least one visit a day while half of the visitors visit the site only in rare occasions or only after a damaging earthquake (Figure 4).

When asked about the necessary improvements of the current service, end-users have mentioned many items notably the addition of clickable maps, the description of the site content for non-specialists and information on potential damage. We will do our best to implement these changes/improvements as rapidly as possible and we thanks all the participants for their valuable inputs.

New applications for EMSC membership

Three new Institutes have been discussing with us their possible EMSC membership: the Seismological Observatory of Republic Macedonia (FYROM), the Centre of Experimental Seismology (Moldova), and the Seismological Survey of Serbia (Serbia and Montenegro). So, our membership continues to expand and these new members will be joining the EMSC community during our next General Assembly to be held next September in Potsdam during the ESC meeting.

The database of Earthquake Mechanisms of the Mediterranean Area (EMMA): a call for contributions

G. Vannucci[1] and P. Gasperini[2]

[1] Istituto Nazionale di Geofisica e Vulcanologia, INGV, Bologna, Italy

[2] Dipartimento di Fisica, Università di Bologna, Italy

Abstract

We present to CSEM/EMSC community a database on MS-ACCESS platform of revised fault plane solutions, taken from the literature, including earthquakes which occurred in the Mediterranean and in surrounding regions. A PC installable CD-ROM is freely available, for scientific purposes, to all investigators upon e-mail request to the writers' addresses:
vannucci@bo.ingv.it, paolo.gasperini@unibo.it.
We also want to take advantage of this occasion to make a request to the authors of papers not already included, to cooperate to next releases of the database by signaling us missing and/or new data and possibly sending the numerical parameters by e-mail or other computer media. Any correction, recommendation or suggestion is also heartily welcome. A new release of the database is planned for mid summer 2004, the

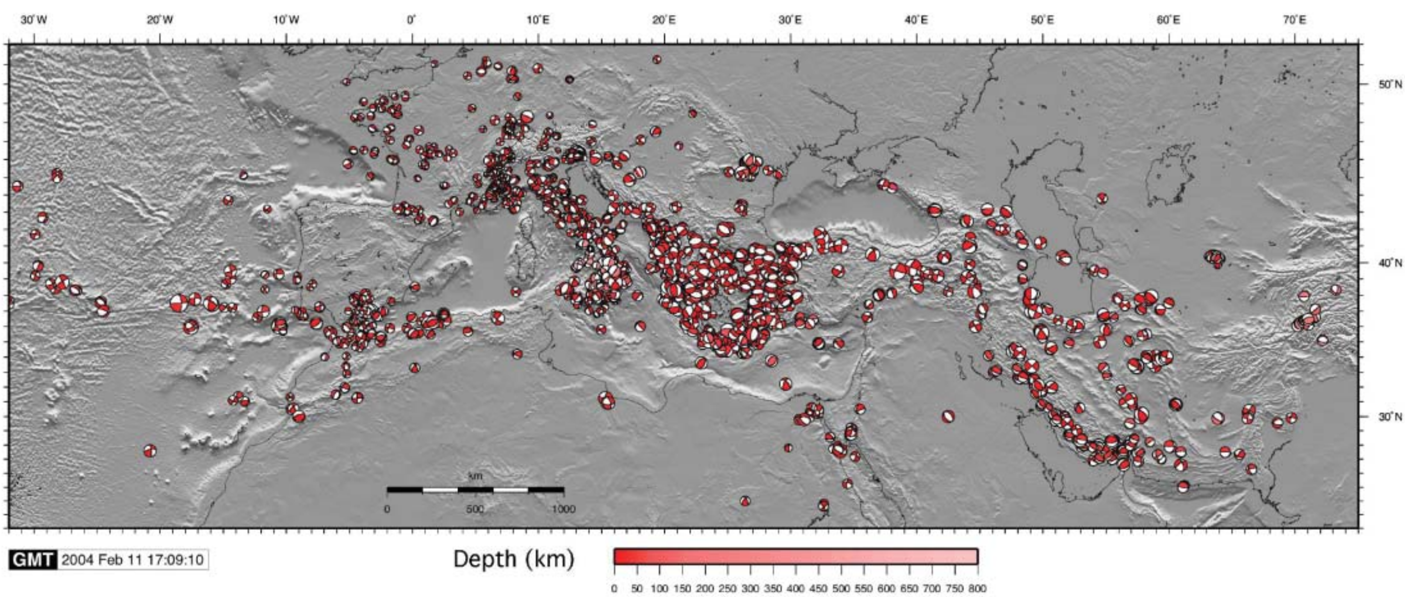

Figure 1: *Spatial distribution of fault plane solutions taken from the literature (on-line CMT catalogs excluded).*

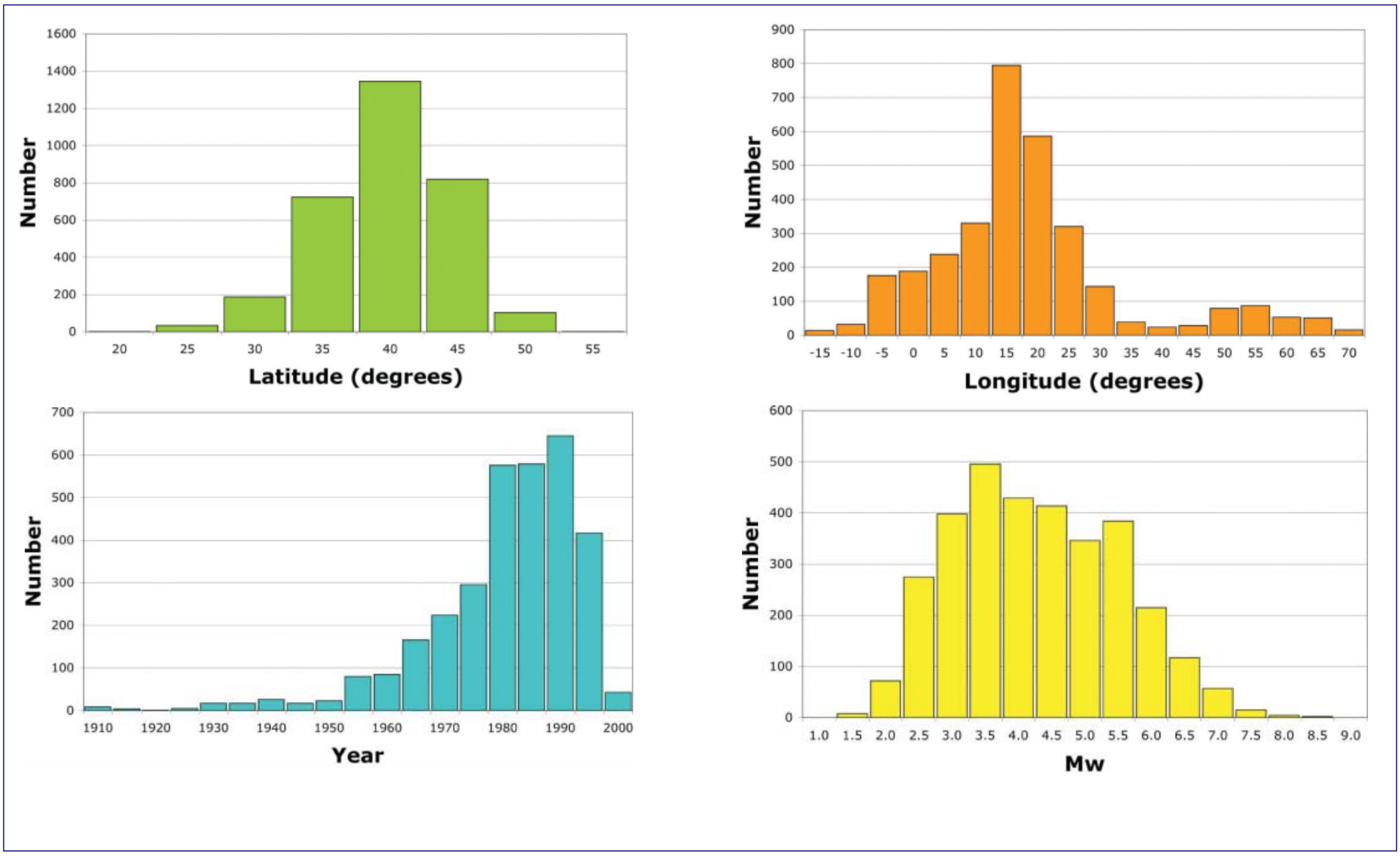

***Figure 2:** Distribution in space, time and magnitude of earthquakes included in EMMA database.*

approximate deadline for contributors is at end of May 2004.

Motivations of the work

The analysis of earthquake focal mechanism data is the most common tool to characterize the tectonic style of a seismogenic area and to estimate stress and strain principal directions and rates. The global CMT on-line catalog, continuously updated by the Harvard Seismology team (Dziewonski et al., 1981 and subsequent papers appeared quarterly on *Phys Earth Plan. Int.,* available at address: http://www.seismology.harvard.edu/projects/CMT/), gives a rather detailed and complete description of seismic styles for most areas of the globe where the occurrence rate of earthquakes above the catalog magnitude threshold (about Mw≥5.5) is relatively high. This is the case for example of eastern Mediterranean area, where several hundreds of CMT mechanisms are available since 1976 but it is not true for central and western sectors of this sea. In the last few years (since 1997 and 1999 respectively), two Regional CMT (RCMT) catalogs of the Mediterranean Region were also made available by the *Istituto Nazionale di Geofisica e Vulcanologia* (INGV) of Rome (Pondrelli et al, 2002, available at address: http://www.ingv.it/seismoglo/RCMT/) and by the *Eidgenössische Technische Hochschule* (ETH) of Zürich (Braunmiller et al., 2002, available at address: http://seismo.ethz.ch/info/mt.html) including earthquakes with about Mw≥4.5.

However, for certain areas like Italy and central Europe, where seismic activity is moderate or low, the recourse to solutions published in the literature (mainly first motion) still represents the only way to focus on the fine details of seismotectonic pattern. This is particularly important in probabilistic seismic hazard assessment (PSHA) studies where this information is very useful for example to establish the seismic zonation to be used in computations.

Just in the ambit of Framework Project 2000/2002 of the Italian *Gruppo Nazionale Difesa dai Terremoti* (GNDT), devoted to the revision of seismic hazard assessment in Italy, we have started the collection of fault plane solutions, for the Italian regions, published on national and international journals. The area of interest has been extended later to include the entire Mediterranean Sea and surrounding regions. At present time we have collected in all 5100 mechanisms coming from 141 papers, some of which also report data from other sources that we were not able to examine directly (about 200). We anyhow recorded for each solution both direct bibliographic references

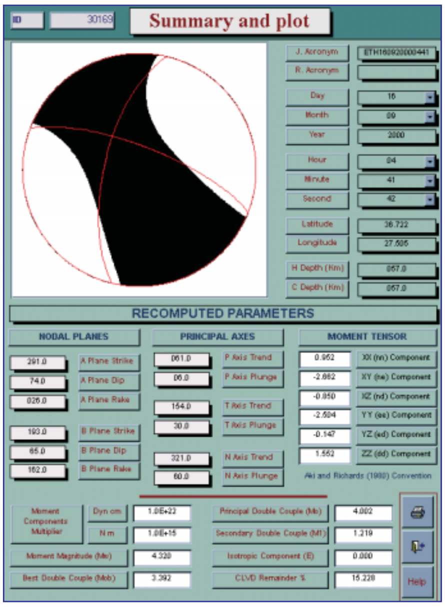

***Figure 3:** Summary mask with plot of mechanism (red lines indicate best double couple nodal planes).*

Region	Relations	Reference
Italy and surrounding areas (34≤latitude≤45, 6≤longitude≤19.5)	$LogM_0$=19.3+0.96Ms $LogM_0$=17.9+1.21mb $LogM_0$=17.7+1.22Ml	Gasperini and Ferrari (2000)
All others	$LogM_0$=24.66-1.083Ms+0.192Ms^2 $LogM_0$=18.28+0.679mb+0.077mb^2 $LogM_0$=18.31+1.017Ml	Johnston, (1996)

Table 1: *LogMo-magnitude regressions used in the database*

(actually examined) as well as indirect ones (only referred by other sources).

During this preliminary stage we verified that a significant fraction of published data (about 1/3) was showing a number of defects, ranging from the misuse of terms and notations (for example the confusion between strike and dip direction) to various kind of misprints and inconsistencies. In other cases the reported data were not sufficient to constrain the solution at all (whenever for example only the orientations of planes were reported, without the indication of slip directions). Moreover, a further source of uncertainty concerns cases where several solutions (often very different from each other) are available for the same earthquake from different authors. This implies an ambiguity that cannot be easily settled but requires an evaluation of the quality of the computations and/or the "authoritativeness" of the source of the data.

The work done

In order to correct some of the defects encountered, we firstly wrote a structured package of Fortran 77 subroutines (Gasperini and Vannucci, 2003) performing the most common computations and checks on focal mechanism data. This package (that is freely available from the ftp server of Computers & Geosciences journal: ftp://ftp.iamg.org/VOL29/v29-07-08.zip) includes, among the others, routines to compute nodal planes from P and T axes and vice versa as well as to compute moment tensor components from planes or axes or best double couple parameters from moment tensor components. Using different criteria we were able to re-compute consistent data for the majority of defective solutions so that the final dataset of "usable" fault plane solutions presently includes about 4600 mechanisms relative to more than 3300 distinct earthquakes. The spatial coverage approximately corresponds to Fig. 1. The distribution of included earthquakes in space, time and magnitude is shown in Fig.2. The origin time year ranges from 1905 to 2001 while the moment magnitude Mw from 1.4 to 8.7.

The final revised database (Vannucci and Gasperini, 2003) has been imported in a MS-ACCESS application allowing the visual comparison between original and recomputed data and the importing (without checking) of the data of the Global CMT Harvard catalog and of the two regional CMT catalogs (INGV and ETH). Each user can easily perform the latter operation, after downloading the data files from corresponding web sites (see above).

The MS-ACCESS application also permits to make selections on the basis of earthquake source parameters (date, location, magnitude, etc.) and of bibliographic data (authors, journal, etc.). The selected mechanisms can be examined singularly as well as they can be exported to ASCII files in order to be plotted by the Graphic Mapping Tool (GMT) (Wessel and Smith, 1991), or processed by external codes. A button of the display mask activates a procedure, making use of GMT and Ghostscript, displaying the "beach-ball" plot of the selected mechanism (Fig. 3). Another feature of the application exports the list of bibliographic references of selected data in a format suitable to be included in manuscripts. This simplifies the correct citation of all of the papers that contributes with mechanism data to investigations making use of the EMMA database.

To make uniform selections on the basis of the earthquake size as well as to compute the seismic moment tensor, we compute the scalar seismic moment, using empirical regressions with available magnitude estimates, for all of the mechanisms for which this parameter is not reported on the original paper. For Italy and surrounding regions, we used the relations estimated by Gasperini and Ferrari (2000) while for all other areas we provisionally adopted the ones computed by Johnston (1996) (see Table 1). This point, however, will be a matter of future revision based on specific analyses of earthquake data included in the database.

To choose, in case of duplications, the most representative mechanism for each earthquake we assigned to each solution a weight based on a series of objective criteria. Listed with decreasing rank, these are:

1. correctness of the solution (presence or absence of errors in the published FPS parameters);
2. originality of the source (original sources are preferred with respect to indirect ones);
3. "authoritativeness" of the source, roughly based on the impact factor of the journal or on the diffusion ambit of the publication (international, national, thesis, etc.) where the solution is published;
4. recentness of the publication (most recent papers override previous ones).

Among all duplicate mechanisms we choose the one having the largest weight.

As this choice is to some extent arbitrary the user is free to override it and to follow different criteria, as the data of all of the alternative solutions are also included in the database.

A call for contributions

Although we made our best, we can easily predict that at least some mistakes are still present in our work. As well we certainly missed some published papers (see below the complete list of contributing papers). So we explicitly request the collaboration of all investigators that are interested in the improvement of this database to indicate us any kind of mistakes and malfunctioning of the procedure they could find or the omission of interesting papers they know had been published.

We want to stress that our contribution represents only an added value to the work done by the authors of original papers and thus the database must not be cited as the source of data but only as a tool to easily access them. We thus strongly recommend the users to insert in their references the complete list of original works that really computed the focal plane solutions they use. As noted above a specific option is available to simplify this task in our MS-ACCESS application.

We are presently updating the database with the addition of new papers since the first release (end of year 2002). We expect to continue this updating in the coming years and to release new versions on an yearly basis. The next issue is planned for mid summer 2004 on a special issue of the INGV journal *Annals of Geophysics* (with an enclosed CD-ROM) together with the new release of the INGV Regional CMT Catalog mentioned above. We thus renew our invitation to signal us missing papers and/or to send numerical data possibly before the end of May 2004.

References

Braunmiller, J., Kradolfer, U., Giardini, D., 2002. Regional moment tensor determination in the European-Mediterranean area – initial results, Tectonophysics, 356, 5-22.

Dziewonski, A.M., Chou, T.A., Woodhouse, J.H., 1981. Determination of earthquake source parameters from waveform data for studies of global and regional seismicity, Journal of Geophysical Research, 86, 2,825-2,852.

Johnston, A.C., 1996. Seismic moment assessment of earthquakes in stable continental regions – I. Instrumental seismicity, Geopys. J. Int., 124, 381-414.

Gasperini, P., Ferrari, G., 2000. Deriving numerical estimates from descriptive information: the computation of earthquake parameters, Annali di Geofisica, 43, 729-746

Gasperini, P., Vannucci, G., 2003. FPSPACK: A package of simple FORTRAN subroutines to manage earthquake focal mechanism data, Computers & Geosciences, 29, 893-901.

Kostrov, V.V., 1974. Seismic moment and energy of earthquakes and seismic flow of rocks. Izvestia Earth Physics, 1, 23-40.

Pondrelli, S., Morelli, A., Ekström, G:, Mazza, S., Boschi, E., Dziewonski, A.M., 2002. European-Mediterranean Regional Centroid Moment Tensors catalog: 1997-2000, Physics of the Earth and Planetary Interior, 130, 71-101.

Vannucci, G., Gasperini, P., 2003. A database of revised fault plane solutions for Italy and surrounding regions, Computers & Geosciences, 29, 903-909.

Wessel, P., Smith, W.H.F., 1991. Free software helps map and display data, Eos Transactions of the AGU, 72, 441.

Contributing papers (directly examined)

Abou Elenean et al., 2000. Annali di Geofisica, 43, 485. **Amorese et al., 2000**. Geophys. J. Int., 143, 837. **Amoruso et al., 1998.** J. Geophys. Res., 103, 29989. **Anderson and Jackson. 1987**. Geophys. J. R. Astr. Soc., 91, 613. **Anderson and Jackson. 1987**. Geophys. J. R. Astr. Soc., 91, 937. **Augliera et al., 1990**. Atti Gngts, 9° Conv., 221. **Augliera et al., 1994.** Boll. Geof. Teor. Appl., 36, 363. **Azzara et al., 1993**. Annali di Geofisica, 36, 237. **Badawy, 2001**. Tectonophysics, 343, 49. **Badawy and Fattah. 2001**. Tectonophysics, 343, 63. **Baker et al., 1993. Geophys**. J. Int., 115, 41. **Baker et al., 1997**. Geophys. J. Int., 131, 559. **Baroux et al., 2001.** Geophys. J. Int., 145, 336. **Basili et al., 1996**. Annali di Geofisica, 39, 1167. **Batini et al., 1993.** Atti Gngts, 12° Conv., 207. **Berberian et al., 2000**. Geophys. J. Int., 142, 283. **Bonasia et al., 1986**. Atti Gngts, 5° Conv., 539. **Bonjer, 1997**. Tectonophysics, 275, 41. **Boore et al., 1981**. Phys. Earth Plan. Inter., 27, 133. **Bottari et al., 1989**. Tectonophysics, 166, 221. **Bowers and Pearce**, 1995. Tectonophysics, 248, 193. **Buforn et al., 1995.** Tectonophysics, 248, 247. **Buforn et al., 1988**. Bull. Seism. Soc. Am., 78, 2008. **Buforn et al., 1988.** Tectonophysics, 152, 89. **Caccamo et al., 1996**. Geophys. J. Int., 125, 857. **Canitez and Uçer, 1967**. Tectonophysics, 4, 235. **Cattaneo et al., 2000**. Journ. of Seismol., 4, 401. **Chandra, 1984**. Phys. Earth Plan. Inter., 34, 9. **Chiodo et al., 1994**. Atti Gngts, 13° Conv., 915. **Ciaccio et al., 2001**. Atti Gngts, 20° Conv., 247. **Cipar, 1980**. Bull. Seism. Soc. Am., 70, 963. **Cisternas et al., 1982**. Bull. Seism. Soc. Am., 72, 2245. **Console, 1976**. Boll. Geof. Teor. Appl., 18, 549. **Console and Favali, 1981**. Bull. Seism. Soc. Am., 71, 1233. **Console et al., 1989.** Tectonophysics, 166, 235. **De Luca et al., 2000**. Journ. of Seismol., 4, 1. **Deichmann et al., 1991**. Atti Gngts, 10° Conv., 317. **Del Ben et al., 1991**. Boll. Geof. Teor. Appl., 33, 155. **Del Pezzo et al., 1985**. Atti Gngts, 4° Conv., 79. **Delibasis et al., 1999**. Tectonophysics, 308, 237. **Deschamps and King, 1984**. Bull. Seism. Soc. Am., 74, 2483. **Ekstrom and England, 1989**. J. Geophys. Res., 94, 10231. **Ekstrom et al., 1998**. Geophys. Res. Lett., 25, 1971. **El-Sayed et al., 1998**. Journ. of Seismol., 2, 293. **Eva et al., 1978**. Boll. Geof. Teor. Appl., 20, 263. **Eva et al., 1988**. Boll. Geof. Teor. Appl., 30, 53. **Eva and Pastore, 1993**. Atti Gngts, 12° Conv., 147. **Eva and Solarino, 1992**. Studi Geol. Camerti, Vol. Spec. 2, Append. Crop 1-1a, 75. **Eva and Solarino, 1998**. Geophys. J. Int., 135, 438. **Eva et al., 1997**. J. Geophys. Res., 102, 8171**. Eyidogan, 1988**. Tectonophysics, 148, 83.**Eyidogan and Jackson, 1985**. Geophys. J. R. Astr. Soc., 81, 569. **Frepoli and Amato, 1997**. Geophys. J. Int., 129, 368. **Frepoli and Amato, 2000**. Annali di Geofisica, 43, 437. **Frepoli et al., 1996**. Geophys. J. Int., 125, 879. **Galindo-Zaldivar et al., 1993**. Tectonophysics, 227, 105. **Gallart et al., 1985**. Annales Geophysicae, 3, 239. **Gasparini et al., 1982**. Tectonophysics, 84, 267. **Gasparini et al., 1985**. Tectonophysics, 117, 59. **Giardini, 1984**. Geophys. J. R. Astr. Soc., 77, 883. **Grimison and Chen, 1986**. J. Geophys. Res., 91, 2029. **Grimison and Chen, 1988**. Geophys. J. Int., 92, 391. **Grunthal and Stromeyer, 1992**. J. Geophys. Res., 97, 11805. **Hatzfeld et al., 1993**. Geophys. J. Int., 115, 799. **Hatzfeld et al., 1993**. Geophys. J. Int., 120, 31. **Horálek et al.,2002**. Tectonophysics, 356, 65. **Huang and Salomon, 1987**. J. Geophys. Res., 92, 1361. **Hussein, 1999.** Annali di Geofisica, 42, 665. **Iannaccone et al., 1985**. Atti Gngts, 4° Conv., Roma, 145. **Jackson and Mckenzie, 1984.** Geophys. J. R. Astr. Soc., 77, 185. **Jackson et al., 1992. J. Geophys**. Res., 97, 17657. **Jackson et al., 1995**. J. Geophys. Res., 100, 15205. **Jost et al., 2002**. Tectonophysics, 356, 87. **Kiratzi and Langston, 1989**. Phys. Earth Plan. Inter., 57, 225. **Kiratzi and Louvari, 2001**. Annali di Geofisica, 44, 33. **Kiratzi et al., 1991**. Pure Appl. Geophys., 135, 515. **Lammali et al., 1997**. Geophys. J. Int., 129, 597. **Louvari et al., 1999**. Tectonophysics, 308, 223. **Lyon-Caen et al., 1988**. J. Geophys. Res., 93, 14967. **Maggi et al., 2000**. Geophys. J. Int., 143, 629. **Main and Burton, 1990**. Tectonophysics, 179, 273. **Mckenzie, 1972**. Geophys. J. R. Astr. Soc., 30, 109. **Mckenzie, 1978**. Geophys. J. R. Astr. Soc., 55, 217. **Medina, 1995**. Journ. Struct. Geol., 17, 1035. **Medina and Cherkaoui, 1992**. Eclogae Geol. Helv., 85/2, 433. **Meghraoui et al., 1996**. Bull. Soc. Géol. Franc., 167, 141. **Melis et al., 1995.** Geophys. J. Int., 122, 815. **Mezcua and Rueda, 1997.** Geophys. J. Int., 129, F1. **Milano et al., 1999**. Tectonophysics, 306, 57. **Morelli et al., 2000**. Journ. of Seismol., 4, 365. **Muço, 1994**. Tectonophysics, 231, 311. **Nicolas et al., 1998**. Pure Appl. Geophys., 152, 707. **Nicolas et al., 1990**. Tectonophysics, 179, 27. **Nowroozi, 1972.** Bull. Seism. Soc. Am., 62, 823. **Oncescu et al., 1990**. Tectonophysics, 172, 121. **Ouyed et al., 1983**. Geophys. J. R. Astr. Soc., 73, 605. **Papadimitriou, 1993**. Boll. Geof. Teor. Appl., 35, 401. **Papazachos and Delibasis, 1969**. Tectonophysics, 7, 231. **Papazachos et al., 1983**. Geophys. J. R. Astr. Soc., 75, 155. **Papazachos et al., 1984**. Boll. Geof. Teor. Appl., 26, 101. **Papazachos et al., 1988**. Pure Appl. Geophys., 126, 55. **Papazachos et al., 1991**. Pure Appl. Geophys., 136, 405. **Patanè et al., 1990**. Atti Gngts, 9° Conv., 57. **Pierri et al., 1993**. Atti Gngts, 12° Conv., 227 **Pino and Mazza, 2000**. Journ. of Seismol., 4, 451. **Polonic, 1985**. Tectonophysics, 117, 109. **Pondrelli et al., 2001**. Journ. of Seismol., 5, 73. **Priestley et al., 1994**. Geophys. J. Int., 118, 111. **Renner and Slejko, 1986**. Atti Gngts, 5° Conv., 577. **Renner and Slejko, 1994**. Boll. Geof. Teor. Appl., 36, 141. **Renner and Slejko, 1994**. Atti Gngts, 13° Conv., 907. **Renner et al., 1991**. Atti Gngts, 10° Conv., 305. **Ribeiro et al., 1996.** Tectonics, 15, 641. **Ricciardi et al., 1986**. Atti Gngts, 5° Conv., 503. **Rigo et al., 1996**. Geophys. J. Int., 126, 663. **Rocca et al., 1985**. Boll. Geof. Teor. Appl., 27, 101. **Rouland et al., 1976**. Boll. Geof. Teor. Appl., 18, 889. **Schick, 1979**. Tectonophysics, 53, 289. **Scordilis et al., 1985**. Pure Appl. Geophys., 123, 389. **Selvaggi, 2001**. Annali di Geofisica, 44, 155. **Sipkin and Needham, 1991**. Phys. Earth Plan. Inter., 67, 221. **Slejko and Rebez, 1988**. Atti Gngts, 7° Conv., 157. **Slejko et al., 1987**. Cnr-Gndt, Rend. 1, Trieste, 82 pp. **Slejko et al., 1989**. Boll. Geof. Teor. Appl., 31, 109. **Slejko et al., 1999**. Bull. Seism. Soc. Am., 89, 1037. **Soufleris and Stewart, 1981**. Geophys. J. R. Astr. Soc., 67, 343. **Stanishkova and Slejko, 1990**. Atti Gngts, 9° Conv., 177. **Sue et al., 1999**. J. Geophys. Res., 104, 25611. **Suleiman and Doser, 1995**. Geophys. J. Int., 120, 312. **Sulstarova et al., 2000.** Journ. of Seismol., 4, 117. **Taymaz, 1993**. Geophys. J. Int., 113, 260. **Taymaz and Price, 1992**. Geophys. J. Int., 108, 589. **Taymaz et al., 1990**. Geophys. J. Int., 102, 695. **Taymaz et al., 1991**. Geophys. J. Int., 106, 537. **Taymaz et al., 1991**. Geophys. J. Int., 106, 433. **Thio et al., 1999**. J. Geophys. Res., 104, 845. **Thouvenot et al., 1998**. Geophys. J. Int., 135, 876**. Udias, 1967**. Tectonophysics, 4, 229. **Udias et al., 1976**. Tectonophysics, 31, 259. **Udias et al., 1989**. Dept. of Geophysics, Univ. Complutense, Madrid. **Ward and Valensise, 1989**. Bull. Seism. Soc. Am., 79, 690.