
Earthworks Seismic Inversion Plug-in for DecisionSpace®

Installation Guide and Release Notes

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What's In This Release

The 5000.8.2 version of Earthworks Seismic Inversion is specifically designed and engineered to be part of the plug-in module system for DecisionSpace® Geosciences 5000.8.2 released by Halliburton, Landmark Software and Services. This version of Earthworks Seismic Inversion for DecisionSpace® will also run with the 5000.8.3 version of DecisionSpace® Geosciences.

The key features of this initial release are:

- ***Deterministic Inversion***

- Post-stack / single stack inversion

- Pre-stack simultaneous inversion

- Pre-stack methods include IP/IS/(Rho) and AI/GI

- ***Stochastic Inversion***

- Post-stack / single stack inversion

- Pre-stack simultaneous inversion

- Pre-stack methods include IP/IS/(Rho) and AI/GI

- Post-processing statistical volume generation

- ***Integrated drag and drop data selection with DecisionSpace®***

- ***Automated parameter estimations***

- ***Sophisticated interactive and off-line job controls***

- ***Native seismic I/O***

- ***Inversion outputs listed in inventory ready to display***

Introduction

Earthworks Seismic Inversion Software is produced by Earthworks Environment & Resources Ltd. Earthworks Seismic Inversion Plug-in for DecisionSpace® Version 5000.8.2 provides proven seismic inversion technology fully integrated with the DecisionSpace® environment. Ultra-fast stochastic inversion software builds upon your model-based deterministic solution (provided with this release) by allowing you to understand the uncertainty inherent in seismic inversion. You can explore the effect of this geophysical uncertainty on the rock and reservoir properties of your inverted 3D seismic volume.

This plug-in module provides complete access to the capabilities of the full-featured 3D seismic inversion software.

With Earthworks Seismic Inversion, you can easily:

- Create, save, and restore seismic inversion sessions and parameters for DecisionSpace® projects.
- Select input seismic and wavelets, wells and logs, and build layered models from seismic horizons.
- Submit interactive or background runs with complete immediate feedback on the job status and Progress.
- Automatically load resulting final inversions, and optional synthetics and residual volumes into the DecisionSpace® session.

Outputs and Data Management

The online User Guide contains Overview, Launch, User Interface, Workflow, and Inversion Reference information that you will find helpful. In particular, please note two important sections in that User Guide, Outputs and Data Management.

The Earthworks Seismic Inversion Plug-in generates:

- OpenWorks seismic datasets.
- A variety of temporary flat files (used by the batch processes).
- Session files.
- Output log files.

The session file directory structure includes the well_statistics.txt file and several types of output. Disk space requirements for Earthworks Seismic Inversion Plug-in can be very large. Segy files containing the stochastic realizations can require many Gigabytes of disk space to complete normally.

Flat files are stored in the OW_PROJ_DATA area defined by OpenWorks configuration files. You can use OpenWorks configuration files, including district specifications, to define alternate file systems when more space is required. Please review the Outputs and Data Management sections of the User Guide and prepare for anticipated disk storage requirements.

Software Requirements

Earthworks Seismic Inversion requires an existing installation of OpenWorks® (full installation including MKS™) and DecisionSpace® Geosciences version 5000.8.2 or 5000.8.3. Refer to the DecisionSpace® system requirements and installation documents to install these applications.

Installing Earthworks Seismic Inversion Plug-in

You can install the Earthworks Seismic Inversion Plug-in by executing the 'installer' application, Install Anywhere, loaded from the Landmark Software Manager web site.

To install Earthworks Seismic Inversion:

Windows 7 64 Installation instructions

1. Un-zip the Windows 7 installation file.
2. The installation executable is labeled ewplugin_5000_8_2_Win_setup.exe.
3. Determine where DecisionSpace® 5000.8.2.0 and/or 5000.8.3.0 is installed. It is most commonly in the OpenWorks® software home directory.
4. Double click on the install executable and the InstallAnywhere interface will guide you through the installation.
5. The installation will place files in the DecisionSpace® 5000.8.2 or 5000.8.3 stagingArea, bin/win64, and help folders.
6. When DecisionSpace 5000.8.2.0 or 5000.8.3.0 is launched, the DecisionSpace® application will recognize the plug-in jar file and move it into the extensions folder.
7. In the case the user does not have write permissions to the DecisionSpace® installation (as in the case DecisionSpace® was installed as Administrator), the owner of the DecisionSpace® installation will need to first launch DecisionSpace ®to register the Earthworks plug-in. They do not need to select a session, just bring up the session manager. This only has to be done once.
8. If the installation is successful the listing in the Modules on the New Session tab will include Earthworks Seismic Inversion at the bottom of the listing.
9. After DecisionSpace® is launched Earthworks Seismic Inversion will be listed under the Tools menu, and when selected will launch the Earthworks Seismic Inversion user interface.

Linux 64 Installation instructions

1. Un-zip the Linux installation file into a folder and then copy onto the Linux platform if not already there.
2. The installation executable is labeled `ewplugin_5000_8_2_Lnx_setup.bin`
3. Determine where DecisionSpace® 5000.8.2.0 or DecisionSpace® 5000.8.3.0 is installed. It is most commonly in the OpenWorks® software home directory.
4. In a Linux xterm navigate to the installation bin file and type `./ewplugin_5000_8_2_Lnx_setup.bin`. The InstallAnywhere interface will guide you through the installation.
5. The installation will place files in the DecisionSpace® stagingArea, bin/win64, and help directories.
6. When DecisionSpace® 5000.8.2.0 or 5000.8.3 is launched, the DecisionSpace application will recognize the plug-in jar file and move it into the extensions folder.
7. In the case the user does not have write permissions to the DecisionSpace installation (as in the case DecisionSpace® was installed as root) the owner of the DecisionSpace® installation will need to first launch DecisionSpace® to register the Earthworks plug-in. They do not need to select a session, just bring up the session manager. This only has to be done once.
8. If the installation is successful the listing in the Modules on the New Session tab will include Earthworks Seismic Inversion at the bottom of the listing.
9. After DecisionSpace® is launched Earthworks Seismic Inversion will be listed under the Tools menu, and when selected will launch the Earthworks Seismic Inversion user interface.

Previous Beta Installation Note

If you have previously installed the Earthworks Seismic Inversion Plug-in Beta, the uninstaller may not completely remove the beta installation. The following is the list of files installed into DecisionSpace®. Please verify these files are removed before installing the released version.

Remove Installed Files/Folders, Windows 7

DS_HOME/stagingArea

com.earthworks.inversion.jar

During the registration process (when DecisionSpace is launched) this file is moved to the DS_HOME/extensions folder.

DS_HOME/help

Files:

ewi_about.html
ewi_plugin.html
ewi_release_notes.html
ewi_userguide.doc
ewi_userguide.pdf

Folders:

ewi_release_notes_files
ewi_userguide_files

DS_HOME/bin/Win64 (Windows)

ewio.lib
ewio.dll
ewirunbat.bat
ewirunbat2.bat
ewirunwin.bat
EWMeancube.exe
EWProdcube.exe
lgcio.lib
lgctendcube.exe
lgctendcube.lib
Runsln-CLR.exe
Runinv-CLR.exe
tendcube.exe
trendcube.lib

Remove Installed Files/Folders, Linux

DS_HOME/bin/linux64

ewirun.sh
ewirunbat.sh
EWMeancube
EWProbcube
libewio.so
libewio.so.1
Runinv
Runsim

Licensing Earthworks Seismic Inversion Plug-in

Earthworks Seismic Inversion uses a license provided via Landmark's Application Manager (LAM). LAM must be installed on the license server for client machines to check out licenses. LAM is accessed from the Landmark Support Portal or can be downloaded from Landmark Software Manager (LSM).

Each license instance permits the use of the plug-in for one user on one computer, and any number of batch or interactive jobs launched from that plug-in on the same computer.

Please contact your sales or technical representative if you receive errors or warnings regarding Earthworks Seismic Inversion Plug-in license violations.

Launching Earthworks Seismic Inversion Plug-in

After you launch DecisionSpace® Geosciences, the Session Manager dialog allows you to define the modules required and project data. You must select the Earthworks Inversion module, which is dependent on the Geophysics module.

If you select Earthworks Inversion first, the Geophysics module will be activated.

You will find Earthworks Inversion under the Tools pull-down menu on the main menu bar. Remember, the Earthworks Seismic Inversion module must be selected upon session startup.

If Earthworks Inversion is not listed on the Tools pull-down menu, verify the defined session modules or the installation itself. After you select Earthworks Inversion, the plug-in will open a new window.

Detailed instruction on using Earthworks Seismic Inversion is available in the user guide, Help > User Guide.

Known Issues

The Earthworks Seismic Inversion Plug-in currently is set up to only work in a Time session.

There is a known problem with DecisionSpace seismic handling such that once a seismic dataset has been added to the Inventory, even if it is removed, the seismic data file remains locked and cannot be deleted. Thus, successive runs on the same session will try to delete previous seismic and fail. A workaround that is implemented now is that the old seismic will be renamed.

Killing a running job may leave any open seismic in a damaged state such that it cannot be opened or deleted by the plug-in. Use Seismic Data Manager to delete the seismic.

The Earthworks Seismic Inversion code has the following data restrictions:

- There may be no dead or missing seismic traces in the area of interest.
- There may be no holes or missing data in horizons in the area of interest.
- Horizons are not permitted to cross.
- There may be no missing values in the logs in the area of interest.
- Horizons and seismic must be from only one seismic survey, and that survey must be active in the DecisionSpace Inventory.
- On Windows™, if seismic datasets of the same name already exist (say, from a previous interactive run), if they are already in the DSD session their entry is removed but since the seismic are held open by DecisionSpace, they cannot be deleted if another run is intended to overwrite the current seismic. They are in that case renamed with "_" plus the seismic dataset id added to the end of the version string.

- Thus, my_di_run, v0 would become my_di_run, v0_nnn where nnn is this seismic dataset's database id. These uniquely tagged seismic datasets are essentially superseded by the new runs with the same names, they can be deleted at a later time when not in use by SDM.
- If you run a DI test one for one line, you can get one line's output for inversion and optionally synthetic and residual. If you run again with a different line, crossline, or full AOI, the original outputs are renamed (as described in the job output log) . Thus you can keep multiple sets of output from test lines or runs with different parameters.

When you have the Seismic tab selected, the Cube view becomes inactive and does not respond to mouse button selections. As soon as another tab is selected, the control will resume.

When the inversion or post-processing completes and the output volumes are finalized and added to the Inventory, they update the display of all Section views, not just the active one.

The only valid seismic input is SeisWorks formats (brick, compressed, and 3dv). Shared memory volumes are not a valid seismic format for the tool and will not be recognized by the Seismic tab menu.

Please contact Landmark Customer Support to report any issues with the software so that they may be addressed for future releases.

Do to issues with the background execution of the stochastic inversion we have had to remove the progress meter posted at the bottom of the UI as referenced on Page 29 in the documentation. The percentage value will still be posted on the status line and in the job log.

Customer Support

Landmark operates Technical Assistance Centres (TACs) in Australia, the United Kingdom, and the United States. Additional support is also provided through regional support offices around the world.

Support Via Web Portal

Support information is always available on the Landmark Customer Support internet page. You can also submit a support request directly to Landmark Customer Support through the Landmark Customer Support Portal:

<http://css.lgc.com/InfoCenter/index?page=home>

To request support in the Landmark Customer Support Portal:

1. In the PIN and Password text boxes in the Please Sign in area, enter your registered personal identification number and password.
2. Click the Sign In button.
3. In the Case & Defect information area, click the Create A New Case link.
4. In the Create Case area, fill in the necessary information. Provide details about your technical concern, including any error messages, the workflow steps where the problem occurred, and the attachments of screen shots that display the problem. To help understand the concern, you can also attach other files such as example data files.
5. Click the Submit button. A support analyst in the nearest Technical Assistance Center will respond to your request.

Technical Assistance Centers

Asia Pacific

8:00 am – 5:00 pm Local Time
Monday-Friday, excluding holidays

61-8-9481-4488 (Perth, Australia)
Toll Free 1-800-448-488
Fax: 61-8-9481-1580
Email: apsupport@lgc.com

Installation Guide and Release Notes

Europe, Africa, Middle East

9:00 am – 5:30 pm Local Time
Monday-Friday, excluding holidays

44-1372-868686 (Leatherhead, UK)
Fax: 44-1372-868601 (Leatherhead, UK)
Fax: 44-1224-723260 (Aberdeen, UK)
Email: support@lgc.com

Latin America

(Spanish, Portuguese, English)
7:00 am – 5:00 pm Local Time

713-839-3405 (Houston, TX, USA)
Fax: 713-839-3646
Email: soporte@lgc.com

North America

7:30 am – 5:30 pm Central Standard Time
Monday-Friday, excluding holidays

713-839-2200 (Houston, TX, USA)
Toll Free 1-877-435-7542
(1-877-HELP-LGC)
Fax: 713-839-2168
Email: support@lgc.com

Regional Offices

For contact information for regional offices, see the Contact Support page located at:

<http://css.lgc.com/InfoCenter/index?page=contact§ion=contact>

If problems cannot be resolved at the regional level, an escalation team is called in to resolve your incidents quickly.

Third Party Applications

Halliburton acknowledges that certain third party code has been bundled with, or embedded in, its software. The licensors of this third party code, and the terms and conditions of their respective licenses, may be found in a document called `third_party.pdf`. This document is included in the installation directory of each application from Landmark® software. The path name of the file is similar to the following:

Linux

`$DS_HOME/help/mergedProjects/dspx/third_party.pdf`

or

Windows

`...\DecisionSpaceDesktop5000.8.2\help\mergedProjects\dspx\third_party.pdf`

International Trade Compliance

This application is manufactured or designed using U.S. origin technology and is therefore subject to the export control laws of the United States. Any use or further disposition of such items is subject to U.S. law. Exports from the United States and any re-export thereafter may require a formal export license authorization from the government. If there are doubts about the requirements of the applicable law, it is recommended that the buyer obtain qualified legal advice. These items cannot be used in the design, production, use, or storage of chemical, biological, or nuclear weapons, or missiles of any kind.

The **ECCN**'s provided in Release Notes represent Halliburton's opinion of the correct classification for the product today (based on the original software and/or original hardware). Classifications are subject to change. If you have any questions or need assistance, please contact us at FHOUEXP@halliburton.com.

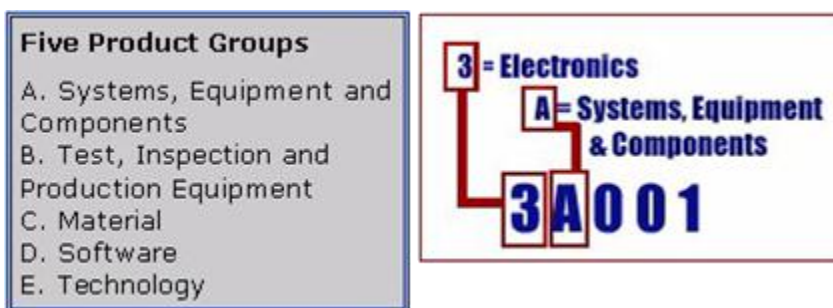
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Definitions

CCATS (Commodity Classification Automated Tracking System): the tracking number assigned by the U.S. Bureau of Industry and Security (BIS) to products formally reviewed and classified by

the government. The CCATS provides information concerning export/re-export authorizations, available exceptions, and conditions.

ECCN (Export Control Classification Number): The **ECCN** is an alpha-numeric code, e.g., 3A001, that describes a particular item or type of item, and shows the controls placed on that item. The CCL (Commerce Control List) is divided into ten broad categories, and each category is further subdivided into five product groups. The CCL is available on the [EAR web site](http://www.access.gpo.gov/bis/ear/ear_data.html#ccl) (http://www.access.gpo.gov/bis/ear/ear_data.html#ccl).



The **ECCN** Number, License Type, and the CCATS Numbers for this product are included in the table below. Also included is the date the table was last updated.

Product/Component/R5000	ECCN Number	License	CCATS Number
Earthworks Seismic Inversion Plug-in for DecisionSpace®	EAR99	NLR	N/A

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Trademark Notice

3D Drill View, 3D Drill View KM, 3D Surveillance, 3DFS, 3DView, Active Field Surveillance, Active Reservoir Surveillance, Adaptive Mesh Refining, ADC, Advanced Data Transfer, Analysis Model Layering, ARIES, ARIES DecisionSuite, Asset Data Mining, Asset Decision Solutions, Asset Development Center, Asset Development Centre, Asset Journal, Asset Performance, AssetConnect, AssetConnect Enterprise, AssetConnect Enterprise Express, AssetConnect Expert, AssetDirector, AssetJournal, AssetLink, AssetLink Advisor, AssetLink Director, AssetLink Observer, AssetObserver, AssetObserver Advisor, AssetOptimizer, AssetPlanner, AssetPredictor, AssetSolver, AssetSolver Online, AssetView, AssetView 2D, AssetView 3D, BLITZPAK, CasingLife, CasingSeat, CDS Connect, Channel Trim, COMPASS, Contract Generation, Corporate Data Archiver, Corporate Data Store, Data Analyzer, DataManager, DataStar, DBPlot, Decision Management System, DecisionSpace, DecisionSpace 3D Drill View KM, DecisionSpace AssetLink, DecisionSpace AssetPlanner, DecisionSpace AssetSolver, DecisionSpace Atomic Meshing, DecisionSpace Nexus, DecisionSpace Reservoir, DecisionSuite, Deeper Knowledge. Broader Understanding., Depth Team, Depth Team Explorer, Depth Team Express, Depth Team Extreme, Depth Team Interpreter, DepthTeam, DepthTeam Explorer, DepthTeam Express, DepthTeam Extreme, DepthTeam Interpreter, Desktop Navigator, DESKTOP-PVT, DESKTOP-VIP, DEX, DIMS, Discovery, Discovery Asset, Discovery Framebuilder, Discovery PowerStation, DMS, Drillability Suite, Drilling Desktop, DrillModel, Drill-to-the-Earth-Model, Drillworks, Drillworks ConnectML, DSS, Dynamic Reservoir Management, Dynamic Surveillance System, EarthCube, EDM, EDM AutoSync, EDT, eLandmark, Engineer's Data Model, Engineer's Desktop, Engineer's Link, ESP, Event Similarity Prediction, ezFault, ezModel, ezSurface, ezTracker, ezTracker2D, FastTrack, Field Scenario Planner, FieldPlan, For Production, FZAP!, GeoAtlas, GeoDataLoad, GeoGraphix, GeoGraphix Exploration System, GeoLink, Geometric Kernel, GeoProbe, GeoProbe GF DataServer, GeoSmith, GES, GES97, GESXplorer, GMaPlus, GMI Imager, Grid3D, GRIDGENR, H. Clean, Handheld Field Operator, HHFO, High Science Simplified, Horizon Generation, iWellFile, I² Enterprise, iDIMS, Infrastructure, Iso Core, IsoMap, iWellFile, KnowledgeSource, Landmark (*as a service*), Landmark (*as software*), Landmark Decision Center, Landmark Logo and Design, Landscape, Large Model, Lattix, LeaseMap, LogEdit, LogM, LogPrep, Magic Earth, Make Great Decisions, MathPack, MDS Connect, MicroTopology, MIMIC, MIMIC+, Model Builder, Nexus (*as a service*), Nexus (*as software*), Nexus View, Object MP, OpenBooks, OpenJournal, OpenSGM, OpenVision, OpenWells, OpenWire, OpenWire Client, OpenWire Direct, OpenWire Server, OpenWorks, OpenWorks Development Kit, OpenWorks Production, OpenWorks Well File, PAL, Parallel-VIP, Parametric Modeling, PetroBank, PetroBank Explorer, PetroBank Master Data Store, PetroStor, PetroWorks, PetroWorks Asset, PetroWorks Pro, PetroWorks ULTRA, PlotView, Point Gridding Plus, Pointing Dispatcher, PostStack, PostStack ESP, PostStack Family, Power Interpretation, PowerCalculator, PowerExplorer, PowerExplorer Connect, PowerGrid, PowerHub, PowerModel, PowerView, PrecisionTarget, Presgraf, Pressworks, PRIZM, Production, Production Asset Manager, PROFILE, Project Administrator, ProMAGIC, ProMAGIC Connect, ProMAGIC Server, ProMAX, ProMAX 2D, ProMax 3D, ProMAX 3DPSDM, ProMAX 4D, ProMAX Family, ProMAX MVA, ProMAX VSP, pSTax, Query Builder, Quick, Quick+, QUICKDIF, Quickwell, Quickwell+, QUIKRAY, QUIKSHOT, QUIKVSP, RAVE, RAYMAP, RAYMAP+, Real Freedom, Real Time Asset Management Center, Real Time Decision Center, Real Time Operations Center, Real Time Production Surveillance, Real Time Surveillance, Real-time View, Reference Data Manager, Reservoir, Reservoir Framework Builder, RESev, ResMap, RTOC, SCAN, SeisCube, SeisMap, SeisModel, SeisSpace, SeisVision, SeisWell, SeisWorks, SeisWorks 2D, SeisWorks 3D, SeisWorks PowerCalculator, SeisWorks PowerJournal, SeisWorks PowerSection, SeisWorks PowerView, SeisXchange, Semblance Computation and Analysis, Sierra Family, SigmaView, SimConnect, SimConvert, SimDataStudio, SimResults, SimResults+, SimResults+3D, SIVA+, SLAM, SmartFlow, smartSECTION, Spatializer, SpecDecomp, StrataAmp, StrataMap, StrataModel, StrataSim, StratWorks, StratWorks 3D, StreamCalc, StressCheck, STRUCT, Structure Cube, Surf & Connect, SynTool, System Start for Servers, SystemStart, SystemStart for Clients, SystemStart for Servers, SystemStart for Storage, Tanks & Tubes, TDQ, Team Workspace, TERAS, T-Grid, The Engineer's DeskTop, Total Drilling Performance, TOW/cs, TOW/cs Revenue Interface, TracPlanner, TracPlanner Xpress, Trend Form Gridding, Trimmed Grid, Turbo Synthetics, VESPA, VESPA+, VIP, VIP-COMP, VIP-CORE, VIPDataStudio, VIP-DUAL, VIP-ENCORE, VIP-EXECUTIVE, VIP-Local Grid Refinement, VIP-THERM, WavX, Web Editor, Well Cost, Well H. 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