

HARRIS GEOSPATIAL SOLUTIONS

CHERIE MULEH

Asia Pacific Sales Manager



Segment Overviews



- ⊗ **Communication Systems \$1.8B**
Tactical and airborne radios, night vision technology, and defense and public safety networks
- ⊗ **Electronic Systems \$2.3B**
Electronic warfare, avionics, robotics, advanced communications and maritime systems for the defense industry, as well as air traffic management solutions for the civil aviation industry
- ⊗ **Space and Intelligence Systems \$1.9B**
Complete solutions encompassing advanced sensors and payloads, processing systems, and analytics for global situational awareness, space superiority missions, and Earth insights

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Space and Intelligence Systems



Complete solutions encompassing advanced sensors and payloads, processing systems, and analytics for global situational awareness, space superiority missions, and Earth insights

- > ENVIRONMENTAL SOLUTIONS
- > GEOSPATIAL SOLUTIONS
- > INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE
- > POSITIONING, NAVIGATION, AND TIMING
- > PROPRIETARY SOLUTIONS
- > SPACE SUPERIORITY

U.S. Civil and Intelligence Community



U.S. Department of Defense



Commercial Customers



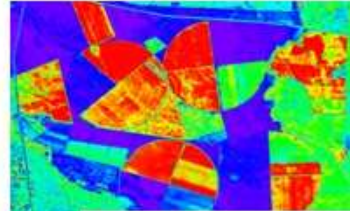
An Expanding Commercial Portfolio



Geiger-Mode LiDAR



Data Products



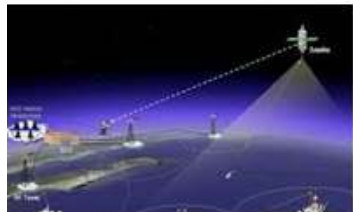
ENVI/IDL



Jagwire Data Management



MEGA Deep Learning



Real-Time AIS



SARscape



UAS Support



Helios



Amplify for Utilities

Harris Geospatial continues to develop world class geospatial technology to solve real-world problems. We are focused on developing sophisticated analytics using technologies such as deep learning, SAR, and hyperspectral and making them accessible through a range of products and services

Challenges Facing our Clients

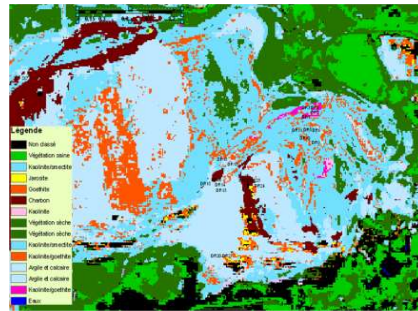


Socio-Economic Security

Understand and protect critical components, including food, water, energy, health, and infrastructure

Sustainable Development Support

Monitor stages of growth, manage resources, and integrate with Smart Cities for efficient development

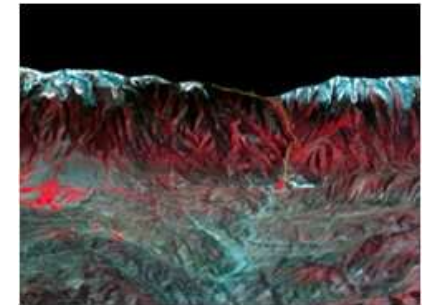


Emergency and Disaster Preparedness

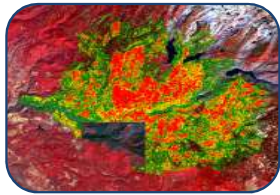
Have the necessary tools to perform early and predictive detections and plan response and recovery efforts

National Security, Protection, and Governance

Plan, monitor and execute national decision, manage disparate data sources, and disseminate products



Analytics to Answers with ENVI + IDL Platform



ENVI

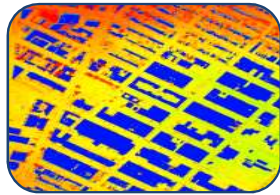
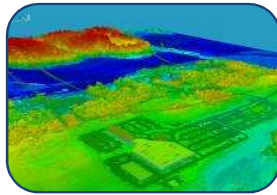
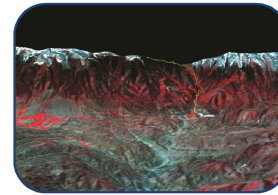


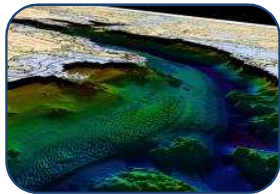
Photo-grammetry



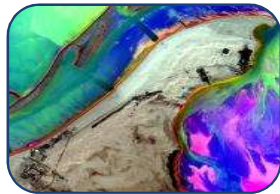
Feature Extraction



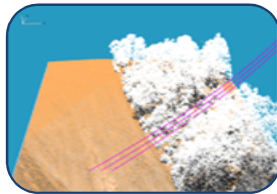
DEM Extraction



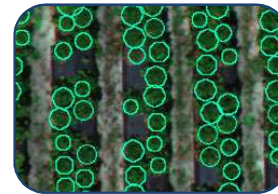
Atmospheric Correction



SARscape Suite of Tools



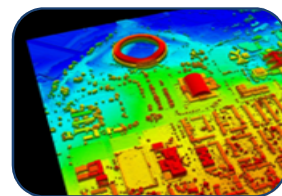
NITF Data



Crop Science



ENVI Engine



ENVI OneButton



IDL Extensibility



We are continuously updating our products to bring you answers that you can trust...

ENVI - The leader in image science



ENVI image analysis software is used by GIS professionals, scientists, and image analysts to extract meaningful information from imagery to make better decisions.

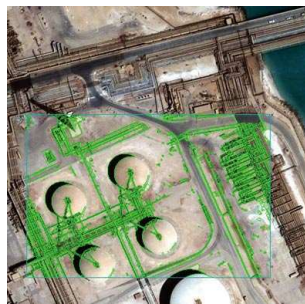
ENVI can be deployed and accessed from the desktop, in the cloud, and on mobile devices, and can be customized through an API to meet specific project requirements.



ENVI Capabilities Overview



ENVI image analysis software uses scientifically proven analytics to deliver expert-level results. Businesses and organizations choose ENVI because it integrates with existing workflows, supports today's most popular sensors, and can easily be customized to meet unique project requirements.

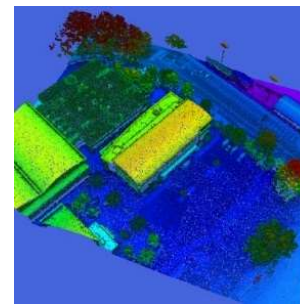
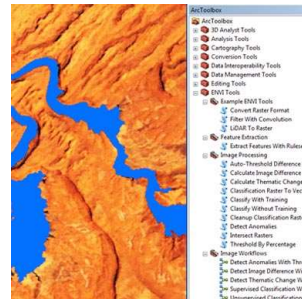


Extensible

Combine multiple tools, including image analysis functionality, to create new custom image analysis capabilities based on desired outcomes.

ArcGIS® Integration

Workflows and automated tools open in the ArcToolbox® and results can be pushed directly to ArcMap, run as GP tools in ArcGIS Pro, or ArcGIS Online

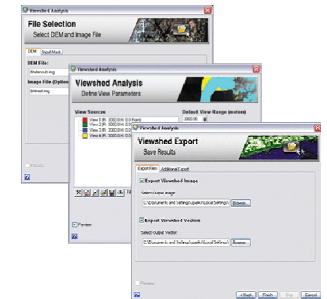


Data Support

ENVI works with any size data set and has automated tools to quickly and easily prepare big and small imagery for viewing and further analysis.

Workflows

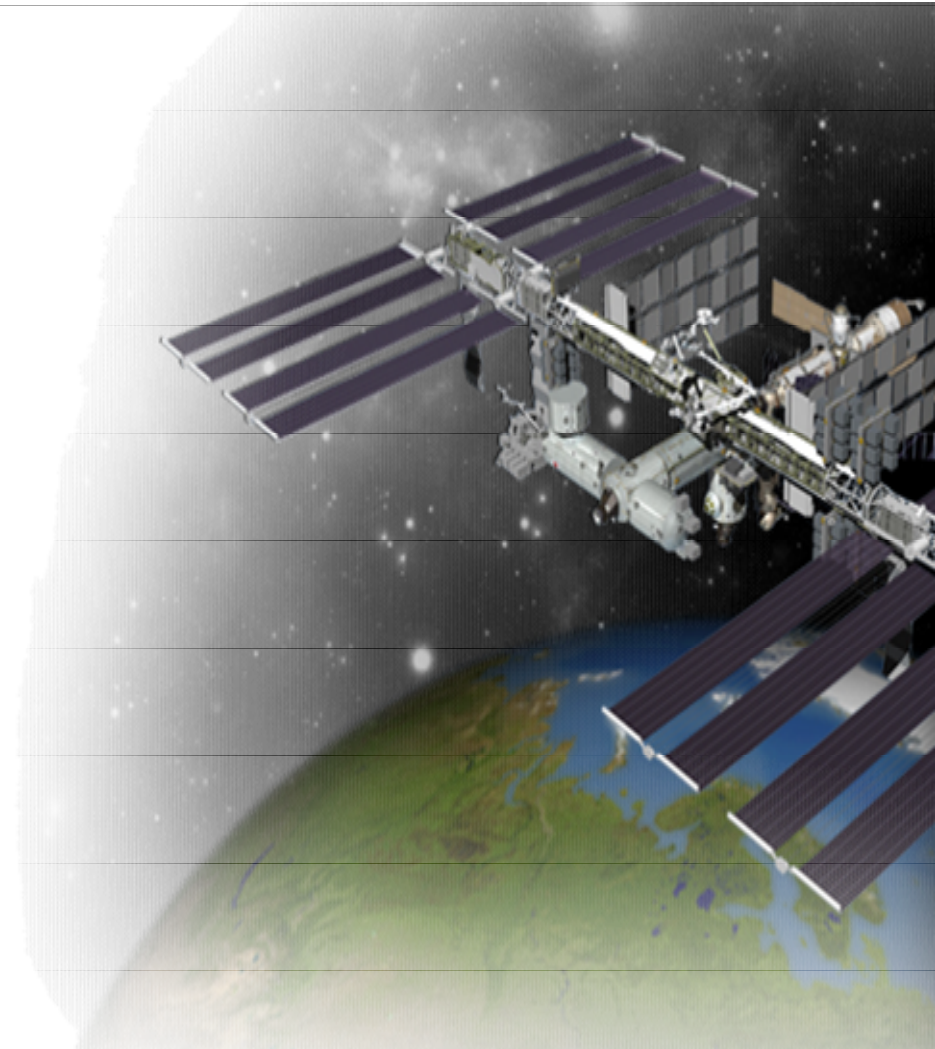
ENVI workflows automate popular image analysis tasks such as change detection, anomaly detection, viewshed analysis, and many more.



New Sensor Support for ENVI 5.5.1



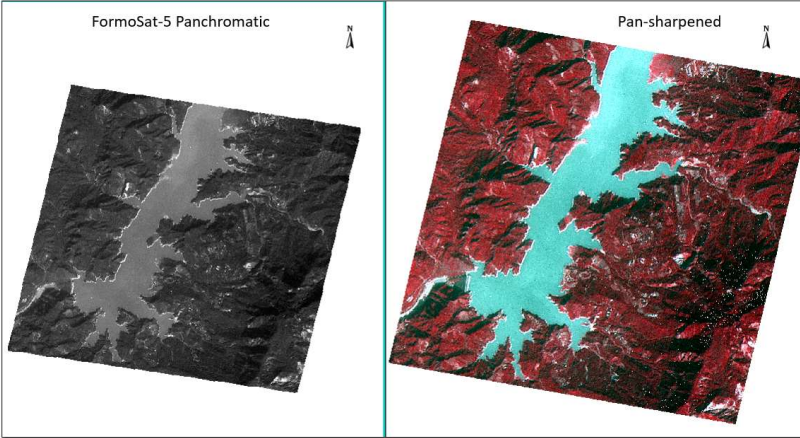
ENVI 5.5.1 adds support for new earth observation satellites and cutting edge geospatial data formats



New Earth Observation Satellite Support



Alsat-1B is an Algerian satellite for agricultural and disaster monitoring



Formosat-5 is an Earth observation satellite operated by the National Space Organization of Taiwan



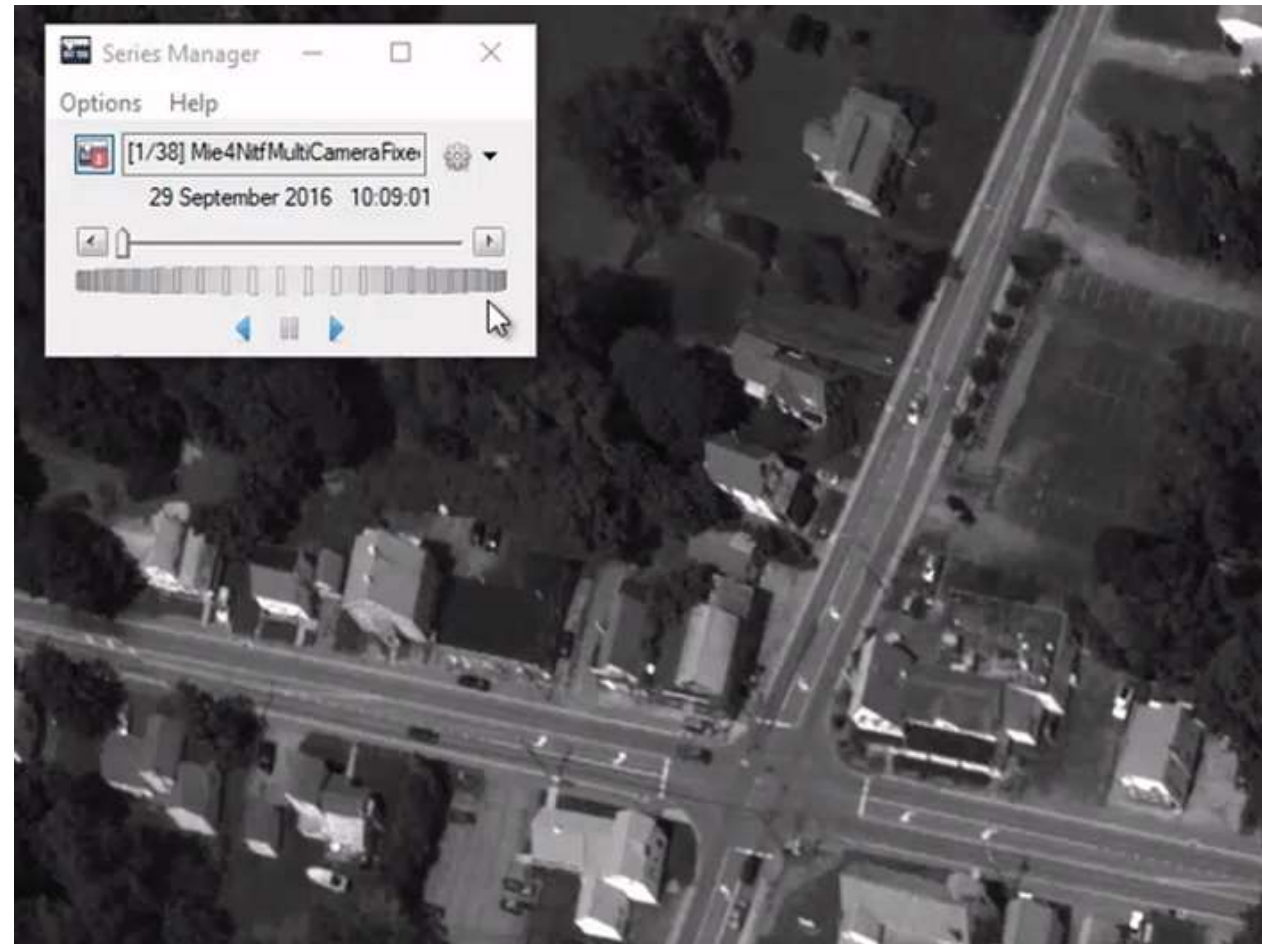
Analysis-ready PlanetScope Reflectance Data support

MIE4NITF: Time-Series Enabled NITF Imagery



View and analyze time series of images for change detection, tracking patterns and movement, and activity-based intelligence.

MIE4NITF promises HD resolution, high frame rates, and rich metadata content.



ENVI is one of the first commercial software products to support the newest standard, MIE4NITF.

MIE4NITF: Time-Series Enabled NITF Imagery



The ENVI Series Manager allows an analyst to load specific images within a series to the ENVI Layer Manager for further analysis

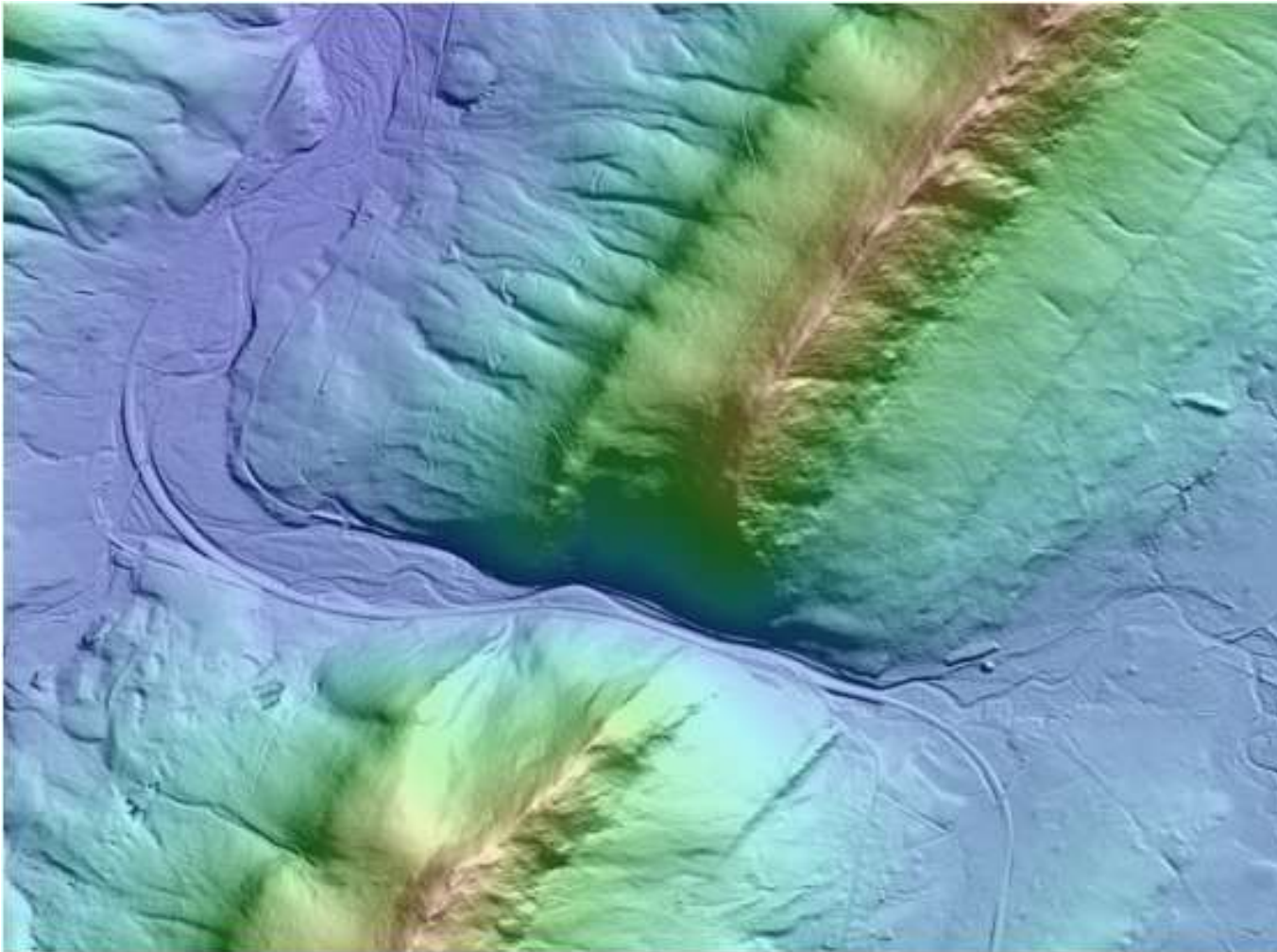
The screenshot shows the NITF Metadata Viewer interface. On the left, a tree view displays the metadata structure for a file named 'Mie4NtifMultiCameraFixedRate.r0t'. The tree includes a 'File Header' section with sub-items like Security, CAMSDA, MIMCSA, MTIMFA, TMINTA, and FREESA. Below this are three 'Image Segment' entries, each with its own 'Security' and 'Band 1' sub-items, and further sub-items like BLOCKA, ENGRDA, HISTOA, J2KLRA, and SENSRA. The 'Image Segment #1 (0000612)' is currently selected. On the right, a table displays the metadata for the selected segment.

Image Segment #1 (0000612)	
Actual Bits Per Pixel	12
Pixel Justification	R
Image Coordinate Representation	D
Image Geolocation	+43.214-077.509+43.214-077
Number of Image Comments	4
Comment #1	SENSOR CONFIGURATION:
Comment #2	COLLECTION TIMESTAMP:
Comment #3	SERIAL NUMBER / FRAME
Comment #4	CORNER ELEVATIONS: +00
Image Compression	C8
Compression Rate Code	N200
Number of Bands	1
Image Sync Code	0
Image Mode	B
Number of Blocks Per Row	2
Number of Blocks Per Column	1
Pixels Per Block Horizontal	1024
Pixels Per Block Vertical	1024
Bits Per Pixel	12
Display Level	1
Attachment Level	0
Image Location	X:0, Y:0
Image Magnification	1.0
Image Mask Present	False

MIE4NITF is expected to become the new standard implemented across defense and intelligence agencies.

New Powerful Visualization and Analysis Tools in ENVI

New Topographic Shading Tool



Topographic shading allows the user to more readily inspect and identify characteristics and anomalies in 3D data.

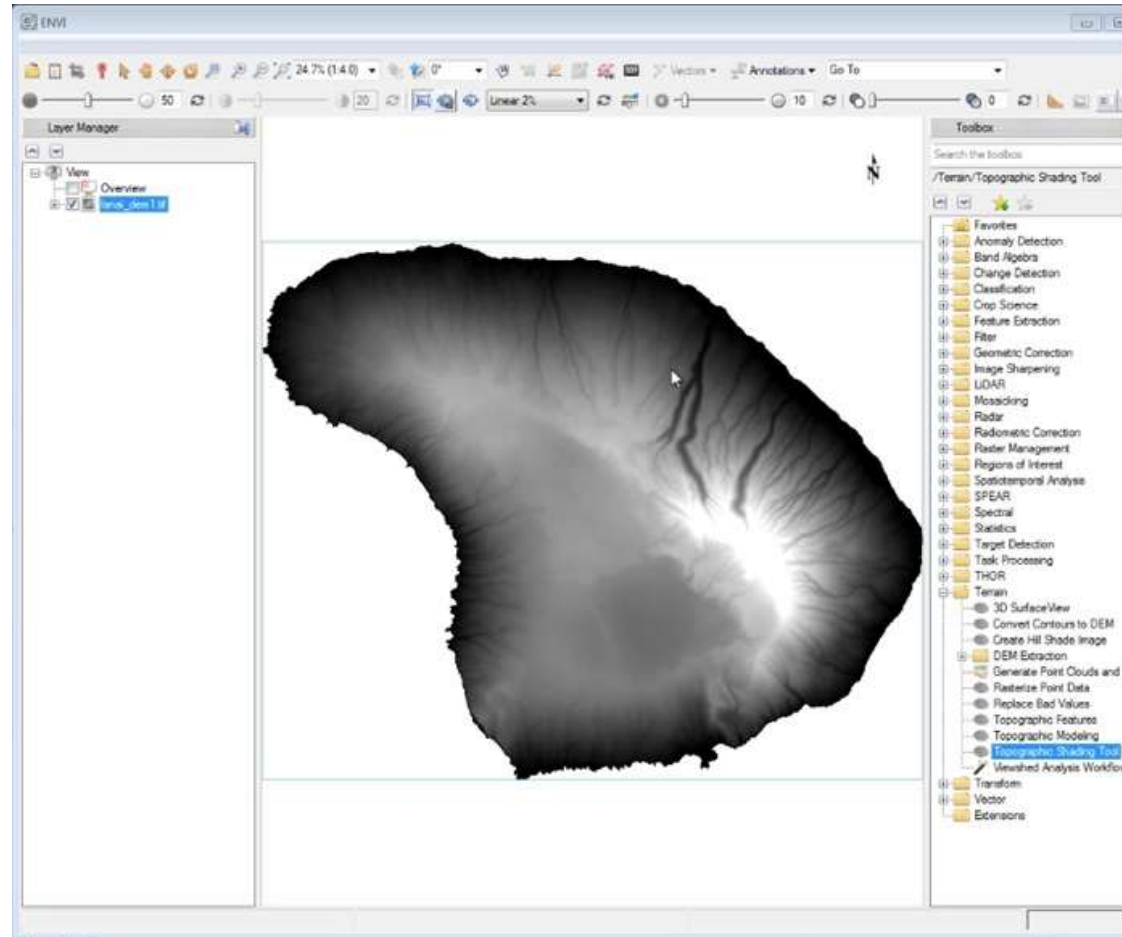
This level of resolution, combined with unique illumination angles, makes it easy to identify roads, trails, and streams.

Color-blended hillshade image of a subset of the DEM at 1/9-arc-second resolution.

New Topographic Shading Tool



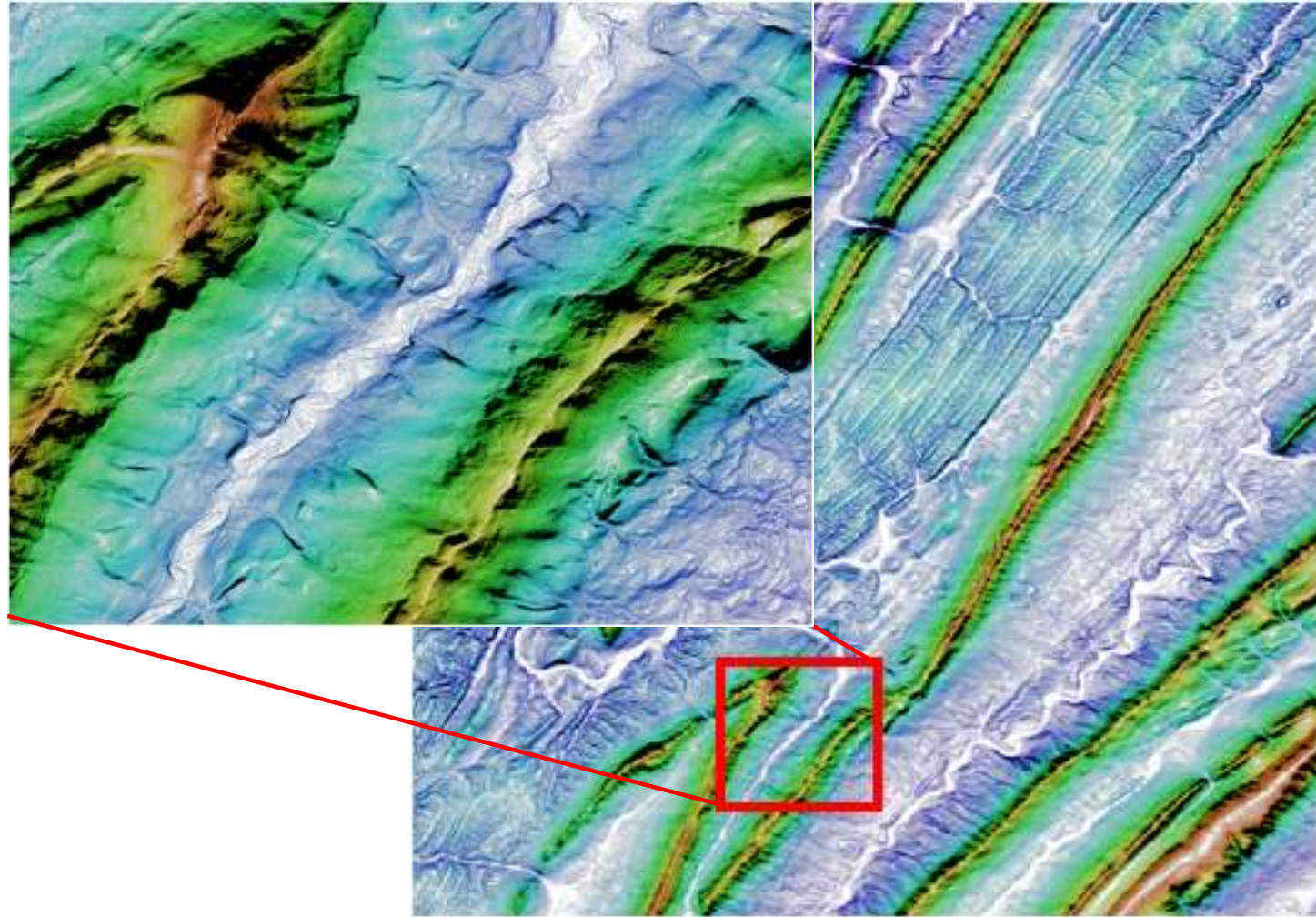
- Blend topographic features with a DEM: slope, aspect, profile convexity, plan convexity, longitudinal convexity, and more
- Choose a predefined color ramp or create your own.
- Can use red/green/blue (RGB), hue/lightness/saturation (HLS), or hue/saturation/value (HSV) color models



New Topographic Shading Tool



- Use a HLS color model for the DEM instead of the default RGB color model.
- The HLS and HSV models create highlights and shadows and give the blended image a glossy or "wet" effect.



New Topographic Shading Tool

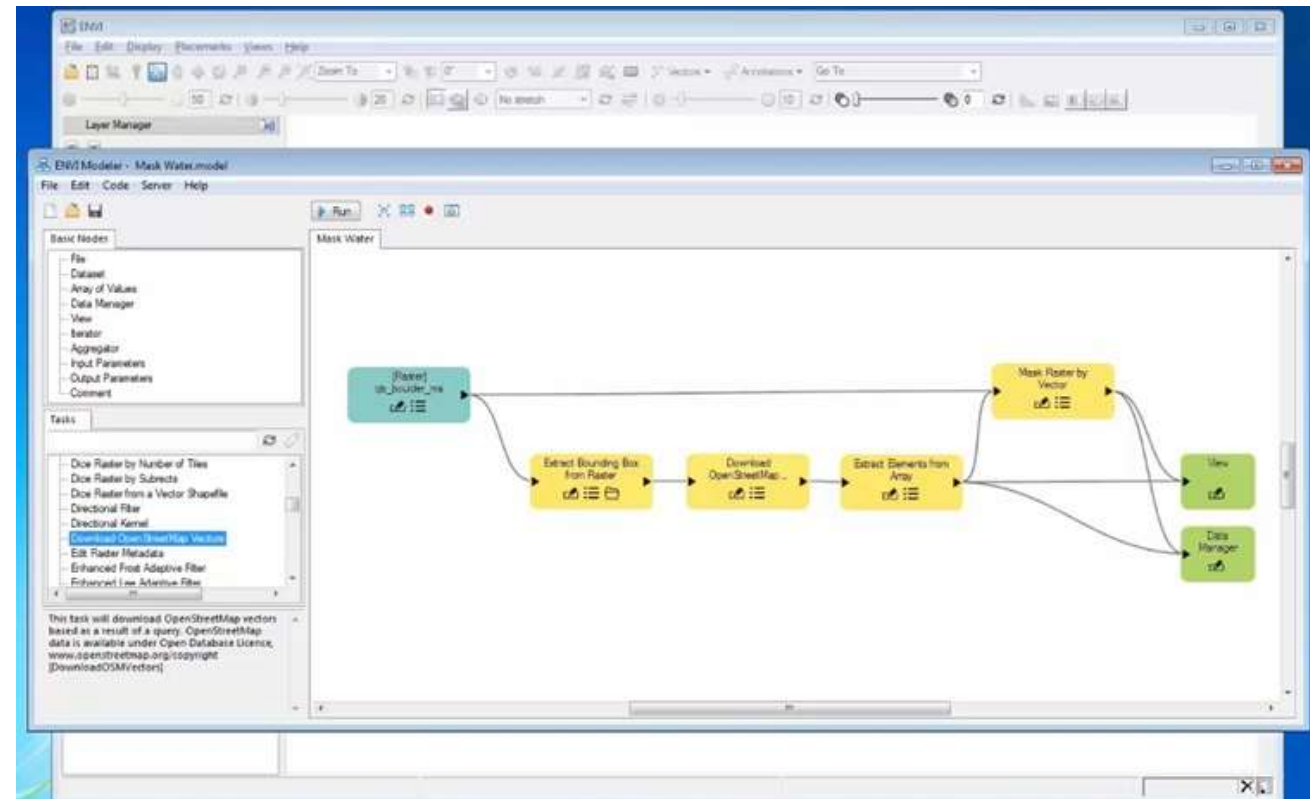
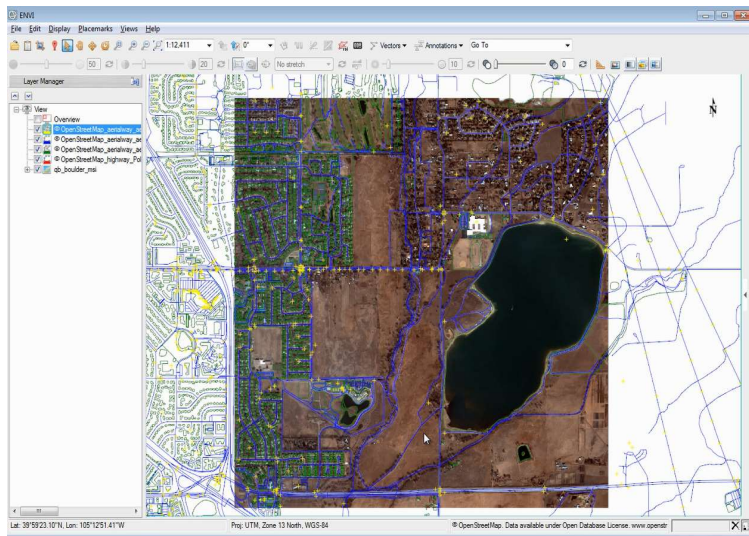


Multi-directional hillshade image of the Appalachian DEM subset, 45° elevation, Gaussian stretch applied.

New Open Street Maps Capability in ENVI

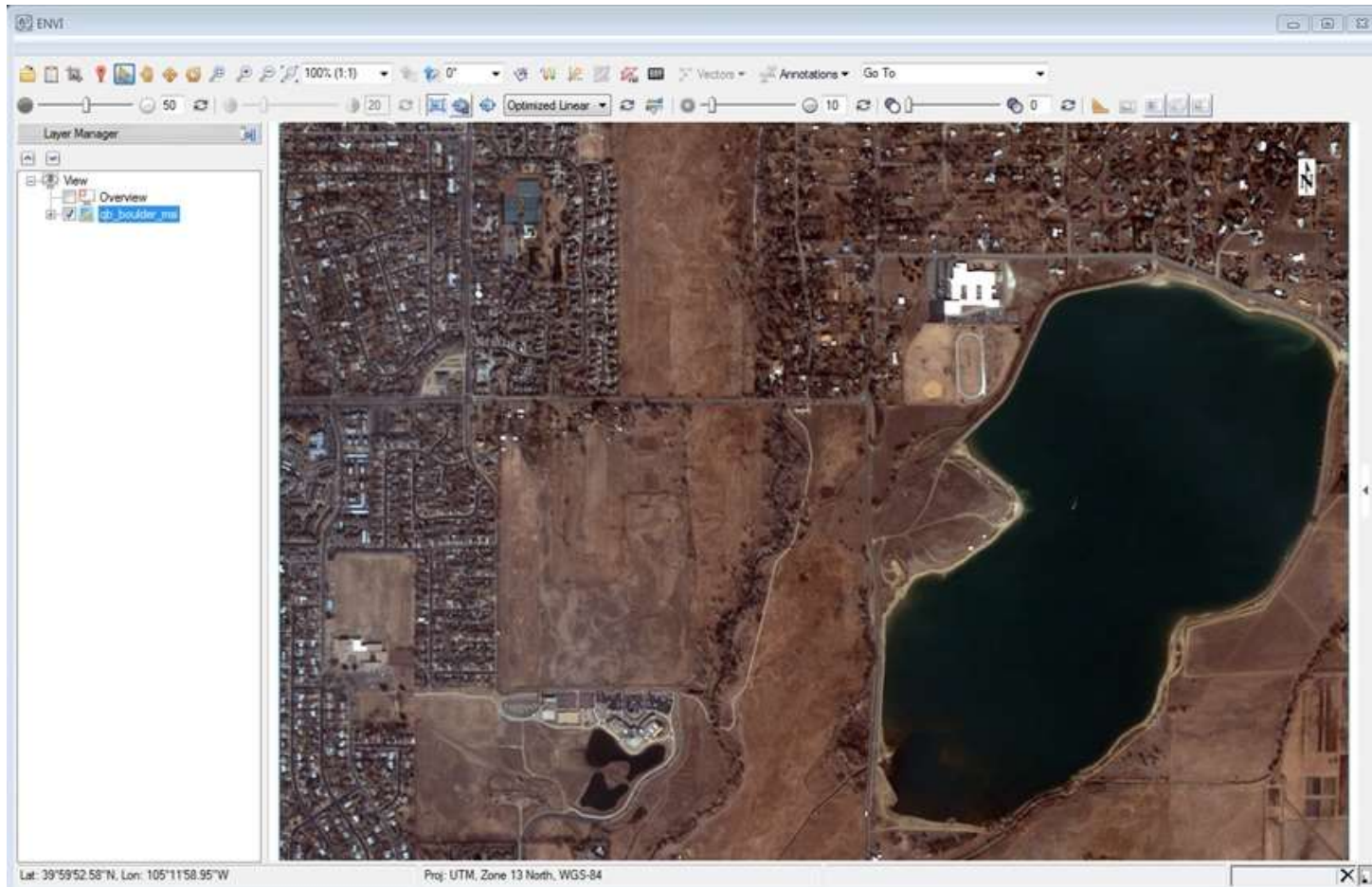


Download, open, and display OpenStreetMap vectors within ENVI.



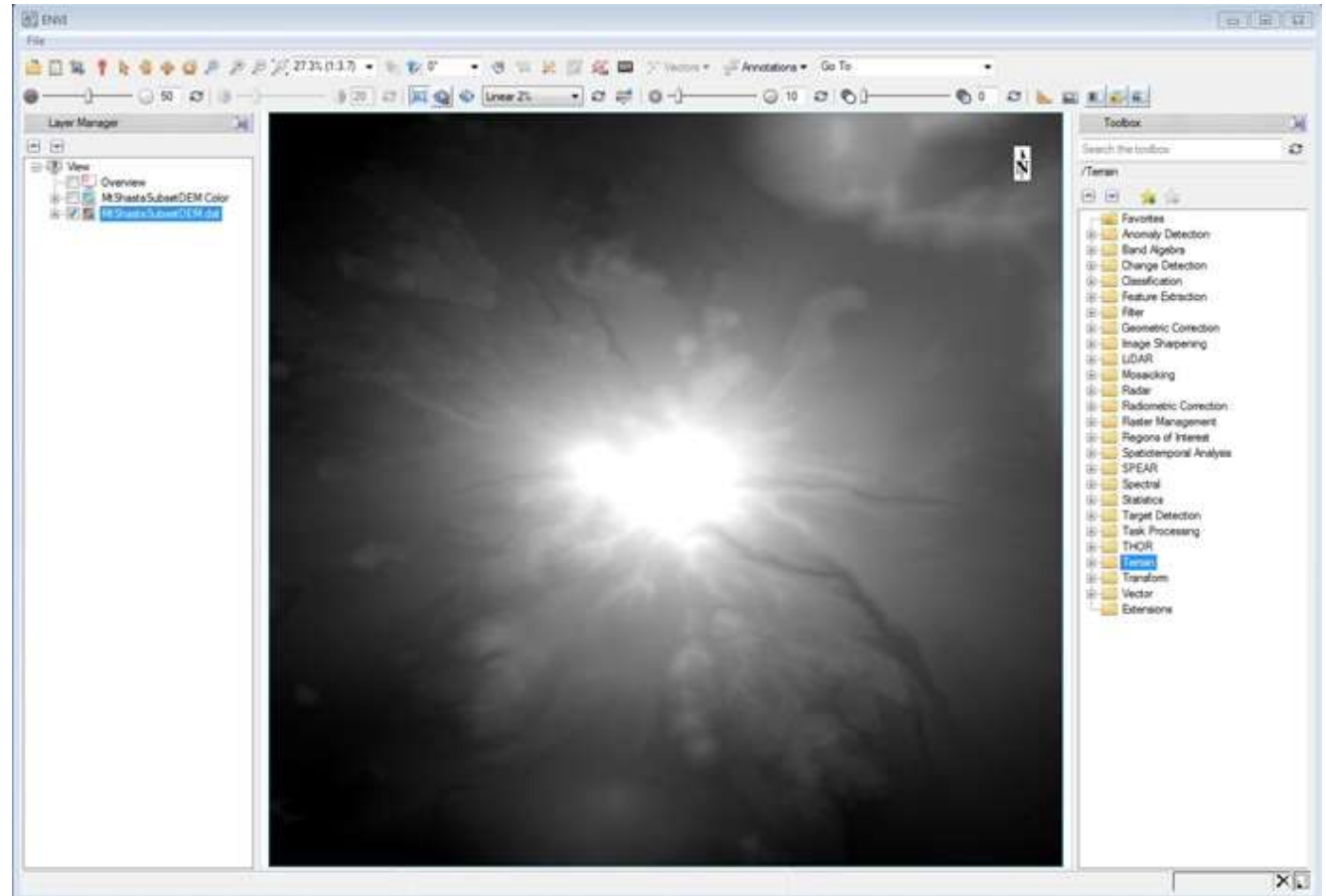
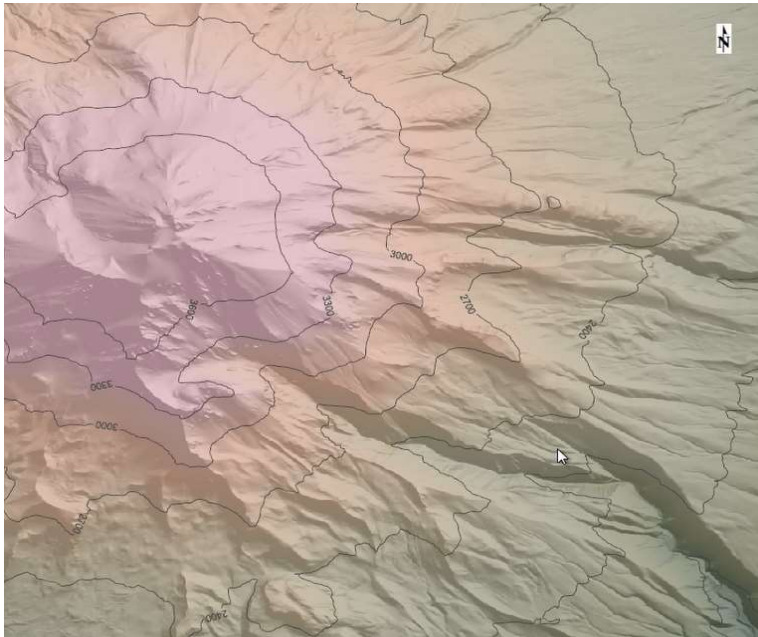
Use vectors for water features and mask out water in a scene.

New Open Street Maps Capability in ENVI



Download, open, and display OpenStreetMap vectors within ENVI.

New Contour Lines in ENVI

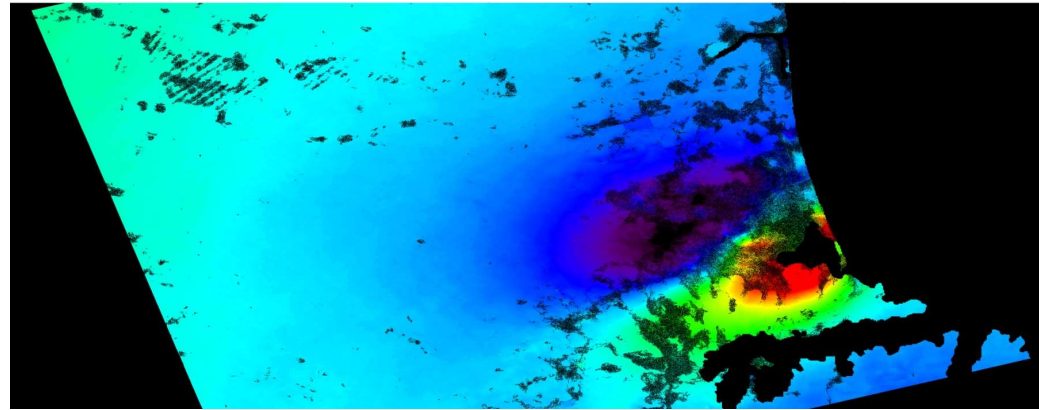


Use the New Contour Layer menu option to display contour lines on a single-band image.

Additional SAR Data Workflow Support

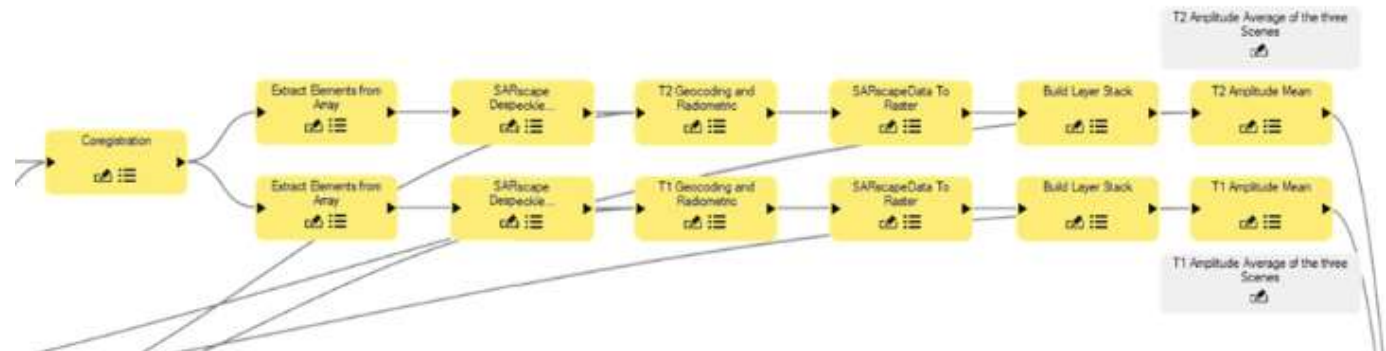


- SARTask API enables end-to-end analytic workflows that run on desktop, ENVI Modeler, enterprise networks or the cloud
- Sensor Independent Complex Data (SICD) standardization support for SAR data



Other new ENVI modules coming soon

- **Opticalscape 5.4.2:** Automated Bundle Adjustment and 1-step DSM & mosaic generation
- **ENVI Crop Science: 1.1.1 -** Curved Rows support



Portion of a SAR workflow in the ENVI modeler for averaging amplitude values in pre/post event data to determine change around airports.

Modern analytic methods in the new Machine Learning framework in IDL

- Softmax
- SVM
- K-means
- Neural Network (Feed Forward FFNN)

Other analytic tools are included

- Autoencoder
- Confusion matrix & Metrics about a classifier applied to test data
- Partition and shuffle
- Normalizers & Optimizers
- Activation functions
- Kernels
- Loss functions

```
; Read data
read_seeds_example_data, data, labels, $
  N_ATTRIBUTES=nAttributes, N_EXAMPLES=nExamples, $
  N_LABELS=nLabels, UNIQUE_LABELS=uniqueLabels

; Shuffle data
IDLmlShuffle, data, labels

; Normalize data
Normalizer = IDLmlVarianceNormalizer(data)
Normalizer.Normalize, data

; Partition data
Part = IDLmlPartition({train:80, test:20}, data, labels)

Classifier = IDLmlSupportVectorMachineClassification(nAttributes, uniqueLabels)

Loss = Classifier.Train(part.train['data'], LABELS=part.train['labels'])
confMatrix = IDLmlTestClassifier(Classifier, part.test['data'], $
  part.test['labels'], ACCURACY=accuracy)
Print, 'Model accuracy:', accuracy

; Classify the first example
Print, Classifier.Classify(data[*],0)
```

Example code that trains a Support Vector Machine (SVM) classifier in IDL

IDL Package Manager (IPM) makes it easier for developers to share IDL code in open ecosystems

- Publish to github
- Create, install, update, and remove IDL packages, which are zipped files & folders
- Packages can contain IDL pro code, IDL save files, and/or IDL DLMS
- New IDL_PACKAGE_PATH preference, and the IDL path is automatically updated

Previous releases provided the building blocks that enable integration

- IDL Python bridge was the initial Python integration that paved the way
- ENVI Py is used in the Esri ArcGIS integration
- GSF Py enables Python code with GSF

IPM-ready libraries are now available

- ipm, /install, 'https://github.com/csalvaggio/IDL_RIT_Salvaggio'
 - ipm, /install, 'https://github.com/hadfieldnz/idl-motley'
 - ipm, /install, 'https://github.com/hadfieldnz/idl-roms'
 - ipm, /install, 'https://github.com/mankoff/kdm-idl'
 - ipm, /install, 'http://packages.idldev.com/idldoc.zip'
 - ipm, /install, 'http://packages.idldev.com/mgunit.zip'
-

New ENVI and ArcGIS Integration Features

ArcGIS Integration Updates

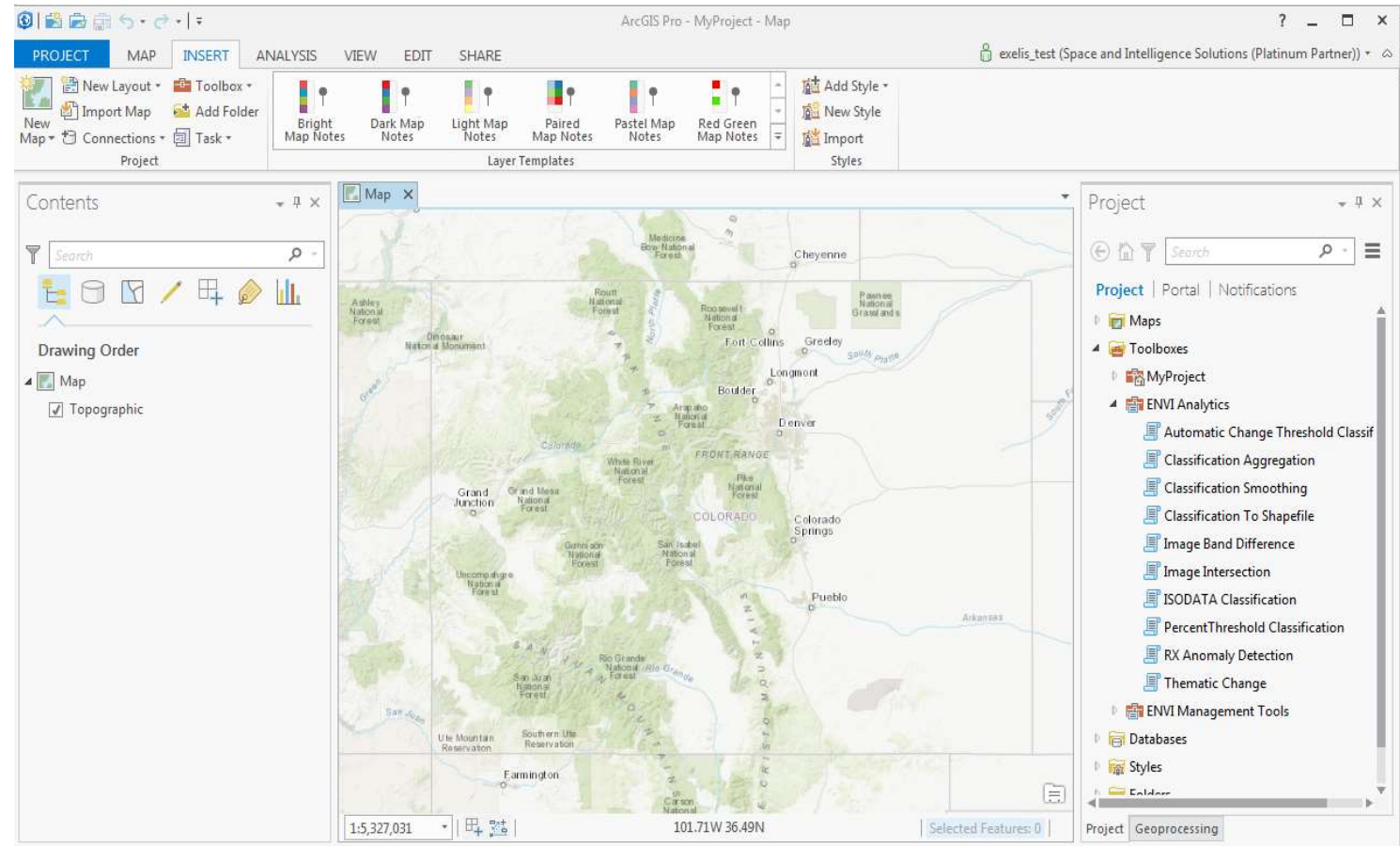


Harris and Esri are close partners to bring trusted ENVI analytics into ArcGIS

The ENVITasks API enables ENVI analytics to run in ArcGIS Pro

ENVI Modeler makes it very easy to create and publish custom ENVI workflows to ArcGIS





ENVIPy leverages the ArcGIS Python support for this integration



Support for ArcGIS 10.6



Thank You!

 www.harrisgeospatial.com
 www.facebook.com/HarrisGeospatialSolutions
 <https://twitter.com/GeoByHarris>
 www.youtube.com/user/ExelisVis