3
Operating manual

ROBERTO BASILI and PIERFRANCESCO BURRATO

Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy

This chapter describes how to install (section 3.1.), operate (section 3.2.), and consult (section 3.3.) the *Database of Potential Sources for Earthquakes Larger than 5.5 in Italy* (hereinafter referred to as *Database*), and how to get the most out of its tools and information content.

The first section deals with the basic operations that have to be done to install the *Database* onto a computer and ensure that it runs correctly. The computer system requirements will also be specified. The second section illustrates all the application menus and commands, their basic features, and the tasks they perform. Full descriptions about how to use them are also given. Finally, the third section presents and comments several examples of actual *Database* records that will guide the user through the practice of interacting with it and familiarising with all its features.

3.1. Installing the *Database*

3.1.1. Generalities

The *Database* consists of several data tables and other files organised in an easy-to-understand hierarchical structure. It requires a properly working copy of MapInfo® 4.0 or higher already running on your computer. The *Database* can be run directly from the CD or copied onto the hard disk. This second option is strongly recommended for full and faster performance but it requires about 450 Mb of free disk space regardless of the platform of your choice. In either case, the *Database* can be run directly or through a specifically designed web interface. To run it directly simply click on the `DISS.mbx` icon within the folder `database` and wait for all the files to load properly. To run it through the web interface just click the `Startup` icon and follow the instructions. The web interface was designed and operates properly under Microsoft Explorer® 5 or higher version, both on Macintosh and PC. Some of the commands will not work properly under Netscape® regardless of the version used.

The full configuration of the *Database* consists of three main folders, named **`database`**, **`images`** and **`pages`**, and of the html file **`startup.html`**. The folder **`database`** contains everything that is needed to run the *Database* correctly, including empty folders used to store export files temporarily. The user may remove files that are no longer used, but notice that removing empty folders or modifying the overall structure of the *Database* will prevent it from operating properly.

3.1.2. Macintosh-users version

System requirements

Operating system: MacOs 8 or later version (™ & © Apple Computer, Inc. 1983-2001) running on a PowerPC G3 or higher performance machine.

RAM: 16 Mb minimum, 32 Mb or more recommended.

Installing

To install the *Database* on your Macintosh simply drag and drop the folders **`database`**, **`images`** and **`pages`** and the html file **`startup.html`** from the CD into a new empty folder on your hard-disk (the name of this folder is arbitrary; we suggest "`DISS 2.0`"). The Macintosh version does not require any further modification of the files and the *Database* is immediately ready to operate.

3.1.3. PC-users version

System requirements

Operating system: W9x or later running on a Pentium® or higher performance machine.

RAM: 16 Mb minimum, 32 Mb or more recommended.

Installing

To install the *Database* on your PC simply drag and drop, or copy and paste, the folders **`database`**, **`images`** and **`pages`** and the html file **`startup.html`** from the CD into a new empty folder on your hard-disk (the name of this folder is arbitrary; we suggest "`DISS 2.0`"). Since all files on the CD are read-only, the user must modify their properties to allow the system to operate correctly. To do this click *Start* > *Find* > *Files or Folders...*, set *name* "*.*", set *find in* "`C:\(folder name)`", check *Search* in the subfolder check-box, and click the *Find* button. Then select all files listed in the pick-list frame, right-click the selection and then click *Properties* from the pop-up menu. Unselect the *read-only* check-box and select the *archive* check-box. Click the *OK* button. This operation may take a while since over 4000 files and folders are being selected and modified at once.

3.2. USING THE *DATABASE* CARTOGRAPHIC INTERFACE

3.2.1. Generalities

This chapter contains detailed information on how to use each of the commands of the *Database*. It is organised into seven main sections, one for each of the menus in the *Database* menu bar. The menus are named *File*, *View*, *Tools*, *Source Info*, *Lineament Info*, *Scenarios* and *Maintenance* (fig. 3.1). In each of these sections all the dialogs of the corresponding menu will be described in the same order as they appear in the menu list. The heading of the section that describes a given command corresponds to the path that have to be used to run it. See section 2.2. for a description of the organisation of the *Database* and of the different tables that contain the data.

3.2.2. The *File* menu

The *File* Menu contains commands that allow the user to manage the output options of the *Database*, to exit the MapBasic® application (`DISS.mbx`, § 2.1.2.) and enter a "normal" MapInfo® session, or to exit the entire procedure (fig. 3.2).

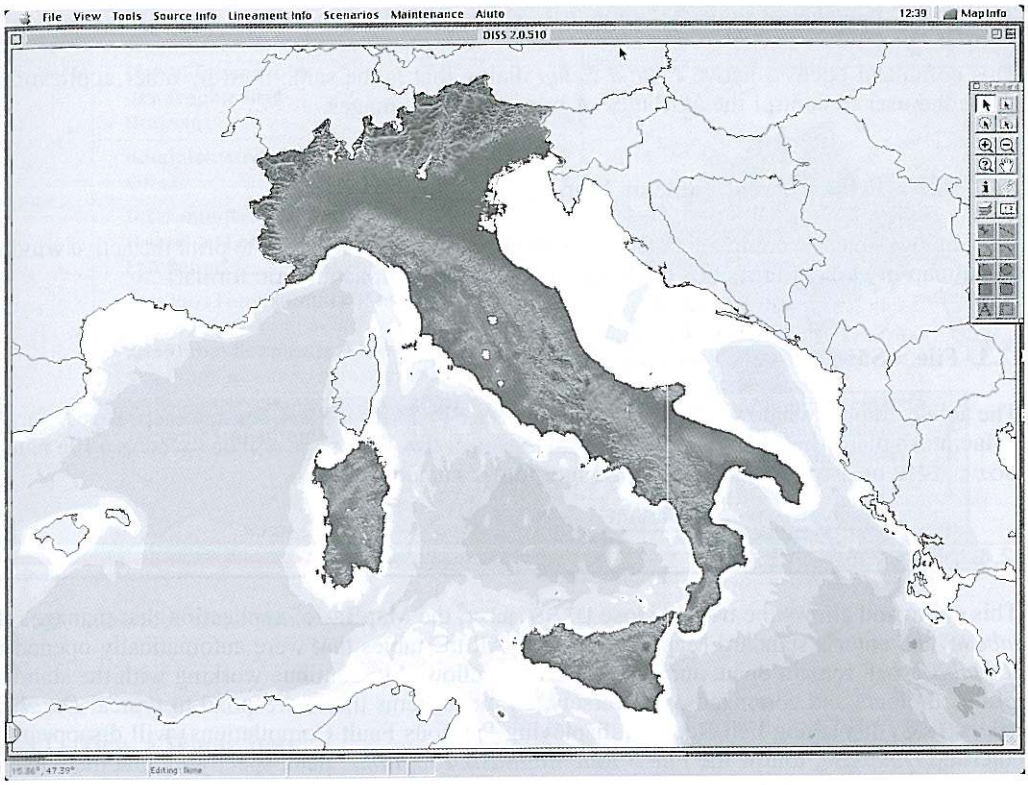

Fig. 3.1. Startup window of the *Database*.

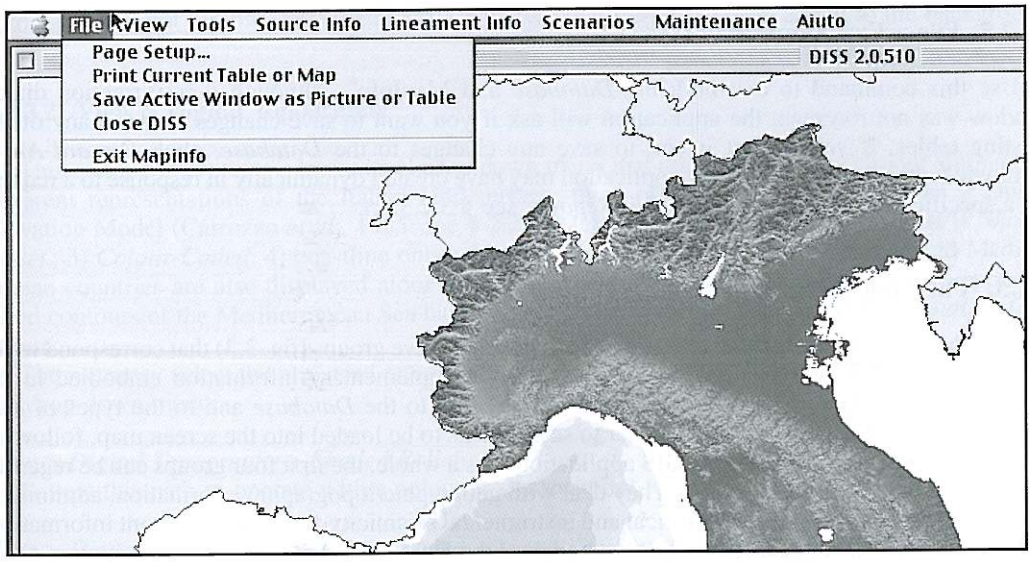

Fig. 3.2. Submenus of the menu "File".

3.2.2.1. File > Page setup...

This command opens a native *Printer Setup* dialog that is the same used by other applications. It allows the user to control the attributes of printed text or images.

3.2.2.2. File > Print Current Table or Map

This dialog opens the computer native *Print* dialog. Click the *OK* button to print the active window (either a map in graphic format or the browser of a table in alphanumeric format).

3.2.2.3. File > Save Active Window as Picture or Table

The active graphic window can be saved as an image in BMP or PICT format, respectively for PC and Macintosh platforms. A window will remind the user that the image will be saved as a file named `Export.BMP` or `Export.PICT` located in a folder named `Quakes`.

3.2.2.4. File > Close DISS

This command allows the user to close `DISS.mbx`, the MapBasic® application that manages the *Database*, and enter a standard MapInfo® session. All the tables that were automatically opened by the *Database* will remain open, and the user will be allowed to continue working with the standard MapInfo® toolbars and commands. Conversely, all menu items that correspond to typical *Database* functions (*e.g.*, displaying Felt Reports, displaying Previous Fault Compilations) will disappear. To re-enter the *Database*, follow the *File > Run MapBasic Program...* path, specifying that the name of the program is `DISS.mbx`.

3.2.2.5. File > Exit MapInfo®

Use this command to exit both the *Database* and MapInfo®. Although a confirmation dialog window was not foreseen, the application will ask if you want to save changes made to any of the existing tables. If you do not intend to save any changes to the *Database*, click *Discard All* to eliminate temporary tables that the application may have created dynamically in response to a request for a specific function *(e.g., View > Felt Reports*, see § 3.2.3.9.).

3.2.3. The *View* menu

This drop-down menu contains commands divided into five groups (fig. 3.3) that correspond to the different categories of seismological data and their complementary information embodied in the *Database* (see section 2.1. for a conceptual introduction to the *Database* and to the types of data contained in it). The menu allows the user to select items to be loaded into the screen map, following the typical multi-layer structure of GIS applications. As a whole, the first four groups can be regarded as the "cold body" of the *Database*. They deal with geographic/topographic information, administrative information, catalogues of historical and instrumental seismicity, and other pertinent information. The fifth group can be regarded as the "hot body" of the *Database* for it deals with information about the *Seismogenic Sources* and the *Tectonic Lineaments*.

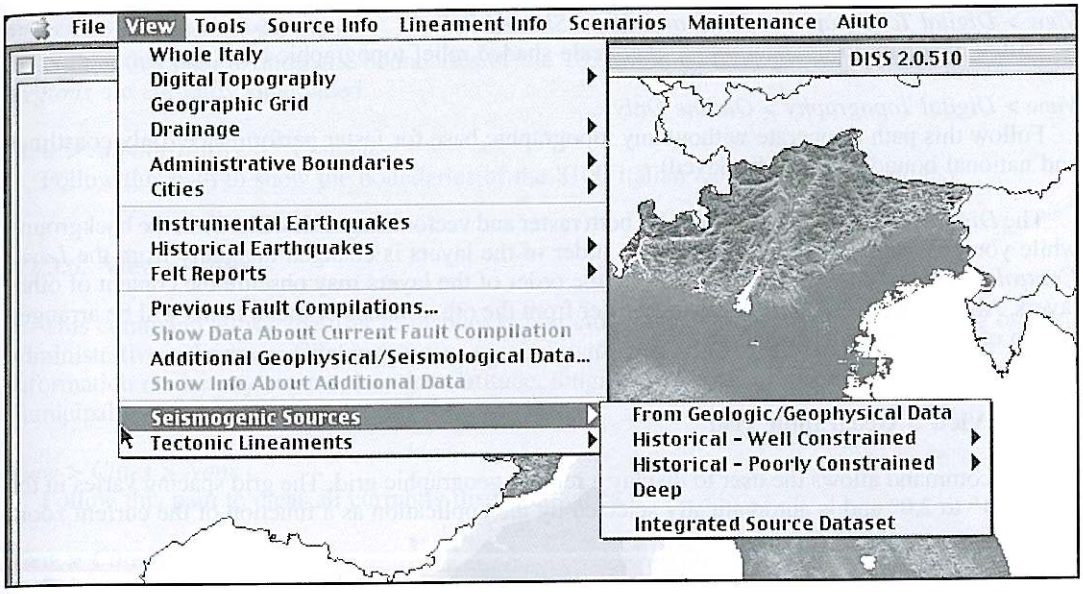

Fig. 3.3. Submenus of the menu "View".

3.2.3.1. View > Whole Italy

This command allows the user to zoom and centre the whole Italian territory in the active window. It is used to restore the startup conditions after manipulations involving zooming and panning. The command will not remove, hide, or modify any layer that may have been added to the background.

3.2.3.2. View > Digital Topography

This command prompts a lower level drop-down menu that allows the user to choose among four different representations of the Italian land-surface, three of which are obtained from a Digital Elevation Model (Carrozzo *et al.*, 1985; see § 2.2.5.3.1.): 1) *Colour Shaded Relief*; 2) *B/W Shaded Relief*; 3) *Colour-Coded*; 4) coastline only with no topography. Most of the European and Mediterranean countries are also displayed along with colour (for options 1 and 3) or B/W (for option 2) filled contours of the Mediterranean Sea bathymetry. No bathymetry is shown with the *Outline Only* option.

The user may select the preferred representation by clicking on one of the four items displayed in the drop-down menu:

View > Digital Topography > Shaded Relief
Follow this path to operate with a coloured shaded-relief topographic base.

View > Digital Topography > Colour Coded
Follow this path to operate with a colour-coded topographic base.

View > Digital Topography > Black and White Shaded Relief
Follow this path to operate with a grey-scale shaded relief topographic base.

View > Digital Topography > Outline Only
Follow this path to operate without any topographic base for faster performance (only coastlines and national boundaries are displayed).

The *Digital Topography* layer includes both raster and vector images. It will stay in the background while you browse the *Database* unless the order of the layers is changed manually from the *Layer Control* dialog window. Notice that altering the order of the layers may obscure the content of other layers. All the layers that are added by the user from the other menus or menu items will be arranged on top of the previously loaded layers.

3.2.3.3. View > Geographic grid

This command allows the user to display a regular geographic grid. The grid spacing varies in the range 0.1° to 2.0° and is automatically selected by the application as a function of the current zoom range.

3.2.3.4. View > Drainage

Three different options for the drainage network coverage can be displayed using this command. No additional information is supplied with these layers. All drainage is represented by thin blue lines (rivers) or solid blue regions (lakes).

View > Drainage > None
Follow this path to clear the active drainage coverage.

View > Drainage > Main rivers only
Follow this path to display the main Italian rivers and the main Italian lakes.

View > Drainage > Main and intermediate
Follow this path to display the main and intermediate Italian rivers and the main Italian lakes.

View > Drainage > Full drainage
Follow this path to display the full hydrographic network and the main Italian lakes.

3.2.3.5. View > Administrative boundaries

This command prompts the application to display one out of three classes of administrative boundaries. Clicking inside an outlined region with the *Object Info* tool (§ 3.2.4.8.) returns information on the corresponding administrative unit. The information supplied includes: full name, hierarchy level, "ISTAT code", and area (in km^2). All administrative boundaries are shown as thin black lines.

View > Administrative > Regions
Follow this path to show the boundaries of the 20 main administrative *Regions* into which the Italian territory is currently subdivided.

View > Administrative > Provinces
Follow this path to show the boundaries of the 103 administrative *Provinces* into which the 20 *Regions* are currently subdivided.

View > Administrative > "Comuni"
Follow this path to show the boundaries of the 8100 Italian *Comuni* (municipalities).

3.2.3.6. View > Cities

This command allows the user to display Italian cities selected from four classes based on their administrative relevance. Clicking a city symbol with the *Object Info* tool (§ 3.2.4.8.) returns information on the city's name, location (latitude, longitude), elevation above sea level, area (of the municipality, in km^2) and population.

View > Cities > None
Follow this path to clear all currently displayed cities.

View > Cities > Large Cities
Follow this path to display only large cities (capital cities of the administrative *Regions*). The symbol used is a solid violet circle.

View > Cities > Intermediate Cities
Follow this path to display only intermediate cities (capital cities of the administrative *Provinces*). The symbol used is a solid orange circle.

View > Cities > Small Towns ("Comuni")
Follow this path to display only small towns (capital cities of the Italian municipalities or *"Comuni"*). The symbol used is a solid yellow circle.

View > Cities > All Localities ("Frazioni")
Follow this path to display even the smallest localities (*"Frazioni"*). The symbol used is a solid light blue circle.

3.2.3.7. View > Instrumental Earthquakes

Use this command to display the catalogue of Italy's instrumental seismicity, which covers a 16 years time span from January 1985 to December 2000 and is taken from the official bulletin of the INGV seismometric network. Each earthquake is shown as a solid white circle, the diameter of which is proportional to the earthquake magnitude. Clicking one of these symbols with the *Object Info* tool returns the essential parameters of the earthquake (see § 2.2.5.2.1. for further details).

3.2.3.8. View > Historical Earthquakes

This command allows the user to display one of the catalogues of Italy's historical seismicity available at the end of the year 2000 (see § 2.2.5.2.2.). The three catalogues can be displayed either separately or together, and the earthquakes are shown with squares of different colour according to

the catalogue to which they belong (blue for the CFTI, purple for the NT, and red for the CPTI). The length of the sides of the squares is proportional to the earthquake magnitude. Clicking one of these symbols with the *Object Info* tool returns the essential parameters of the earthquake.

View > Historical Earthquakes > CFTI
Follow this path to display the earthquakes contained in the CFTI3 Catalogue (Boschi *et al.*, 2000).

View > Historical Earthquakes > NT
Follow this path to display the earthquakes contained in the NT 4.1.1 Catalogue (Camassi and Stucchi, 1997).

View > Historical Earthquakes > CPTI
Follow this path to display the earthquakes contained in the *Catalogo Parametrico dei Terremoti Italiani* (CPTI Working Group, 1999).

3.2.3.9. View > Felt Reports

This command allows the user to select and display the distribution of intensities associated with a specific historical earthquake according to the NT 4.1.1/DOM 4.1 and the CFTI3 catalogues. All the localities where any given earthquake was felt are pin-pointed with a little red flag labelled with a roman numeral indicating the intensity value that was assigned to it. Clicking the little flag with the *Object Info* tool (§ 3.2.4.8.) returns the full name and the geographic coordinates of the locality, and also the intensity reported for that site.

View > Felt Reports > Show Felt Reports (CFTI3)...
Follow this path to show the intensity distribution associated with earthquakes contained in the CFTI3 catalogue (Boschi *et al.*, 2000). A window will open allowing the user to select the earthquake of interest from a pick-list. If the active window is not centred on the epicentral region of the chosen earthquake the application automatically moves and resizes it.

View > Felt Reports > Show Felt Reports (NT, before 1900 AD)...
Follow this path to show the intensity distribution of earthquakes contained in the NT 4.1.1 catalogue (Camassi and Stucchi, 1997) that occurred prior to 1900 AD. A window will open allowing the earthquake of interest to be selected from a pick-list. If the active window is not centred on the epicentral region of the chosen earthquake the application automatically moves and resizes it.

View > Felt Reports > Show Felt Reports (NT, after 1900 AD)...
Follow this path to show the intensity distribution of earthquakes contained in the NT 4.1.1 catalogue (Camassi and Stucchi, 1997) that occurred since 1900 AD. A window will open allowing the earthquake of interest to be selected from a pick-list. If the active window is not centred on the epicentral region of the chosen earthquake the application automatically moves and resizes it.

View > Felt Reports > Clear Felt Reports
Follow this path to clear the currently displayed felt report and resume initial conditions in the active window.

3.2.3.10. View > Previous Fault Compilations...

This command allows the user to choose among a wide selection of maps representing fault compilations prepared and published by various investigators for different parts of Italy or, in a few cases, for the whole country. A pick-list is shown where the compilations are listed in geographical order, from north to south. The selected compilation is shown in its correct geographical position since all maps are georeferenced with the best accuracy allowed by their characteristics. The compilations are displayed above the topographic base but below all the other layers. This allows the user to overlay other layers of data, including the seismogenic sources, and compare them with the information shown in the compilation itself (see § 2.2.5.2.3. and 3.3.3.2. for further information). The complete list of the available *Previous Fault Compilations* is presented in Appendix III.

3.2.3.11. View > Show Data About Current Fault Compilation

This command is highlighted only when a *Previous Fault Compilation* is displayed. Follow this path to access information about the compilation (Year of publication, Title, Author(s), Reference(s)).

3.2.3.12. View > Additional Geophysical/Seismological Data...

This command can be used to display additional geophysical and/or seismological data. They include sets of complementary data that have been embedded into the *Database* to expand its capabilities. These datasets include the direction of minimum horizontal stress axes, a model of seismogenic zonation, the path of regional or local water divides, and others (see § 2.2.5.2.4. for further details). The dataset to be shown can be selected from a pick-list. When a set of additional data is displayed, the application highlights the command *Hide Selected Additional Data* that can be used to remove it from the active window. The complete list of the available *Additional Data* is presented in Appendix IV.

3.2.3.13. View > Show Info About Additional Data

This command is highlighted only when a set of additional data is displayed. Follow this path to access information about the *Additional Data* (Year of publication or compilation, Description, Author(s), Reference(s)).

3.2.3.14. View > Seismogenic Sources

This command gives access to a lower level drop-down menu that deals with the main and original body of information embedded into the *Database*. The seismogenic sources are divided into six main categories (*From Geologic/Geophysical Data*; *Historical-Well Constrained with Geological Background*; *Historical-Well Constrained, no Geological Background*; *Historical-Poorly Constrained with Geological Background*; *Historical-Poorly Constrained, no Geological Background*; *Deep*), and can be displayed separately or simultaneously (see § 2.2.3. for further details and a description of each individual source type). To retrieve all the information available in the *Database* concerning each source the user must first select the source by clicking into its map symbol, then select an item from

the *Source Info* drop-down menu (see § 3.2.5.). The essential source parameters may also be viewed through the *Object Info* tool (§ 3.2.4.8.).

View > Seismogenic Sources > From Geologic/Geophysical Data
Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Geologic/Geophysical* category (see § 2.1.3., 2.2.3.1., and 3.3.2.1. for a comprehensive description of this source type). Each seismogenic source will be displayed as a yellow rectangle and a yellow line parallel to one side of it. The first represents the surface projection of the fault plane with its size and orientation; the second represents its cut-off. Coseismic fault scarps are represented as red barbed lines (with barbs on the down-thrown block).

View > Seismogenic Sources > Historical-Well Constrained
Sources of this category are divided into two sub-sets that can be displayed separately or at the same time (see § 2.1.3., 2.2.3.2., 2.2.3.3., 3.3.2.2. and 3.3.2.3. for a comprehensive description of this source type). Since sources of this type derive exclusively from good quality intensity data using the method of Gasperini *et al.* (1999), their orientation is calculated but their plunge and dip are unknown. They are represented as oriented and scaled rectangular boxes.

View > Seismogenic Sources > Historical-Well Constrained > with Geological Background
Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Historical-Well Constrained with Geological Background* category. Sources of this category are shown in blue to highlight them with respect to the remaining intensity-based sources.

View > Seismogenic Sources > Historical-Well Constrained > no Geological Background
Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Historical-Well Constrained, no Geological Background* category. Sources of this category are shown in black.

View > Seismogenic Sources > Historical-Well Constrained > ... both
Follow this path to display simultaneously the two previous source types.

View > Seismogenic Sources > Historical-Poorly Constrained
Sources of this category are divided into two sub-sets that can be displayed separately or at the same time (see § 2.1.3., 2.2.3.4., 2.2.3.5., 3.3.2.2., and 3.3.2.3. for a comprehensive description of this source type). Sources of this type derive exclusively from intensity data using the method of Gasperini *et al.* (1999), but in this case the quality of the solution was not good enough to allow their representation as oriented rectangular boxes. For this reason they are shown as scaled circles.

View > Seismogenic Sources > Historical-Poorly Constrained > with Geological Background
Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Historical-Poorly Constrained with Geological Background* category. Sources of this category are shown in blue to highlight them with respect to the remaining intensity-based sources.

View > Seismogenic Sources > Historical-Poorly Constrained > no Geological Background
Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Historical-Poorly Constrained, no Geological Background* category. Sources of this category are shown in black.

View > Seismogenic Sources > Historical-Poorly Constrained > ... both
Follow this path to display simultaneously the two previous source types.

View > Seismogenic Sources > Deep

Follow this path to display in a dynamic layer of the cartographic interface the seismogenic sources belonging to the *Deep* category (see § 2.1.3., 2.2.3.6., and 3.3.2.4. for a comprehensive description of this source type). Sources of this category are shown as open purple scaled hexagons.

View > Seismogenic Sources > Integrated Source Dataset

Since there may exist multiple solutions for the same physical seismogenic sources (see § 2.2.3.7. for a discussion on this subject), use this command to display all and only the set of sources that is "preferred" by the compilers of the *Database*.

3.2.3.15. View > Tectonic Lineaments

This command gives access to a lower level drop-down menu that allows the user to display the *Tectonic Lineaments*. These are linear tectonic features taken from published literature (see § 2.2.3.10.); they are shown as yellow dashed lines. To retrieve information about a lineament the user must first select it by clicking on its map symbol, then select an item from the *Lineament Info* drop-down menu (see § 3.2.6.).

View > Tectonic Lineaments > Transverse Tectonic Lineaments

Follow this path to show only the linear tectonic features that lie perpendicular to the general trend of the main seismogenic sources.

View > Tectonic Lineaments > Generic Tectonic Lineaments

Follow this path to show all the other lineaments.

View > Tectonic Lineaments > ... both

Follow this path to display simultaneously the two previous types of lineaments.

3.2.4. The *Tools* menu

The *Tools* menu allows the user to access to the main tools and commands available for a typical working session with the *Database* (fig. 3.4). The same tools plus other specific MapInfo® tools are also displayed in the MapInfo® Standard Button Pads that are made available upon startup. For a detailed description of the tools of the Standard Button Pad see the MapInfo® User Guide.

3.2.4.1. Tools > Select

There are three basic commands for making selections from the screen; when multiple layers are laid on top of the other only the topmost is available for selection. Experienced users may reverse the order of layers through the Layer Control command of the Standard Button Pad bringing at the top the one they are interested in. The three commands *Select Individual Objects*, *Select Over Rectangular Area*, and *Select Over Circular Area* respectively correspond to the *Select*, *Marquee Select* and *Radius Select* buttons of the Standard Button Pad. When one or more objects are selected the *Database* creates a temporary list that can be browsed and saved like any other table.

Tools > Select > Select Individual Objects

Use this command to select an individual seismogenic source, tectonic lineament or any other

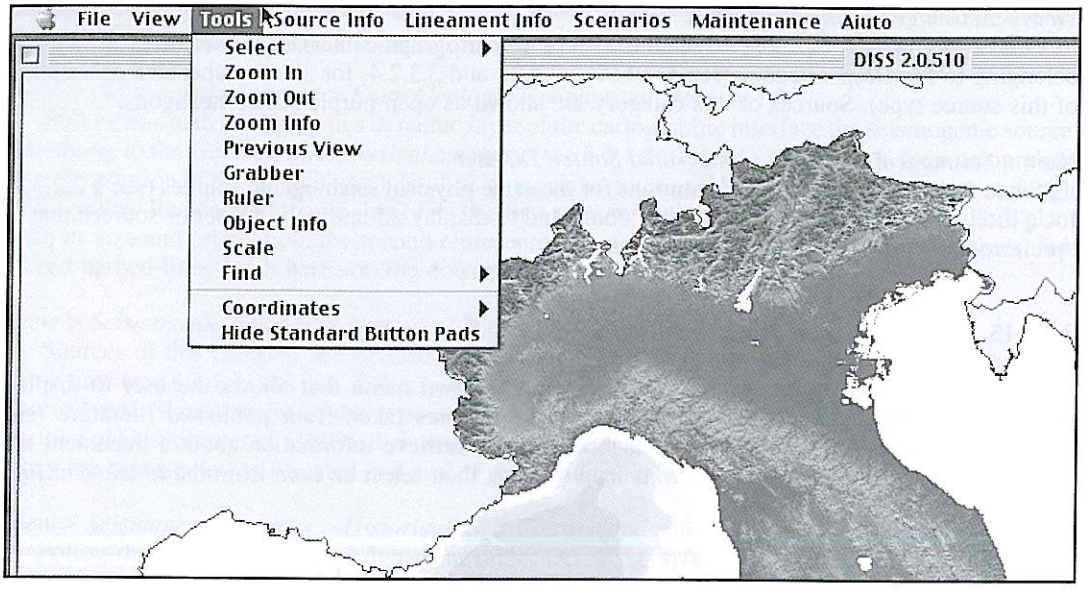

Fig. 3.4. Submenus of the menu "Tools".

currently displayed selectable object by clicking on it with the arrow cursor. Holding down the Shift key while clicking allows for multiple (one-by-one) selections.

Tools > Select > Select Over Rectangular Area
Use this command to select more than one object over a rectangular area.

Tools > Select > Select Over Circular Area
Use this command to select more than one object over a circular area.

Tools > Select > Browse Selection
Use this command to browse the attributes of the selected items through an alphanumeric table.

Tools > Select > Save Selection
This command allows a specific selection to be saved as a MapInfo® table file; when used a pop-up window appears showing the folder and the name of the saved file.

Tools > Select > Print Selection
Use this command to print out the selection.

3.2.4.2. Tools > Zoom In

This command provides a closer view of a map. When used the cursor takes the shape of a lens with a plus sign within it. The user can either click the zoom-in cursor in an area to magnify it by a

factor of two (this point will became the centre of the zoomed-in view), or drag the cursor over a rectangular area. This area will be enlarged to fit the active window. This command corresponds to the *Zoom-in* button of the Standard Button Pad.

3.2.4.3. Tools > Zoom Out

This command provides a more distant view of a map. When used the cursor takes the shape of a lens with a minus sign within it. The user can either click the zoom-out cursor in an area to reduce it by a factor of two (this point will became the centre of the zoomed-out view), or drag the cursor over a rectangular area. The active window will be reduced to fit this area. This command corresponds to the *Zoom-out* button of the Standard Button Pad.

3.2.4.4. Tools > Zoom Info

This command allows the user to set a specific scale for the active window manually. A *Change View* dialog window will open where the values of the window width (or the map scale) and the coordinates of the centre of the window can be typed in. This command corresponds to the *Change View* button of the Standard Button Pad.

3.2.4.5. Tools > Previous View

This command allows the user to get back to the latest view of the currently active map window prior to any change in map scale or position of the map centre.

3.2.4.6. Tools > Grabber

This command allows the user to reposition a map within its window. When used the cursor takes the shape of a hand. To move a map click on it, hold down the mouse button and drag the cursor in the desired direction; releasing the mouse button will cause the map to be redrawn at the new location. This command corresponds to the *Grabber* button of the Standard Button Pad.

3.2.4.7. Tools > Ruler

This command allows the user to determine the distance between two points or the cumulative distance along a multi-segment path. When used the cursor takes the shape of a cross and a *Ruler Window* opens. The *Ruler Window* displays the distance that the ruler is currently measuring and the total of all the distances measured at each segment increment. Double-click to stop measuring. This command corresponds to the *Ruler* button of the Standard Button Pad.

3.2.4.8. Tools > Object Info

This command allows the user to view the attributes associated with map objects. When used the cursor takes the shape of a cross. Click on any selectable object to open a window showing the list of attributes. This command corresponds to the *Info Tool* button of the Standard Button Pad.

3.2.4.9. Tools > Scale

This command allows the user to display a graphical scale at the lower left corner of the active window; the graduation changes according to the current level of magnification of the map.

3.2.4.10. Tools > Find

This command prompts a lower level drop-down menu which lists the several options illustrated below. It can be used to locate a specific historical earthquake, a city/town or a seismogenic source. In case of ambiguity the application opens a dialog box showing all database entries that correspond to the given input.

Tools > Find > an Earthquake by Year in CFTI
Use this command to locate an earthquake listed in the CFTI3 catalogue by the year of its occurrence. A dialog window will prompt the user to enter the year of the earthquake to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > an Earthquake by Year in CPTI
Use this command to locate an earthquake listed in the CPTI catalogue by the year of its occurrence. A dialog window will prompt the user to enter the year of the earthquake to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > an Earthquake by Year in NT
Use this command to locate an earthquake listed in the NT 4.1.1 catalogue by the year of its occurrence. A dialog window will prompt the user to enter the year of the earthquake to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > a Small City (Comune) by Name
Use this command to locate a small city (*Comune*) by its name. A dialog window will prompt the user to enter the name of the small city to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > a Small Locality (Frazione) by Name
Use this command to locate a small locality (*Frazione*) by its name. A dialog window will prompt the user to enter the name of the small locality to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > a Seismogenic Source by Name
Use this command to locate a seismogenic source belonging to either of the six source types by its full conventional name (`SourceName`). A dialog window will prompt the user to enter the conventional name of the source to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

Tools > Find > a Seismogenic Source by Code
Use this command to locate a seismogenic source belonging to either of the six source types by its numerical identifier (`IDSource`). A dialog window will prompt the user to enter the identifier of the source to be looked for. Click the *OK* button to start searching or the *Cancel* button to quit.

3.2.4.11. Tools > Coordinates

Use this command to choose between two different coordinate systems. Selecting a different coordinate system will affect the indication of the "cursor location" (shown at the left-hand side of the *Status Bar* at the bottom of the active window) and all the coordinates of any of the objects displayed by the application.

Tools > Coordinates > Geographic (ED 50)
Follow this path to choose the geographic coordinates of the ED50 (European Datum 1950) system.

Tools > Coordinates > Kilometric (UTM Zone 32)
Follow this path to choose the kilometric coordinates of the UTM Zone 32.

3.2.4.12. Tools > Show[Hide] Standard Button Pads

This command allows the user to show or hide the MapInfo® Standard Button Pads. The use of the Standard Button Pads is recommended to experienced users that want to access additional native MapInfo® functions directly from within the *Database*.

3.2.5. The *Source Info* menu

Use this drop-down menu to access the main body of information of the *Database* (fig. 3.5). To get information on a specific seismogenic source select it with the *Select* cursor and browse the *Source*

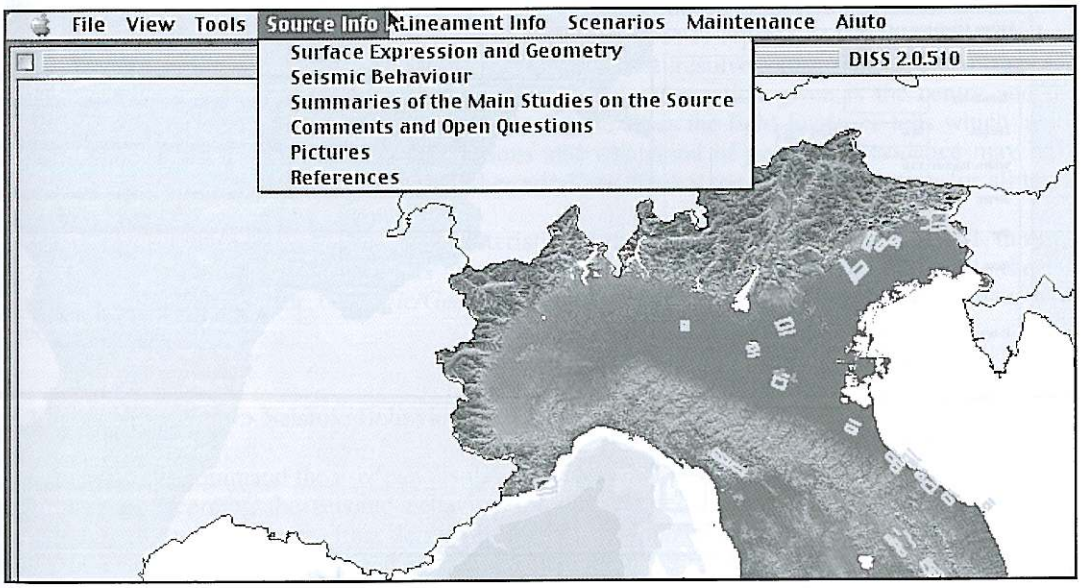

Fig. 3.5. Submenus of the menu "Source Info".

Info menu; note that if no one of the seismogenic source is selected, none of the commands is highlighted (see § 2.2.3. for a detailed description of the source types and of the associated tables containing geometric and kinematic parameters and earthquake recurrence properties).

3.2.5.1. Source Info > Surface Expression and Geometry

Through this command the user can display a window that supplies the main geometric and kinematic parameters of the source and informs about the evidence that was used by the compiler to constrain them. The title bar of the window contains the full source name (`SourceName`) and identifier (`IDSource`) (fig. 3.6).

Information contained in individual fields

The field *Source Type* tells the category to which the selected source belongs. The field *Reliability* tells how much confidence the compiler(s) put in the decisions made in reviewing the scientific material on the source.

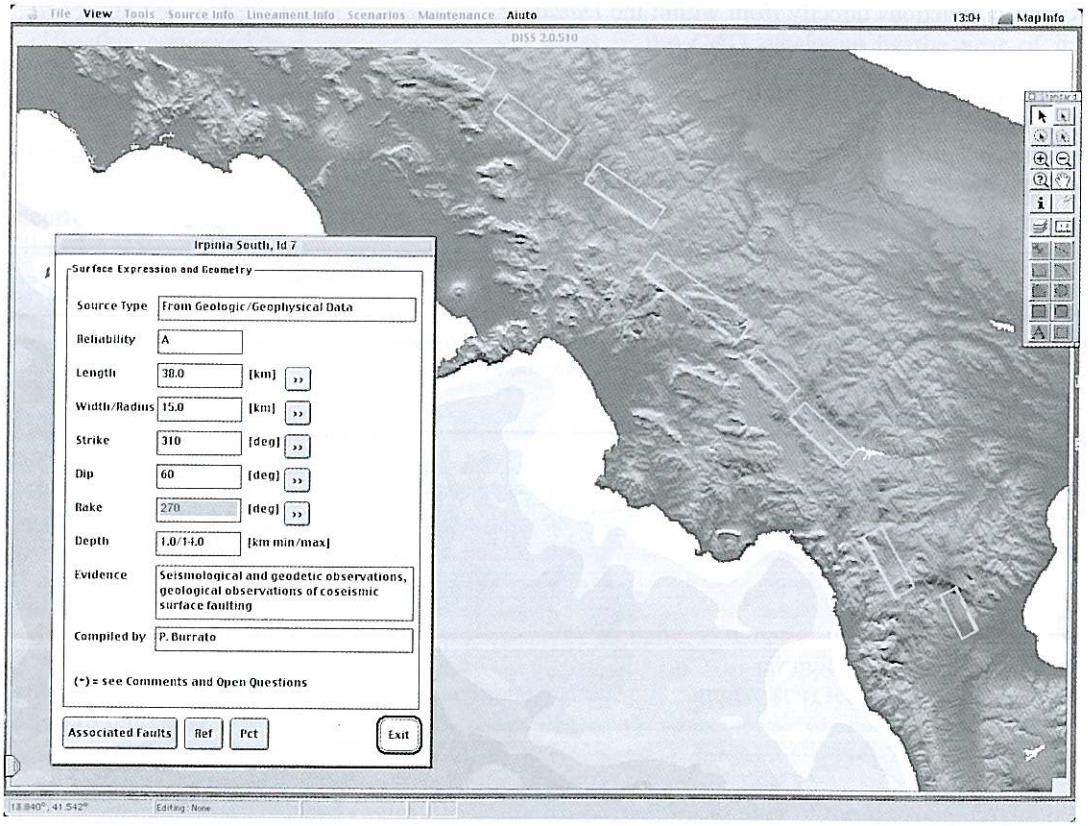

Fig. 3.6. View of the dialog box "Surface Expression and Geometry".

The fields *Length* and *Width/Radius* supply the conventional size of the seismogenic source. Notice that, depending on source type, this parameter could have been derived directly (*e.g.*, from field observations of coseismic faulting in conjunction with instrumental data), or derived from the inferred equivalent moment-magnitude of a historical earthquake following the relationships by Wells and Coppersmith (1994). *Strike* and *Dip* define the orientation of the source.

The field *Rake* indicates the expected type of motion on the fault plane.

The field *Depth* indicates the minimum and maximum depth of faulting as inferred from all the available data.

Finally, the field *Evidence* tells the user what are the main observations and constraints that were used to describe the surface expression and the geometry of the source.

Each of the buttons located to the right of the various fields of this window and marked by >> retrieves from the table `Assign_References.tab` the specific reference from which the information displayed was obtained (the software link that underlies this functionality is described in § 2.2.4.4. and 4.1.4.). Notice that this piece of information is optional: the default is "Compilers of this Database". New links become operational during the *Maintenance* operations (see section 4.5.).

Information contained in pop-up windows

When the source is associated with a surface faulting event, either historical or pre-historical, the associated fault scarps are also shown in the map with a hachured red line. In this case the button *Associated Faults* is highlighted. Clicking this button opens a window that lists all surface ruptures associated with the given source along with the reference for each individual rupture.

The buttons *Ref* and *Pct* open windows that lists all references and all pictures available for the selected source, respectively. These two important functionalities are described in detail in the following § 3.2.5.5. and 3.2.5.6.

Since different datasets are associated with different types of sources, the corresponding fields of this window are not always filled. For example, for sources entirely derived from intensity data the *dip*, *rake*, and *depth* fields are empty and the source is represented as a rectangular box with no constraints on its plunge and dip. For the least resolved historical sources also the fields *Length* and *Strike* are empty and the only spatial information given is the centre and the radius of a source represented as a circle. In all of these cases the field *Evidence* tells which historical catalogue was adopted for the calculations and what kind of geological evidence may have helped in constraining the source. All the other windows display the same information for all types of sources.

Notice also that due to the intrinsic characteristics of the different source types (§ 2.2.3.1. through 2.2.3.6.) the *Associated faults* button is always disabled for intensity-based sources, while the *Pct* button is enabled only for *Geologic/Geophysical* sources and for intensity based sources with Geological Background.

3.2.5.2. Source Info > Seismic Behaviour

Through this command the user can display a window that provides the available information and hypotheses concerning the seismic behaviour of the selected source. In general the parameters reported in this window were either derived from published material or inferred from it or from other lines of evidence, in which case it is implied that they were calculated by the compilers. This circumstance is normally indicated next to the relevant estimate (*e.g.*, "*Average Displacement: 0.7 m (calculated from Mo)*") (fig. 3.7).

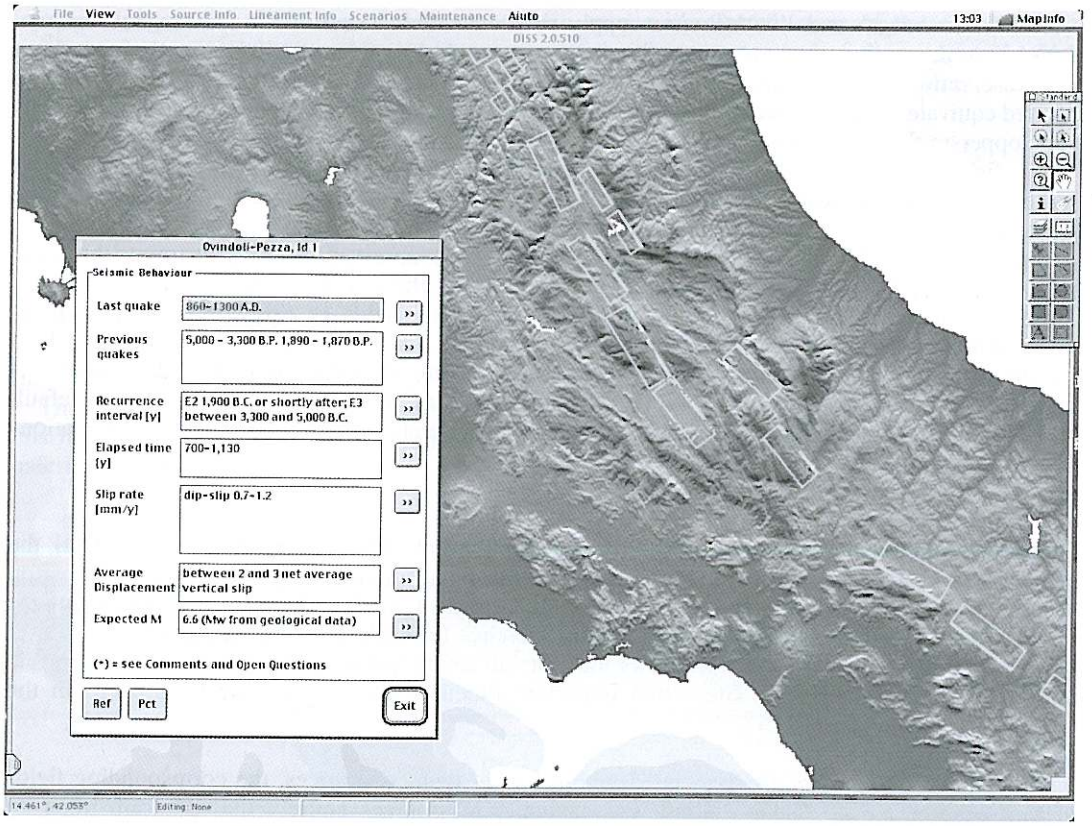

Fig. 3.7. View of the dialog box "Seismic Behaviour".

Information contained in individual fields

For sources belonging to the *Geologic/Geophysical* category the different fields of the window are often filled with directly derived information.

If the source is associated with a known surface faulting event, the *Average Displacement* field supplies also the average height of the fault scarp.

The *Recurrence Interval* and *Slip Rate* fields are filled with direct information from trenches or indirect information from geomorphic modelling or other geological constraints.

In the case of sources derived from intensity data the *Seismic Behaviour* window supplies information only about the earthquake with which the source is associated (*Last quake*), the time elapsed since its occurrence *(Elapsed time)* and the estimated earthquake magnitude (*Expected M,* which shows an equivalent magnitude taken from a catalogue).

The other seismic parameters can not be calculated/inferred from the intensity data only and the corresponding fields show the clause "not applicable".

Each of the buttons located to the right of the various fields of this window and marked by >> retrieves from the table `Assign_References.tab` the specific reference from which the information displayed was obtained (the software link that underlies this functionality is described in

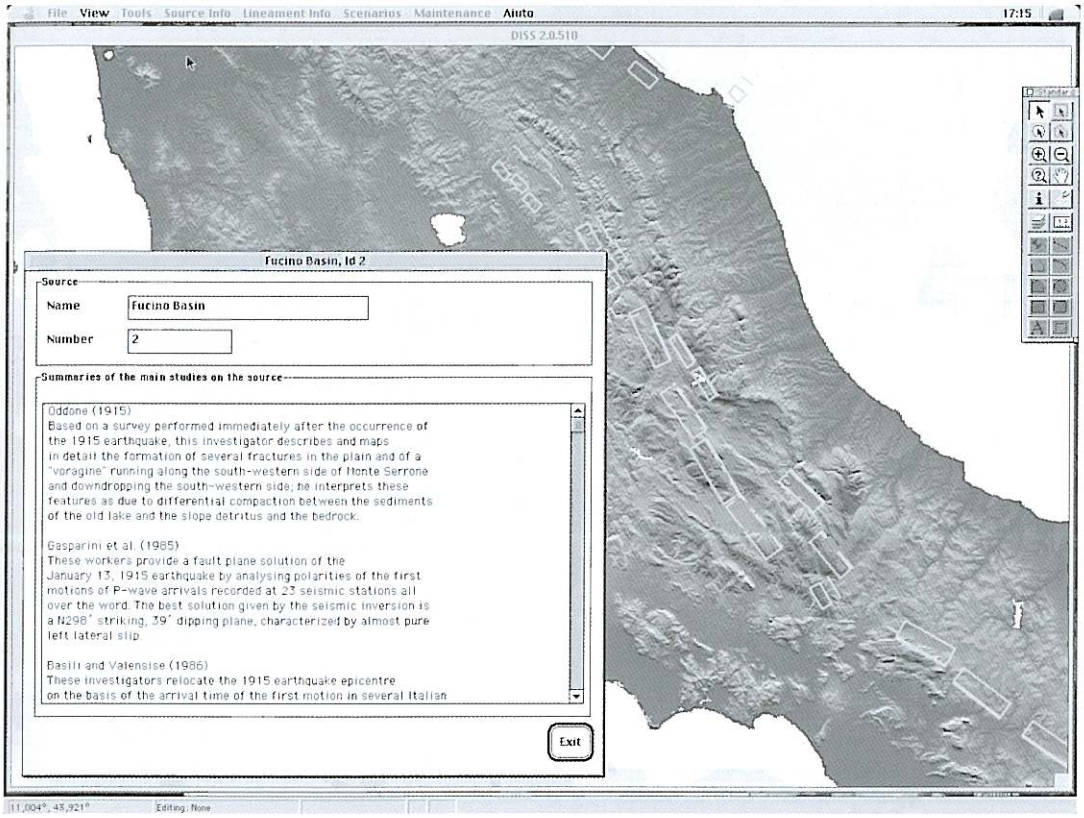

Fig. 3.8. View of the dialog box "Summaries of the main studies on the source".

§ 2.2.4.4. and 4.1.4.). Notice that this piece of information is optional: the default is "Compilers of this Database". New links become operational during the *Maintenance* operations (see section 4.5.).

Information contained in pop-up windows

Similarly to the case of the *Surface Expression and Geometry* window, also this window includes two buttons (*Ref* and *Pct*) that allow direct access to all the references and all the pictures available for the selected source. These two important functionalities are described in detail in the following § 3.2.5.5. and 3.2.5.6.

3.2.5.3. Source Info > Summaries of the Main Studies on the Source

Through this command the user can display a window that contains a full list of summaries of the papers dealing with the identification and characterisation of the selected source, with reference both to geologic evidence and to the associated seismicity (see § 2.2.5.1.). This section gives the reader the opportunity to evaluate the level at which the source has been studied by specialists and provides an overview of the main approaches that have been used to identify and characterise the source itself (fig. 3.8).

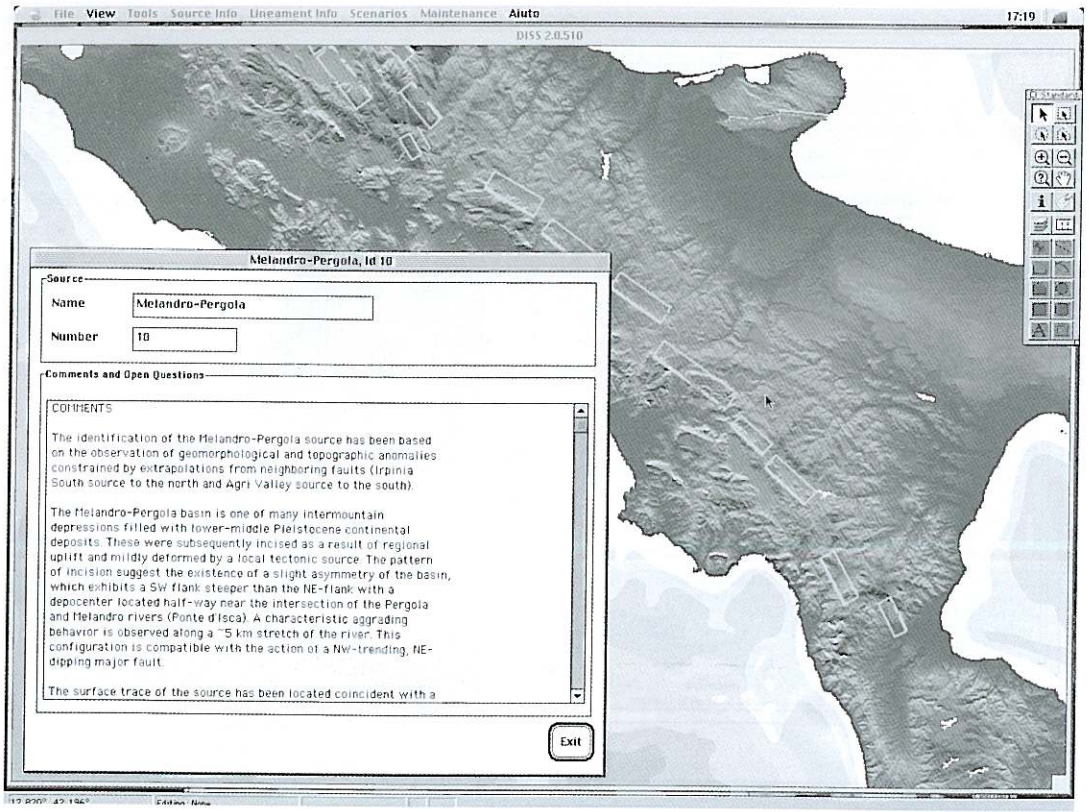

Fig. 3.9. View of the dialog box "Comments and open questions".

3.2.5.4. Source Info > Comments and Open Questions

Through this command the user can display a window that presents descriptions and comments concerning what the compiler has or has not found in the literature, the main debated points and the questions that remain open (see § 2.2.5.1.). Unlike the previous case, where previous work is simply presented and summarised objectively, this section is entirely based on personal judgement and as such it forms the "core" of the analysis and the starting point for further investigations (fig. 3.9).

3.2.5.5. Source Info > Pictures

This command opens a dialog box that allows the user to browse through the iconography associated with a given source. The total number of pictures available for the selected source appears on the title bar of the dialog box. The dialog box consists of two frames: the upper frame contains the name and identifier of the selected source, while the lower frame shows the picture title. Picture titles may be browsed using the arrow buttons at the bottom of the window. To display the selected picture

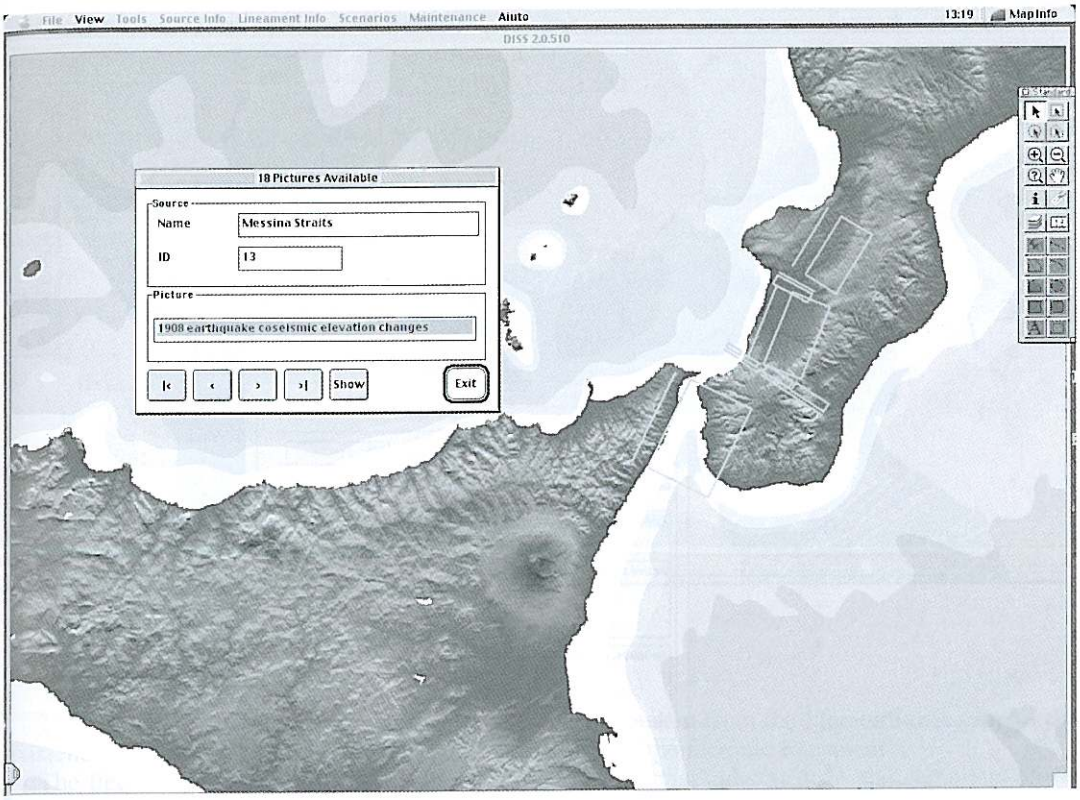

Fig. 3.10. View of the dialog box "Pictures".

in a child-window click the *Show* button, then repeat the procedure for other pictures or exit the dialog box to bring them in the foreground and view them in detail. The pictures supplied with the *Database* represent a selection of pictures that are reprinted or modified from published papers, such as geological maps, cross-sections, trench-wall logs, photographs and others significant drawings, in addition to original pictures prepared specifically to describe the source at hand (fig. 3.10).

3.2.5.6. Source Info > References

This command opens a dialog window that allows the user to browse through a full list of references concerning the source. The total number of references available for the selected source appears on the title bar of the dialog box. The dialog window consists of two frames: the upper frame contains the name and identifier of the selected source and the identifier of the reference, while the lower frame shows the full reference. For each reference the following information is provided: author(s), year of publication, title, journal/book. The list can be browsed using the arrow buttons at the bottom of the window. Notice that the reference identifier (`Code_referenceID`, shown as *Ref*

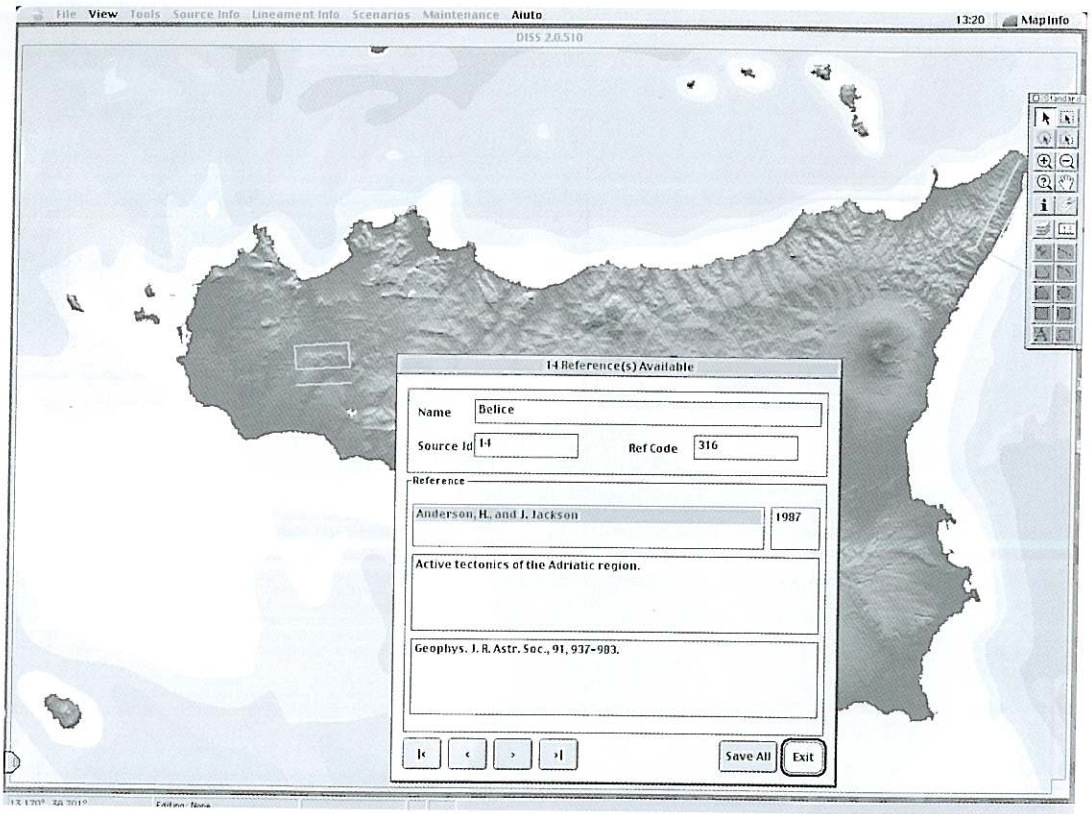

Fig. 3.11. View of the dialog box "References".

Code in the dialog box) allows any user to locate the paper in the INGV hard-copy archive. The full list of references available for the selected seismogenic source can also be saved as an ASCII file with the *Save All* button (a pop-up window will appear showing the full path-name of the file where the references are saved) (fig. 3.11).

3.2.6. The *Lineament Info* menu

Use this drop-down menu to access the information regarding the *Tectonic Lineaments* (see § 2.2.3.10. for a detailed description of the *Tectonic Lineaments* and of the associated tables) (fig. 3.12). To get information on a specific lineament select it with the cursor and browse the *Lineament Info* menu; note that if none of the lineaments is selected, none of the menu items is highlighted.

3.2.6.1. Lineament Info > Main Features

Through this command the user can open a window that supplies the name and reliability of the selected tectonic lineament.

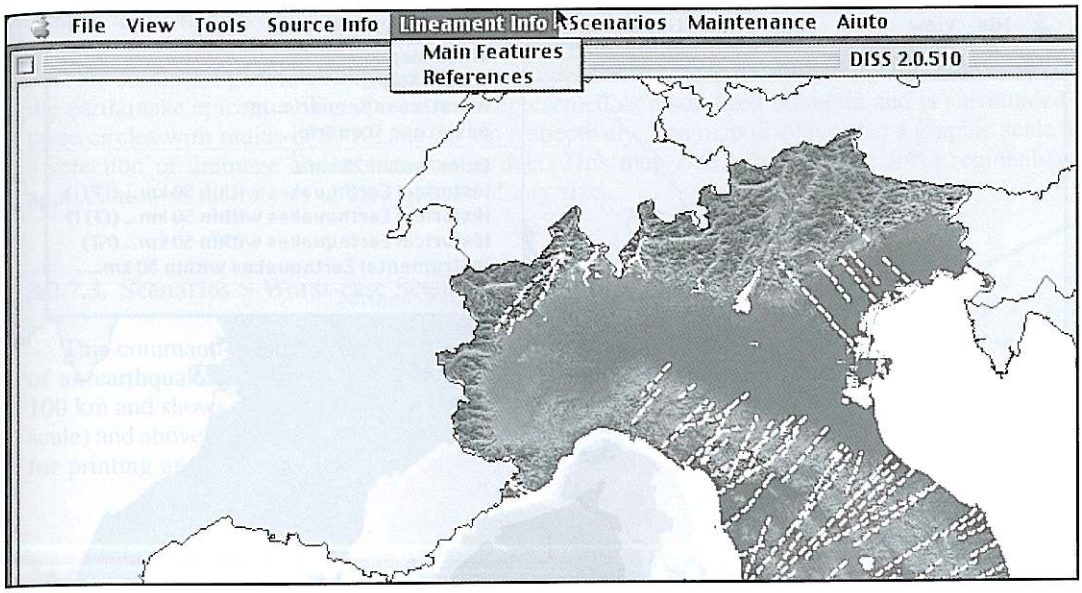

Fig. 3.12. Submenus of the menu "Lineament Info".

The field *Evidence* reports the basic geologic evidence taken from the literature that support the existence, the location and the geologic time of activity of the tectonic lineament.

The field *Notes* lists a series of comments based on personal judgement by the compilers of the *Database*.

3.2.6.2. Lineament Info > References

This command opens a dialog window that allows the user to browse through a full list of references concerning the lineament. The total number of references available for the selected lineament appears on the title bar of the dialog window. The dialog window consists of two frames: the upper frame contains the name and identifier of the selected source and the identifier of the reference, while the lower frame shows the full reference. For each reference the following information is provided: author(s), year publication, title, journal/book. The list can be browsed using the arrow buttons at the bottom of the window. Notice that the reference identifier (`Code_referenceID`, shown as *Ref Code* in the dialog box) allows any user to locate the paper in the INGV hard-copy archive. The full list of references available for the selected lineament can also be saved as an ASCII file with the *Save All* button (a pop-up window will appear showing the full path-name of the file where the references are saved).

3.2.7. The *Scenarios* menu

This drop-down menu allows the user to create simple scenarios of the expected consequences of either a real or a hypothetical normal-depth (upper crustal) earthquake of given magnitude and

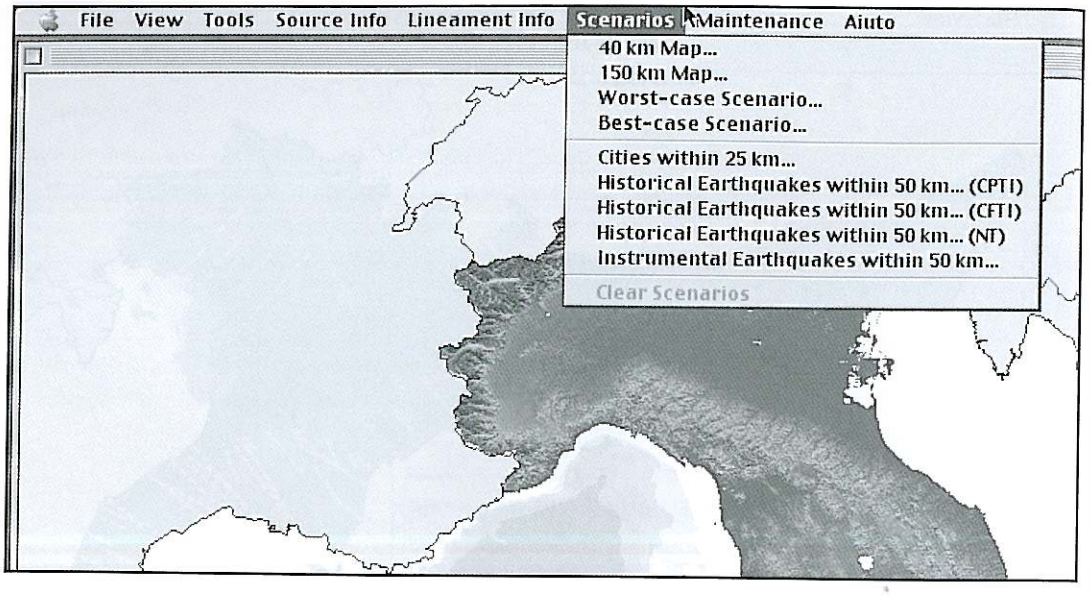

Fig. 3.13. Submenus of the menu "Scenarios".

epicentral location (fig. 3.13). The user can construct different maps showing cities and historical seismicity falling close to epicentral area, as well as the intensities expected at the nearest towns. Maps generated with the *Scenarios* tool can be saved as MapInfo® tables or printed to create ready-to-use reports. The shaking scenarios are calculated starting from two built-in empirical attenuation relationships (denominated *best-case* and *worst-case*) derived from more than 31 000 felt reports listed in the CFTI historical catalogue, version 2 (Boschi *et al.*, 1997). All scenarios created with commands from this menu can be complemented by any of the information contained in the *Database* (*e.g.*, seismogenic sources to emphasise the spatial relationships between them and an earthquake that just occurred; administrative boundaries, to highlight the administrative bodies that will be affected by a specific event; etc.).

All commands illustrated below open an *Input/Confirm Earthquake Data* dialog window prompting the user to type in the epicentre of the earthquake (latitude and longitude), its magnitude and its origin time. Subsequently, two dialog boxes present the options of printing and/or saving the map (these operations can also be done later, after having analysed the actual map on the screen or having modified/complemented it, through the submenus *Print Current Table or Map* and *Save Active Window as Picture or Table*, see § 3.2.2.2. and 3.2.2.3.).

3.2.7.1. Scenarios > 40 km Map...

This command generates a map with a width of 40 km, scaled to fit the window, and centred on the earthquake epicentre. The epicentre is represented as a solid red diamond and is surrounded by three circles with radius of 2.5, 5, and 10 km respectively. The map displays also a graphic scale and a selection of drainage and administrative data. This map size is suitable for exploring details of the topography and settlement distribution of the epicentral region.

3.2.7.2. Scenarios > 150 km Map...

This command generates a map with a width of 150 km, scaled to fit the window, and centred on the earthquake epicentre. The epicentre is represented as a solid red diamond and is surrounded by three circles with radius of 5, 10, and 20 km respectively. The map displays also a graphic scale and a selection of drainage and administrative data. This map size is appropriate for a regional-scale appreciation of the effects of earthquakes of any size.

3.2.7.3. Scenarios > Worst-case Scenario...

This command generates a map showing the worst-case scenario for the expected consequences of an earthquake of assigned epicentral location and magnitude. The map has a window width of 100 km and shows all the *Small towns* that would experience intensity III (Mercalli-Cancani-Sieberg scale) and above, labelled with roman numerals (fig. 3.14). The application then presents dialog boxes for printing and/or saving the map.

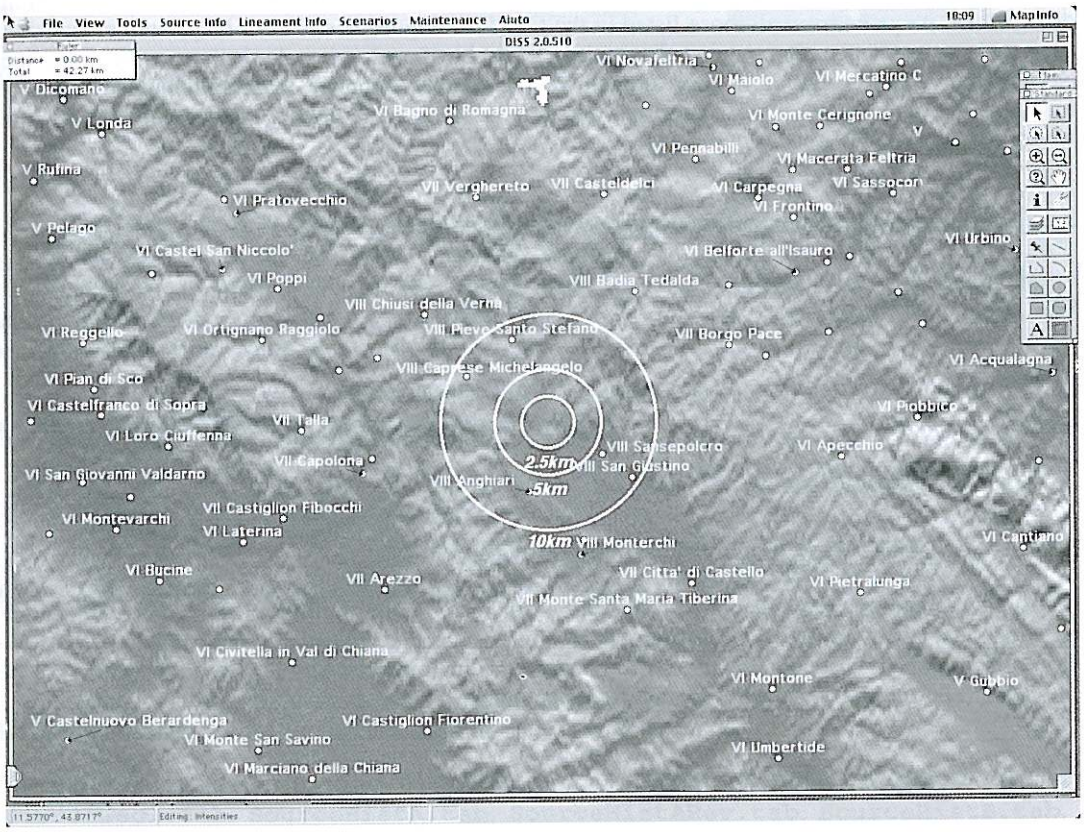

Fig. 3.14. Sample of "worst-case scenario" for an imaginary M 5.2 earthquake.

3.2.7.4. Scenarios > Best-case Scenario...

This command generates a map showing the best-case scenario for the expected consequences of an earthquake of assigned epicentral location and magnitude. The map has a window width of 100 km and shows all the *Small towns* that would experience intensity III (Mercalli-Cancani-Sieberg scale) and above, labelled with roman numerals. The application then presents dialog boxes for printing and/or saving the map.

3.2.7.5. Scenarios > Cities within 25 km...

This command creates a list of all small towns (*Comuni*) falling within 25 km of the epicentre. For each town the list includes the full name, the province, latitude and longitude, population, distance from the epicentre, and the intensity expected for the best-case and worst-case scenarios. The application then presents dialog boxes for printing and/or saving the map.

3.2.7.6. Scenarios > Historical Earthquakes within 50 km... (CPTI)

This command extracts all the historical earthquakes falling within 50 km of the epicentral location of a given earthquake from all those listed in the CPTI catalogue. The list can be printed or saved at the user's convenience. It contains the main geographical and seismological parameters of the earthquakes, such as origin time, nearest locality, epicentral coordinates, maximum intensity, magnitude, number of available intensity reports, source radius, ID, and acronym of the historical catalogue where the earthquake is listed.

3.2.7.7. Scenarios > Historical Earthquakes within 50 km... (CFTI)

This command performs the same task as that of the previous command (see § 3.2.7.6.), but in this case the earthquakes are taken from the CFTI3 catalogue.

3.2.7.8. Scenarios > Historical Earthquakes within 50 km... (NT)

This command performs the same task as that of the previous two commands (see § 3.2.7.6.), but in this case the earthquakes are taken from the NT 4.1.1 catalogue.

3.2.7.9. Scenarios > Instrumental Earthquakes within 50 km...

This command extracts all the instrumental earthquakes falling within 50 km of the epicentral location of a given earthquake from all those contained in the INGV instrumental bulletin. The resulting earthquake list contains the main seismological parameters. Similarly to all previous cases, the list can be printed or saved at the user's convenience.

3.2.7.10. Scenarios > Clear Scenarios

This command clears any previously created scenarios and returns to the standard interface of the *Database*.