



Release Notes GEOLYMPUS 3.5

Pre-requisites



Computing and system environment:

- The GeOlympus user interfaces are Java applications integrated into CGGVeritas GeOlympus package. A Java Runtime Environment (JRE) or Java Development Kit (JDK) version 1.5 or 1.6 must therefore be installed locally on each computer running a GeOlympus application. Note that the dependencies with the Geocluster XPS database require Java 1.5 and above. The JRE or JDK is not provided with GeOlympus. If GeOlympus is the first Java application from CGGVeritas installed on your system, you can request the JRE CD, containing all multi-platform JREs necessary for running CGGVeritas Java applications, from the Distribution department at: cgg_distribution@cggveritas.com
- The inversions to update the model in Geostar and the residual static-velocity computations in GeoPACS are implemented as native non-Java standalone process, which can be run on either the local computer (default mode) or a remote computer; in any case this computer must be a PC/Linux platform.
When such process is launched from the graphic user interface, the integrated Java job manager handles the following processes:
 - data transmission to the target machine
 - standalone job execution
 - re-direction of output to the graphic interfaceThe remote PC/Linux workstation(s) on which you intend to run a GeOlympus standalone process must also be installed with a local Java environment, and they must be previously declared in the `GsWServices` environment variable; for example to declare `n01` and `n02` workstations, type:

```
setenv GsWServices //n01/GsWJob://n02/GsWJob.
```

This preliminary declaration is not necessary when the standalone process runs on the same PC/Linux workstation than the GeOlympus application (i.e. in local mode).
- For Geostar, the environment varies according to the inversion type and data size:
 - The Layered Model Inversion (LMI) can be executed as a Geostar process in the local (or remote) PC/Linux workstation for any data size, assuming there is enough free space in the scratch directory.
 - The Tomographic Inversion constitutes a much heavier process.
For 2D profiles or small 3D surveys, it can run as a Geostar process on the one or two CPUs of the local (or remote) PC/Linux workstation.
To speed up its execution for mid- to large-size 3D surveys, Geostar can prepare a Geocluster job for manual or automatic submission on a cluster of Linux PC nodes. Refer to Geostar on-line documentation for more details.



Licensing:

- As explained in the previous section, the applications integrated in the release 3.5 of the GeOlympus statics workstation are composed of Java-based Graphic User Interfaces and

C/Fortran calculation codes, which require different license feature formats.

All these license features can be grouped in the same file, either in the centralized license file on a license server upgraded to FLEXlm 9.5, or in a specific `license.lic` file integrated in GeOlympus installation directory.

Cgg_distribution can provide floating or node-locked licenses.

- In GeOlympus launch pad, the applications without an active Java license are grayed out. Note that the information displayed in the “Licenses” panel from GeOlympus Help menu can be erroneous when the listed license features are installed on a remote license server.

New features



Job and data management:

- GeOlympus 3.5 applications are interfaced with the Geocluster XPS data server. Auxiliary data like Statics, Velocities, Horizons and Mutes can be read or written in the XPS database. The Geometry data can be saved and read as XPS Scatter-type dataset, and the first break pick times can be saved and read as XPS Others-type dataset. Several XPS datasets can be selected and loaded in one go and all loading parameters apply to all selected datasets.
- GeOlympus 3.5 applications can read trace sets in SEG-Y standard format; for example weathering shots in Geostar or GeoWZ, CMP or Bin gathers in GeoPACS. The models computed in Geostar and GeoWZ can also be exported as SEG-Y trace sets. In the `Setup > File Formats` dialogs from the application’s main window menus, you can adapt (to some extent) the header’s mapping for non-standard SEG-Y formats.
- Thanks to specific options, Promax velocity, static, horizon and trace set formats are supported.
- Several controls were added in Geostar to define the environment for the execution of the tomographic inversion in parallel mode on a cluster of PC (using PTLR3 standalone). The default patch name and scratch path on nodes can be modified directly in the Geostar interface. The Geocluster level and the targeted (cluster) actor name can be defined in specific variables:
 - `setenv GCT_P_LEVELS "3100;4100;5000";setenv LEVEL 4100` defines the default level
 - `setenv GCTServices img3-32:opteron:img24-16` to declare various PC cluster actorsYou can switch between two inversion modes:
 - “Intra-node” (default): the matrix is splitted on the nodes; this mode requires less memory per node but the inversion step takes longer
 - “Inter-node” (default): each node receives a copy of the whole matrix, which is time and memory consuming but allows faster inversion
- The interactive Picker in Geostar can store picked values directly in the seismic trace header, when the “Store FB in header” icon from the Picker toolbar is pressed. Reminder: when loading trace sets, the trace headers are cached (in `~/ .glrCache` directory). This cache can be cleared by selecting the “Clear traces cache” from the Session menu of the GeOlympus launch pad.
- In the General UI tab of the UI Setup window in Geostar and GeoWZ, an option (non-activated by default) permits the backup of the previous version (in `.backup` file) on project save.



Graphic user interface:

- The X/Y limits of the Geostar or GeoWZ project can be changed. Remember also that a polygons digitized on a map view can be used as a mask to bound any surface display.
- The size of the active window (in pixels) can be changed with the Window > Resize Frame menu.
- Snapshot tool to capture the active window (with or without border frame) and save the image in various formats: .BMP, .PNG, .JPEG, etc.
- A Legend can optionally be displayed in the Map and Section view. This panel that can be positioned beside the current view shows a graduated color bar for grid-type displays, annotated symbols for point-type displays and annotated lines for curve-type displays.
- Dynamic color histogram in the properties of map grid layers. The palette and its edges can be moved.
- In Geostar and GeoWZ, the Control Points can be sorted by increasing or decreasing alphanumeric order, or according to “Class” codes that can be defined at project level and assigned to selected control points. In the Map view, the control points can be color-coded according to their Class (using “Unique” symbol and color per CLASS).



Geostar 3.5 (including TLR3 and PTLR3 tomographic inversion):

- Reminder: the JMAN_TMP_DIR variable can be set to relocate Geostar scratch files as well as temporary files created during the non-parallel inversion jobs (stored in /tmp by default). These temporary/scratch spaces should be local, because Geostar uses memory-mapped files and may become unstable if such files are accessed via NFS.
- The picking and the interpretation of the surface weathering shots (“LVL” shots) was reported from GeoWZ into Geostar, where a Control Point can be defined at the central position of the LVL spread, with a radius encompassing the spread length. The layer attributes defined at this position can be saved in a CP file for further use in Geostar or GeoWZ. Moreover, remember that the layer attribute surfaces computed in GeoStaR can be exported and reloaded in GeoWZ.
- When exporting the edited first break pick times in a text file or in XPS, you can choose between exporting all picks or only “valid” picks (the ones with QC field equal to 1 in the Traces/FB project table). The picks auto-edited during model updates are always exported.
- Automatic refractor branch picking in the Offset View: as soon as “Add Control Point” is pressed, an automatic refractor branch picking fitting with the current model parameters is proposed on the picks currently displayed in the time-offset graph.
- Various gridding methods were made available to transform point sets into grid surfaces: Inverse Distance Weighting, Bicubic Spline, Kriging, Proximity.
- An option was added in the “Iterate” pull-down list to realize distinct residual iterations for short-wave statics. So that once a model is updated after the LMI or Tomographic inversion, you don’t have to re-run the whole inversion if you just want to modify the parameters of the residual Gauss-Seidel decomposition for short-wave statics.

- In the tomographic inversion dialog, instead of fixing $l_x/l_y/l_z$ values between 0.1 and 10.0, you can choose between four levels of smoothing for the preconditioning of the matrix: No smoothing, Weak, Moderate (recommended default), Strong.
- For the tomographic update, the “Additional” parameterization dialog contains damping parameters representing the maximum deviation allowed in terms of velocity and travel time from the “ideal” solution (theoretical). The defaults are 100 for the velocity deviation and 0.1 for the time deviation, which means that we allow the tomo solution to deviate by $[0.1 * \text{standard_deviation}]$ from the ideal solution.
- The tomography ray paths for sampled shots can be overlaid on the resulting Earth model or displayed (and browsed in depth) in the Map view. The shots can be selected in the “Additional” parameterization dialog.
- The raypaths and traveltimes computed during a tomographic update can be stored for a subsequent tomographic update with different inversion parameters. Setting the number of “Geological iterations” to 0, the computation will stop after the ray-tracing phase.
- When generating a Geocluster job for the tomographic inversion in parallel mode on a cluster of PCs, Geostar searches the `TEMPLATES` folder containing the model job successively in the user's home, project and installation directories.
The parameters are replaced with the site or user-defined parameters from Geostar during the job generation. Remember that the job (`gsrXXXXX.job.gsl`) and the data (`gsrXXXXX.job`) files are generated in a `GEOSTAR` directory created in the directory from where GeOlympus was launched. The output of the tomographic update (`.res` file) is also retrieved in the `GEOSTAR` directory.
- The maximum Ray penetration depth can be used as model base for statics calculation on an updated tomographic model.
- On a tomographic model, the statics can be computed using a layer elevation from a preliminary layered model as model base (floating pseudo-datum). Like the floating pseudo-datum obtained by smoothing and shifting down the topographic elevation, the chosen layered model surface can be smoothed and shifted down, if necessary.
The floating pseudo-datum can also be a loaded or calculated surface (using “Load Basemap” or “Add calculated item” options in the Map view).
- In Geostar and GeoWZ a plug-in accessible from the Project menu of the main window permits the calculation of Statics for “external” geometries. Through the "External statics calculation" dialogs you can load the new geometry and select an existing model to compute statics for the loaded points.
Obviously it will not be possible to compute valid statics for loaded points that are too far from the selected model limits.



GeoWZ 1.3:

- Multi-uphole Excel files with one column per uphole (in the same sheet) can be decoded.
- A plug-in accessible from the Project menu in the main window permits the decoding of uphole data issued from InterbaseX in “Finder DB” ascii format.
- Surfaces and models can be computed from uphole curves only. But statics can only be computed for loaded shot/receiver geometry.

- A table compiling the main statistics (min/max, average) for all existing surfaces can be displayed.
- “Set as Topography” option replaces the project elevations (free surface) by the selected layered model surface. Doing this, the un-saved models and related statics are lost.
- Various gridding methods were made available to transform point sets into grid surfaces (Inverse Distance Weighting, Bicubic Spline, Kriging, Proximity).
- “Calculate surface” includes additional functions to compute the vertical times on a given elevation surface:
`atTime(<Model> , <Surface>)` computes the travel times from the ground surface to the defined surface with the model's velocities
`atAvgVelocity(<Model> , <Surface>)` computes the travel times from the ground surface to the defined model surface using the defined constant velocity.



GeoPACS 1.9:

- GeoPACS 2D parameters: "Split statics" can be used to calculate different static values for forward and reverse shot traces.
- "Horizon weight" in GeoPACS horizon-based parameters allows horizon's weighting (within Interval) during statics calculation - for advanced users only.
 W_n with n = "quality" or weighting factor for the defined horizon interval.
 $n = -3$ - The cross-correlation from this portion of horizon will not be used for statics
 $n = -2$ - Phase skip in this interval
 $n = -1$ - Tectonic fault: the cross-correlation is not computed for this portion of horizon

Fixes



Geostar 3.5:

- The rays that “escape” from the tomographic model limits are automatically canceled. It concerns particularly some rays that were traveling in the air (above the topography) at the bottom of sharp valleys.
- The Ray density and Ray penetration depth are also displayed for the tomographic inversions executed on the local workstation. These graphic layers can be overlaid on the resulting Earth model or displayed (and browsed in depth) in the Map view.
- The execution log for the mono- or multi-CPU tomographic inversion was completed and some useless information was removed (at least in the part related to the TLR3 or PTLR3 standalone execution).
The elapse time is updated for the tomographic inversions executed on the local workstation.
- Fixed random problem causing wrong values to be exported for Tomo statics and statics computed with the Floating pseudo-datum downward continuation mode.
- A bug which prevented the correct simultaneous export of Elevation and Thickness layers, depending of the layered model smoothing type (smooth on elevation or on thickness), was fixed.



GeoWZ 1.3:

- The option to export short-wave statics from GeoWZ was removed (not meaningful).

Known limitations



The porting of the Geocluster application Sditr to Java for integration in the GeOlympus statics workstation is in progress.

Sditr derives statics from the picking of a single refractor that can be followed over the whole survey extension. The picking is done on first break stacks (not on elementary traces like in Geostar) and Sditr includes options for Source/Receiver Repositioning and Refractor Velocity Analysis.



Input/Output:

- To automatically decode known format files without extension, uncheck “Check Extension” in Setup > File Formats > Edit dialog for the relevant format definition.
- When the tomographic model update is executed in parallel mode on a remote cluster of PC, the execution log cannot be retrieved in Geostar (no reliable way to locate it). You will find this listing file where the Geocluster job returned it (in the `LISTS` sub-directory of the Geocluster Project for example).



Geostar 3.5:

- As long as you have not read a first set of geometry and picks data, the Raw `Traveltimes` cannot be displayed in the section view.
- Combining `Smooth thickness` and `Smooth elevation` options for the different layers of a given layered model is not currently allowed. You can by-pass this limitation by creating the initial model in GeoWZ using the same geometry.
- It's difficult in Geostar to generate 3D models for 3D surveys with large gaps (more than twice the smaller smoother size for layered models), because surface fitting is very time consuming in large areas where there is no data. Additionally, if your model has more than 50x50 bi-cubic patches, the computation matrix can exceed the available memory (it will work, but again very slowly).
The option "Allow holes in surfaces for 2D Survey geometry" on `Data Handling` tab of UI Setup dialogs is intended primarily for sparse 2D surveys and it was not tested yet for 3D geometries.
- When exporting layer grids with “Export layers” or “Export Surface”, the cell size depends on the layered model parameters and differs for velocity and elevation/thickness grids if the related smoothers have different length.
An option may be added to control the output cell size.
- The tomographic inversion can be executed under Linux 2.4 or 2.6 in 32-bit mode, and the parallel inversion is supported on a PC cluster running Geocluster level 3100 or 4100 with i686

or PIV processors.

Please contact gvrsupport.master@cggveritas.com if you intend to run this tomographic inversion on another PC/Linux configuration.

- The tool to estimate the optimal cell size and number of CPUs for the tomographic model update is still in construction.
- You may sometime read the following set of messages in the execution log of the tomographic inversion:

```
Stopping condition:      3
***** The system is ill conditioned. ****
***** No convergent solution can be found!
***** Try to change smoothing or precond
***** parameters and/or cell sizes!
Update(min,max,mean):  1642.595   4421.259   2266.879
```

It means that the least-squares iterative inversion encounters difficulties to converge towards an “exact” solution, but it will not systematically stop the job. If the resulting model is not satisfactory, you should try to decrease the matrix pre-conditioning smoothers (lx, ly, lz parameters).

```
Stopping condition:      5
The system is (probably) incompatible.
Reasonably good least squares solution      is found
Update(min,max,mean):  1531.546   4373.795   2278.901
```

“Incompatible” refers here to the set of linear equations built by TLR3, which is by design an approximation of an “ideal” minimization solution; but a “Reasonably good least squares solution is found”, so the iterative inversion process can continue.

- The Earth model display for a tomographic model is wrong when “PolyPosition” profile is a sinuous line, but correct when the profile is made of straight segments.



GeoPACS 1.9:

- The improvement of the MACROBIN option with shot/receiver packing rather than only bin packing is in progress. Remember that this option can be implemented to compute mid-wave residual statics.
- The horizon picking must fit within the CMP or Bin data area.
- In 3D mode, the output velocity function set must have at least two inline and two crossline nodes, with a minimum step of two bins between nodes.
- When you click on Save / Check button to confirm that the current job is correct and that changes are saved, no message is displayed. The message appears only in case of an incorrect or incomplete coding.
- As there is no coordinate information in the output datasets, the Map and Section views are not operational in the 2D mode.
In the Map view, the computed 3D horizon items can be displayed, even if they are grayed.



GeoWZ 1.3:

- Interpreted uphole tables in Excel format must be converted into text (. cvs) uphole tables to be decoded.