ENVI. Get the Information You Need from Imagery.

ENVI® is the premier software solution to quickly, easily, and accurately extract information from geospatial imagery.
Easy to Use Tools. Proven Functionality. Fast Results.

The growing reliance on geospatial information makes it increasingly important for you to quickly find and define features in imagery. Tools and processes that help you easily and accurately extract information from imagery are essential for commercial, government, and research applications.

Today’s imagery analysts, scientists, and GIS professionals in a wide variety of disciplines choose products from the ENVI® line of premier software solutions for extracting information from geospatial imagery. ENVI provides advanced, user-friendly tools to read, explore, prepare, analyze and share information extracted from all types of imagery.

Developed by the experts in image processing and data visualization, ENVI is built on an extensible platform that allows you to easily expand and customize ENVI to suit your needs. A robust suite of add-on modules also allows you to expand your image processing capabilities to address your specific needs. And, with its broad cross platform support, ENVI is your solution regardless of whether you are in a Windows®, Macintosh, Linux or UNIX environment.

Learn more about how ENVI can be your solution for extracting information from geospatial imagery.
Read Virtually Any Imagery Type and Format

ENVI supports imagery types gathered from today’s popular satellite and airborne sensors including panchromatic, multispectral, hyperspectral, radar, thermal, lidar, and more. ENVI can read over 70 data formats and includes HDF, GeoTIFF and JITC compliant NITF support. ENVI also allows you to easily drag and drop files from Windows Explorer, search results, and ArcGIS® making it easy to access and integrate information into ENVI from other desktop applications. And, ENVI also delivers enterprise capabilities that allow you to quickly and easily access imagery from OGC and JPIP compliant servers within your organization or over the internet.

Prepare Your Imagery

ENVI provides automated pre-processing tools that allow you to quickly and easily prepare your imagery for viewing or additional analysis. With ENVI you can:

- Orthorectify imagery
- Register two or more images
- Calibrate imagery
- Correct imagery for atmospheric distortions
- Create vector overlays
- Identify regions of interest (ROIs)
- Create digital elevation models (DEMs)
- Perform pan sharpening, masking, and mosaicking
- Resize, rotate, or convert the data type

Explore Your Imagery

ENVI gives you an intuitive user interface and easy-to-use tools that allow you to quickly and easily view and explore your imagery. You can use ENVI to view large datasets and metadata, visually compare imagery, create powerful 3D visualizations, create scatter plots, explore pixel signatures, and more. ENVI also allows you to display ArcGIS layers with your imagery, giving you the ability to view vector information with the same styling, symbology and rendering as your GIS applications.
Process & Analyze Your Imagery

ENVI provides the leading image processing and analysis functionality you need to extract information for your research, intelligence or planning purposes. ENVI provides a complete suite of tools based on proven scientific methods to help you analyze your imagery. And, ENVI provides unique, automated processes and procedures to make processing and analyzing your imagery easier than ever.

Data Analysis Tools

Understanding your imagery often involves discerning information about your image. ENVI includes a comprehensive suite of data analysis tools that allow you to access proven algorithms to quickly, easily and accurately analyze imagery.

- Create geospatial statistics such as autocorrelation and semi-variance
- Calculate image statistics such as mean, min/max, standard deviation
- Extract linear features
- Synthesize radar imagery
- Calculate principal components
- Detect change
- Measure features
- Model topographic characteristics
- Apply common and user-defined filters
- Perform custom band and spectral math functions

Spectral Analysis Tools

Spectral analysis allows you to use pixel responses at different wavelengths to obtain information about the materials within each pixel. ENVI has the most advanced yet easy-to-use spectral analysis tools that give you access to established, scientific methods for imagery analyses. ENVI’s spectral analysis tools allow you to:

- Classify your imagery using supervised and unsupervised methods
- Identify spectral signatures using robust libraries
- Detect and identify targets
- Identify features of interest
- Analyze & map materials of interest
- Perform whole-pixel and sub-pixel analyses
- Use a suite of post classification tools to refine your results
- Calculate forest health with vegetation analysis tools

Automated Workflows

ENVI gives you automated workflows that step you through today’s popular image processing functions. This unique automation takes the complexity out of common image analysis methods and makes advanced image analysis accessible regardless of your experience level.

ENVI’s automated workflows give you step by step windows with instructions and recommended settings, based on proven scientific methods, for each step of the process. Subsequent steps automatically update while prompting you for required information. ENVI includes workflows that automate a wide range of image exploitation tasks that include preparing imagery, finding features, detecting change over time, and classifying similar materials. Whether you are new to ENVI or an experienced user, ENVI’s automated workflows will save you time and effort in getting the results you need from imagery.
**Share Your Information**

ENVI easily integrates into your existing workflow, allowing you to share maps, reports and presentations with colleagues in virtually any environment. Information extracted from imagery in ENVI can be easily saved directly to your computer, your geodatabase, or other server environment as image files, shapefiles or Microsoft® PowerPoint® files. And, with its tight integration with ArcGIS, ENVI outcomes can also be output as map products, using the popular ArcGIS map templates and printing dialogs directly from the ENVI interface.

**Customize Your Geospatial Image Application**

ENVI is built on a powerful development language, IDL, allowing its features and functionality to be easily extended or customized to fit your specific application. This powerful and flexible platform allows you to create batch processes, customize menus, add your own algorithms and tools, integrate C++ and Java code into your tools, and much more.

**Extend Your ENVI Functionality**

ENVI’s image processing and analysis functionality is robust, and can be even further extended by adding any one of these modules to expand its core capabilities:

- **ENVI Orthorectification Module** – provides geospatial imagery users with simple but robust tools to accurately register imagery to ground coordinates and remove geometric distortions.

- **ENVI NITF Module** – allows you to access, read, write, process, and share imagery in the government standard NITF file format.

- **ENVI DEM Extraction Module** – improves the image analysis workflow by allowing you to create spatially accurate 3-D data representations directly within ENVI.

- **SARscape Modules for ENVI** – provide a unique set of functionality to read, process, analyze and output SAR data and integrate results with other remotely sensed data and geospatial tools.

- **ENVI Atmospheric Correction Module** – removes challenging atmospheric conditions from imagery using both the proven FLAASH and QUAC algorithms.


**Easy-to-use tools. Proven functionality. Fast results.**

ENVI provides all this, in an easy to use solution. From reading and preparing, to exploring, analyzing and sharing — you’ll find what you need in ENVI to get information from your imagery quickly and easily.
Today’s imagery analysts and scientists in a wide variety of disciplines choose ENVI®, the premier software solution for extracting information from geospatial imagery. ENVI provides advanced, user-friendly tools to access, analyze, and share information from geospatial imagery.
Operating Systems
Windows XP SP2 (Intel/AMD 32- & 64-bit)
Windows Vista (Intel/AMD 32- & 64-bit)
Windows 7 (Intel/AMD 32- & 64-bit)
Linux Kernel 2.6.x (Intel/AMD 32- & 64-bit)
Mac OS X 10.5.x (Intel 32- & 64-bit)
Max OS X 10.6 (Intel 32- & 64-bit)
Sun Solaris 10 (SPARC 32- & 64-bit)

Data Import
Raster Formats:
• ADRG
• ArcView Raster BIL
• ASCII (x,y,z & gridded)
• Binary (flat)
• BMP
• CADRGR
• CIF
• DPPDB (with license)
• DTED (levels 0, 1, 2)
• ECW
• ENVI Raster
• ENVI Gzip Compressed
• ER Mapper ERS
• ERDAS IMAGINE (.img)
• GeoTIFF
• HDF4
• JPEG
• JPEG2000
• MsSID (including MG3)
• NITF 1.1, 2.0, 2.1 (with license)
• NSIF 1.0 (with license)
• PCI PIX
• PDS
• PICT
• PNG
• RemoteView R-Set (with license)
• SRF
• SRTM DEM
• TFRD (with license)
• TIFF
• USGS DOQ
• USGS DRG
• USGS Native DEM
• USGS SDTS DEM
• XWD

Vector Formats:
• ARC/INFO Interchange
• AutoCAD DXF
• ENVI Vector File
• ESRI Geodatabase Feature Class:
  • Personal (.mdb)
  • File (.gdb)
  • Enterprise (.sde)
• ESRI Layer
• ESRI Shapefile
• MapInfo MIF
• Microstation DGN
• USGS DLG

LiDAR Formats:
• ASCII
• LAS

Multispectral Sensors:
• ADS40
• ALOS AVNIR-2
• ALOS PRISM
• ALSAT-1
• ASTER
• ATSR
• AVHRR
• CARTOSAT-1
• DMSP (NOAA)
• ENVISAT AATSR
• ENVISAT MERIS
• EROS
• FORMOSAT-2
• GeoEye-1
• IKONOS
• IRS
• KOMPSAT-2
• Landsat MSS, TM, ETM+
• MAS-50
• MASTER
• MISR
• MODIS
• NigeriaSat-1
• OrbView-3
• RapidEye
• SeaWIFS
• QuickBird
• SPOT
• TIMS
• UK-DMC4
• WorldView-1
• WorldView-2

Hyperspectral Sensors:
• AISA
• ARTEMIS (with license)
• AVIRIS
• CASI
• HyMap
• Hyperion
• HyperScan
• HySpex
• MIVIS
• PROBE-1
• ProspectIR

Radar Sensors:
• AIRSAR
• ALOS PALSAR
• COSMO-SkyMed
• ENVISAT ASAR
• ERS
• JERS
• RADARSAT-1
• RADARSAT-2
• SIR-C / X-SAR
• TOPSAR

Remote Connections:
• IAS Server
• JPIP
• OGCS WCS
• OGCS WMS

Spectral Libraries:
• ASCII
• ENVI SLI
• ASD Indico

• MRSL

Annotations:
• ENVI Annotation
• ENVI Zoom Annotation

Output Formats
Raster Formats:
• ArcView Raster BIL
• ASCII (x,y,z & gridded)
• BMP
• DTED (levels 0, 1, 2)
• ENVI Raster
• ENVI Gzip Compressed
• ER Mapper ERS
• ERDAS IMAGINE (.img)
• ESRI Geodatabase Raster Dataset:
  • Personal (.mdb)
  • File (.gdb)
  • Enterprise (.sde)
• ESRI GRID
• GeoIP2 / GeoJ2K
• GeoTIFF
• HDF4
• JPEG
• JPEG2000
• NITF 2.0, 2.1 (with license)
• PICT
• PCI PIX
• PNG
• SRF
• TIFF
• XWD

Vector Formats:
• AutoCAD DXF
• ENVI EVF
• ESRI Geodatabase Feature Class:
  • Personal (.mdb)
  • File (.gdb)
  • Enterprise (.sde)
• ESRI Shapefile

Other Formats:
• Direct To Printer
• Google Earth KML
• MPEG
• PostScript
• VRML

Chip Display To:
• ArcMap
• ENVI Raster
• ESRI Geodatabase Raster Dataset
• JPEG
• JPEG2000 / GeoIP2
• NITF 2.0, 2.1 (with license)
• PowerPoint PPT
• Printer
• TIFF / GeoTIFF

Export Map To:
• AI
• BMP
• EMF
• EPS
• GIF
• JPEG
• PDF
• PNG
• Printer
• SVG
Display Functions
Chip To:
• File
• PowerPoint
• Print
• ArcMap
Drag/Drop from:
• ArcGIS
• File System
• Windows Explorer
• Data Manager
Drag/Drop to the:
• Display
• Process
• Workflows
GeoLink with ArcMap
Color Mapping
Color Tables:
• Pre-built Tables
• Interactive Color Table Editor
Cursor Query for Data/Screen Value, Elevation, Map Coordinates
Dynamic Overlays (unlimited displays)
Histogram Matching Between Displays
Image Flickering and "Movies"
Image Overlays:
• Annotation
• Classification Results
• Contour Lines
• Density (gray level) Color Slicing
• Grid Lines
• Regions of Interest
• Vector Layers
Interactive 2-D Scatter Plotting
Interactive Histograms & Stretching:
• Arbitrary Stretching
• Auto Apply Stretchs
• Gaussian Stretching
• Histogram Equalization Stretching
• Histogram Matching Between Displays
• Linear, Piecewise Linear Stretching
• Square Root Stretching
• Import/Export ASCII Look Up Tables
• User-Defined Look Up Tables
Interactive Pixel Editor
Line-of-Sight (Viewshed) Analysis
Link Unlimited Displays
Measurement Tool
Output Displays PowerPoint:
• Create New Presentation
• Append to Existing Presentation
Output Displays to File or Printer
Output Displays of Zoom Window
Quick Filters:
• Sharpen
• Smooth

Regions of Interest
Buffer Zones Around ROIs
Classification Images from ROIs
Export ROIs to Vectors
Input ROIs from ASCII
Interactive, Easy-to-use ROI Definition:
• Draw Polygons, Polylines, Pixels
• Draw ROIs with Interior Spaces (Donuts)
• ROIs from Intersection of Other ROIs
• Multiple Objects Within One ROI
• ROI Definition via Scatter Plots
• Threshold Images to ROI
• Merge ROIs
• Import ROIs from Vectors
Output ROIs to ASCII
ROI Save & Restore
Reconcile ROIs between Images via Map Coordinates
ROI Growing Based on Statistics
ROI Statistics

Data Preparation
Create New Standard or Virtual Image File from Existing Bands
Generate Test Image
Mask Generation From:
• Annotation
• Image Data Values
• ROIs
• Intersection of ROIs
• Vectors
• NaN
Mosaic Functions:
• Color Mosaic Preview
• Outline & Edge Feathering
• Interactively Mosaic Multiple Bands, Files
• Mosaic by Pixel (Line, Sample) or Map Coordinates
• Automatic Color Balancing
• Standard Image or Virtual Mosaic Output
Define Spatial Subset by:
• Drawing on Display
• File, Map Coordinates
• Region of Interest
• Other Image Extent
• Meta Scroll Extent
NITF Metadata Browser
Rotate/Flip Data
Spatial and Spectral Subsets
Storage Order (Interleave) Conversions:
• BSQ, BIL, BIP
• New File or Replace Original
Spatial Data
Subsample Images

Pre-processing & Calibration
Apply Gain & Offset
Bad Band Identification
Bad Line Replacement
Bad Pixel Replacement
Cross-Track Illumination Correction
Dark Subtraction
Destripe Data
Empirical Line Calibration
ERS and Radarsat Data Calibration
Flat Field Calibration
Ignore Pixel Value
Internal Average Relative Reflectance Calibration
Log Residuals
MODIS Bowtie Correction
Radiometric Calibrations:
• AVHRR
• Landsat MSS, TM, ETM
• TIMS
• QuickBird
Sea Surface Temperature From AVHRR
Thermal Atmospheric Correction

Registration & Rectification
Associate DEM With Image
Automatic Georeferencing of ASTER, AVHRR, AATSR, ASAR, MERIS, MODIS, Radarsat, SeaWIFS, SPOT
Subpixel Ground Control Point Locations
Georectify SPOT Using Information From Leader File
Ground Control Points Prediction
Image-to-Map Registration
Image-to-Image Registration
Interactive Ground Control Point Collection
Import Ground Control Points from File
Orthorectification:
• Aerial Photographs (Digital and Frame)
• ASTER
• CARTOSAT-1
• Generic RPC
• Generic Pushbroom Sensors
• IKONOS
• OrbView-3
• GeoEye-1
• WorldView & WorldView-2
• FORMOSAT-2
• Kompsat-2
• QuickBird
• SPOT 1-5
Radial Resampling
Rational Polynomial Coefficients (RPCs) Support
Replacement Sensor Model (RSM)
Real-time GPS Link
Rotated Projections
Save Transformation Matrix to ASCII
Warp Resampling Methods:
• Bilinear
• Cubic Convolution
• Nearest Neighbor
Warping Methods:
• Delaunay Triangulation
• Polynomial
• Rotation, Scaling, Translation (RST)

Map Projection Support
Datum Support (90)
Dozens of Prebuilt Map Projections (Examples Include):
• Universal Transverse Mercator (UTM)
• State Plane
• Albers Conical Equal Area
• Lambert Conformal Conic
• Miller Cylindrical
• Ellipsoid Support (35)
• Chip To:
• Destripe Data
• Empirical Line Calibration
• ERS and Radarsat Data Calibration
• Flat Field Calibration
• Ignore Pixel Value
• Internal Average Relative Reflectance Calibration
• Log Residuals
• MODIS Bowtie Correction
• Radiometric Calibrations:
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  • Landsat MSS, TM, ETM
  • TIMS
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• Albers Conical Equal Area
• Lambert Conformal Conic
• Miller Cylindrical
• Ellipsoid Support (35)
• Pseudo-Projections from RPCs and RSM

ENVI tools for ArcGIS®
Auto-Threshold Difference Raster
Calculate Image Difference
Calculate Thematic Change
Classification Raster To Vector
Classify With Training
Classify Without Training
Cleanup Classification Raster
Convert Raster Format
Detect Anomalies
Filter With Convolution
Intersect Rasters
LiDAR To Raster
Threshold By Percentage
Workflow Models with Cleanup
Vector GIS Functions
Drag/Drop ArcGIS Layers
ArcGIS Layer Attribute Viewing
Add Nodes to Vectors
Annotate Vector Windows
Attributes:
- Create New Vector Attributes
- Edit Query Vector Attributes
- Import from ArcView Shapefiles, ASCII
- Query to Create New Vector Layer
Burn-in Vectors on Raster Image
Convert Vector Layer Projection
Create Contour Vectors from Raster Data
Create New Vector Layers
Create Vector Boundaries:
- Countries, States, Coasts, Rivers
- For Whole World
- For Lat/Long Boundaries
Direct Printing of GIS Layers
Display Vectors with Different Projections in the Same Window
Drag/Drop to Arrange Layer Order
Edit Layer Characteristics
Export Vector Data to Common GIS Formats
Export Vector Attributes
GPS Input
Heads-up (On-screen) Digitizing
Intelligent Digitizer
Import Common GIS Formats:
- ESRI Shapefiles
- Arc Interchange
- AutoCAD DXF
- MapInfo
- Microstation DGN
- USGS DLG
- USGS SDTS
- ENVI Native Vector Format
Import from ArcGIS GeoDatabase
Interactive Vector Layer Querying
Join Vectors
Multiple Vector Selection
On-the-fly Vector Projection Conversion
Raster to Vector Conversions
Save Vectors to ArcGIS GeoDatabase
Split Vectors
Vector Cursor Query
Vector Display Zooming
Vector Editing
Vector to Raster Conversion

Spectral Analysis Tools
Adaptive Coherence Estimator (ACE)
Anomaly Detection
Automated Corner Clustering in N-D Scatter Plot
BandMax Band Optimization
Constrained Energy Minimization (CEM)
Continuum Removal of Images, Spectra
Decision Tree Classifier
Extraction of Endmember Spectra
Integrated Spectral Viewing & Analysis
Linear Spectral Unmixing
Least Squares (LS) Fit
Matched Filtering
Mixture Tuned Matched Filtering
Mixture Tuned Target - Constrained Interference - Minimized Filter (MTTCIMF)
N-Dimensional Visualizer (Scatter Plot)
Orthogonal Subspace Projection (OSP)
Pixel Editing
Pixel Purity Index (PPI)
SAM Target Finder With BandMax
SMACC Endmember Extraction & Sub-pixel Analysis

SPEAR Tools:
- Anomaly Detection
- Change Detection - Two Color Multi-view (ZCMV)
- Change Detection - PCA
- Change Detection - Subtractive
- Pan-Sharpening
- Lines of Communication - Water
- Lines of Communication - Roads
- Watercraft Finder
- Relative Water Depth
- Vegetation Delineation and Stress Detection
- Spectral Analogues
- TERCAT (Terrain Categorizations)
- Spectral Resampling:
  - Predefined Sensor Band Filters
  - User Defined Filters
  - Spectral Libraries and Images
- Spectral Analyst for Material Identification
- Spectral Angle Mapper (SAM)
- Spectral Feature Fitting (SFF)
- Spectral Hourglass Wizard
- Spectral Information Divergence (SID)
- Spectral Libraries Included:
  - Minerals, Vegetation, Rocks, Water, Soils, Snow, Manmade
  - VNIR, SWIR, MWIR, LWIR
  - Spectral Library Builder/Importer
  - Spectral Library Viewer
  - Spectral Math
  - Spectral Plots:
    - Boxcar Average of Pixel Spectra
    - Continuum Removal
    - Cursor Query of X,Y Plot Values
    - Drag and Drop Spectra Among Plot
    - From 3D Surface View
    - From Image Pixels (Z Profile)
    - From Spectral Libraries
    - From ROI Averages
    - Link Spectral Plots from Multiple Images
    - Plot Stacked Spectra
    - User-Defined Plot Functions
    - Wavenumber or Wavelength
    - Subspace Background Suppression
    - Spectral Slices
    - Target - Constrained Interference - Minimized Filter (TCIMF)
    - Target Detection Wizard
- Vegetation Guided Workflows:
  - Fire Fuel Load
  - Agricultural Stress
  - Forest Health
- Vegetation Indices:
  - Greenness
  - Light-use Efficiency
  - Canopy Nitrogen
  - Senescent Carbon
  - Canopy Water
  - Leaf Pigment
- Vegetation Suppression Algorithm

Transforms
Adaptive Coherence Estimator (ACE)
Band Ratios
Color Transforms:
- RGB to HSV, HSL, or Munsell HSV
- HSV, HSL, or Munsell HSV to RGB
- Decorrelation Stretch
- Independent Components Analysis
- Image Sharpening:
  - Color Normalized Spectral
  - Gram-Schmidt Spectral
  - HSV and Brovey
- PC Spectral
- Preserving Spectral Integrity
- Minimum Noise Fraction (MNF)
- Normalized Difference Vegetation Index (NDVI)
- Pan Sharpening (see Image Sharpening)
- Principal Components Rotation
- Saturation Stretch
- Synthetic Color Image
- Tasseled Cap

Filters
Adaptive Filters:
- Frost, Enhanced Frost Gamma, Kuan, Lee, Enhanced Lee, Local Sigma, Bit Error
- Convolution Filters:
  - High & Low Pass, Laplacian, Directional,
  - Gaussian, Median, Sobel, Roberts
- Filtering Preview
- Interactive Fourier Filtering:
  - Forward Transform
  - Interactive Frequency Domain Masking
  - Inverse Transform
- Morphology Filters:
  - Dilate, Erode, Opening, Closing
- Texture Filters:
  - Data Range, Mean, Variance, Entropy,
  - Skewness, Homogeneity, Contrast, Dissimilarity,
  - Second Moment, Correlation
- User-Defined Filter Kernels

Mathematics & Statistics
Auto-correlation
Band Histograms
Band Math and Spectral Math:
- Boolean Operators
- Trigonometric Functions
- Data Type Conversion Functions
- Relational Operators
- Many Other Mathematical Expressions
- Corrograms
- Display Statistics:
  - Minimum, Maximum, Mean, Standard Deviation
- Image Statistics:
  - Band Minimum, Maximum, Mean, Standard Deviation,
    - Eigenvalues, Eigenvectors,
    - Covariance, Correlation Matrices
- Output Matrix Stats to Image Files:
  - Covariance Matrix
  - Correlation Matrix
  - Eigenvectors
- Semiarlograms

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Image Classification
Adaptive Coherence Estimator (ACE)
Accuracy Assessment
AIRSAR Scattering Mechanism Classifier
Automatic Legends for Classified Images
Change Detection - PCA
Change Detection - 2CMV (2 Color Multi-view)
Change Detection - Subtractive
Change Detection, Thematic and Grayscale Images
Classification Preview
Class Statistics
Classification Image from ROIs
Constrained Energy Minimization (CEM)
Decision Trees
Density Slicing
Interactive User-Defined Rule Classifier
Independent Components Analysis
Orthogonal Subspace Projection (OSP)
Mixture Tuned Target-Constrained Interference-Minimized Filter (MTCMIF)
Receiver Operating Characteristic (ROC) Curves:
- Find Optimal Classification Thresholds
- Decrease False Classifications
- Separate Classification Thresholds for Each Class Supervised Classifications:
  - Binary Encoding
  - Parallellepiped
  - Mahalanobis Distance
  - Minimum Distance
  - Maximum Likelihood
  - Neural Network
  - Spectral Angle Mapper (SAM)
  - Spectral Information Divergence (SID)
  - Support Vector Machine (SVM)
  - TERCAT (Terrain Categorization)
Target-Constrained Interference-Minimized Filter (TCIMIF)
Training Data From:
- Regions of Interest
- Pixel Spectra
- Library Spectra
Unsupervised Classifications:
- K-Means
- ISODATA
Vegetation Guided Workflows:
- Fire Fuel Load
- Agricultural Stress
- Forest Health

Post Classification Tools
Accuracy Assessment:
- Kappa Coefficient
- Confusion Matrix
Classification to Vector
Class Statistics
Interactive Class Overlay Tool
Reassign Class Colors, Names
Spatial Functions:
- Buffer Zones Around Classes
- Clump, Sieve, Combine
- Majority & Minority Analysis
- Segmentation Image
Stratified Random Point Generation

Topographic Analysis
Associate DEM with Image
Calculate Slope and Aspect Images
Calculate Shaded Relief Image
Create DEM From Vector Elevation Contours
Hillshade (Shaded Relief Combined with RGB Image)
Line-of-Sight (Viewshed) Analysis
Rasterize Point Data
Topographic Measures:
- Convexity
- Plan Convexity
- Longitudinal Convexity
- Cross Segmental convexity
- Minimum Curvature
- Maximum Curvature
- Three-Dimensional Visualization
Topographic Feature Extraction (Classification):
- Ridge, Channel, Plane, Peak, Pit

3-D SurfaceView
Animated 360° Visualization
Associate DEM With Image
Change View Interactively Using Mouse
Create Fly-Through Sequence:
- Interpolate Between User Selected Views
- Follow Annotation Line
Custom Background Color
Drape Image Over 3-D Surface
Output Fly-Through Sequence:
- MPEG, VRML 2.0
Overlay Vectors, Regions Of Interest
Set Vertical Exaggeration
Smooth Image, DEM

Annotation and Map Composition
Map/Print Layout utilizing ArcGIS Templates
Utilize ArcGIS Layout Templates
Automatic Contour Labeling
Automatic Legends for Classified Images, Scale Bars, and Color Ramps Text, Polygons, Polylines, Points, Symbols
Burn-in or Overlay Annotations
Cartographic Symbols
Contour Lines from DEM, Other Images
Counting Tool
Create Reusable Map Templates
Grid Lines: Pixel, Lat/Long &/or Map Grids
Inset Images (e.g., Logos) or Vector Plots
Interactive Map Composition Using Image Displays
Interactively Reposition Annotation and Map Elements
Interactive Plot Scaling
Rotated Map Projections
Save & Restore All Parameters
TrueType® Fonts (Plus Add Your Own)
User Definable Arrows, Declination Diagrams
(True, Grid and Magnetic North)
Vector Overlays

Radar Functionality
Adaptive (Speckle Reduction) Filters:
- Frost
- Enhanced Frost
- Gamma
- Kuan
- Lee
- Enhanced Lee
- Local Sigma
- Bit Error
Antenna Pattern Correction
AIRSAR Scattering Mechanism Classifier
CEOS Tape Reading
Convert integrated TOPSAR to:
- C-band VV data
- Correlation image
- Digital Elevation Model (DEM)
- Incident Angle image
- L- and P-band polarimetric AIRSAR Data
Display and Analyze Radar Data Using Standard ENVI tools
Edge Enhancement Filters
Import ASAR, ERS, JERS, RADARSAT, AIRSAR, TOPSAR, SIR-C/X-SAR, ALOS
Incident Angle Images
Multi-Look SIR-C Data
Pedestal Height Images
Phase Difference Images
Polarization Signatures from ROIs & Single Pixels
RADARSAT - 2 Endorsement
Sigma nought and Beta nought from ERS, Radarsat
Slant-to-Ground Range Conversion
Synthetic Color Image
Synthesize Images from Compressed, Complex Scattering Matrix Data
Texture Measures
View CEOS Headers

General Interface & Operation
8- and 24-Bit Color, Multiple Displays
Access to IDL Functions*
Add Custom Routines to Menu
Batch Recording, Queuing, and Playback
Build Scripts for Common Functions*
Command Line Use of ENVI Routines*
Context-Sensitive Mouse Descriptions
Cursor Coordinates (Pixel & Map), Data Values, and Elevations
Direct Link to GPS Devices (Real-time Input)
Edit ENVI Header Information
Efficient Memory Management
Extended Preferences Settings
Geo-Browser Image Selection from Graphical Index Map
Logical Menu-Based GUI (Graphical User Interface)
Multi-Processor Aware Algorithms
Platform-Independent Operation
Recursive Directory Scanning for Files
Support for Files Greater than 2GB
User-Configurable Menus & Buttons

Modules
ENVI Atmospheric Correction Module
ENVI Certified NITF Module:
- Only available in ENVI+IDL.
ENVI Certified NITF Module with TRF
ENVI DEM Extraction Module for Stereo Images
ENVI Feature Extraction Module
ENVI Orthorectification Module
SARscape Family of Modules for ENVI

Documentation
Context-Sensitive Help
Module Documentation
On-line, Hyperlinked Documentation
Printed Documentation
Programmer's Guide (with Examples)
Training Manuals
Tutorials & Sample Data
User's Guide

* Only available in ENVI+IDL.
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Regardless of your industry, from forestry and agriculture to defense and intelligence, your reliance on geospatial imagery as a source of important geographic information continues to grow. ENVI is the premier software solution for extracting information from geospatial imagery. ENVI delivers innovative, time saving ways to get information from imagery, while making it easy to incorporate image processing and analysis into your existing workflow.

Now, the latest release of ENVI delivers features and functionality to further streamline your workflow and reduce the time you spend on image processing and analysis. ENVI 4.8 makes it seamless to update a GIS with current information from geospatial imagery by delivering image analysis tools directly from the ArcGIS environment. A new, high performance LiDAR viewer allows you to easily incorporate information from LiDAR data with your other geospatial data, and a new workflow for viewshed analysis automates and streamlines a multi-step process. And, because ENVI is built on a fully extensible platform, you can easily customize it to your specific imagery needs.

**ENVI Image Analysis Tools Now Available in ArcGIS®**

In the past, updating a GIS with valuable information obtained from geospatial imagery required multiple tools. With ENVI 4.8, image analysis capabilities are fully integrated with ArcGIS, eliminating the need to switch between software packages.

ENVI 4.8 completes the integration with ArcGIS from Esri – delivering for the first time, advanced image processing and analysis tools directly from the ArcGIS desktop and ArcGIS® Server environments. Because ENVI 4.8 is completely compatible with ArcGIS 10 and 9.3, you can now include imagery in your workflow while taking advantage of the latest technology that Esri has to offer.

The new ENVI tools for ArcGIS are available in a familiar ArcGIS toolbox, exposing ENVI functionality through geoprocessing scripts that operate in both desktop and server environments. ENVI provides you with nearly 20 pre-built tools to easily perform a variety of advanced image processing and analysis tasks without leaving ArcGIS, allowing you to:

- Detect change over time
- Find and extract features of interest
- Classify features or land cover
- Identify anomalies
- Much more

For ArcGIS® Server users, ENVI tools can also be delivered to your entire organization using the newest addition to the ENVI product line, ENVI for ArcGIS® Server.
Easily Add LiDAR Data to Your Workflow

Geospatial information comes in a variety of formats, all of which help to build a complete picture about a geographic area. With ENVI 4.8, you’ll have the tools you need to combine different data sources and the information they provide to piece together a complete picture of an area of interest.

ENVI 4.8 introduces the LiDAR viewer, extending the existing ENVI LiDAR functionality by adding a high performance, 3-dimensional viewer that efficiently works with very large LiDAR data sets. And, with the ability to quickly and easily display point clouds in a variety of colors and ranges, the new LiDAR viewer will help you visually interpret your data and give you a more complete understanding of a particular area of interest.

Use the ENVI LiDAR viewer to:

• Filter by return, elevation, or point classification
• Display your data with a variety of surface types
• Measure height or volume of any structure
• Add custom color palettes

And, with the high performance ENVI LiDAR viewer, you can easily underlay a satellite or airborne image with your LiDAR display to create important situational awareness.

New Automated Workflow for Viewshed Analysis

In recent releases, ENVI introduced automated workflows to make a variety of tasks less labor intensive. ENVI workflows deliver scientifically proven methods for processing and analyzing imagery in step-by-step, wizard-like processes that make advanced functionality available to users of any experience level.

The new viewshed analysis workflow in ENVI 4.8 guides you through the multi-step process of viewshed analysis, providing you with the information you need to make important tactical decisions, such as where to strategically place a cell tower for maximum coverage, determining the safest path for troop movement, or indentifying out-of-site locations for concealing landfills and wastewater treatment centers. The ENVI viewshed workflow allows you to easily exploit a DEM and determine visible areas from a variety of view sources, including points, lines, or polygons, so you can easily:

• Export results directly to raster, vector, or an ArcGIS geodatabase
• Define multiple, simultaneous viewshed points, polylines, or polygons
• Determine viewshed and view range independently

Imagery becomes information.

See the other ways ENVI 4.8 can help streamline your image analysis workflow. Learn more today at www.ittvis.com/ENVI, or call your ENVI representative at 303-786-9900.

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ENVI EX
Unlock the information in your imagery quickly and easily.

Engineered for life
Add Image Processing & Analysis to Your GIS.

ENVI EX is the newest addition to the ENVI line of premier image processing and analysis software products. ENVI is the choice of imagery scientists and professionals for extracting scientifically accurate information from imagery. Now ENVI EX delivers the accurate, scientifically proven processes that ENVI is known for in revolutionary step-by-step workflows that quickly and easily guide you through advanced image processing tasks, regardless of your experience level.

Completely Streamline Your GIS Workflow.

We understand that just making an image processing and analysis solution available to you as a GIS user is only part of the answer – you also need a software solution that integrates seamlessly with your current workflow. ENVI EX was specifically designed around the needs of GIS users, and made to be fully interoperable with ArcGIS data and layers. This tight integration with ArcGIS allows you to:

- **Easily exchange data files and layer files** between ArcGIS and ENVI EX by simply selecting an image in ArcGIS and dragging and dropping it into ENVI EX.
- **View and interact with ArcGIS layers** in ENVI EX while viewing vector information with the same symbology, styling and rendering as ArcGIS.
- **Execute image processing tasks** in ENVI EX, make changes to the parameters on the fly, and see the changes as you move between the two products.

Satellite and airborne imagery, once considered a simple backdrop to maps, is now readily available, more affordable, and a great source of valuable data to add to your GIS applications. Imagery enables and enhances operational decision making. The challenge to unlocking the information in imagery and its associated data has been to make image processing and analysis easier and less time consuming, while still delivering accurate results.

Now, there is a solution to easily add information from imagery to your GIS - ENVI EX.

ENVI EX. The image processing software for GIS users. Trusted by image scientists for years. Now integrated with ArcGIS®.

ENVI EX. The image processing software choice for GIS users. Now you can easily add information from imagery to your GIS with a product designed specifically with your needs in mind, and with seamless integration to the tools you already trust.
Access Your Files and Data

ENVI EX supports imagery types gathered from today’s popular satellite and airborne sensors including panchromatic, multispectral, hyperspectral, radar, thermal, LiDAR and more. ENVI EX can read over 70 data formats and includes J2K, GeoTIFF, and optional JTC-compliant NITF support. ENVI EX also allows you to easily drag and drop files from Windows® Explorer, search results, and ArcGIS, making it easy to access and integrate information into ENVI from other desktop applications.

Display and View Your Imagery and Data

ENVI EX provides a dynamic display and intuitive interface designed specifically for viewing and exploring large imagery datasets from a wide variety of sources. You can easily manipulate imagery with a series of menus, buttons, and sliders and you can explore large images by panning, zooming and flying to find the information you need. And, ENVI EX is completely interoperable with ArcGIS, so you can load and manipulate both raster and vector files, and move them back and forth while maintaining a consistent view across both products.

Visualize Your Imagery and Data

The desktop toolbox and layer manager in ENVI EX give you the tools you need to visualize your imagery and data, and to create representations that are clear and easily interpreted. Advanced manipulation tools allow you to stretch, sharpen, blend, rotate, adjust brightness, transparency and contrast, create histograms, and add annotations to your imagery.

The ENVI EX unique portal view allows you to display an image or an ArcGIS layer, select an area of interest, and quickly visualize that selected area using the manipulation tools. ENVI EX even gives you access to vector editing tools, such as a rectangulator and smoother, to “clean up” your visualizations and make features in your image more true to life.
Process and Analyze Your Imagery and Data

We work closely with GIS professionals to determine the image processing and analysis procedures that are most needed for you to add important information to your GIS applications. ENVI EX now delivers the methods that have been trusted by image scientists for years in easy to use image processing routines and image analysis workflows that produce results you can count on.

Image Processing Tools

ENVI EX provides image processing routines to prepare your imagery and data for further advanced analysis. These routines allow you to:

- Pan Sharpen an Image
  The process of taking low resolution multispectral data and combining it with high resolution panchromatic data to get a spatially sharpened, multispectral result.

- Detect Anomalous Features
  Find features in an image that differ from the overall image scene.

- Suppress Vegetation
  Minimize the visual effects of vegetation in your imagery to highlight non-vegetation materials.

Image Analysis Workflows

ENVI EX automated image analysis workflows are easy to use, stepping you through each stage of image processing and analysis with intuitive dialog boxes and predetermined parameters based on typical desired outcomes. The workflows also offer enough flexibility to allow you to interactively modify parameters and data at various stages of the process. ENVI EX automated workflows allow you to:

- Extract Features from an Image
  The Feature Extraction Workflow automatically isolates and extracts features of interest in an image for further analysis or output as a layer to your GIS.

- Detect Change in an Area Over Time
  The Change Detection Workflow compares images taken at different times or with different sensors, and allows you to visualize change over time in an area of interest.

- Classify Materials or Land Cover
  The Classification Workflow provides supervised and unsupervised methods for grouping pixels in an image into categories in order to identify and extract materials or land cover.

- Orthorectify Images for Analysis
  The RPC Orthorectification Workflow accurately registers imagery to a digital elevation map and geometrically corrects it to remove distortions that happen during image capture.

Preview the results of these workflows in the flexible portal, where you can easily view results before processing the entire image. And, the portal will update dynamically and quickly with processing results as you move it over your image.
Output and Share Your Results

Once you’ve completed your image analysis workflow, ENVI EX makes it easy to output and share your results. The output capabilities are seamless with your GIS workflow, giving you a variety of ways to share the information from your imagery including:

**Chip to print, to a file, or to PowerPoint**
Easily capture any screenshot of your processed data and send it to the printer, to a file for future use, or to a Microsoft® PowerPoint® file.

**Save to the geodatabase or to a shapefile**
With ENVI EX you can easily save directly to the geodatabase, or save your results as a new shapefile for use in other applications.

**Output Using ArcGIS Print Dialog**
The ENVI EX solution gives you complete integration between printing and viewing. With its tight integration with ArcGIS, ENVI EX results can be output as map products, using the popular ArcGIS map templates and printing dialogs directly from the ENVI interface.

Trusted by scientists for years, now integrated with ArcGIS.

ENVI EX provides the easy-to-use software tools you need to add imagery to your GIS, and enhance your results with the important information imagery provides. Start unlocking the information in your imagery today at [www.ittvis.com/ENVI](http://www.ittvis.com/ENVI).

Unlock the information in your imagery quickly and easily.
Today's imagery analysts and scientists in a wide variety of disciplines choose ENVI®, the premier software solution for extracting information from geospatial imagery. ENVI EX provides advanced, user-friendly tools to access, analyze, and share information from geospatial imagery.
ENVI EX 4.8 Functional Summary

Operating Systems
Windows XP SP2 (Intel/AMD 32- & 64-bit)
Windows Vista (Intel/AMD 32- & 64-bit)
Windows 7 (Intel/AMD 32- & 64-bit)
Linux Kernel 2.6.x (Intel/AMD 32- & 64-bit)
Mac OS X 10.5.x (Intel 32- & 64-bit)
Max OS X 10.6 (Intel 32- & 64-bit)
Sun Solaris 10 (SPARC 32- & 64-bit)

Data Import
Raster Formats:
• DPPDB (with license)
• DTED (levels 0, 1, 2)
• ENVI (raster & classification)
• ERDAS IMAGINE (.img & .ige)
• ESRI Geodatabase Raster Dataset
• ESRI GRID
• GeoJP2 / GeoJ2K
• GeoTIFF
• JPEG
• JPEG2000
• MrSID (including MG3)
• NITF 1.1, 2.0, 2.1 (with license)
• NSIF 1.0 (with license)
• TIFF

Vector Formats:
• ENVI Vector File
• ESRI Geodatabase Feature Class
• ESRI Layer
• ESRI Shapefile

Military Formats:
• DPPDB
• DTED (levels 0, 1, 2)
• NITF 1.1, 2.0, 2.1 (with license)
• NSIF 1.0 (with license)
• RemoteView R-Set (with license)
• TIFF (with license)

Sensor Support:
• GeoEye-1
• IKONOS
• Landsat MSS, TM, ETM+:
  • GeoTIFF w/ Metadata (MTL)
• OrbView-3
• RapidEye
• QuickBird
• SPOT DlMAP
• WorldView-1
• WorldView-2

ESRI Formats:
• Geodatabase Raster Dataset:
  • Personal (.mdb)
  • File (.gdb)
  • Enterprise (.sde)
• Geodatabase Feature Class:
  • Personal (.mdb)
  • File (.gdb)
  • Enterprise (.sde)
• GRID
• Layer
• Shapefile

Annotation Formats:
• ENVI Annotation (.ann)
• ENVI EX Annotation (.anz)

Output Formats
ESRI Geodatabase:
• Personal (.mdb)
• File (.gdb)
• Enterprise (.sde)
Raster Formats:
• DTED
• ENVI
• GeoTIFF
• NITF 2.0, 2.1 (with license)
• TIFF

Vector Formats:
• ESRI Shapefile
  • Chip Display to:
    • NITF 2.0, 2.1 (with license)
    • ENVI
    • TIFF / GeoTIFF
    • JPEG
    • JPEG 2000
    • Geodatabase
    • PowerPoint
    • Print
    • ArcMap

Export Map To:
• PDF
• EMF
• AI
• EPS
• SVG
• BMP
• JPEG
• PNG
• TIFF
• GIF

ENVI tools for ArcGIS®
Auto-Threshold Difference Raster
Calculate Image Difference
Calculate Thematic Change
Classification Raster To Vector
Classify With Training
Classify Without Training
Cleanup Classification Raster
Detect Anomalies
Extract Features With Ruleset
Intersect Rasters
Threshold By Percentage
Workflow Models with Cleanup

Display Functions
Chip Display To:
• File
• PowerPoint
• Print
• ArcMap

Drag/Drop from:
• ArcGIS Desktop
• File System
• Windows Explorer
• Data Manager

Drag/Drop to the:
• Display
• Process
• Workflows

GeoLink with ArcMap
Color Mapping
Cursor Query for Data Value, Map
Coordinates, Lat/Lon
Dynamic Overlays
Image Flicker/Swipe/Blend
Image Overlays:
• Annotation
• Classification Results
• ESRI Shapefile
• Vector Layers

Interactive Histograms & Stretching:
• Arbitrary Stretching
• Auto Apply Stretches
• Gaussian Stretching
• Histogram Equalization Stretching
• Linear Stretching
• Optimized Linear Stretching
• Square Root Stretching

Output Displays to File or Printer
Preview Portals
Quick Color-Infrared, True-Color Displays
Set Default Display Bands
Sub-Pixel Cursor Location
Unlimited Number of Layers

Vector Overlays & GIS Capabilities

Data Preparation
Mask Generation From:
• Annotation
• ESRI Shapefile
• Geodatabase
• Vectors

Define Spatial Subset by:
• Display
• File Coordinates
• NITF Metadata Browser

Rotate/Flip Data
Unlimited Number of Layers

Registration & Rectification
Rational Polynomial Coefficients (RPCs) Support
RPC Orthorectification Workflow
Rotated Projections

Map Projection Support
Datum Support (90)
Dozens of Prebuilt Map Projections (Examples Include):
• Universal Transverse Mercator (UTM)
• State Plane
• Albers Conical Equal Area
• Lambert Conformal Conic
• Miller Cylindrical

Ellipsoid Support (35)
Pseudo-Projections from RPCs and RSM

Vector Functions
Import Common Formats:
• ESRI Shapefile
• ENVI Vector Format
• ESRI Geodatabase
• ESRI Layer

(continued on back)
Add Nodes to Vectors
Display Shapefile Attributes
Burn-in Vectors on Raster Image
Create New Vector Layers
Direct Printing of GIS Layers
Display Vectors with Different Projections in the Same Window
Drag/Drop to Arrange Layer Order
Edit Layer Characteristics
Export Vector Data to Common GIS Formats
Export Vector Attributes
Heads-up (On-screen) Digitizing
Import from ArcGIS GeoDatabase
Join Vectors
Multiple Vector Selection
On-the-fly Vector Projection Conversion
Raster to Vector Conversions
Save Vectors to ArcGIS GeoDatabase
Split Vectors
Vector Editing
Vector to Raster Conversion
Display Attributes

**Transforms**
Pan/Image Sharpening:
- Gram-Schmidt Spectral

**Image Processing**
Anomaly Detection Workflow
Classification Workflow (Supervised)
Classification Workflow (Unsupervised)
Feature Extraction Workflow (Rule Based)
Feature Extraction Workflow (Supervised)
Image Difference Change Detection Workflow
Pan Sharpening Tool
RPC Orthorectification Workflow
Thematic Change Detection Workflow
Vegetation Suppression Tool

**Post Classification Tools**
Classification to Vector
Class Statistics
Thresholding
Majority & Aggregation Analysis

**Map Composition**
All supported data formats
ESRI Map templates

**General Interface & Operation**
8- and 24-Bit Color
Context-Sensitive Mouse Descriptions
Cursor Coordinates (Pixel & Map) & Data Values
Efficient Memory Management
Extensive Preferences Settings
Logical Graphical User Interface
Multi-Processor Aware Algorithms
Platform-Independent Operation
Support for Files Greater than 2GB

**Documentation**
Context-Sensitive Help
Module Documentation
On-line, Hyperlinked Documentation
Printed Documentation
Training Manuals
Tutorials & Sample Data
User’s Guide
SARscape® Modules for ENVI

Read, process, analyze, and output products from SAR data.

Engineered for life
Get the Information You Need from Your SAR Data.

The SARscape® modules for ENVI allow you to easily read, process, analyze your SAR data, and generate products, while giving you the option to integrate this information with other geospatial products. This unique data analysis capability takes your data from hard-to-interpret numbers to meaningful, contextual information. And, since SARscape modules are integrated with ENVI, the premier image processing and analysis solution, you get the added benefit of image analysis tools and SAR processing functionality in one package.

SARscape Basic Module

The Basic Module includes a set of processing steps for the generation of SAR products based on intensity and coherence. This module is complemented by:

• **Focusing Module**
  Supports ERS-1/2 SAR, JERS-1 SAR, ENVISAT ASAR, and ALOS PALSAR-1 data.

• **Gamma & Gaussian Filter Module**
  Includes SAR specific filters, extending the range of filters of the Basic Module.

SARscape Interferometry Module

The Interferometry Module supports the processing of Interferometric SAR (2-pass interferometry, InSAR) and Differential Interferometric SAR (n-pass interferometry, DInSAR) data for the generation of Digital Elevation Models (DEM), Coherence, and Land Displacement / Deformation maps. This module is complemented by:

• **ScanSAR Interferometry Module**
  Offers the capabilities to process InSAR and DInSAR data over large areas (400 km by 400 km).

• **SAR Polarimetry / Polarimetric Interferometry Module**
  Supports the processing of polarimetric and polarimetric interferometric SAR data.

• **Interferometric Stacking Module**
  Based on Small Baseline Subset (SBAS) and Persistent Scatterers (PS) techniques, it determines displacements of point and distributed-targets.
SARscape Basic Module

Prepare Your SAR Imagery

The SARscape Basic Module includes processing functionality for generating airborne and spaceborne SAR products, based on intensity and coherence. This is complemented by a multi-purpose tool, which includes a wide range of functions - from image visualization, to Digital Elevation Model import and interpolation, to cartographic and geodetic transforms.

The SARscape module provides automated pre-processing tools that allow you to quickly and easily prepare your imagery for analysis and visualization. With the SARscape Basic Module, the following processing capabilities are supported:

- Multilooking
- Coregistration
- Despeckling
- Geocoding and Radiometric Calibration
- Mosaicking
- Feature Extraction
- Segmentation
- Classification

Accessory Modules for the Basic Module:

Focusing Module

The Focusing Module generates complex images (SLC) based on a frequency domain algorithm. It supports ERS-1/2 SAR, JERS-1 SAR, ENVISAT ASAR and ALOS PALSAR-1 data.

Gamma and Gaussian Filter Module

The Gamma and Gaussian Filter Module includes a variety of SAR specific filters, extending the range of filters of the Basic Module. Algorithms for this module are based on Gamma and Gaussian-distributed scene models. They are particularly efficient in reducing speckle noise while preserving radar reflectivity, textural properties, and spatial resolution, especially in strongly textured SAR images.
SARscape Interferometry (InSAR/DInSAR) Module

Generate Your Interferometric Products
This module enables the generation of Digital Elevation Models (InSAR technique) and surface deformation maps (DInSAR technique). State-of-the-art methodology, applied to data acquired from recent SAR sensors, generate accurate (up to a vertical resolution of few meters) and detailed surface and terrain height products. The DInSAR technique can detect centimeter-scale displacements over time spans of days to years. The interferometry module is applicable in geophysical monitoring of natural hazards like earthquakes, volcanoes, and landslides. It is also useful in structural engineering, particularly for the monitoring of subsidence and structural stability.

The SARscape Interferometry Module allows you to process Interferometric SAR (2-pass interferometry, InSAR), and Differential Interferometric SAR (n-pass interferometry, DInSAR) data.

The processing includes the following steps:
- Coregistration Using DEM Data
- Interferogram Generation
- DEM Flattening
- Interferogram Adaptive Filtering and Coherence
- Phase Unwrapping
- Phase Editing
- Geometry Optimization, Based on Ground Control Points
- Phase to Map Conversion and Geocoding (DEM)
- Phase to Displacement Conversion and Geocoding (Displacement Maps)

The three accessory modules ScanSAR Interferometry, SAR Polarimetry Polarimetric Interferometry, and Interferometric Stacking, complement the InSAR/DInSAR Module.

Download detailed technical information, get pricing, or purchase the SARscape Module for ENVI at www.ittvis.com/ENVI or call 303.786.9900.

Filtered interferograms (every 11 days) of a building in Barcelona, TerraSAR-X-1 StripMap, 1 fringe — 1.55 cm displacement. ©TerraSAR-X-1 data, Infoterra

ENVI and SARscape.
When You Need Every Piece of the Puzzle.
Accessory Modules to the Interferometry Module

The ScanSAR Interferometry Module allows you to generate Digital Elevation Models, Coherence and Land Displacement maps based on ENVISAT ASAR Wide Swath data (400 km x 400 km). In addition, this module provides hybrid interferometric products, by combining StripMode (ASAR Image Mode) data with ScanSAR (ASAR Wide Swath) data.

SAR Polarimetry/Polarimetric Interferometry (Pol/PollnSAR) Module

The SAR Polarimetry/Polarimetric Interferometry (Pol/PollnSAR) Module allows you to process polarimetric data, polarimetric interferometric ALOS PALSAR-1, RADARSAT-2, and TerraSAR-X-1/2 data.

• SAR Polarimetry
  Includes among others Pauli Decomposition, Entropy-Anisotropy-Alfa Decomposition, and Classification Tools.

• Polarimetric SAR Interferometry
  Includes among others SLC Coregistration, Polarimetric Phase Difference, Interferogram Generation, Polarimetric / Interferometric Coherence, and Coherence Optimization.

Interferometric Stacking Module

The Interferometric Stacking Module integrates point-based (PS-like) and area-based (SBAS-like) techniques for the processing of interferometric stacks. This combined approach enables users to obtain accurate results both on point and distributed targets.

• Persistent Scatterers (PS)
  Enables users to detect very small displacements (mm scale) and to infer the deformation velocity - and its variation over the time - in particular for very stable (man-made) reflectors that might have independent displacements in respect to the surrounding areas.

• Small Baseline Subset (SBAS)
  Is a complementary method that exploits differential synthetic aperture radar interferometry (DIFSAR) techniques to analyze stacks of SAR acquisitions to extract small deformations over large areas, when no point targets are identified but large, correlated displacements occur over natural targets.

The combination of the two approaches allows analyzing deformation phenomena affecting both extended area (e. g. natural features) and localized structures (e. g. man-made features), related to natural or man-induced phenomena (e. g. volcanic or seismic activity, landslides, subsidence, building failures, etc.).
Today’s imagery analysts and scientists in a wide variety of disciplines choose ENVI®, the premier software solution for extracting information from geospatial imagery. ENVI provides advanced, user-friendly tools to access, analyze, and share information from geospatial imagery.
ENVI Orthorectification Module
Orthorectify Your Imagery Quickly and Easily.
Rigorous Orthorectification.
Simple Workflow. Trusted Method.

The Need for Orthorectification

Satellite and aerial imagery is used increasingly in GIS and scientific applications for the rich information it provides about a geographic area. If you use imagery as a source of information, you've encountered a need to perform orthorectification - the process of accurately registering imagery to ground coordinates and geometrically correcting it to remove distortions that occur during image capture.

A Rigorous Solution from ENVI

Previously, methods for orthorectifying imagery required extensive knowledge of the process and complex software systems that were not necessarily available to the typical image consumer. Now, the add-on ENVI Orthorectification Module delivers a trusted, rigorous orthorectification method and robust capabilities, all distilled into an easy-to-use workflow.

This solution creates a seamless data transition, easily taking you from data ingest to orthorectification and further exploitation of results using your ENVI software. Designed for use by non-expert and expert users alike, the wizard-based interface guides users through orthorectification steps to quickly produce accurate results.

Trusted Method for Rigorous Orthorectification

The method in the ENVI Orthorectification Module is based on the mathematical model for rigorous orthorectification designed by worldwide ortho experts, Spacemetric. Spacemetric's engineers have worked closely with satellite and aerial providers for many years, optimizing their models to accurately work with today's most popular airborne and satellite sensors.

This extensive research and development has produced a solid, truly rigorous method that is widely accepted as an industry standard in image orthorectification technology. Spacemetric's highly optimized software allows imagery users to produce high quality results quickly. Since this trusted method is now combined with the image processing and analysis capabilities in ENVI, you can trust that your orthorectification results are scientifically accurate and of the highest quality.

Orthorectify your imagery quickly and easily.
Automated Workflow

ENVI is known for making scientifically advanced image processing and analysis capabilities accessible to all levels of geospatial imagery users by incorporating easy-to-use, automated processes and procedures. Now, the ENVI Orthorectification Module delivers orthorectification capabilities in an automated, wizard-based workflow, so you can perform advanced techniques, regardless of your experience with image processing or orthorectification.

And, since ENVI is integrated with ArcGIS, you can seamlessly output your results to a GIS without ever interrupting your workflow.

Steps to Orthorectify an Image with the ENVI Orthorectification Module:

Select Input Imagery and DEM

The first step in the ENVI Orthorectification workflow is to load your imagery and digital elevation models by simply choosing files from the current available bands list.

- Include multiple data files, even from multiple sensors
- Restore a project file to work with previously saved results

Collect and Edit Ground Control Points

Once input data is defined, this optional step allows you to associate image pixels with points on the ground whose locations are known through geographic coordinate data.

- Manually enter ground control points or restore points from a previous session
- View the distribution of ground control points over the project area
- Evaluate errors between the ground control points and the model solution
Collect and Edit Tie Points
When multiple images are orthorectified and mosaicked, you may choose to establish tie points in areas of image overlap.

- Restore previously created tie point files
- Add new tie points
- Edit existing tie points

Reorder Images and Define Cutlines
Once tie points are collected, you can define the image extent and specify which areas between two or more overlapping images should appear in the final output.

- Define the hierarchy of each image relative to all others
- Define an optional cutline for the image by simply drawing a polygon or polyline on the image

Select Output Parameters
In the final step of the workflow, you will specify the output map projection, pixel size, filename and path.

- Perform automatic image-to-image color balancing
- Preview option will show you preliminary results before the entire result is processed

Robust Capabilities

The ENVI Orthorectification Module delivers a rigorous method for precision orthorectification. When compared with simple geometric registration or the RPC method, ENVI’s rigorous method is far more accurate and essential to applications where precision matters, such as engineering roadways or bridges, or targeting specific objects of interest.

Orthorectify Using an Automated Workflow
A wizard-based interface guides you through the rigorous orthorectification process step-by-step to achieve expert level results.

Utilize Imagery from a Broad Range of Sensors
The ENVI Orthorectification Module comes with built-in sensor model support for the following sensors: SPOT 1-5, IKONOS-2, QuickBird-2, WorldView-1, EROS A1, Landsat 4-5, Landsat 7 ETM+, ERS SAR, Radarsat-1, IRS P6, CARTOSAT-1, FORMOSAT-2, OrbView-3, KompSat-2, and ASTER. You can also add your own sensor model via custom coding.

Perform Block Bundle Adjustment
Achieve optimized results and minimize model error using GCP’s and tie points.

Create Mosaics Using Cutlines
Easily draw cutlines for control of multiple image output seams.

Preview Your Results
Try different parameters and preview your results before processing the entire image.

Extend the Module’s Functionality
Add custom sensor support using XML sensor definition files. Additionally, access the module programmatically using IDL to automate your workflow and perform batch processing.

ENVI Orthorectification Module
Orthorectifying your imagery is easier than ever.

To learn more about the ENVI Orthorectification Module or about our custom implementation services, visit www.ittvis.com/ENVI/Ortho.
Today's imagery analysts and scientists in a wide variety of disciplines choose ENVI®, the premier software solution for extracting information from geospatial imagery. ENVI provides advanced, user-friendly tools to access, analyze, and share information from geospatial imagery.