Advanced School on Non-linear Dynamics and Earthquake Prediction

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CompiCat Program

Program Manual

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http://www.mitp.ru/soft/ecp/doc/mainindex.html

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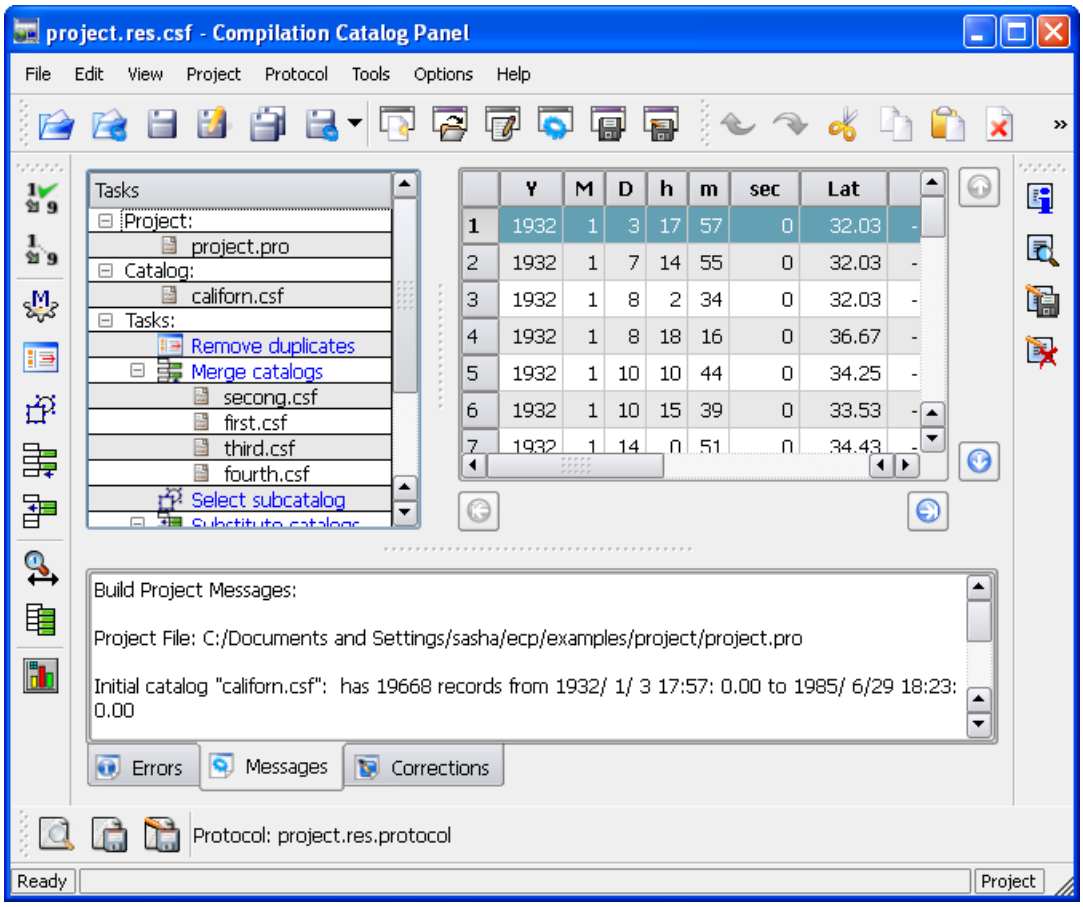
1. Introduction.



CompiCat is an application for editing and compiling catalogs of earthquakes, which is essential part of any study of seismic activity. The application combines the features of EdCat and Catal console applications developed in the early 1980ies (the latest versions of these programs were distributed at the Abdus Salam ICTP Workshops on Nonlinear Dynamics and Earthquake Prediction, last time in 2005 http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a04209).

CompiCat program is a C++ code using Qt C++ tool kit for multiplatform Graphic User Interface and application development. It has single-source portability across Linux, UNIX, and Windows.

CompiCat program was designed for reproducible studies of seismic activity based on catalogs of earthquakes. It could be applied for

- importing catalogs available in different formats and converting them into the standard one;
- exporting catalogs into commonly used formats;
- selection from a given catalog;
- comparison of catalogs;
- editing and compilation of earthquake catalogs, which includes check for errors and disorder;
- converting of magnitudes of different kinds into the common one;
- identification of duplicates and their removal;

- merging several catalogs into a single one;
- calculation and visualization of spectrograms and histograms of a given catalog, etc..

Thus, CompiCat provides a tool-box that allows preparing the catalog of earthquakes in the standard format without evident errors or disorder.

CompiCat supplies users with online help in three levels of detail. Its project wizard allows users to create a project file as a sequence of operations on seismic catalogs for future implementations, e.g., for reproduction of the analysis by other parties.

CompiCat allows writing down a protocol, which contains information on all corrections of errors, identified duplicates, parameters used in different operations, etc.

Running CompiCat results creation and output of the following optional files: output catalog of earthquakes, the project binary file, and the protocol text file.

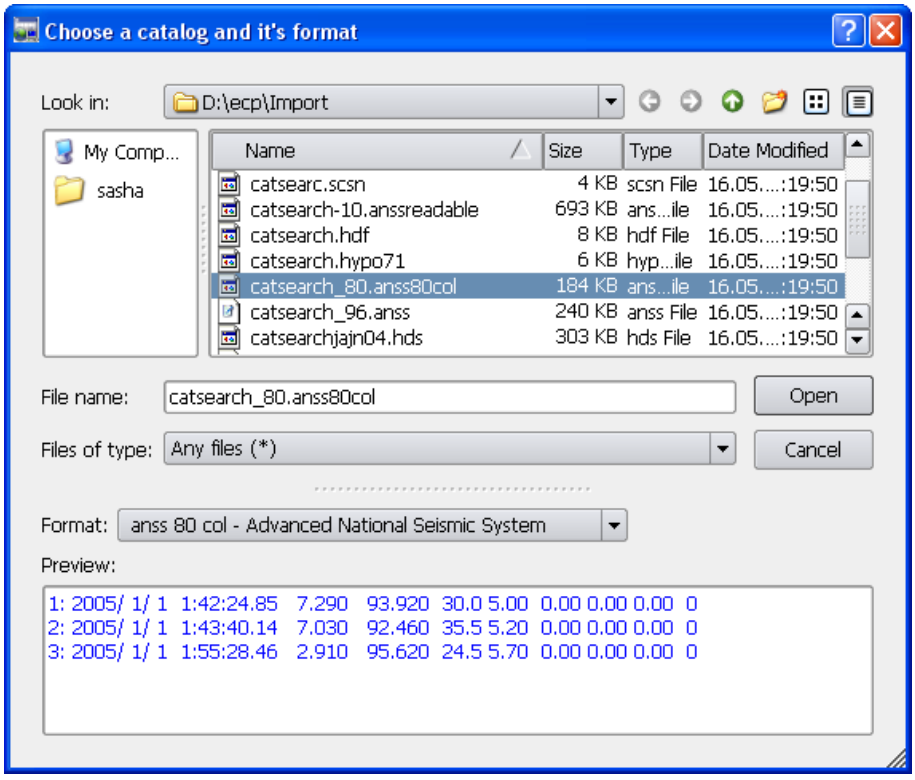
2. Catalog formats and import/export options.

CompiCat program works with catalogs of earthquakes filed in the standard format that specifies the origin time, location, and magnitude of event (see Appendix A).

The ASCII text formats of the original seismic data reported by the US Advanced National Seismic System, the USGS/NEIC Preliminary Determinations of Epicenters, the Northern California Earthquake Data Center, the Southern California Seismographic Network, and other agencies (see Appendix B) are supported for importing research information. The supported formats are listed in a special file, which could be upgraded according to the instructions provided in Appendix B.

CompiCat program allows importing catalogs in the following way:

Click *Import*  button in the uppermost tool bar or *Import* entry of *File* menu to open the import catalog browser.



Find and select file for import from the list that appear in the upper left frame. CompiCat tries recognizing the catalog format automatically and reports in *Preview* frame either the first three records of the catalog or ' Error format ' message. Note that (i) errors of the imported catalog, if any, will appear in *Errors* page of protocol frame (see 4.2.3 Protocol Frame) and can be corrected (for details see 6. Catalog editor); (ii) catalogs with detectable errors cannot be transferred into the standard format (csf files).

To simplify import CompiCat program allows classifying catalog files by their type. The following extensions listed in *Files of type* box are used in the import browser:

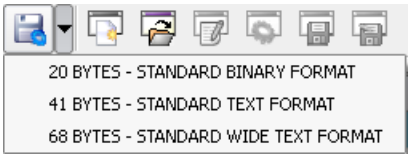
- Any files (*)
- Standard Format - Binary (*.20bytes)
- Standard Format - Text (*.41bytes)
- Standard Wide Format - Text (*.68bytes)
- Advanced National Seismic System (*.anssreadable)
- Advanced National Seismic System (*.anss80col)
- Southern California Earthquake Data Center (*.scedc)
- Southern California Seismographic Network (*.scsn)
- NEIC Preliminary Determinations of Epicenters (*.pde)
- Summary hypo71 format year 2000 (*.hypo71)
- NEIC Hypocenter Database System (*.hds)

When recognizing the catalog format automatically CompiCat uses format description block listed in ASCII text file named .../ecp/ref/standardformat.list and displays one of the following *TITLE* strings in *Format* box:

- 20 bytes - Standard Binary Format
- 41 bytes - Standard Text Format
- 68 bytes - Standard Wide Text Format
- anss readable - Advanced National Seismic System
- anss 80-col - Advanced National Seismic System
- pde - NEIC Preliminary Determinations of Epicenters
- scedc - Southern California Earthquake Data Center
- scsn - Southern California Seismographic Network
- hypo71 - Summary hypo71 format year 2000
- hds - NEIC Hypocenter Database System

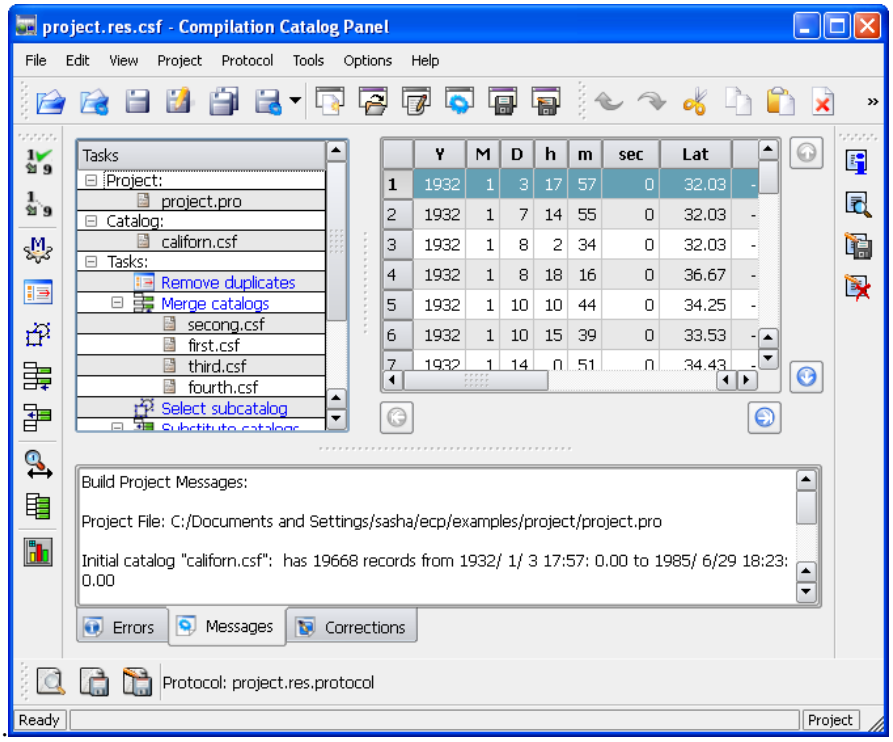
CompiCat program outputs the compiled catalog of earthquakes in the standard binary format. If requested, the program exports the compiled catalog either in the 20 bytes - Standard Binary Format , or 41 bytes - Standard Text Format, or 68 bytes - Standard Wide Text Format. (The first two formats were used previously in the console applications developed at MITP, which applications require "dat" as the file name extension.)

To export the catalog toggle on *Export*  button and select an appropriate format.



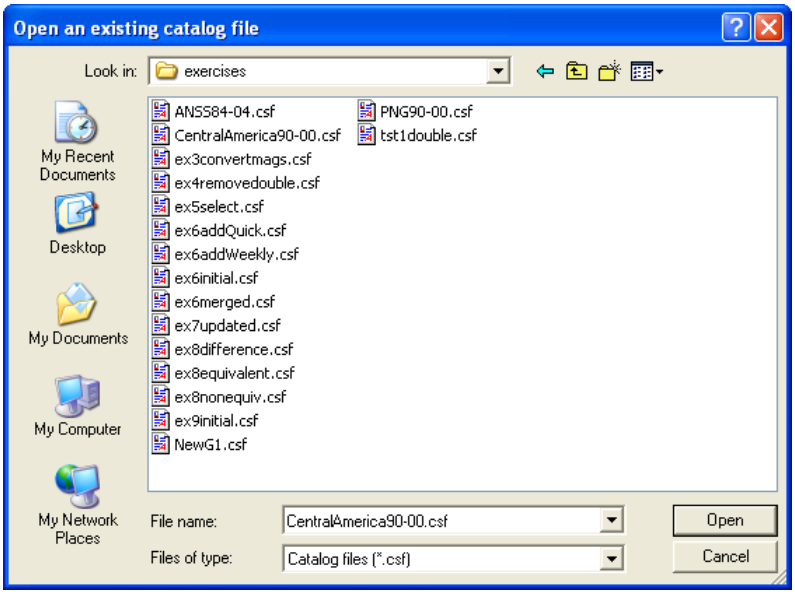
At this point CompiCat opens *Save* file browser that allow the user to save the catalog under any name. CompiCat manages file name extension name automatically, specifically, if for the 20 and 41 bytes formatted files the extension is ".dat", while for the 68 bytes formatted files the extension is ".68bytes".

3. Quick start

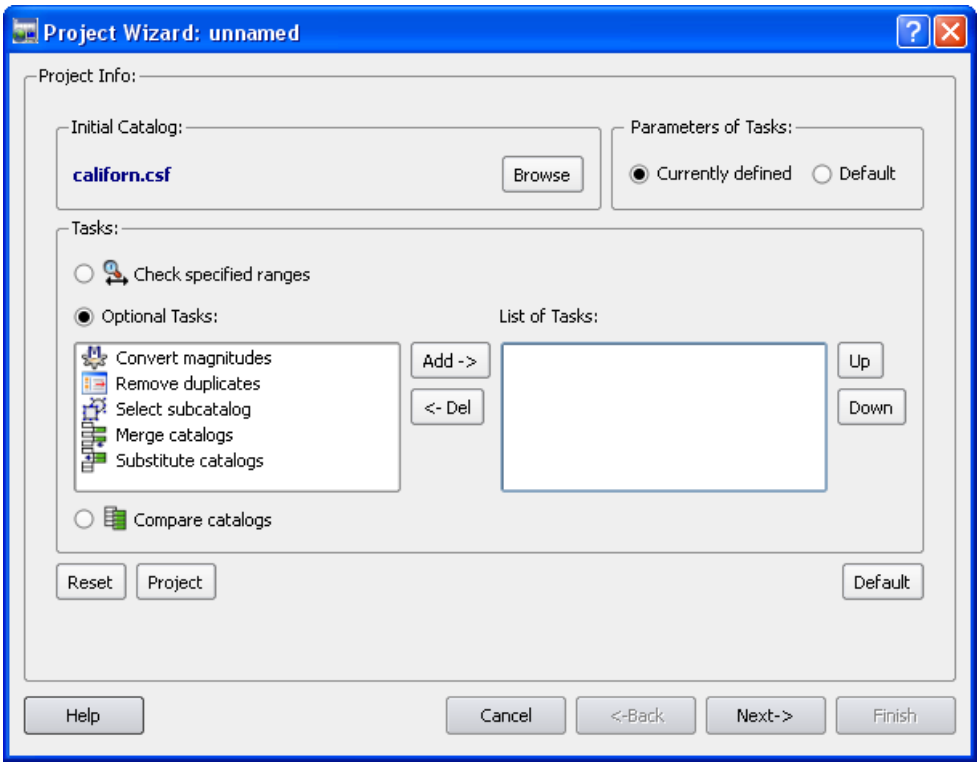


There are the four possibilities to start CompiCat session. All but the four buttons listed bellow are disabled when the user enters the program.

1. Open an existing file in the internal binary Catalog Standard Format (file name extension .csf) with file navigator

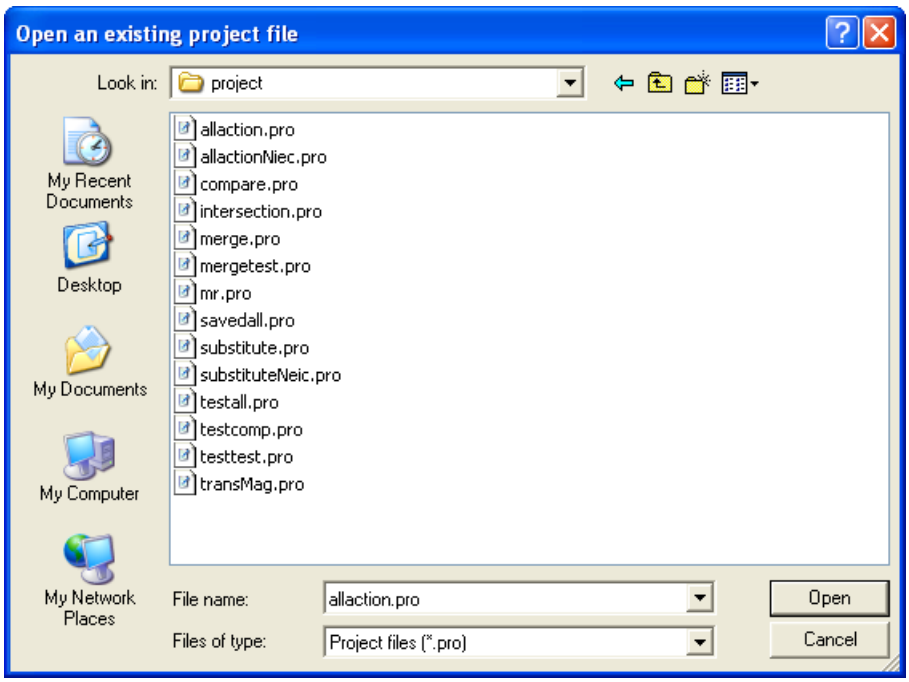


2.  - Generate a new project

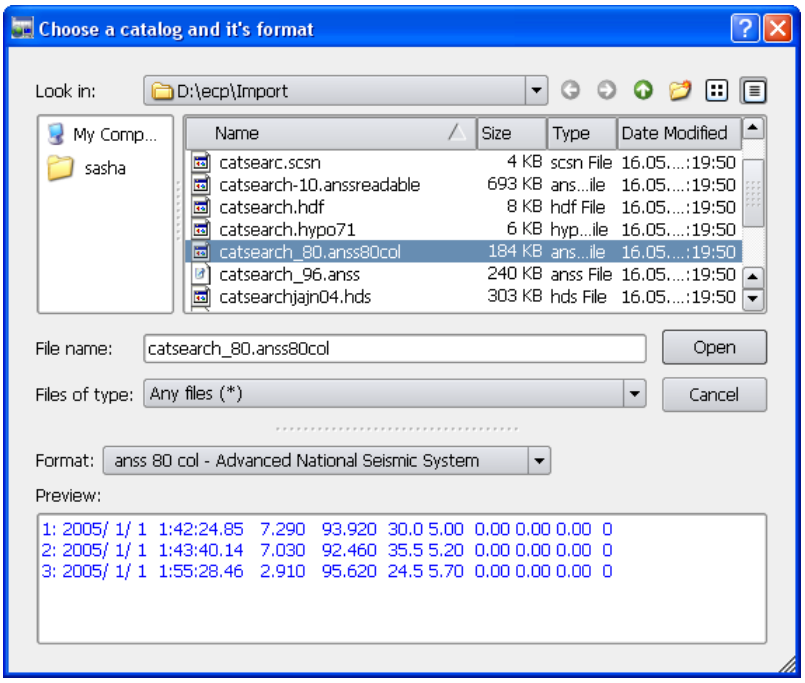


See details 8.2 Project Wizard

3.  - Open an existing project (file name extension .pro) with file navigator



4.  - Import a catalog with file navigator



When the user selects file for import, the program tries to recognize the appropriate format automatically. If the program cannot do it then *Preview* box will report ' Error format '. Otherwise, the first three records of the catalog will appear in *Preview* (for details see 2. Catalog formats and import/export options).
If imported catalog contains errors, e.g., records of parameters out of range or sorting disorder, then these will appear in *Errors* page of the protocol frame (see 4.2.3 Protocol Frame for the list of errors). The user must correct all errors (see details in 6. Catalog editor).
After starting a CompiCat session the user can execute either the project or any of the catalog *Tools* (see **7. Tools**). The user can save current catalog or project or protocol files at any time of a session by clicking the following buttons:

 - Save the current catalog file;
 - Save the current catalog file under a new name;
 - Save the project file;
 - Save the project file under a new name.
 - Save the protocol file;
 - Save the protocol file under a new name.

CompiCat will prompt the user about saving output files on exit. Catalog files have standard extension *.csf , project files have standard extension *.pro, protocol files have standard extension *.protocol. All these extensions are added to the filename automatically.

The user can export the current catalog t any time of a session by clicking *Export* button  . (For details of export formats see 2. Catalog formats and import/export options).

CompiCat remembers the last saved settings (i.e., sizes and positions of windows and some other options) across sessions. For details see Appendix C.

4. Main window

4.1 The Tool Bars.

4.1.1 The File Tool Bar.

- Open an existing catalog file. Correspondent menu option is **File->Open** and keyboard shortcut is Ctrl+O.

- Import a catalog file. Correspondent menu option is **File->Import** and keyboard shortcut is Ctrl+I.

- Save currently open file. Menu option is **File->Save** and keyboard shortcut is Ctrl+S.

- Save the current file under a new name. Menu option is **File->Save as ...**.

- Save the catalog, project and protocol files to disk. Menu option is **File->Save All ...**

- Export a catalog file. Menu option is **File->Export ...**

- Generate a new project. Menu option is **Project->New Project** and keyboard shortcut is Shift+N.

- Open an existing project. Menu option is **Project->Open Project** and keyboard shortcut is Shift+O.

- Edit an opened project. Menu option is **Project->Edit Project** and keyboard shortcut is Shift+E.

- Execute project task list. Menu option is **Project->Execute Project** and keyboard shortcut is Shift+B.

- Save the project to disk. Menu option is **Project->Save Project** and keyboard shortcut is Shift+S.

- Save the project under a new name. Menu option is **Project->Save Project As ...**

4.1.2 The Edit Tool Bar.

- Undo edit action. Correspondent menu option is **Edit->Undo** and keyboard shortcut is Ctrl+Z.

- Redo edit action. Menu option is **Edit->Redo** and keyboard shortcut is Ctrl+Y.

- Cut the current selection's contents to the clipboard. Menu option is **Edit->Cut** and keyboard shortcut is Ctrl+X.

- Copy the current selection's contents to the clipboard. Menu option is **Edit->Copy** and keyboard shortcut is Ctrl+C.

- Paste the clipboard's contents into the current selection. Menu option is **Edit->Paste** and keyboard shortcut is Ctrl+V.

- Delete the current selection. Menu option is **Edit->Delete** and keyboard shortcut is Del.

- Insert row before the selected row. Menu option is **Edit->Insert row** and keyboard shortcut is Ctrl+I .

- Zoom in. Menu option is **View-> Zoom In** and keyboard shortcut is Ctrl++.

- Zoom out. Menu option is **View->Zoom Out** and keyboard shortcut is Ctrl+-.

- Enter What's This? mode. Menu option is **Help->What's This?** and keyboard shortcut is Shift+F1.

- Exit the application. Menu option is **File->Exit** and keyboard shortcut is Ctrl+Q.

4.1.3 The View Tool Bar.

- Information of catalog and view catalog segment. Keyboard shortcut is Shift+I.

- Find catalog record by date or by number. Menu option is **View->Find record** and keyboard shortcut is Shift+F.

- Save view catalog segment changes. Menu option is **View->Save view segment changes** and keyboard shortcut is Shift+V.

- Cancel view catalog segment changes. Menu option is **View->Cancel view segment changes** and keyboard shortcut is Shift+C.

4.1.4 The Tools Tool Bar.

- Check time order. Menu option is **Tool->Check order** and keyboard shortcut is Alt+K.

- Sort catalog records by ascending time. Menu option is **Tool->Sort by time** and keyboard shortcut is Alt+I.

- Convert magnitudes to common type. Menu option is **Tool->Convert magnitudes** and keyboard shortcut is Alt+N.

- Check and remove duplicate records. Menu option is **Tool->Remove duplicates** and keyboard shortcut is Alt+D.

- Select subcatalog. Menu option is **Tool->Select** and keyboard shortcut is Alt+S.

- Merge catalogs . Menu option is **Tool->Merge** and keyboard shortcut is Alt+M.

- Substitute parts of the initial catalog. Menu option is **Tool->Substitute** and keyboard shortcut is Alt+U.

 - Check range of parameters. Menu option is **Tool->Check range** and keyboard shortcut is Alt+C.
 - Compare two catalogs. Menu option is **Tool->Compare** and keyboard shortcut is Alt+L.

 - Draw the histograms. Menu option is **Tool->Draw histograms** and keyboard shortcut is Alt+G..

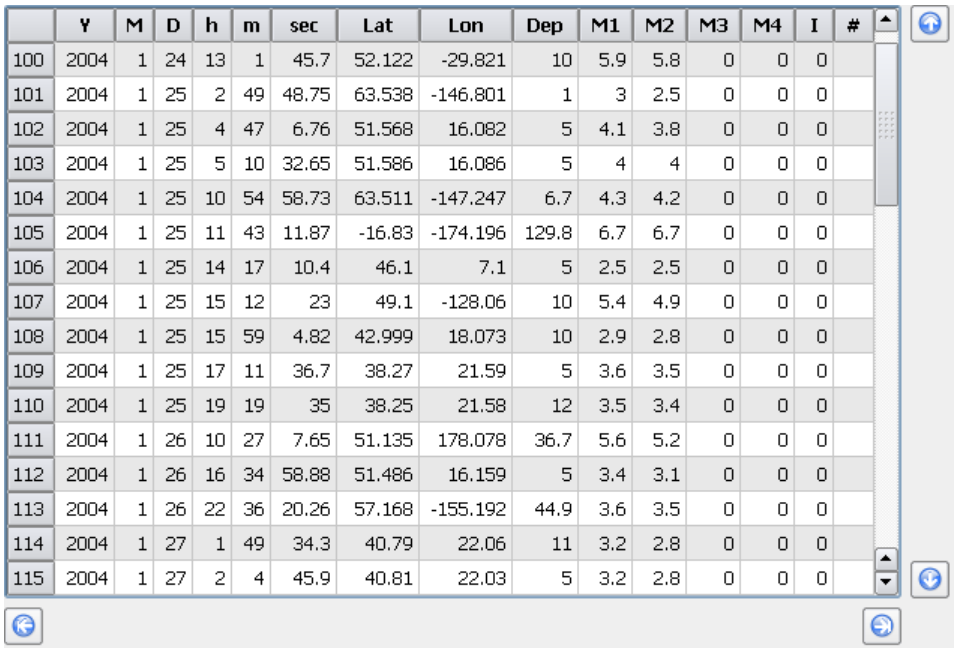
4.1.5 The Protocol Tool Bar.

 - Preview Protocol. Correspondent menu option is **Options->Preview Protocol** and keyboard shortcut is Shift+R.
 - Save the protocol to disk. Menu option is **Options->Save Protocol** and keyboard shortcut is Shift+T.
 - Save the protocol under a new name. Menu option is **Options->Save Protocol As**...

4.2 Central Area

4.2.1 Catalog Frame

The main part of the central area displays Catalog frame.



	Y	M	D	h	m	sec	Lat	Lon	Dep	M1	M2	M3	M4	I	#
100	2004	1	24	13	1	45.7	52.122	-29.821	10	5.9	5.8	0	0	0	
101	2004	1	25	2	49	48.75	63.538	-146.801	1	3	2.5	0	0	0	
102	2004	1	25	4	47	6.76	51.568	16.082	5	4.1	3.8	0	0	0	
103	2004	1	25	5	10	32.65	51.586	16.086	5	4	4	0	0	0	
104	2004	1	25	10	54	58.73	63.511	-147.247	6.7	4.3	4.2	0	0	0	
105	2004	1	25	11	43	11.87	-16.83	-174.196	129.8	6.7	6.7	0	0	0	
106	2004	1	25	14	17	10.4	46.1	7.1	5	2.5	2.5	0	0	0	
107	2004	1	25	15	12	23	49.1	-128.06	10	5.4	4.9	0	0	0	
108	2004	1	25	15	59	4.82	42.999	18.073	10	2.9	2.8	0	0	0	
109	2004	1	25	17	11	36.7	38.27	21.59	5	3.6	3.5	0	0	0	
110	2004	1	25	19	19	35	38.25	21.58	12	3.5	3.4	0	0	0	
111	2004	1	26	10	27	7.65	51.135	178.078	36.7	5.6	5.2	0	0	0	
112	2004	1	26	16	34	58.88	51.486	16.159	5	3.4	3.1	0	0	0	
113	2004	1	26	22	36	20.26	57.168	-155.192	44.9	3.6	3.5	0	0	0	
114	2004	1	27	1	49	34.3	40.79	22.06	11	3.2	2.8	0	0	0	
115	2004	1	27	2	4	45.9	40.81	22.03	5	3.2	2.8	0	0	0	

The frame contains part of the catalog named *View catalog segment*. By default the size of *View catalog segment* is 50 records, which could be changed in *Options*. The frame has the following navigator buttons:

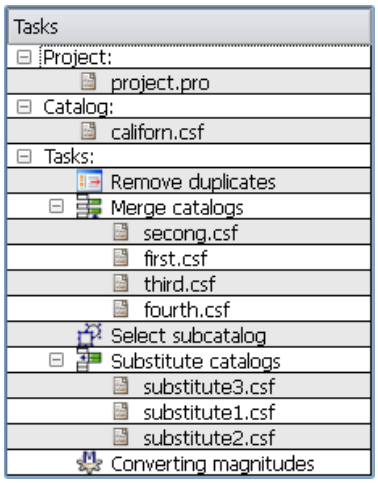
- - Moves to the beginning of the catalog.
- - Moves to the end of the catalog.
- - Moves one view segment up.
- - Moves one view segment down.

The following buttons to the right of Catalog frame allow the user to

- get the brief info on the current catalog and view segment;
- find a record by date and time or by sequential number;
- save the changes made in the current view segment;
- cancel all the changes made in the current view segment.

4.2.2 Project Frame

The CompiCat main window has the project frame that appears in its upper-left part. By default it is empty. It is not empty if some project has been either opened or newly created.

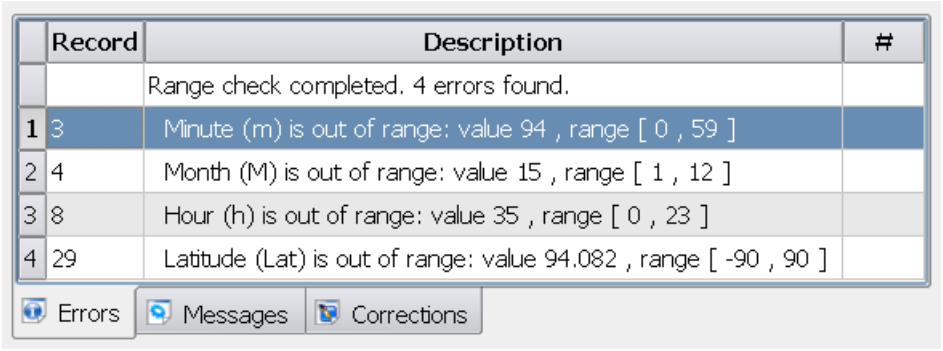


The frame contains the project name, the input catalog name, and a brief description of the sequence of tasks considered. If additional catalogs exist in a task, then the list of these add-ins is provided as branches of the project tree (for details see 8.1 Manage Project).

4.2.3 Protocol Frame

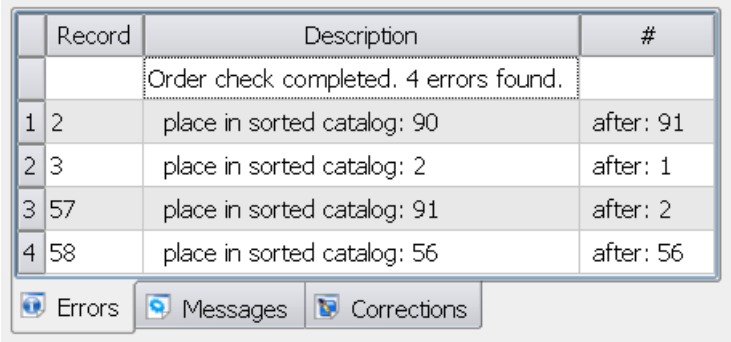
CompiCat displays Protocol frame at the bottom of the central area. The frame has the three tabs, i.e., *Errors, Messages, and Corrections.*

Errors tab page shows the evident errors recognized by CompiCat automatically, as well as the values out of the user defined ranges of parameters (7.7 Check specified range).



The user must fix the errors by (i) clicking *Description* of the error and (ii) making appropriate corrections in prompted cell of Catalog frame above.

In case of recognized disorder in time the user has to check the records of disorder and either correct non-evident errors or sort the catalog by clicking button.



When checking the temporal disorder the user can view the record in question, its place , as well as the preceding record in sorted catalog by clicking the appropriate cell.

The other two tab pages of Protocol frame sum up the comprehensive info about the tasks performed during the current session of CompiCat. Specifically, *Massages* page contains info about project (if any), input-output catalogs, tools and their parameters, while *Corrections* page contains info about editing, details on tasks and tools, and their applications. For details see 9. Protocol of CompiCat session..

4.3 The status bar.

The status bar is horizontal bar at the very bottom of the CompiCat window presenting status information, which indicators corresponds to the three categories, i.e., temporary, normal, and permanent. The temporary one briefly occupies most of the status bar and explains, for example, menu entries, icons, etc. The normal one occupies part of the status bar and may be hidden by temporary messages and displays the tool name or state of readiness. The permanent one is never hidden and indicates either Start, or Tools, or Project.

5. Menu entries

5.1 The File Menu.

The keyboard shortcut is (Alt+F). The following functions are available from the File menu:

File->Open (Ctrl+O) - Open an existing catalog file.

File->Import (Ctrl+I) - Import a catalog file.

File->Save (Ctrl+S) - Save currently open file.

File->Save as ... - Save the current file under a new name.

 File->Save All ... - Save the catalog , project and protocolt files to disk.
 **File->Export ...** - Export a catalog file.

File->Open Recent - Displays a list of recently opened files to choose from.

 File->Close (Ctrl+L) - Close a catalog file.

 File->Exit (Ctrl+Q) - Exit the application.

5.2 The Edit Menu.

The keyboard shortcut is (Alt+E). The following functions are available from the Edit menu:

 Edit->Undo (Ctrl+Z) - Undo edit action.
 Edit->Redo (Ctrl+Y) - Redo edit action.
 Edit->Cut (Ctrl+X) - Cut the current selection's contents to the clipboard.
 Edit->Copy (Ctrl+C) - Copy the current selection's contents to the clipboard.
 Edit->Paste (Ctrl+V) - Paste the clipboard's contents into the current selection.
 Edit->Delete (Del) - Delete the current selection's.
 Edit->Insert row (Ctrl+I) - Insert row before the selected row.

Edit->Select all - Select all rows of catalog workspase.

5.3 The View Menu.

The keyboard shortcut is (Alt+V). The following functions are available from the Edit menu:

 View->Find record (Shift+F) - Find catalog record by date or by number.
 View->Save view segment changes (Shift+V) - Save view catalog segment changes.
 View->Cancel view segment changes (Shift+C) - Cancel view catalog segment changes.
 View-> Zoom in (Cntrl++) - Increase the display font size.
 View-> Zoom in (Cntrl+-) - Decrease the display font size

5.4 The Project Menu.

The keyboard shortcut is (Alt+P). The following functions are available from the File menu:

 Project->New (Shift+N) - Generate a new project.

 Project->Open Project (Shift+O) - Open an existing project .

 Project->Edit project(Shift+E) - Edit an opened project.

 Project->Execute project (Shift+P) - Execute project task list.

 Project->Save Project (Shift+S) - Save the project to disk.

 Project->Save Project As ... - Save the project under a new name.

Project->Open Recent - Displays a list of recently opened project files to choose from.

 Project->Close (Shift+L). - Close an opened file project.

5.5 The Protocol Menu.

The keyboard shortcut is (Alt+R). The following functions are available from the Protocol menu:

 Protocol->Preview Protocol (Shift+R) - Preview protocol.

 Protocol->Save Protocol (Shift+T) - Save the protocol to disk.

 Protocol->Save Protocol As... - Save the protocol under a new name.

5.6 The Tools Menu.

The keyboard shortcut is (Alt+T). The following functions are available from the Tools menu:

 Tool->Check order (Alt+K) - Check sorting oder.

 Tool->Sort by time (Alt+I) - Sort catalog records by ascending time.

 Tool->Convert magnitudes (Alt+N) - Convert magnitudes to common type.

 Tool->Remove duplicates (Alt+D) - Check and remove duplicate records**.**

 Tool->Select (Alt+S) - Select subcatalog.

 Tool->Merge (Alt+M) - Merge catalogs .

 Tool->Substitute (Alt+U) - Substitute parts of the initial catalog.

 Tool->Check range (Alt+C) - Check range of parameters.

 Tool->Compare catalogs (Alt+L) - Compare two catalogs.

 Tool->Draw histograms (Alt+G) - Draw histograms.

5.7 The Options Menu.

The keyboard shortcut is (Alt+O). The following functions are available from the Protocol menu:
Option->Catalog veiw segment - Change the number of records in a segment on catalog part of main window.
Option->Change *Errors* page size - Change the maximum error lines on the E*rrors* page of the mane window protocol frame .
Option->Change *Correction* page size - Change the maximum number of lines on the *Correction* page of the mane window protocol frame .

5.8 The Help Menu.

The keyboard shortcut is (Alt+H). The following functions are available from the Help menu:

 Help->Content (F1)

 Help->What´s This (Shift + F1)

Help->About - Displays a simple message box about **compicat** program.
Help->About Qt - Displays a simple message box about **Qt C++ tool kit**.

6. Catalog editor.

CompiCat allows the user to edit many-item selections of earthquake catalog entries displayed in Catalog frame (see 4.2.1.Catalog Frame). Fore example, to change a single value in a cell double click it and enter a new value. The edited values are given in blue, while those recognized as errors are marked in red. The user cannot enter erroneous values of parameters.

When changing view segment of the catalog CompiCat will suggest saving the changes, if any. The user may save the current changes or cancel them any time by clicking  or  , respectively (which buttons are located to the right of Catalog frame).

The key-bindings and buttons which are implemented for editing are as follows:

 - Cut the current selection to the clipboard (menu **Edit->Cut** or keyboard shortcut Ctrl+X);

 - Copy the current selection to the clipboard (menu **Edit->Copy** or keyboard shortcut Ctrl+C);

 - Paste from the clipboard into the current selection (menu **Edit->Paste** or keyboard shortcut Ctrl+V);
Note: The copy (cut) and paste areas must be of the same size and refer to the same kinds of parameters;

 - Delete the current selection (menu **Edit->Delete** or keyboard shortcut Del);
Note: many-item selections can be deleted at once.

 - Insert row before the selected row (menu **Edit->Insert row** or keyboard shortcut Ctrl+I)..
Note: a single row can be inserted before selected row and will appear as a copy of selected one;

 - Undo edit action (menu **Edit->Undo** or keyboard shortcut Ctrl+Z.

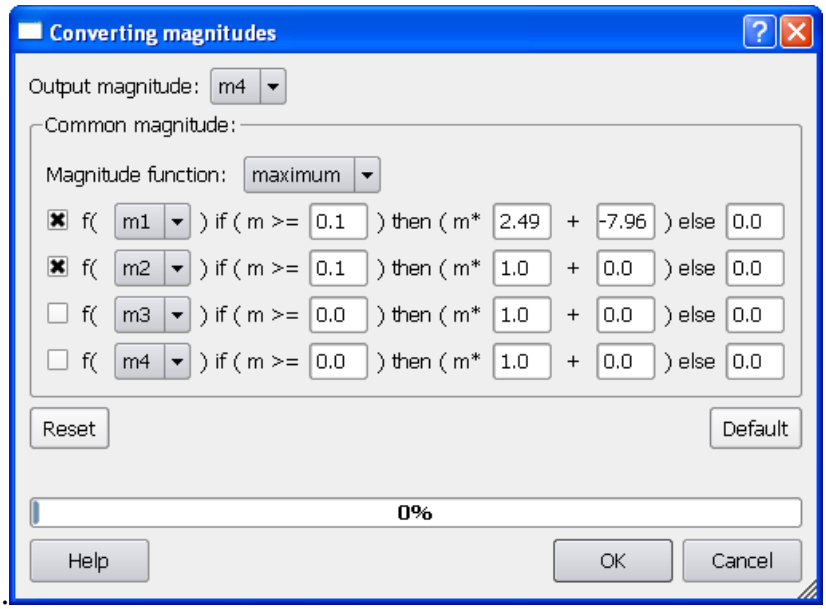
 - Redo edit action (menu **Edit->Redo** or keyboard shortcut Ctrl+Y.

Undo-redo buffer is unlimited. All corrections made is written into *Corrections* of protocol (see 9. Protocol of CompiCat session.).

7. Tools

7.1 Convert magnitudes.

Catalogs may report magnitudes of different types, which values should be calibrated if used in calculations together. CompiCat allows the user to make linear conversions of the four magnitudes reported in a given catalog. To open the window for magnitude conversion (*Convert magnitudes*) click button  .



Each of the boxes with magnitudes, e.g., , allows to chose one of the four magnitudes (m1, m2, m3, m4) reported in the catalog to be used in recalculation.

Output magnitude identifies the magnitude field where the result of the magnitude conversion described in the block *Common magnitude*. All the four magnitudes reported in the catalog in process could participate in the unique determination of the four magnitudes in the output catalog.

The *Magnitude function* box in *Common magnitude* allows the four choices - *value, maximum, minimum, average* - that determine the unique conversion:

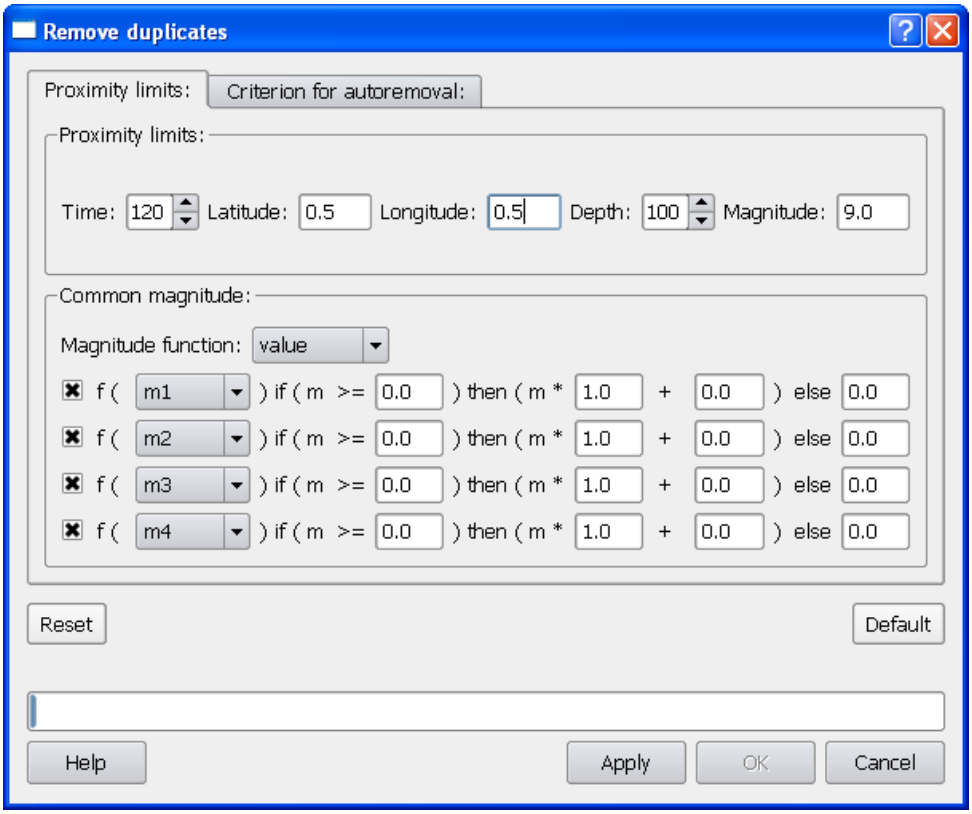
- *value* - The output value is determined by the priority order of recalculated magnitudes that are checked in below. The higher rows are of higher priorities.
- *maximum* - The output value is the maximum of recalculated magnitudes that are checked in below.
- *minimum* - The output value is the minimum of recalculated magnitudes that are checked in below.
- *average* - The output value is the average of recalculated magnitudes that are checked in below.

The user can introduce up to four recalculated magnitudes to be used to derive the converted, presumably, calibrated value by clicking with the left-mouse button the appropriate check-boxes ☐ on the left. To avoid using the magnitude function f(m) in the absence of input magnitude determination you can adjust the values in the leftmost and rightmost edit boxes to a desired magnitude cutoff and output constant, respectively. In the presence of input magnitude determination (i.e., when input magnitude equals to or is above magnitude cutoff) the recalculated value equals to the linear function, which coefficients should be typed in the two appropriate edit boxes.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

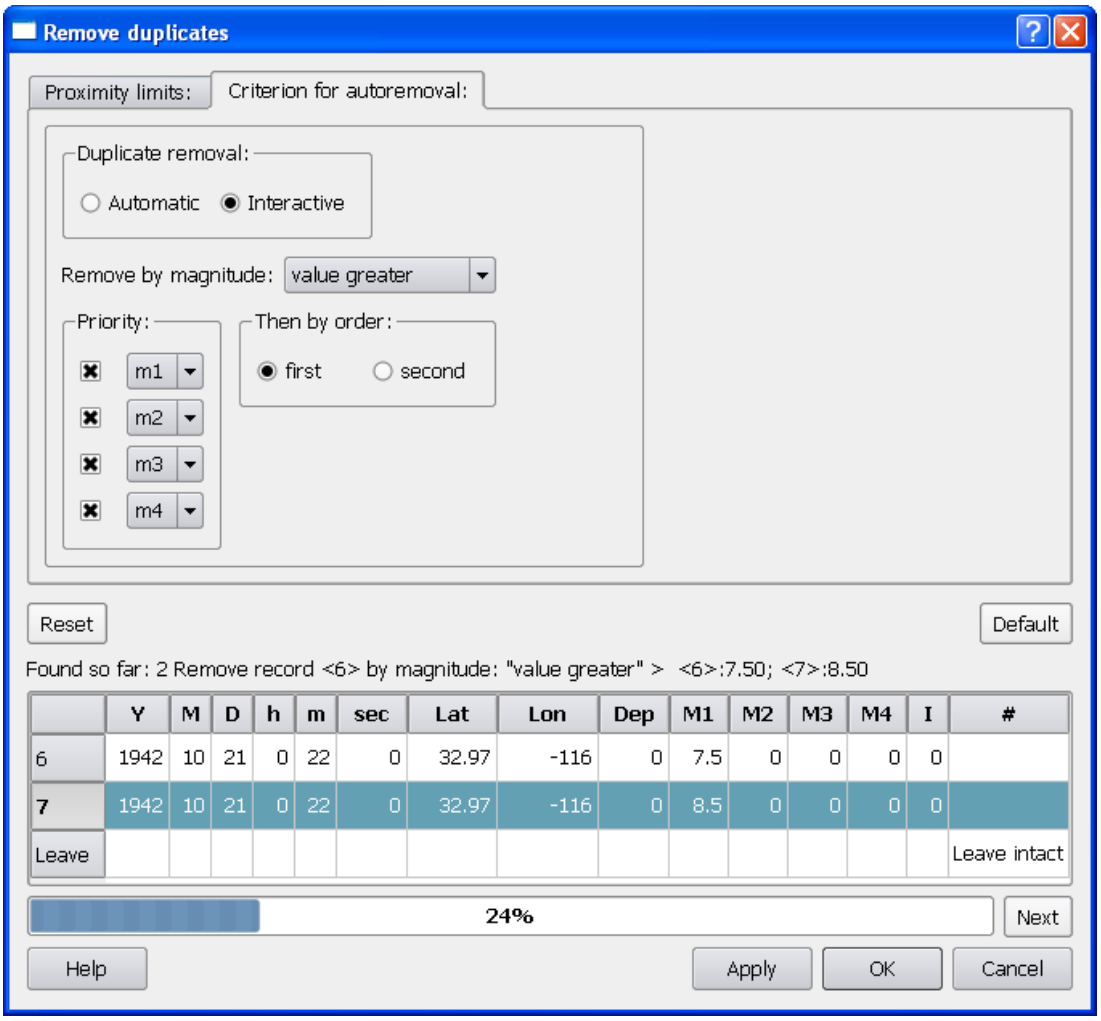
7.2 Remove duplicates.

Catalogs may have duplicate entries referring to the same events. CompiCat allows the user to make search for duplicates and either to delete or to leave intact the candidates for being duplicate entries reported in a given catalog. To open the window for duplicate removal (*Remove duplicates*) click button  .



The *Proximity limits* tab of *Remove duplicates* window allows setting the limits of the temporal, location, and magnitude differences to be use in duplicate search. Specifically, the two catalog entries

are considered candidates for being duplicates if all the differences are less than or equal to the selected values in the five *Proximity limits* boxes. Note the difference in magnitude is related to the *Common magnitude*, which definition could be adjusted by the user in the same way as *Common magnitude* from 7.1 Converting magnitudes
.



The tab *Criterion for auto removal* allows switching the program from *Interactive* to *Automatic* removal of duplicate entries by choosing the appropriate radio-button in the *Duplicate removal* section. Moreover, in the *Automatic* mode the user has an option to define the rule of unique identification and removal of catalog entries. Specifically, the user defines the criterion for choosing one of the two candidate entries by magnitude and, in case of the equality, by their order (the program simply removes either *first* or *second* entry marked with the appropriate radio-button). The magnitude *value greater* (or *value less*) indicates higher priority for the entry to remain in the output catalog; in these cases, the choice of magnitudes in the checked boxes ☐on the left define the priority for the unique magnitude determination. Each of the magnitude indices *maximum greater, maximum less, minimum greater, minimum less, average greater, average less* applied to the checked magnitudes defines higher priority for the entry to remain in the output catalog.

In the *Interactive* mode the user has an option to follow the automatic suggestion, or to chose the alternative entry, or leave both entries intact. The two candidates for removal are shown in the lower part of either *Proximity limits* and *Criterion for autoremoval* tabs. The button Next confirms the choice and proceed to the next candidates for duplicate removal.

The button *Apply* confirms the choice from the *Proximity limits* and *Criterion for autoremoval* tabs and runs duplicate removal procedure.

The button *OK* confirms the choices already made in the *Interactive* mode and, from this very point, continues duplicate removal procedure in the *Automatic* mode. The button *OK* is also used to accept all the results of the Tool. To rerun duplicate removal anew without saving the current results the user can change some of the Tool parameters and click the button *Apply*.

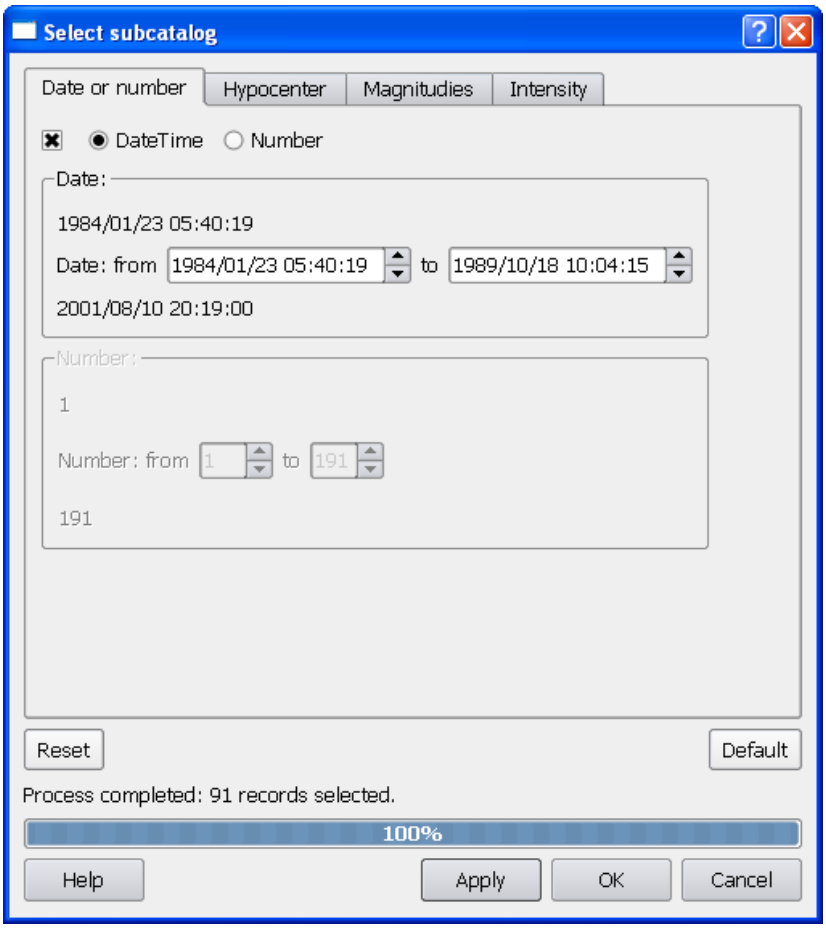
The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes the *Remove duplicates* window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

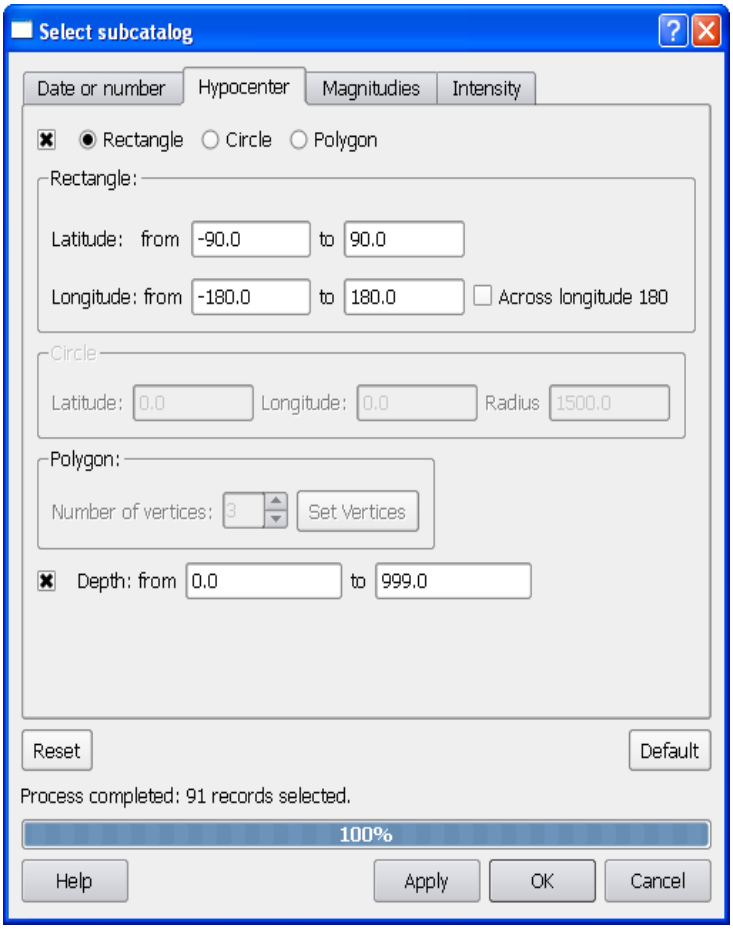
\

7.3 Select subcatalog.

Working with the entire catalog, a large or humongous one, in particular, may appear inconvenient and/or time consuming. CompiCat allows the user to make searches from a given catalog and to create its subcatalog(s). The program may perform different kinds of selection of earthquakes by time, record number, geographic location, depth, magnitudes (or their linear function), and intensity. To open the window for subcatalog search (*Select subcatalog*) click button . The window has the four tabs. To activate searches by parameters listed in the tab, the user must check on the box in its upper leftmost corner.

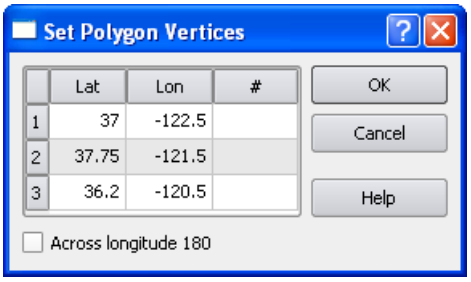


The Tab *By date or number* allows the user to set the limits either for the time period or for the segment of consecutive record numbers by checking the appropriate radio button.

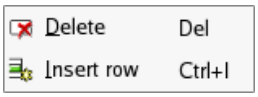


The Tab *Hypocenter* allows the user to set the location limits. There are several options each associated with a choice of the three radio buttons and/or interval of depths. The *Rectangle*, *Circle*, and *Depth* sections are rather self-explanatory and fool-tolerant, while the *Polygon* one needs a few explanations.

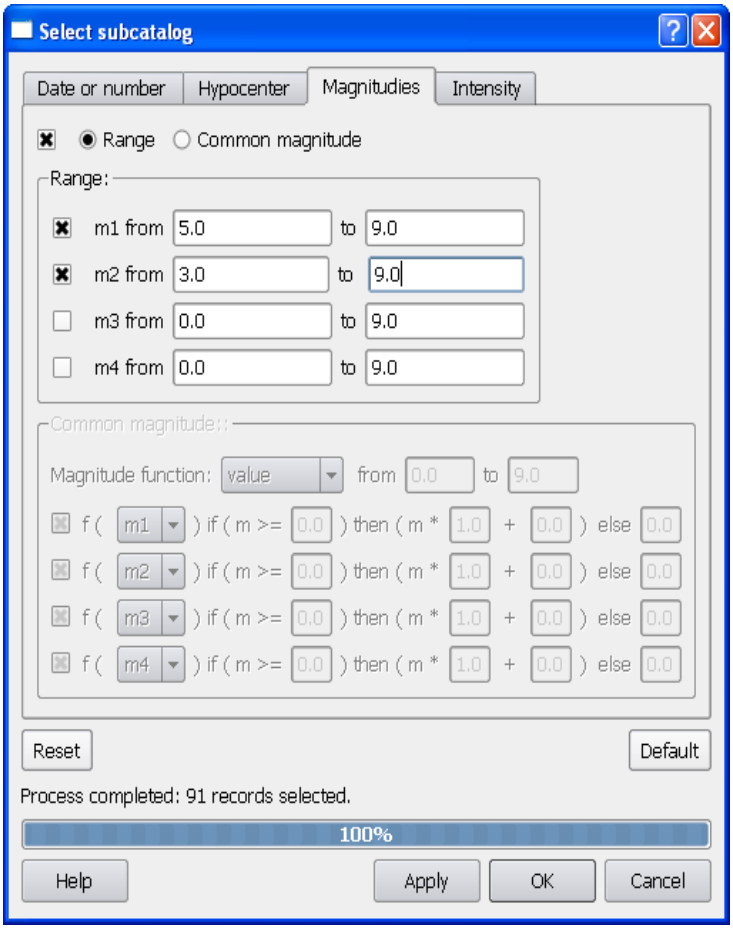
CompiCat can select earthquakes with epicenter coordinates inside any simply connected polygon, which vertices must be listed in the clockwise order. Click *Set Vertices* button to open *Set Polygon Vertices* window.



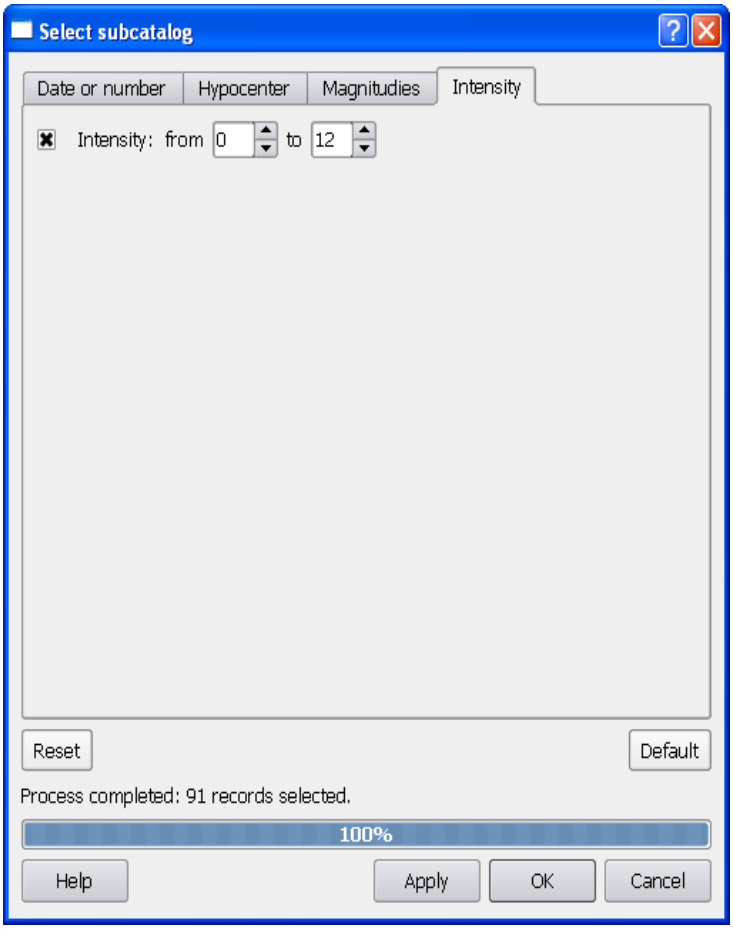
Check on *Polygon crosses 180,* if the vertices are located on both sides of the 180th meridian and fill in the desired coordinates of the polygon vertices. If needed, select any row then invoke the context menu by clicking the right mouse button on the selected row



and complete insertion or deletion. (The user can also use the standard hot keys Del to delete a row and Ctrl+I to insert one.)



The Tab *Magnitude* allows the user to set the limits either for any set of checked magnitudes or for the the common magnitude range by checking either *Range* or *Common magnitude* radio button. (For details on definition of the common magnitude, see 7.1 Convert magnitudes.)



The Tab *Intensity* allows the user to set the limits on the reported intensity of an earthquake.

The button *Apply* confirms the choice of parameters from all activated *Select subcatalog* tabs and runs the requested search.

The button *OK* accepts all the results of the Tool. To rerun *Select subcatalog* anew without saving the current results the user can change some of the Tool parameters and click the button *Apply*.

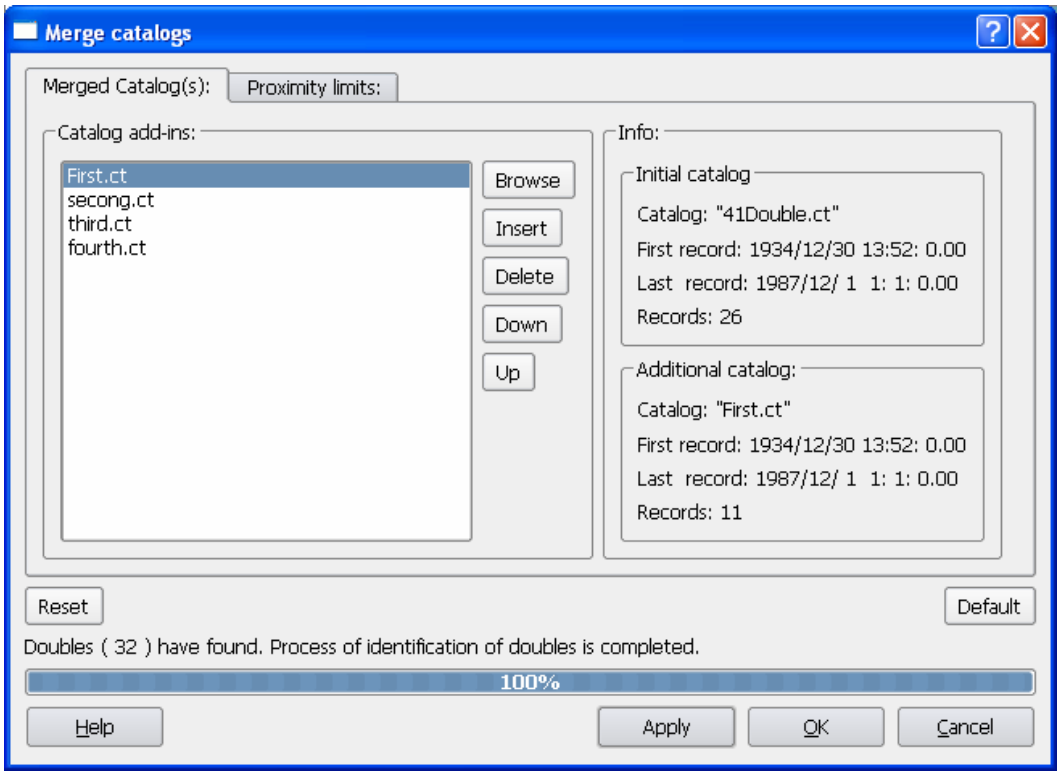
The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes the window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

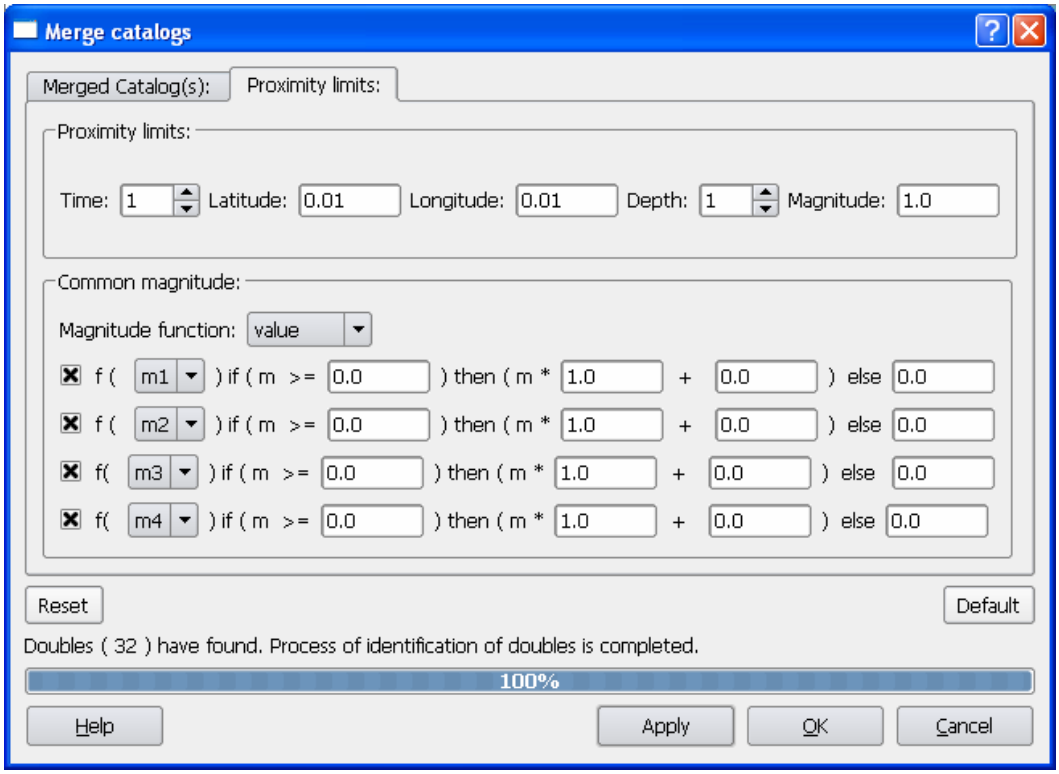
7.4 Merge catalogs.

Catalog compilation may require merging data from different source catalogs. CompiCat allows the user to merge the records of the catalog in work (called Initial) with those from a number of additional source catalogs. When being merged into Initial catalog the Catalog add-ins pass through automatic identification and removal of duplicates according to the user defined choice of Proximity limits.

To open the window for duplicate removal (Merge catalogs) click button 



If *Catalog add-ins* list is empty or its content would not be used in merge, click Browse button, browse the directories on your computer for the catalog add-ins to *Initial catalog* and open one or several of them in any order. To add one by one more add-ins to the existing *Catalog add-ins* list from any directory use *Insert* button. Other buttons - *Delete*, *Down*, *Up* - permit to manage the list. Note that the order of the add-ins defines the priority in automatic duplicate removal during the catalog merge: the higher is the file position in the list the higher priority has its record in duplicate removal.



The content of *Proximity limits* tab window of *Merge catalogs* tool is the same as of *Remove duplicates*.

Note that *Merge catalogs* tool PERFORMS AUTOMATIC removal of duplicates. For a finer identification of duplicates the user may wish, first, to make merge with extremely restrictive *Proximity limits*, then process the result with *Remove duplicates* tool .

The button *Apply* confirms the choice from the *Catalogs* and *Proximity limits* tabs and runs merge procedure. To rerun merge anew without saving the current results the user can change some of the Tool parameters and click the button *Apply*.

The button *OK* is used to accept all the results of the Tool.

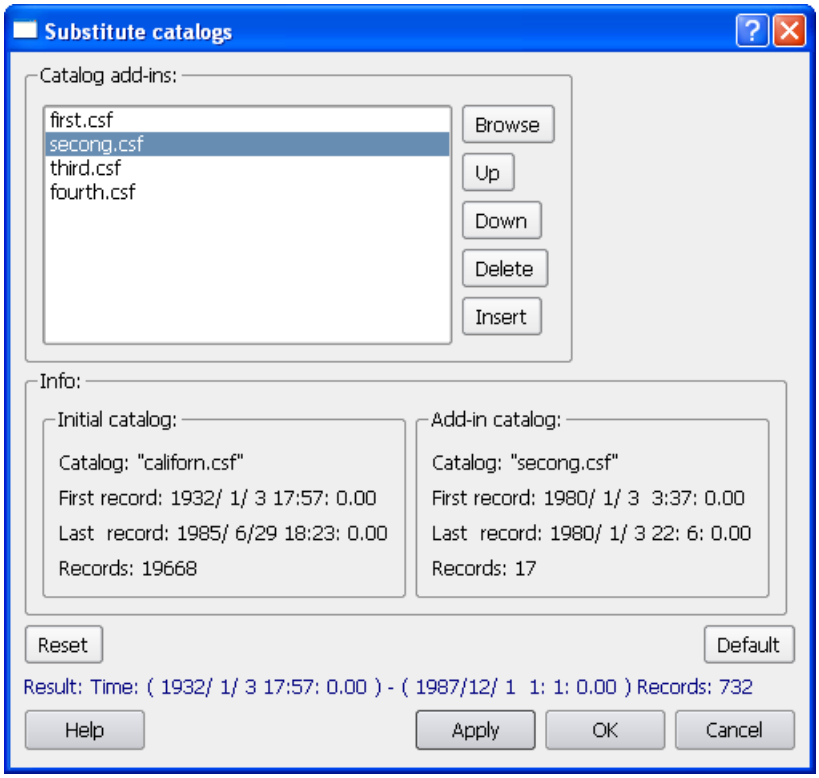
The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes its window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

7.5 Substitute catalog parts.

Catalog compilation may require addition and/or substitution some parts of data from different source catalogs. CompiCat allows the user to upgrade the catalog in work (called *Initial*) with data from a number of additional source catalogs (called *Catalog add-ins*). The *Substitute* tool may seem rather similar to *Merge catalogs* tool although the rules for merging the data from different sources are quite different. Contrary to *Merge catalogs* tool, the *Catalog add-ins* have higher priority than *Initial catalog* - all the records of the initial catalog that fall within any of the time spans of all add-ins will not appear in the resulting output catalog being substituted with data from add-ins. Specifically, *Substitute* starts with the uppermost add-in from the list, determines its time span from the first to the last record, and substitutes all the data from the initial catalog from this time span with all data of the add-in (note that depending on the initial catalog time coverage and the add-in time span, the add-in data would either prepend or insert or replace or append records to the initial catalog). Turning to the next add-in, if any, *Substitute* considers the result of the previous step as the initial catalog and proceeds with the current add-in. Finally, step by step *Substitute* comes to the last add-in and completes the task. Note that the order in in *Catalog add-ins* list defines the ascending add-in priority, according to which the records from the last add-in, evidently, will all be present in the output catalog.

To open the window for duplicate removal (*Merge catalogs*) click button 



If *Catalog add-ins* list is empty or its content would not be used, click Browse button, browse the directories on your computer for the catalog add-ins to *Initial catalog* and open one or several of them in any order. To add one by one more add-ins to the existing *Catalog add-ins* list from any directory use *Insert* button. Other buttons - *Delete*, *Down*, *Up* - permit to manage the list.

The button *Apply* confirms the choice of the *Initial catalog* and *Catalog ins* list and runs *Substitute* procedure. To rerun the procedure anew without saving the current results the user can change *Catalog ins* list and click the button *Apply*.

The button *OK* is used to accept all the results of the Tool.

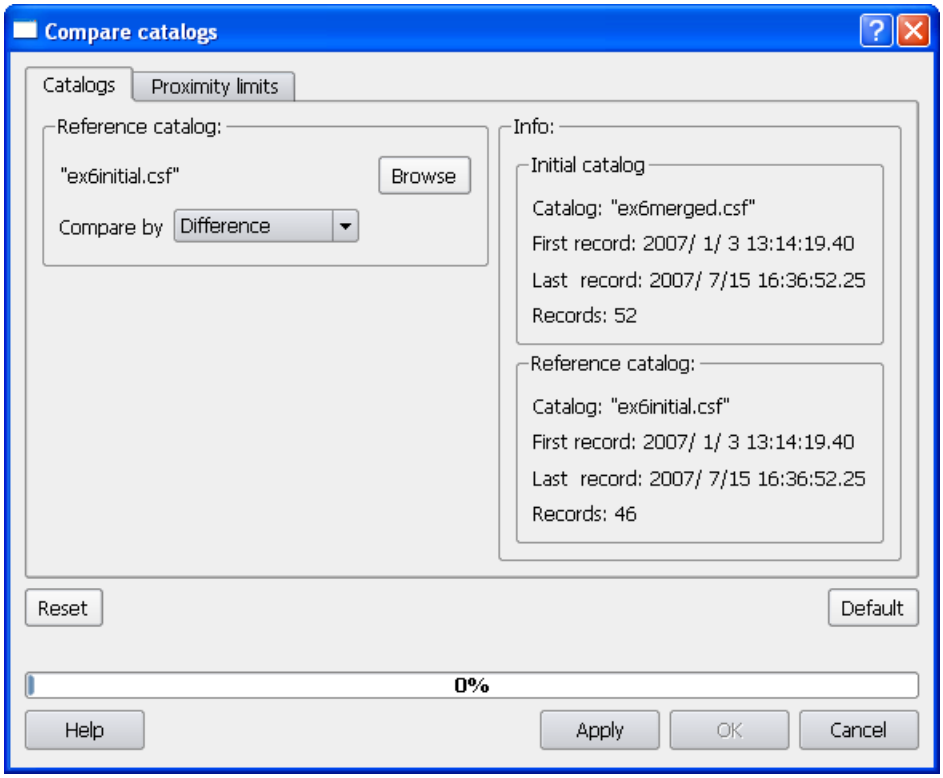
The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes its window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

7.6 Compare catalogs.

CompiCat allows the user to compare the initial catalog with the reference one and determine their intersection or difference and catalog of equivalent pairs or nonequivalent events. The tool makes use of the definition of equivalent events set up by the user defined *Proximity limits*.

To open the *Compare catalogs* tool window click button 

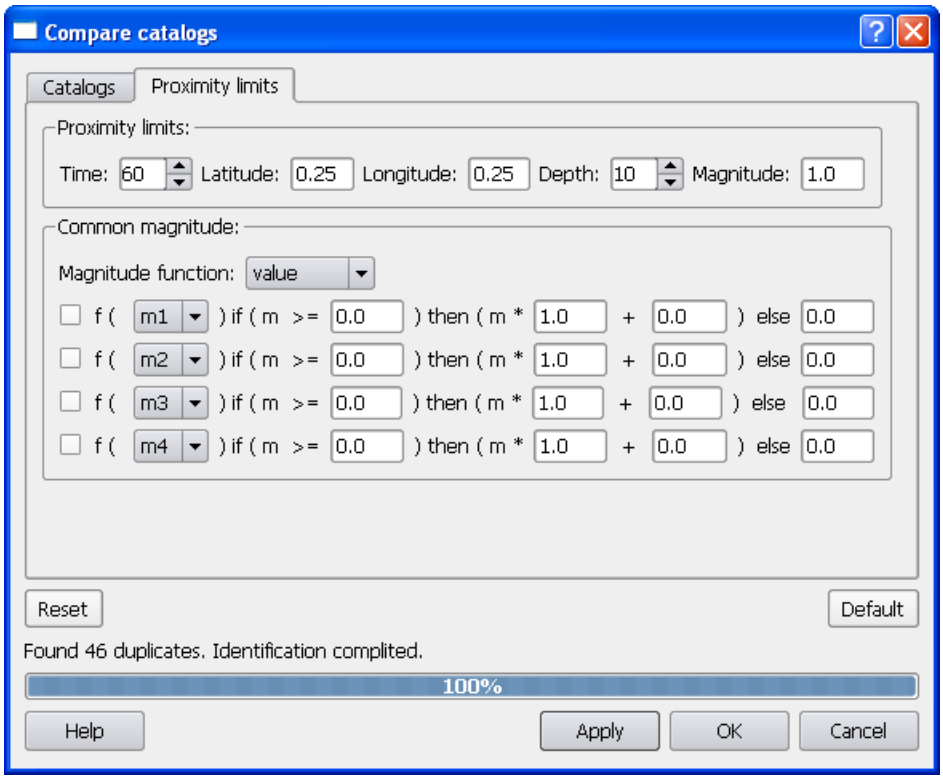


The *Catalogs* tab allows to chose *Reference catalog* for the comparison with *Initial catalog* along with the method of this comparison.
Click Browse button, browse the directories on your computer for the reference catalog, and open it.

The two catalogs could be compared by *Intersection*, *Difference*, *Equivalence*, and *Nonequivalence*.

- *Intersection* mode selects all events from *Initial catalog* that have equivalent in *Reference catalog*.
- *Difference* mode selects all events from *Initial catalog* that have no equivalent in *Reference catalog*.
- *Equivalence* mode creates the catalog of groups of equivalent events from *Initial catalog* and *Reference catalog*.
- *Nonequivalence* mode selects all events from either catalogs that do not appear in groups of equivalent events.

The resulting catalogs could be Exported in the standard 68-bytes ASCII format. In case of *Equivalence* and *Nonequivalence* modes the records from *Initial catalog* and *Reference catalog* are marked respectively with 1 and 2 in the field of Intensity (which original content is lost after completion of *Compare catalogs*).



The content of *Proximity limits* tab window of *Compare catalogs* tool is the same as of *Remove duplicates*. By definition, the two events, one from *Initial catalog* and another one from *Reference catalog*, are equivalent, if all the differences are less than or equal to the selected values in the five *Proximity limits* boxes. (Note that CompiCat program presumes no equivalent events in *Initial catalog*. Therefore, a record from the initial catalog may have several equivalent records in the reference catalog, while a record from the reference catalog may have no more than 1 equivalent in the initial catalog.)

The button *Apply* confirms the choice from the *Catalogs* and *Proximity limits* tabs and runs the selected procedure. To rerun *Compare catalogs* anew without saving the current results the user can change some of the Tool parameters and click the button *Apply*.

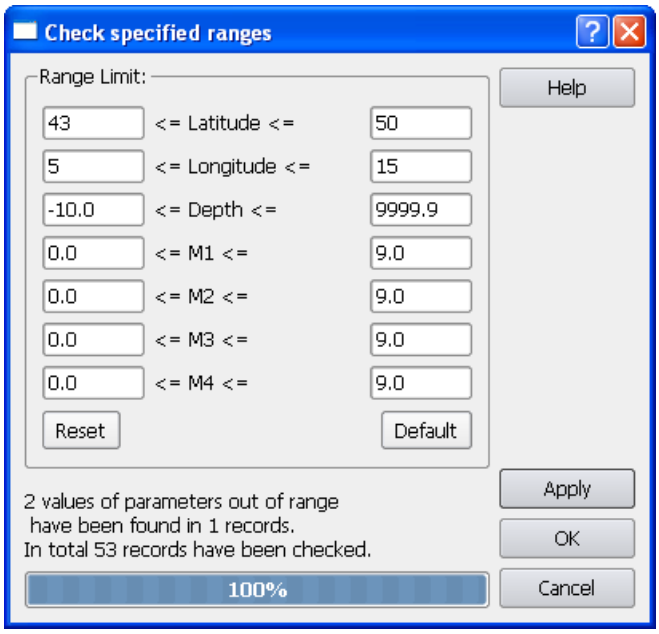
The button *OK* is used to accept all the results of the Tool.

The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes its window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

7.7 Check specified ranges.

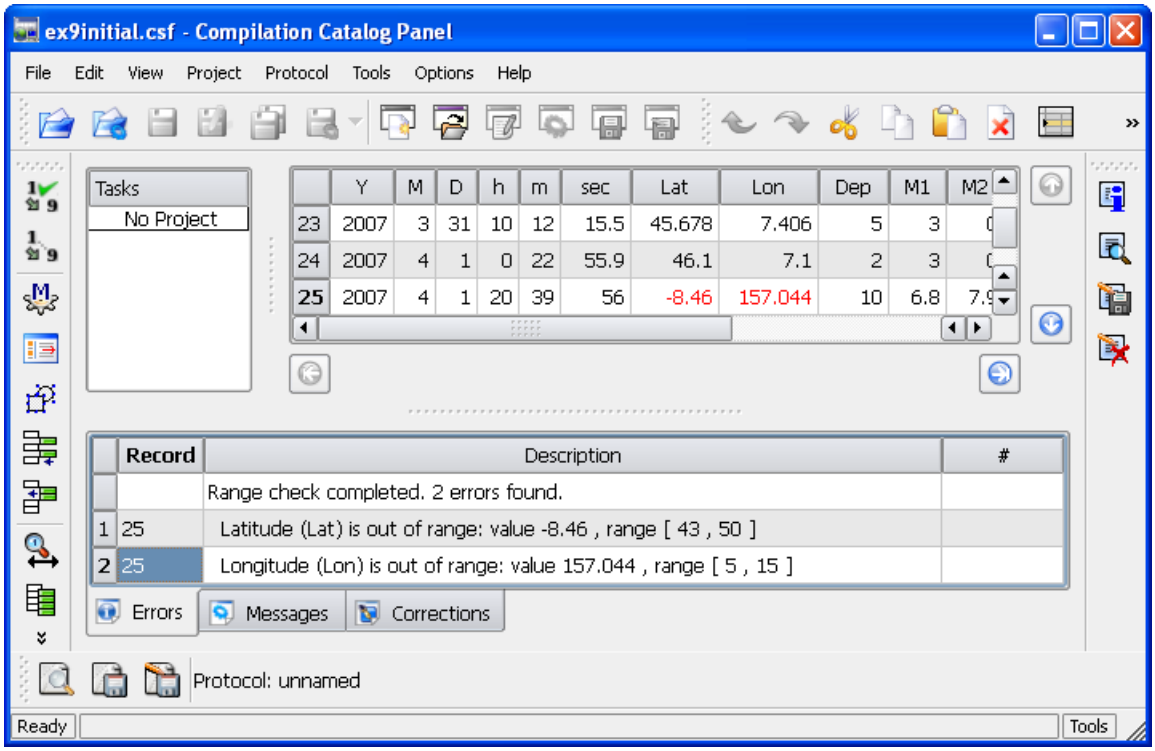
Catalogs may have records that were put in by mistake from irrelevant sources or are erroneous though their parameters being quite acceptable. CompiCat allows the user to search for the records that fall outside the user defined ranges of the parameters and, if needed, to correct those that appear the first records (with up to 200 misfits).
To open the window for checking the specified ranges (*Check ranges*) click button .



If needed, change any content of the boxes for the preferred limits.
The button *Apply* confirms the choice of the ranges and runs *Check ranges* procedure. To rerun *Check ranges* anew without saving the current results the user can change some of the Tool parameters and click the button *Apply* again. The statistics of the run, i.e., the total number of misfits of the ranges along with the number of the corresponding records, appear on top progress bar.

To accept the results of the Tool click OK. The tool completes *Check ranges* procedure with (i) the report to *Messages* tab page the list of user defined ranges and the total number of misfits of the ranges

along with the number of the corresponding records and (ii) the listing in *Errors* tab page of the references to the first records with misfits (up to 200 misfits, 25 by default). To change the number of misfits to report use *Options->Error page size* (see 5.7 Option menu).



To correct the records with misfits follow instructions described in 4.2.3 Protocol frame.

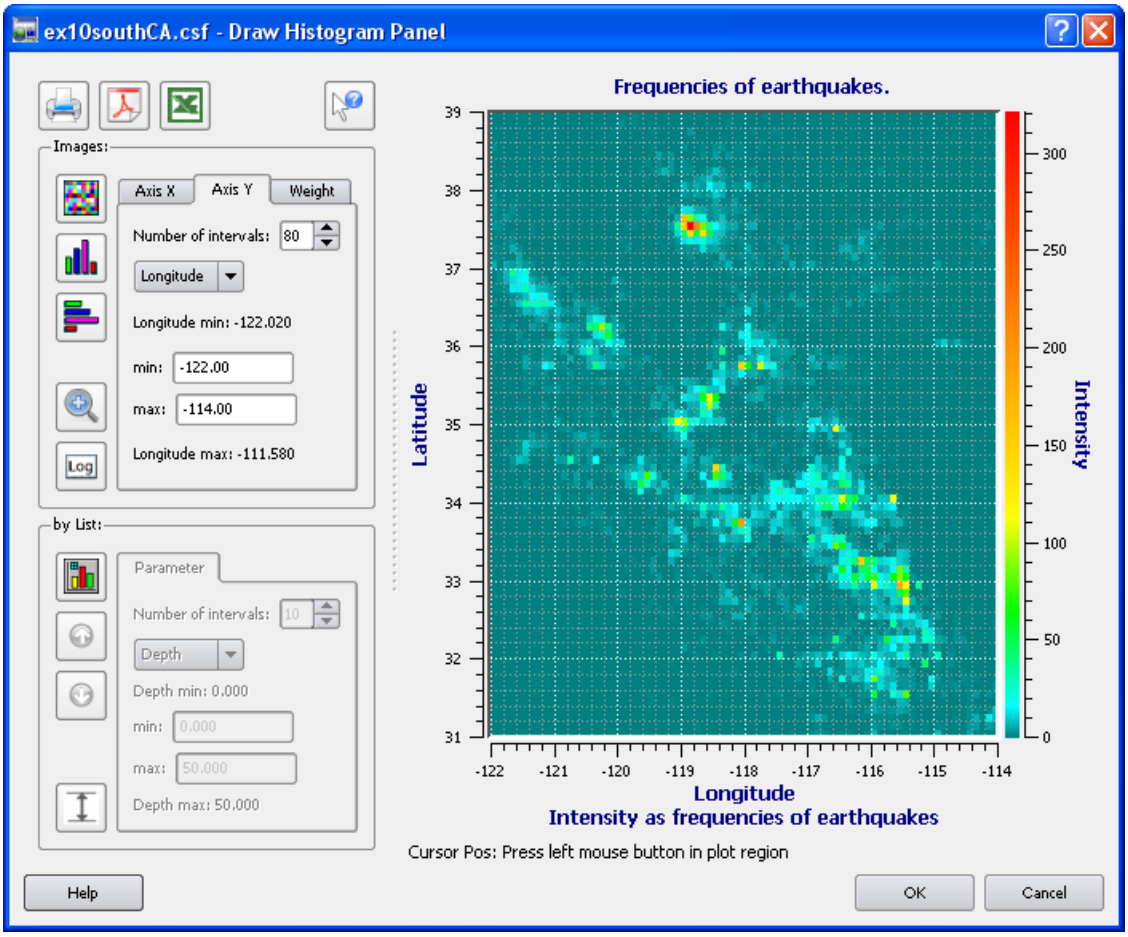
The button *Cancel* is used to cancel all the actions performed by the Tool earlier and closes its window.

By clicking the *Default* button the user sets the default values of the Tool. By clicking the *Reset* button the user can remove all the changes introduced after entering the Tool window. (Note that *Reset* button during the first usage of the Tool is equivalent to the default values.)

7.8 Draw histograms.

CompiCat allows the user to display graphically different kinds of tables associated with the catalog in work. The graphical output could be a traditional (i.e. 1-D), as well as a 2-D histogram. Moreover, the tool permits producing a series of histograms, which display slices of the frequencies considered by an additional parameter, and, therefore, represent either a 2-D or 3-D histogram. Besides frequencies, which is the default option, CompiCat may display maps of some other catalog integrals (like sum of energies etc.) denoted as *Intensity*. The tool may export output tables as comma separated values (the Microsoft Excel CSV format), as well as print and make PDF of the display.

To activate *Draw histograms* tool click button  . By default, CompiCat displays the 2-D histogram of the earthquake frequencies on the longitude-latitude plane.

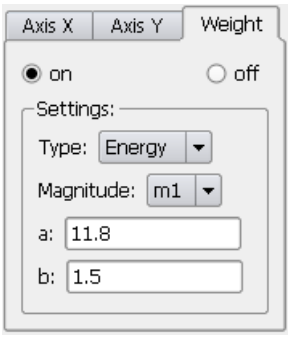


The 2-D histogram displays frequencies as color coded cells, which size could be adjusted by changing the *Number of intervals* (from 10 to 150) and the *min* and *max* limits attributed to X and Y axes. The associated colors of *Intensity* scale are shown on the right side of the histogram. The user may change the X and Y axes to time (in years), latitude, longitude, depth, and any of the four magnitudes. To confirm the choice and redraw 2-D histogram, click button .. The button allows the user to zoom on an area of interest in a 2-D histogram. Toggle the button, bring the cursor on the histogram plate, outline the area of interest by pressing the left mouse button and dragging the cursor. (With the left mouse button pressed at any place of the histogram plate the program displays the cursor XY coordinates. Clicking the right mouse button will zoom out the display one step back . Zooming can operated as often as possible.)

The button Log allows the user to switch *Intensity* scale from linear to logarithmic one. To switch scales toggle the button and redraw histogram.

To display a traditional 1-D histogram either for X- or Y-axis click either button or , respectively. Traditional histograms displays frequencies as bars of different heights.
The user may wish mapping catalog integrals that differ from the default frequencies. CompiCat provides making a choice between sums of earthquake energy, area, and length, as well as the user defined 10^{a*m+b} weights (where a and b are arbitrary constants, and m is the earthquake magnitude). These quantities permit better understanding of of the energy release, or the area ruptured, or the total

length of ruptures in the area of interest. To specify weights open *Weight* tab on the left; click *on* radio button and make the choice of weights.



To produce series of histograms toggle *Invoke by List* button . Make the choice of an additional parameter, *Number of intervals* (from 2 to 20), and the *min* and *max* limits to be used. Toggle button *Switch image scale* to specify either a common or interval dependent normalized scales of intensity. Click either of *Redraw* buttons to display a series of 1-D or 2-D histograms. Click or button to display the previous or the next histogram in a series.

If needed, invoke help text on buttons by clicking , then click a button to get the appropriate quick help on it.

opens the dialog for printout. (Note that a histogram image can be saved in the PostScript format by using print to file option.)

saves a histogram image as a PDF file

saves a histogram table as a Comma Separated Values (CSV) Microsoft Excel file. Note that there might be a problem in reading CSV format files due to Regional Options and Microsoft Excel International Options (see Appendix C. Platform Notes).

Click *Ok* button to leave *Draw histograms* window. CompiCat saves *Number of intervals* for each of the X, Y, and additional axes.
Click *Cancel* to leave window with no save.

8. Project

8.1 Managing Projects.

When using CompiCat on routine basis the user may wish repeating the same or similar sequences of tasks. This is of special importance when reproducing the results of compilation achieved in the past. CompiCat allows the user to create project files that specify sequences of operations performed with seismic catalogs. This could be done with the project wizard, which invokes when the user opens either *New project* or an existing project for editing (*Edit project*). The project wizard allows the user to define a project file as a sequence of catalog operations for implementation in the future. Any single sequence may include the following tasks in any order although without a repetition:

1. Check specified ranges
2. Convert magnitudes
3. Remove duplicates
4. Select subcatalog
5. Merge catalogs
6. Substitute catalogs
7. Compare catalogs

Note that tasks *1. Check specified ranges* and *7. Compare catalogs* define a single sequence by themselves and could not be combined in one project with tasks *2-6*.

The following buttons and menu entries (ordered as they appear on the upper Tool bar) facilitate managing of the projects:

 generates a new project (optional entries Menu item **Project->New Project** or keyboard shortcut Shift+N)

 opens an existing project (optional entries Menu item **Project->Open Project** or keyboard shortcut Shift+O).

 edits an opened project (optional entries Menu item **Project->Edit Project** or keyboard shortcut Shift+E).

 executes the project task list (optional entries Menu item **Project->Execute Project** or keyboard shortcut Shift+P).

 saves the project file to disk (optional entries Menu item **Project->Save Project** or keyboard shortcut Shift+S).

 saves the project file under a new name (optional entries Menu item **Project->Save Project As ...)**.

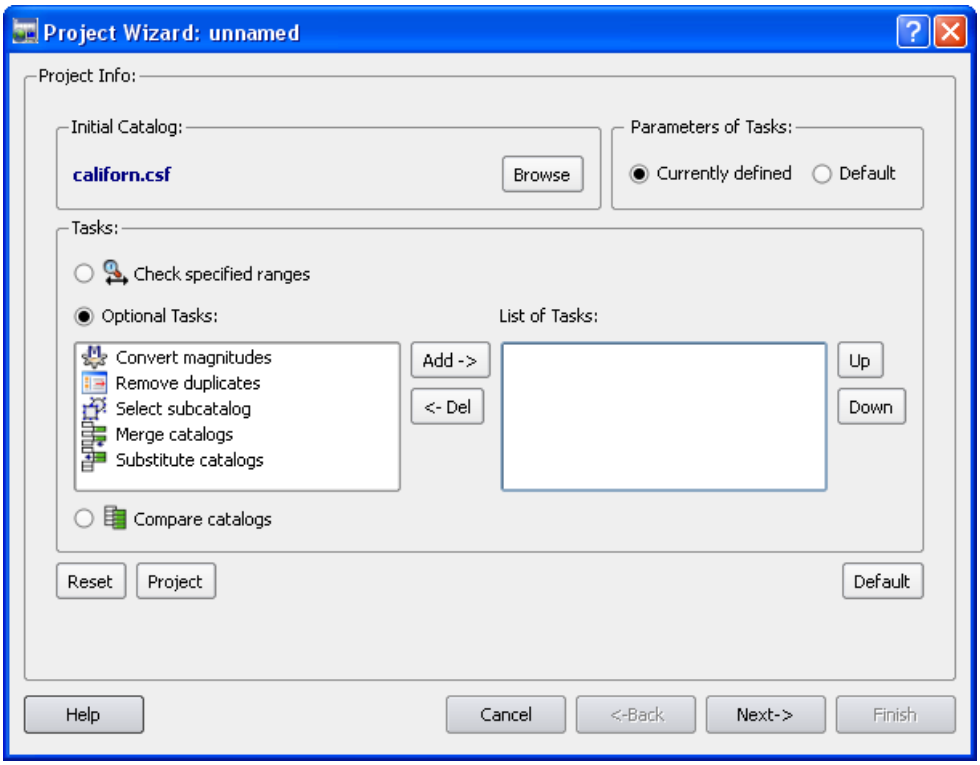
 closes the project without saving (optional entries Menu item **Project->Close project** or keyboard shortcut Shift+L).

Menu item **Project** lists the most recent project files, which could be loaded easily.

The project file names have extension '.pro' or '.PRO' as a CompiCat standard added automatically when you save project files.
In case, some of the catalogs listed in the project files are not found, the user is given automatically an opportunity to fix the problem (see 8.3 Repairing Project).

8.2 Project Wizard.

The project wizard allows the user to define a project file as a sequence of catalog operations for implementation in the future. Its window appears when the user generates a new project (e.g., by clicking button **)** or opens for editing an existing project file (e.g., by clicking). An example of Project wizard window for the existing project file is given below.



The window consists of the two frames - *Initial Catalog* and *Parameters of Task*s - on the top and a larger *Tasks* frame below.
To change *Initial Catalog* for different one Browse computer directories and select a csf formatted catalog.
The *Parameters of Task*s could be set either to *Default* values or to *Currently defined* ones, those in progress before Project wizard has been invoked. The *Currently defined* values of parameters can be obtained by opening some previously saved project file or by working out the tasks parameters anew, without reference to any project.
Tasks frame lists on the left the five *Optional tasks* along with *Check specified ranges* and *Compare catalogs*. low. The user defines the tasks by toggling one of the three radio buttons, adding (Add ->) a selected task to the *List of Tasks*, deleting (<- Del) a selected task from the *List of Tasks*, and by using Up and Down buttons for setting the desired order of tasks.

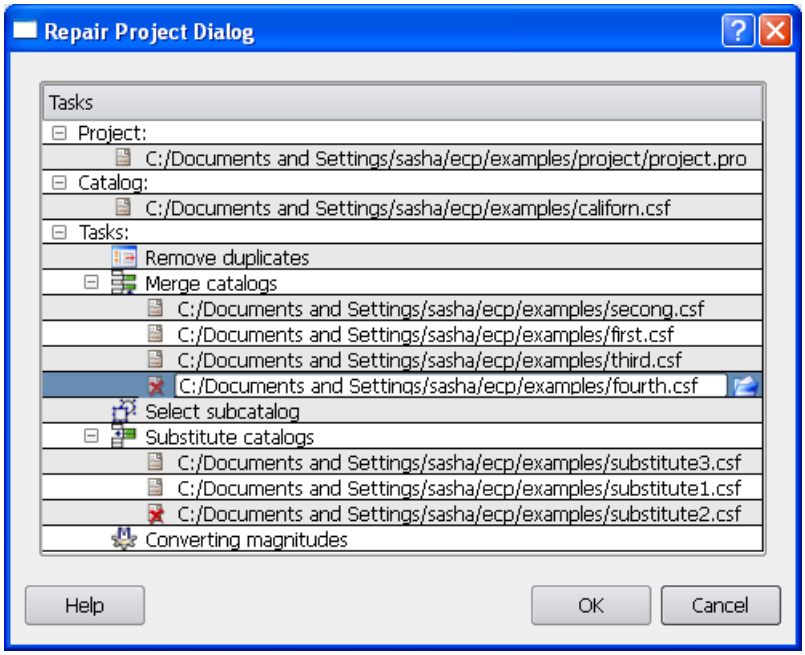
Reset button removes all the changes made after invoking Project wizard. *Project* button reloads the initial project parameters. *Default* button sets default project parameters. In case of a new project, clicking any of the three buttons would lead to the same (*Default*) values.
Clicking *Next->* button invokes one by one, from the first to the last, the current task tool window for setting the desired parameters. (For details of the tools see the appropriate chapter in **7. Tools.**) At any

moment of time the user can return to the previous task tool window by clicking <-*Back* button or exit Project wizard without changes by clicking *Cancel* button. After setting the last task parameters click *Finish* button (i) to complete formation of the project, (ii) to close Project wizard, and (iii) to put the brief info into the project frame of the CompiCat main window.

After formation of the project the user can execute the project by clicking button and save (i) the project file by clicking , (ii) project output catalog by clicking , (iii) project protocol by clicking , etc.

8.3 Repairing Projects.

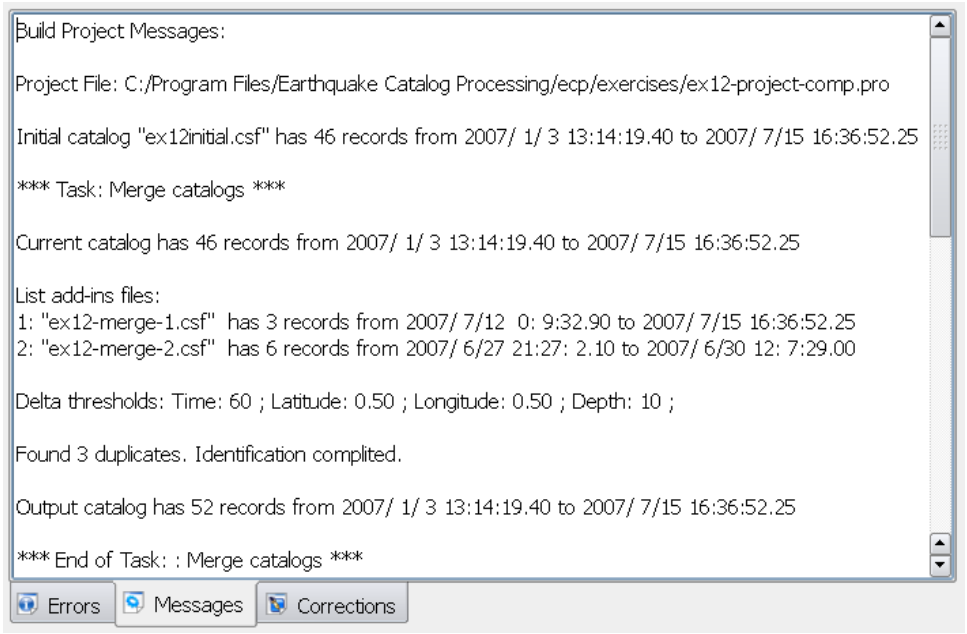
It may happen that the files mentioned in the project have changed their placement. Such a situation is in common when changing computer or computer disk structure. In such a case, when opening the project file CompiCat will find out the problem automatically and will suggest to repair the project with the following comment - "Some input files do not exist. Try fixing the problem?" If the user agrees, the following window of *Repair Project Dialog* opens with the files in absence marked by .

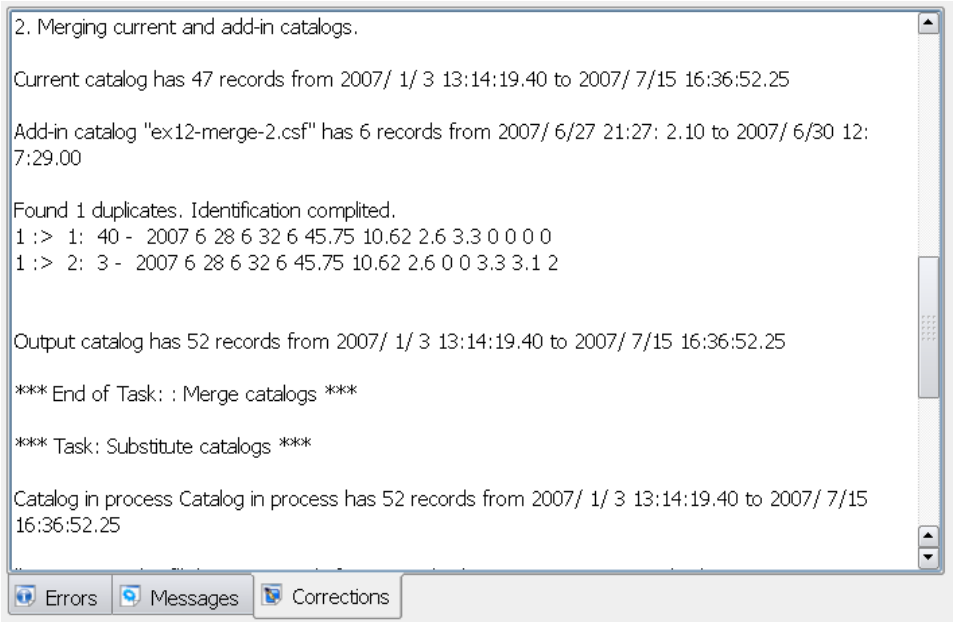


Double click each mark to invoke open file button ; find new location and select the file, which full path reference will appear in blue marked by . (Each correction in blue can be changed in the same way as the marked ones.). After fixing the problem click OK to accept repaired file names of the project file.

9. Protocol of CompiCat session.

Each time CompiCat opens an initial catalog or a project a new session opens. For each session CompiCat generates the protocol, i.e., the comprehensive info about all tasks performed. The protocol has the three pages associated with tabs of the protocol frame. Specifically, *Massages* page that contains info about project (if any), input-output catalogs, tools and their parameters and *Corrections* page that contains info about editing, details on tasks and tools, and their applications. The third page of the protocol frame contains temporary info on *Errors* to be fixed, which corrections when made appear in *Corrections* page.





The user can manage the protocol by invoking the following buttons:

 - preview protocol (menu **Options->Preview Protocol** ; keyboard shortcut Shift+P) - opens text editor window with the content of *Messages* and *Corrections*; click  button to save protocol as an ASCII text file.

 - save the protocol as an ASCII text file (menu **Options->Save Protocol** ; keyboard shortcut Shift+S)

 - save the protocol as an ASCII text file under a new name (menu **Options->Save Protocol As...)**

The standard extension name for protocol ASCII text file is *.protocol added automatically.

10. Help Online.

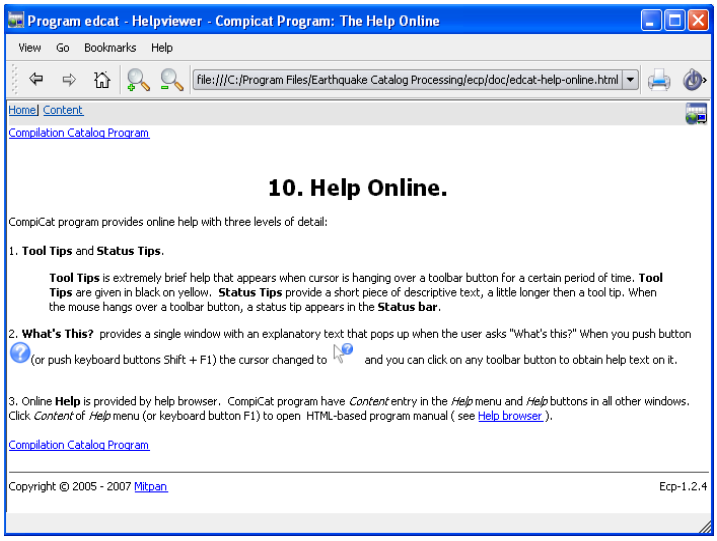
CompiCat program provides online help with three levels of detail:

1. **Tool Tips** and **Status Tips**.

   Tool Tips is extremely brief help that appears when cursor is hanging over a toolbar button for a certain period of time. **Tool Tips** are given in black on yellow. **Status Tips** provide a short piece of descriptive text, a little longer then a tool tip. When the mouse hangs over a toolbar button, a status tip appears in the **Status bar**.

2. **What's This?** provides a single window with an explanatory text that pops up when the user asks "What's this?" When you push button  (or push keyboard buttons Shift + F1) the cursor changed to  and you can click on any toolbar button to obtain help text on it.

3. Online **Help** is provided by help browser. CompiCat program have *Content* entry in the *Help* menu and *Help* buttons in all other windows. Click *Content* of *Help* menu (or keyboard button F1) to open HTML-based program manual.



Menu entries and tool bar of the help browser:

View menu:

View->Print (Ctrl P) - print current HTML page.

View->Zoom in (Ctrl++) - Increase the display font size.

View->Zoom in (Ctrl+-) - Decrease the display font size

View->Exit (Ctrl+Q) - Exit the application.

Go menu:

Go->Backward (Alt + Left Arrow) - Go back one page.

Go->Forward (Alt + Right Arrow) - Go forward one page.

Go->Home (Alt + Home) - Go program contents page.

Help menu:

Help->About - Displays a simple message box about **Help Browser** program.

Help->About Qt - Displays a simple message box about **Qt C++ tool kit**.

Bookmarks menu:

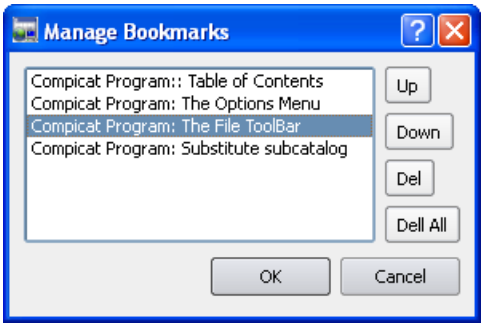
Bookmarks->Add Bookmark (Ctrl++A) - Add Bookmark.

Bookmarks->Manage Bookmarks ... (Ctrl++M) - Manage Bookmarks.

List of chosen bookmarks.

Manage Bookmarks:

Click this menu item to manage bookmarks and following the dialog window will appear:



Click **Up**, **Down** buttons to change the position of bookmarks. Click **Del** button to remove one, click **Del All** to clear bookmarks list.

Appendix A. The ECP standard formats for earthquake data, program project, and protocol.

1. Earthquake catalog format.

The standard format specifies -

- the origin time, i.e., year, month, day, hour, minute, and second with the accuracy of one hundredth,
- the latitude and longitude in degrees with the accuracy of one thousandth,
- the depth in km with the accuracy of one tenth,
- the four magnitudes (presumably mb, ms, m1, m2) with the accuracy of one hundredth, and
- the macroseismic intensity (presumably, Modified Mercalli Intensity; 0 – no data, 1-12).

CompiCat program supports the Gregorian calendar. This calendar was adopted by England from September 14, 1752. The valid year range is [0, 8000]. The standard ranges of other parameters are as follows - latitude [-90, 90], longitude [-180, 180], depth [-10, 999], magnitudes [-10, 10], intensity [0, 12].
CompiCat program checks the ranges of parameters each time you edit catalog and set parameters for catalog operations. Therefore, you cannot type in the value which is outside the standard range.

2. Project format.

CompiCat program creates the binary project file to be used for a repetition of the compiled catalog in the future. See 8.1 Managing Projects.

3. Protocol file.

CompiCat program creates automatically the protocol job file, which lists information about every step and decision you make when compiling the catalog. See Protocol of a session.

Earthquake catalogs (in the ECP standard format) and CompiCat project files are binary files of encoded information, which is compatible with the package running under MS Windows and LINUX. Thus, for example, a catalog compiled on a PC under MS Windows can be used for further runs of the package installed on a PC under LINUX. CompiCat project files are compatible with the package running under UNIX (e.g., a Sun SPARC station under Solaris).

Appendix B. How to register a new format as supported?

CompiCat program helps to upgrade the list of supported earthquake catalog formats, so that only a few lines of description are needed to access earthquake catalog data in a text format.

CompiCat program generates formats from the information listed the file named *standardformat.list* located in the subdirectory *Install Directory*/ecp/ref (see Installation Notes)

To register a new format in the list of supported put an additional block of description at the end of the standardformat.list file. Each block should start and end with a line of minus characters, which embrace the description. Each line of description starts with one of the following locators – TITLE, URL, REF, TIME, LAT, LON, DEP, M1, M2, M3, M4, INTEN, SKIP, REM (note that some of the locators like URL, REF, REM could be not necessary). A locator may have parameters listed in the brackets. Usually, these indicate the starting position of the value followed by the string of its format. For example, TIME(1,YYYY/MM/DD HH:mm:SS.ss) indicates that the origin time is given in positions 1-22, DEP(34,DDDd) – the string of depth format is DDDd, SKIP(1,!GS) – each record that starts with GS will not be skipped, etc. The format specifications for each locator are as follows -

TITLE - used by CompiCat to display the format name;

TIME: Y(year), y(fraction of the year), M(month), D(day) or d(day of the year from January 1st), H(hours), m(minutes), S(seconds), s(fraction of the second);
LAT: D(integer degrees), d(fraction of a degree) or M(minutes, '), m(fraction of a minute) or s(seconds, "), - or N or S(sign);
LON: D(integer degrees), d(fraction of the degree) or M(minutes, '), m(fraction of the minute) or s(seconds, "), - or E or W(sign);
DEP: D(integer including sign if any), d(fraction);
M1, M2, M3, M4 - D(integer), d(fraction);
INT: one character;
SKIP: If the string starts with "!" character than each record that contains this string at the specified position will be read or skipped otherwise. Up to ten SKIP lines are allowed;

URL - the web site reference to receive catalogs, not used by the program;
REF - the place for the reference to format description, not used by the program;
REM - remarks, not used by the program.

The following formats are initially supported after installation of CompiCat program -

1. 20 byte - Standard Format - Binary - used in some MITPAN programs.
2. 41 byte - Standard Format - Text - used in some MITPAN programs.
3. swf.txt - Standard Wide Format - Text - text format of internal standard CompiCat binary format.
4. anss - Advanced National Seismic System - URL http://quake.geo.berkeley.edu/anss/catalog-search.html
5. anss 80-col - Advanced National Seismic System - URL http://quake.geo.berkeley.edu/anss/catalog-search.html
6. pde - NEIC Preliminary Determinations of Epicenters - URLs PDE-monthly - ftp://ghtftp.cr.usgs.gov/pub/pde;

PDE-weekly and QED -
ftp://ghtftp.cr.usgs.gov/pub/weekly
7. scec - Southern California Earthquake Data Center - URL
http://www.data.scec.org/ftp/catalogs/SCEC_DC/
8. scsn - Southern California Seismographic Network - URL
http://www.data.scec.org/ftp/catalogs/SCSN/
9. hypo71 - Summary hypo71 format year 2000 - URL
http://www.data.scec.org/catalog_search/date_mag_loc.php
10. hds - NEIC Hypocenter Database System - URL VX-format - ftp://hazards.cr.usgs.gov/hds

For example:

TITLE pde - NEIC Preliminary Determinations of Epicenters
URL PDE-monthly - ftp://ghtftp.cr.usgs.gov/pub/pde
URL PDE-weekly and QED - ftp://ghtftp.cr.usgs.gov/pub/weekly
REF
TIME(5,YYYYMMDDHHmmSSss);
LAT(21,DDdddN);
LON(27,DDDdddE);
DEP(34,DDDd);
M1(48,Dd);
M2(52,Dd);
M3(57,Ddd);
M4(67,Ddd);
REM a - ascii character list(X -10,E - 11,T - 12)
INTEN(80,a,XET);
SKIP(1,!GS);

Examples of the format files

TIME(1,YYYY/MM/DD HH:mm:SS.ss);
LAT(24,-DD.dddd);
LON(33,-DDD.dddd);
DEP(43,DDD.dd);M3(51,D.dd);
SKIP(1,---);
SKIP(1,);

TIME(3,YYYYMMDDHHmmSSss);
LAT(21,DDdddN);
LON(27,DDDdddE);
DEP(34,DDDd);
M1(48,Dd);
M2(52,Dd);
M3(57,Ddd);
M4(67,Ddd);

```
INTEN(80);
SKIP(1,!GS);

TIME(1,YYYY/MM/DD HH:mm:SS.sss);
LAT(35,-DD.ddd);
LON(43,-DDD.ddd);
DEP(52,DDD.d);
M1(73,Ddd);

TIME(1,YYYY MM DD HH mm SS.ss);
LAT(25,-DD MM.mm);
LON(34,-DDD MM.mm);
DEP(54,DDD.dd);
M1(47,D.d);
SKIP(1,#);
```

Name of the fields:

TIME - year, month, day, hr, minute, second I have not considered possibility to give time in years and fractions
LAT - latitude
LON - longitude
DEP - depth
M1 - first magnitude, or "MS"
M2 - first magnitude, or "MS"
M3 - first magnitude, or "MS"
M4 - first magnitude, or "MS"
INT - intensity (only one character can be read)
SKIP - to manage skipping non-data records

Format specificators:

TIME: Y(year) y(fractions of the year) M(month) D(day) d(day from 1 January of the year) H(hours) m(minutes) S(seconds) s(fraction of second)
LAT: D(integer degrees) d(fraction of a degree) M(minutes,') m(fraction of a minute) s(seconds,") -, N or S(sign)
LON: D(integer degrees) d(fraction of a degree) M(minutes,') m(fraction of a minute) s(seconds,") -, E or W(sign)
DEP: D(integer part including sign if any) d(fraction part)
M1,M2,M3,M4 - D(integer part) d(fraction part)
INT: no specificators, only one character will be read
SKIP: multiple (upto 10) strings of SKIP are allowed. If first character after position and comma is ! - including rule will apply, otherwise excluding rule will apply; the following string upto) will be compared with the input string starting from the indicated position