GeoSIG
swiss made to measure

GeoDAS Advanced Features
Features marked with an * are available only in specific projects.

Strong Motion Data Processing (SMD)*

Various GeoSIG instruments can provide parametric information containing the peak values (i.e. PGA peak ground acceleration, PGV peak ground velocity) and spectral characteristics (i.e. SD peak spectral displacements at different fixed frequencies) of the measured earthquake shaking.

This information can be used to estimate the intensity of the shake in those points where instruments are located and to create a distribution of these parameters throughout an area that is monitored by several instruments. The processing of the information is performed by another application provided by GeoSIG (i.e. Rapid Response Mapping application RRmap/ShakeMap; please contact GeoSIG in case of any questions related to this application) or any other compatible software. Therefore GeoDAS is responsible to acquire the parametric information from all configured stations and to deliver this information to the processing application.

For a processing application, it is important to provide event simulation options for testing the system periodically. However testing data with useful parametric information can seldom be generated if not simulated; i.e. one can not wait for a real earthquake to happen.

Strong Motion Data Processing used in conjunction with optional RRMap/ShakeMap* application for disaster managemnent

GeoDAS lets the user to simulate the system functionality in a flexible and scheduled way which enables the user to create internal reports for testing the data processing algorithm, to send these reports out for testing the communication links and to send the simulation parameters to the field instruments which should perform the simulation at specified time for testing the functionality of the field instruments. The simulation options also include a selection of shaking distribution type and direction of seismic wave propagation, lower and the upper limits for parametric information. If it is necessary to provide some fixed customised parametric information for simulation, the user can also use a text file containing this information for all configured stations.

ISO 9001
REGISTERED FIRM

Messenger of GeoDAS

This is a tool, which is used to deliver different types of information from GeoDAS to the subscribers. Two ways of delivery are currently supported: email and SMS (short message service).
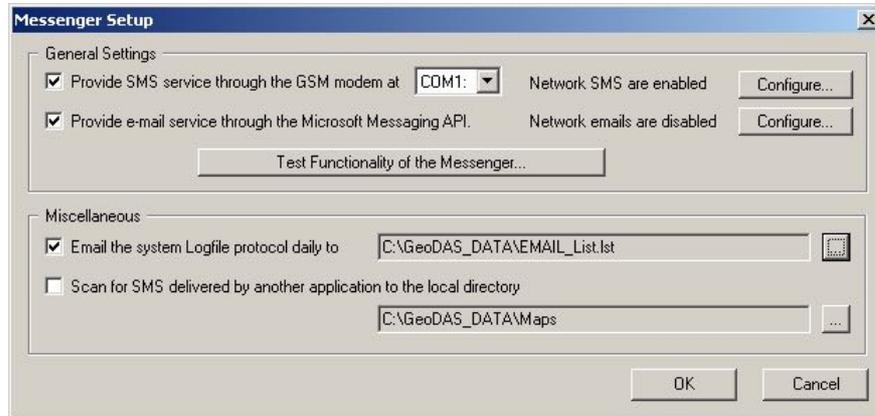
Messengers of the different instances of GeoDAS located in the different computers can exchange the data. Those messengers, which do not have the corresponding services enabled, still can send the emails and SMS by forwarding them to the "master" Messenger. Usually GeoDAS receives the SMS directly from GSM modems. But SMS can also be delivered in any other way, for instance, received by another application through the FTP or HTTP service and dumped into files from where GeoDAS picks them up. The functionality of the Messenger can be tested at any time.

Advanced Station Map (ASM)*

GeoDAS can display the configured stations on a "googlemap" with associated coordinates

All stations with their status are clearly visible with color codes (normal operation, warning state/event recorded, error state, no connection, etc).

Each station's setup / web interface is directly accessible from this map screen. This enables direct configuration, check and maintenance as well as if desired downloading of selected files.

The map includes also dropdown lists of stations grouped by status, therefore provides very intuitive overview and access as seen in the following examples:
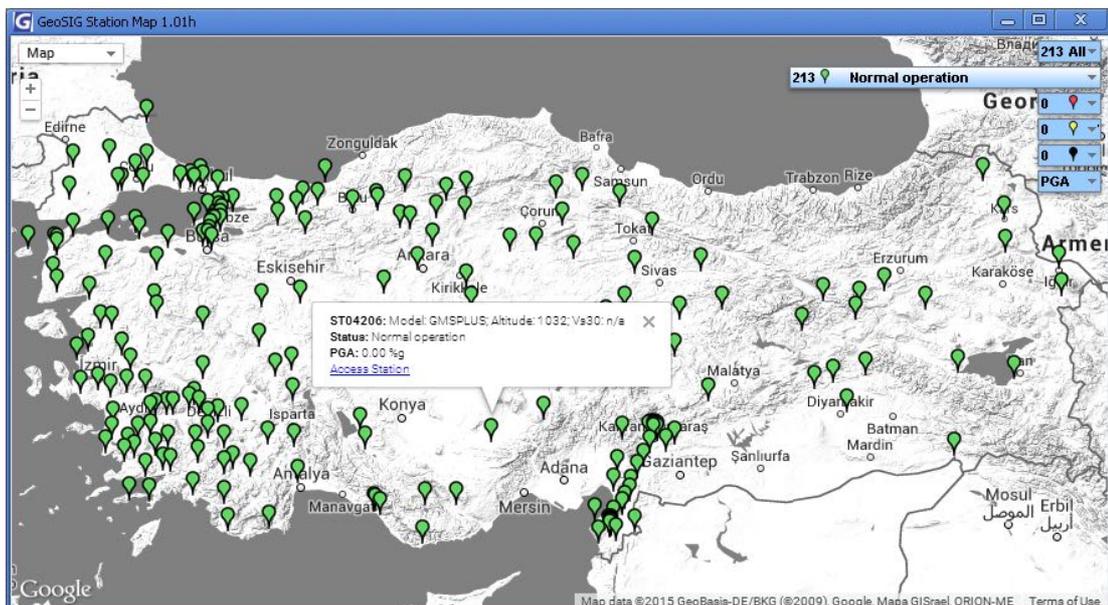
Network Links of GeoDAS

GeoDAS can communicate to other instances of GeoDAS as well as to other applications developed by GeoSIG through Windows sockets.
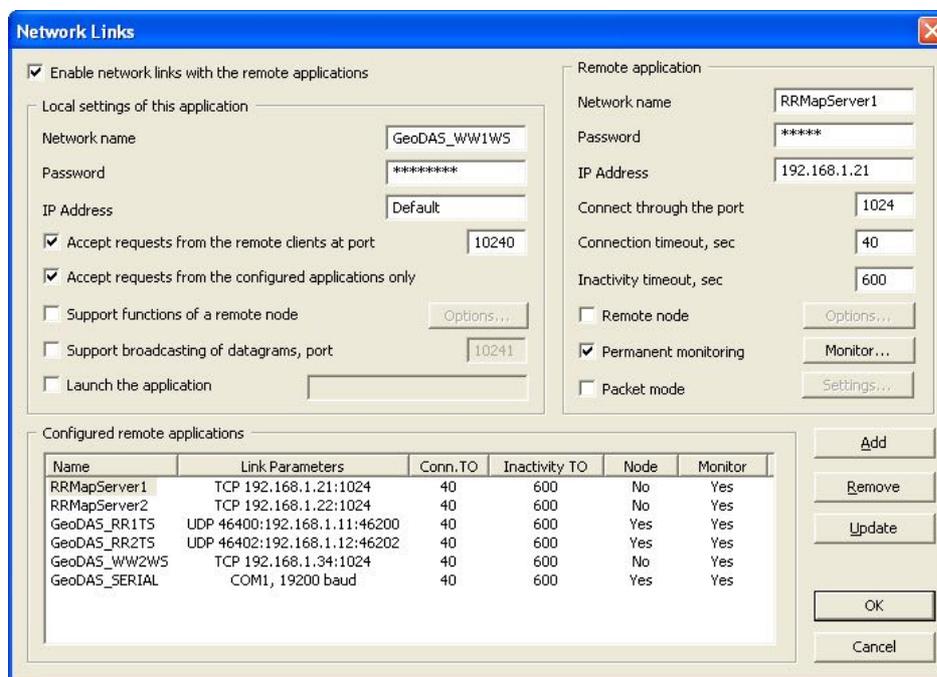
This features allows GeoDAS to,

- accept the requests from remote instances of GeoDAS and/or from other applications,
- support broadcasting of datagrams to forward the information provided by data streams to the remote applications,
- launch an external application that can be a communication utility or any other program required to be working when GeoDAS is active. GeoDAS monitors the status of this application and restarts it in case it is terminated due to some reason
- make the following different GeoDAS services available for the remote clients:
    - Monitoring State of Health (SOH) of the configured stations
    - Downloading events and ring buffer files
    - Requests for statistics of communication
    - Real time data streaming
    - Remote configuration
- activate the feature of permanent network monitor for the current application.
- utilize Packet Mode of communication over the network channel via UDP protocol rather than TCP.
- specify the details of network communications between several program modules that support networking features.

Statistics of Communications

GeoDAS can acquire some statistical information while communicating to the configured stations. This information can be used to optimise communication parameters for the purpose of debugging. The acquired information can be viewed, kept in a file and sent to email recipients.

Statistical information acquired consist of:

- The unique station name,
- Number of successful logins to the instrument,
- Total time spent logged in to the instrument,
- The number of downloaded files and their total size,
- The rate of data transfer from the instrument,
- Minimum/maximum/mean waiting time for a free communication channel to lock it and get an access to the current station,
- Minimum/maximum/mean waiting time for dialling out,
- Number of failed attempts to login to the instrument,
- Number of event detected (EVT) messages received,
- Number of event completed (FIL) messages received,
- Number of state of health (SOH) messages received

Network Monitor

The Network Monitor is used in multi-computer configurations only. A GeoDAS application installed as monitor can control remote GeoSIG applications and can provide general information about them to the subscribers by email and/or by SMS messages.

It is possible to restart a remote application or even reboot a remote computer using the Network Monitor.

The Network Monitor periodically checks the status of remote applications at selected time intervals. The status information is also logged to the status file. Enhanced information consisting of the following details are displayed, monitored and logged:

- The name and colour coded status of the remote application,
- Parameters identifying the link to remote application,
- Time of the last restart of the application,
- Time of the last response from the application,
- Number of the modules of the monitored application, which communicate over the network,
- Number of connections, which are currently active,
- The percentage of the free memory,
- The total amount of physical memory and the amount of free memory available,
- The total amount of virtual memory and the amount of the free virtual memory available,
- The total amount of HDD space and the amount of the free space available,
- Current rate for incoming and outgoing data over the link
- Current state of the system flags at the remote application, if supported
- Status of the monitored application: Online, Offline, Error.
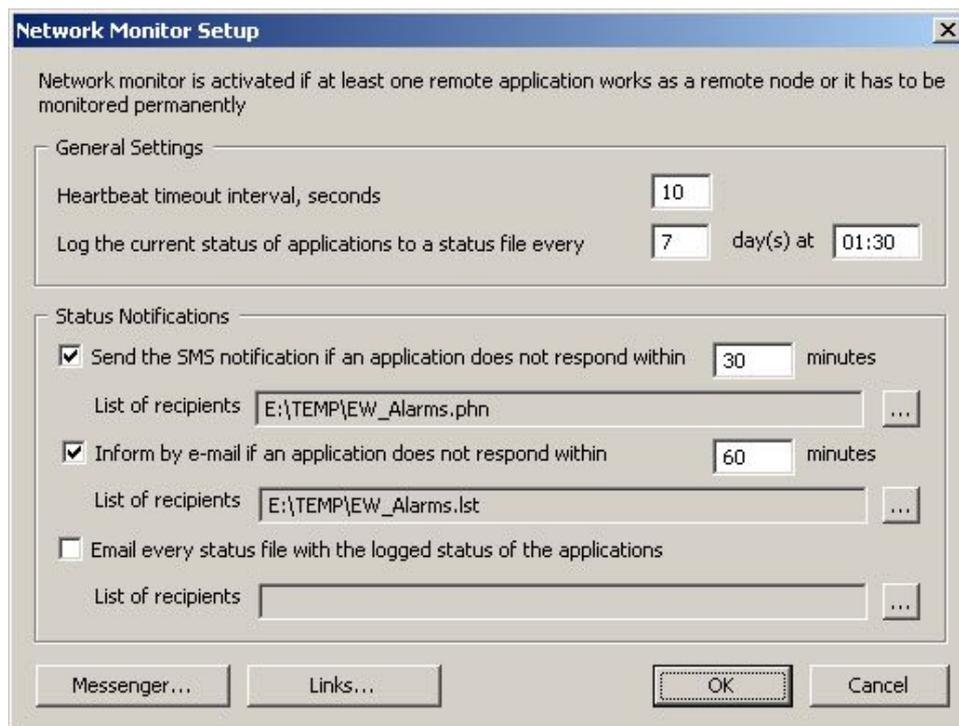
The Network Monitor can send information about monitored applications by email and/or by SMS if the corresponding services are supported and enabled. You can select to send an SMS notification message if any monitored application does not respond within the specified time interval. The same notification can be send by email also with more detailed information attached. The status of applications can be also send by email periodically.

Event Checks (NPP)*

The event files are analysed by GeoDAS in order to check whether they can be declared as seismic ones and whether they meet the Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) criteria. These checks are required for the applications of especially the Nuclear Power Plants (NPP) seismic instrumentation. The main role of such instrumentation is the prompt evaluation of seismic response of the safety-significant plant features after an earthquake. The analysis parameters are selected based on the following Standards and the Regulatory Guides:

- NRC Regulatory Guide 1.12, "Nuclear Power Plant Instrumentation For Earthquakes", Revision 2, March 1997
- NRC Regulatory Guide 1.166, "Pre-earthquake Planning and Immediate Nuclear Power Plant Operator Postearthquake Actions", March 1997
- EPRI TR-100082-T2, "Standardization of the Cumulative Absolute Velocity", December 1991

The parameters specified are used for both manual check of single even files and for automatic check of the group of event files provided by several stations and declared as the single seismic event. Very flexible configuration of these parameters allows to user to conveniently define seismic event checks (to determine whether an event is a seismic event) and to efficiently check any seismic event against OBE and SSE criteria.

Several important parameters used for calculation of the response spectrum acceleration (RSA), response spectrum velocity (RSV) and the cumulative absolute velocity (CAV) as these data used in the Boolean formula for calculation of OBE and SSE. Furthermore other check parameters specify two sets of frequency ranges and the absolute limits for OBE and SSE.

The event meets OBE or SSE criterion if at least one CAV component exceeds the specified limits and if at least one component of RSA or RSV exceeds their limits within the specified frequency range interval. The limits are set separately for horizontal and the vertical components.

The results of event checks can be forced to be positive for the testing of the system.

It is also possible to make PDF reports automatically if the appropriate third-party printer emulation software is installed. Several features of this printout, such as title and the logo can be modified and they can be different for the first and for next pages of the report.

Any event file can also be checked manually whether it meets the seismic and OBE/SSE criteria. The general information stored in the header of a selected data file will be displayed and the brief results of the checks are displayed. Optionally a graph window containing the RSA, RSV and CAV curves with the corresponding limits as well as the original waveforms is created.

A special document summarizing the NPP functionality of GeoDAS is separately available.

Support for ADC boards (ADC)*

GeoDAS, if purchased accordingly, can acquire data directly from an industry standard A/D converter board.
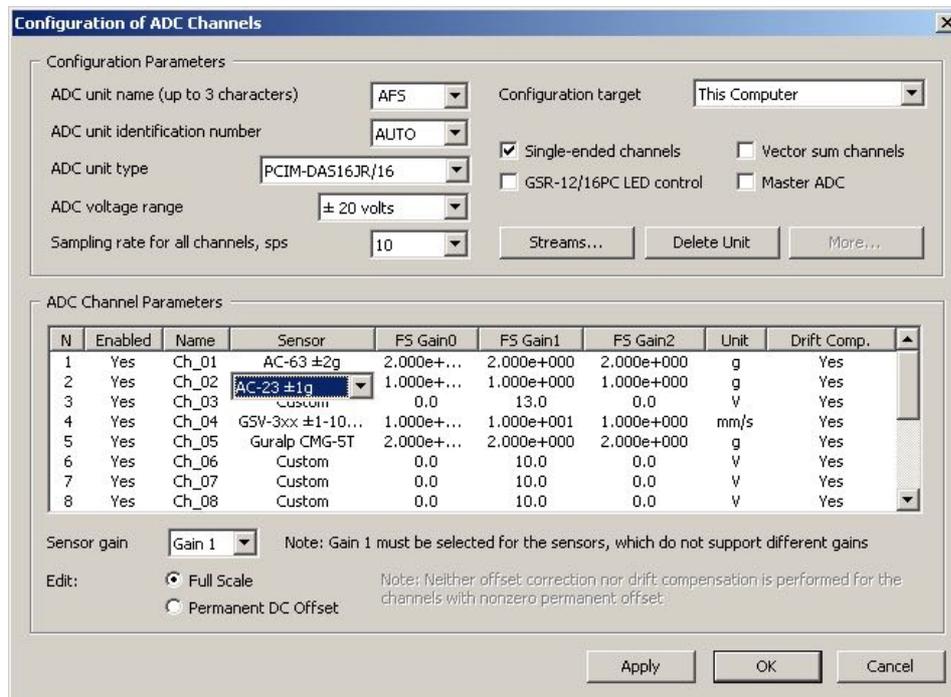
In most cases the configuration of ADC units and channels is edited locally, i.e. in the same computer where ADC units are installed. But there is also a possibility to configure ADC units in the remote instances of GeoDAS if they are configured as remote nodes allowing the remote configuration. This is achieved by the Network Links of GeoDAS.

If several boards of the same type are served simultaneously, the user can connect the clock output of the master board to the external clock input of the other board(s), which would ensure synchronisation between them with the precision of one sample.

Optionally it is possible to simulate an additional channel for every three-channel station, as the vector sum, which is a square root of the sum of the squares of the three channels.

For each channel it is possible to define the following parameters:

- Whether it provides data to the acquisition system or not,
- Channel name,
- Connected Sensor and its full scale,
- Full Scale or DC gain,
- Units,
- Drift Compensation

Furthermore, it is possible to adjust trigger settings and some other parameters for processing of data streams. Note that it is possible to edit both local and remote sets of parameters depending on the type of configuration currently selected. But there are exceptions: options of the data forwarding, messages and notifications and the target communication port for the Early Warning alarm messages cannot be adjusted remotely.

Similar to the data streams from standard instruments, both permanent and the event-based recording of data are possible for ADC channels. Also the filing system is compatible with the standard GSR event files.

Static Measurements (STM)*

If GeoDAS is configured to work with data stream channels, all or some of these channels can be configured for static measurements. The term 'static' does not mean that the signal decimated and delivered by such channel is constant. It changes but rather slowly, so it can be sampled with a time interval of several seconds, minutes or even hours. A typical example of static data is the air temperature. While dynamic data are very often high pass filtered to remove the DC offset, the main measured characteristics of the static channels is their offset, which is never removed or compensated.

Using the processing features of the static measurements it is possible to generate alarms and reports for these measurements. Enhanced analysis options such as rainflow counting is also implemented based on the original article "Simple rainflow counting algorithms" by S.D.Downing and D.F.Socie, INT.J.FATIGUE January 1982. The results of processing are converted automatically to the ASCII format of comma-separated values and are displayed with the default Windows viewer.

If alarm levels of the static channels are exceeded the SMS notification can be sent to recipients. To provide this service the computer running GeoDAS must have at least one GSM modem configured either for the static data transfers or for the use by GeoDAS Messenger. If the computer is connected to network, e-mails can be sent as well if the corresponding option is selected.

GeoDAS static data processing can send generated data files to another instance of GeoDAS over a dial-up link.

Automatic Event Processing (AEP)*

Automatic Event Processing is designed for automatic processing of event files recorded within a selected time interval, usually several hours or days.

The processing is done in the following steps:

- Making an overview of static data for the specified processing interval,
- Creating event files from the ring buffers extracting data recorded at specified times if the corresponding option of automatic data processing is enabled. It is assumed in this case that the data streams of the stations being processed are available and are saved to the DAT files.
- Processing all event files one by one by applying a template preliminary generated.

Results of processing are combined into a report that is forwarded for printing out at the default system printer. At the same time all processed data are stored together in a directory and can be printed later manually at any time.

AEP module configuration dialog with resulting reports

Automatic File Conversion (AFC)*

The name of this functionality indicates that the data files are converted to another format and this operation is performed automatically. It is assumed that the input files are placed to a directory by one or more data collection programs or just manually. During the conversion GeoDAS collects all important event-related information (date and time, duration, sampling rate, etc.) and calculates the peak event amplitude. Though event files can contain data sets of any physical characteristics, it is assumed in this implementation that the data samples are acceleration in units 'g' or cm/s2. Both collected and calculated data are inserted into the database and, additionally, can be saved to the ASCII file. Data processing and storage is performed channel-wise. This means that in case of the standard three-component files (X, Y and Z channels) there will be three records in the event table of the database. Though in most cases event files contain data of triaxial sensors, the implementation has no limitation with respect to the number of processed channels. The details of this functionality are given below. A text file is used to provide the station list to GeoDAS so that it any missing information in the original format can be retrieved.
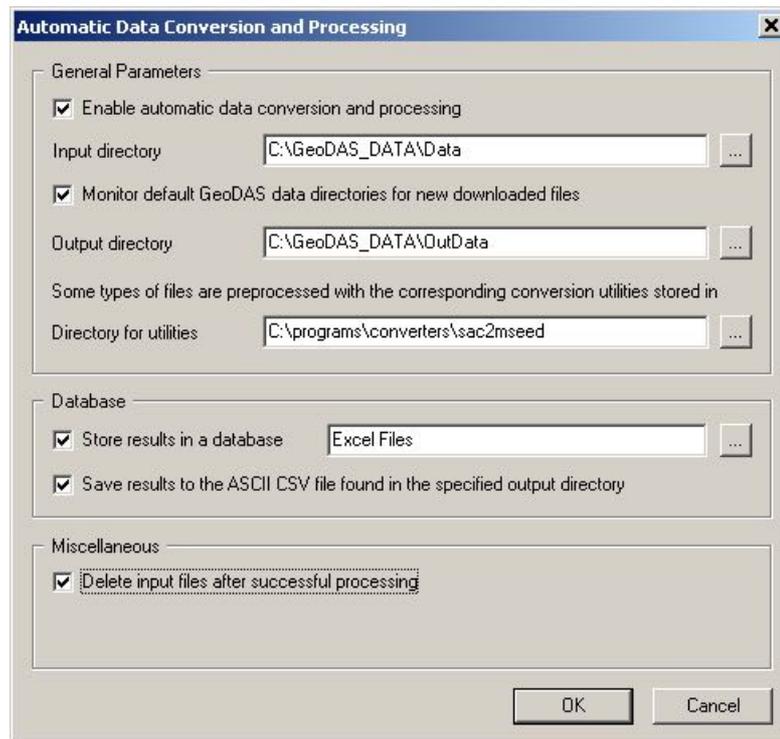
Seismic Evaluation (SEP)*

This special software module enables a joint operation of GeoDAS and SEISAN software, to benefit from seismic analysis features of the SEISAN software automatically or manually. Not all SEISAN features are available to operate automatically.

User can chose automatic conversion of both stream data files and event files to the SEISAN format. If SEISAN is installed on the same computer, GeoDAS stores files to the SEISAN database automatically. Converted data files can be also just copied to a postprocessing directory and original source files can be optionally deleted.
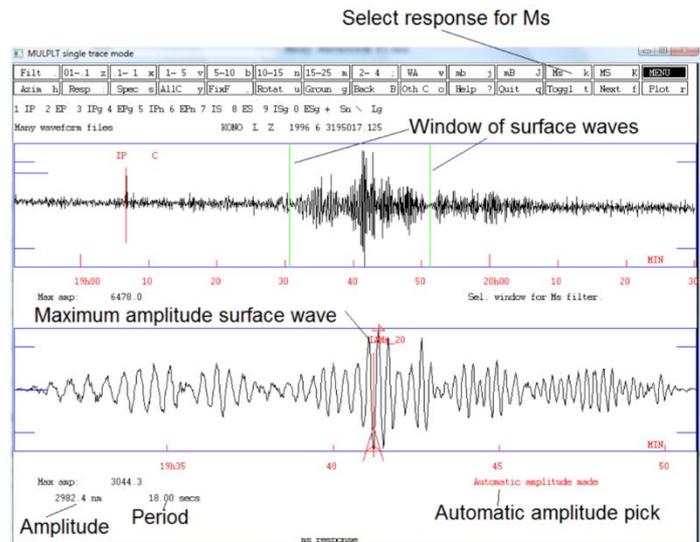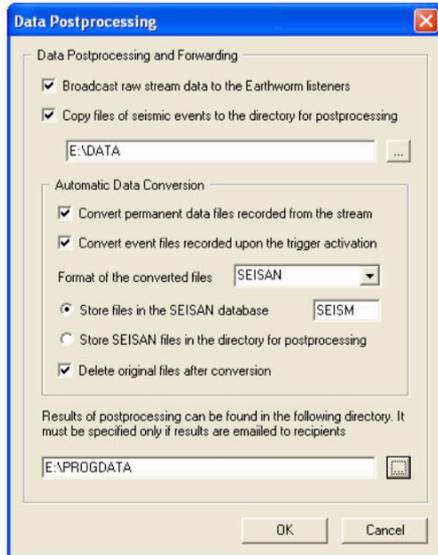
GeoDAS-SEP and SEISAN automatic picking

It is possible to launch any SEISAN routines right after storing data into the database. For instance, automatic phase picking with autopic can be useful, or magnitude estimation with automag. The related commands shall be listed in the file GeoDAS_DATA\Config\seisan.bat, which is launched with a name of the last created S-file as a parameter.

GeoDAS monitors the SEISAN database permanently. Any update of the SEISAN database with location information for the currently monitored event is considered by GeoDAS as completed processing of this event by SEISAN. In this case, GeoDAS can send automatically an email containing this location information.