



THE LATEST AND GREATEST FROM L3 HARRIS GEOSPATIAL

May, 2021

Zachary Norman | Product Manager

ENVipalooza
An Insider's Guide to GEOINT

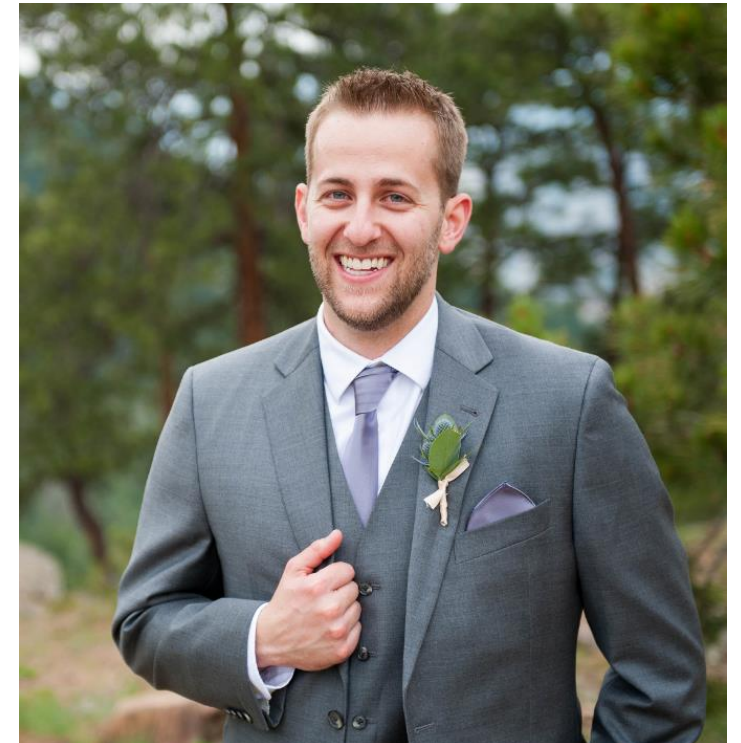
Contact Information and Introductions



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Agenda



Introduction

Software Overviews:

- ENVI
- ENVI Deep Learning
- ENVI Server



What's New in ENVI 5.6 and IDL 8.8
6/22/2020

ENVI 5.6 and IDL 8.8 introduce many new, exciting, and impactful features! Watch this webinar and get a full list of the updated features and to view demos.

[Read More >](#)

Check out the What's New in ENVI 5.6 and IDL 8.8 webinar for an overview of the other, recent features

Core Offerings



We have more than 30 years of experience developing scientifically proven solutions using cutting-edge technology. Today, organizations across industries use our in-depth knowledge of advanced geospatial analytics, machine learning and remotely sensed data to make better decisions.

ENVI®



ENVI® SARscape®



IDL®



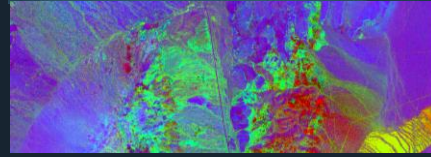
Jagwire™



ENVI Deep Learning



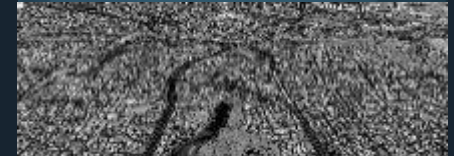
ENVI Server (GSF)



Helios®



Data & Imagery



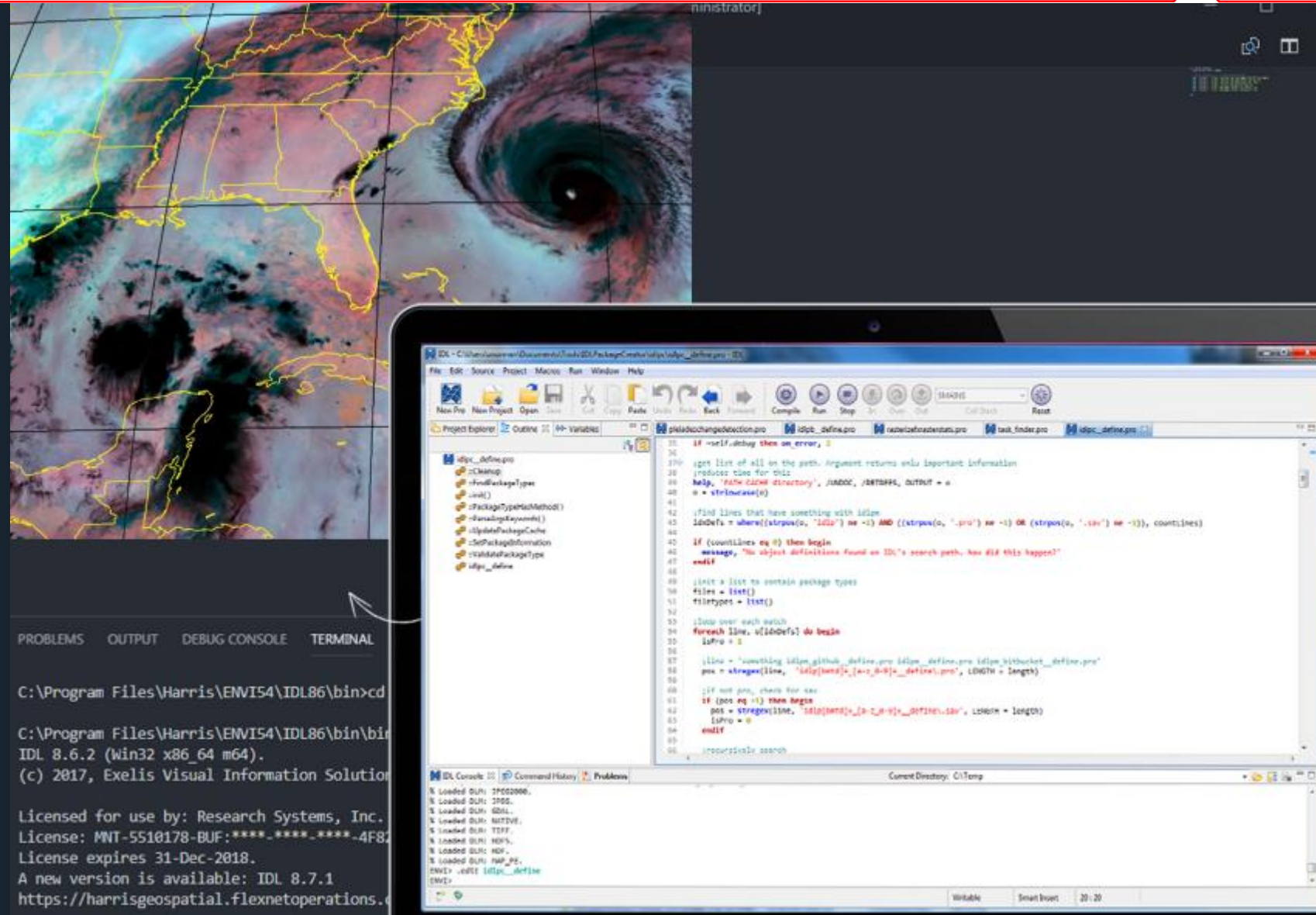
IDL: The Interactive Data Language



IDL is a powerful programming language focused on array-based processing and analysis.

As a scripting language, similar to Python, IDL is the extension point for ENVI. Our rich history of working with arrays (i.e. images) makes IDL an ideal candidate to extend and customize ENVI.

IDL is a fully-fledged programming language and can be used to solve almost any problem.

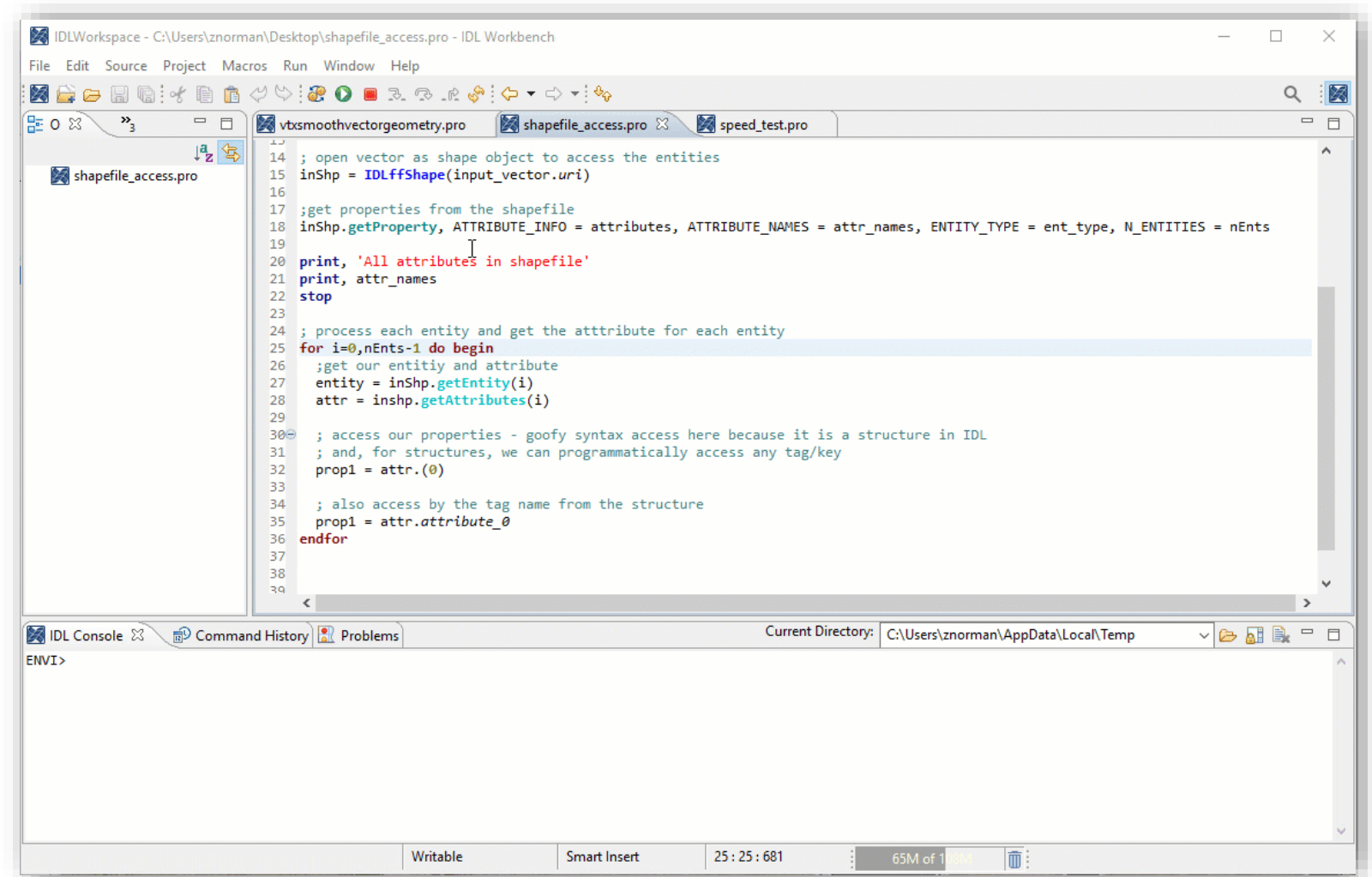




Dedicated environment for writing, running, and debugging code

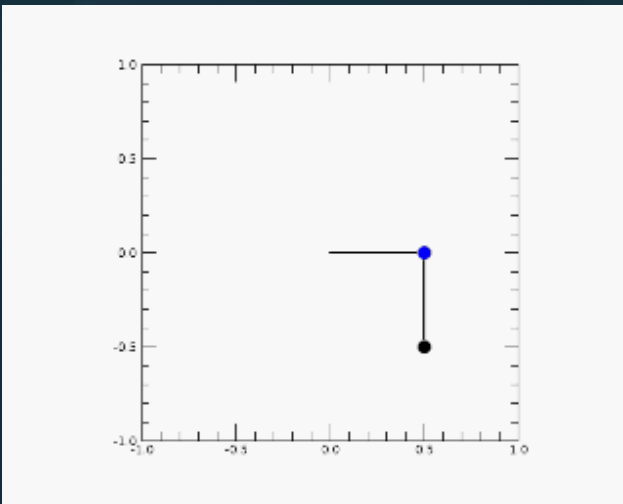
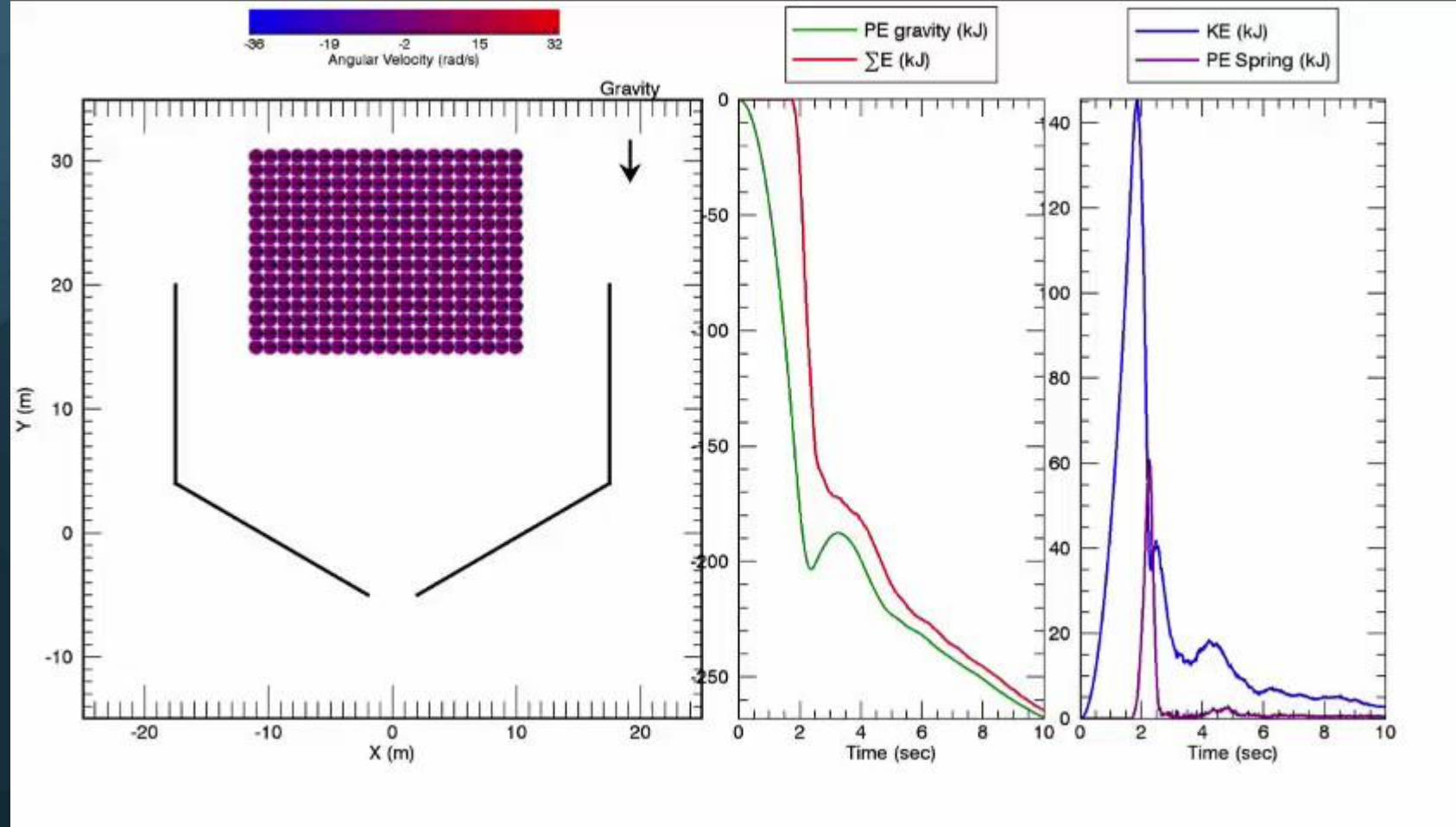
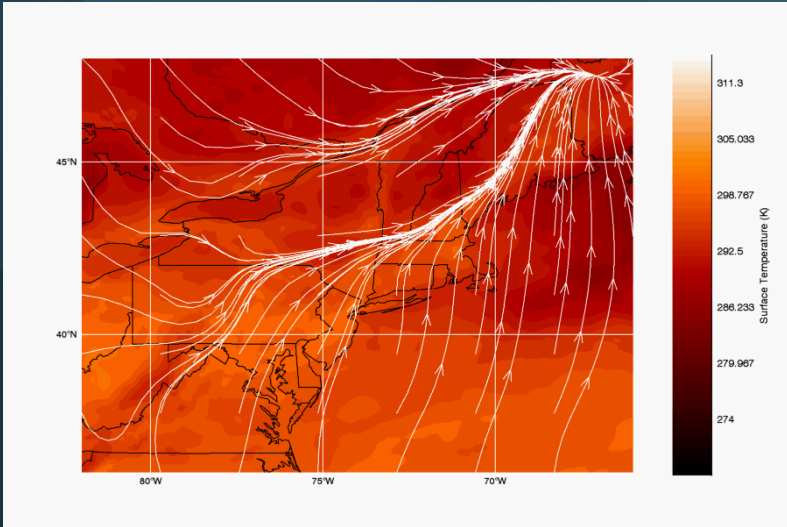
Recompile routines on-the-fly for faster development and easy bug fixing

Cross-platform: Windows, Linux, Mac



Animation showing how to enable dark mode in the IDL Workbench

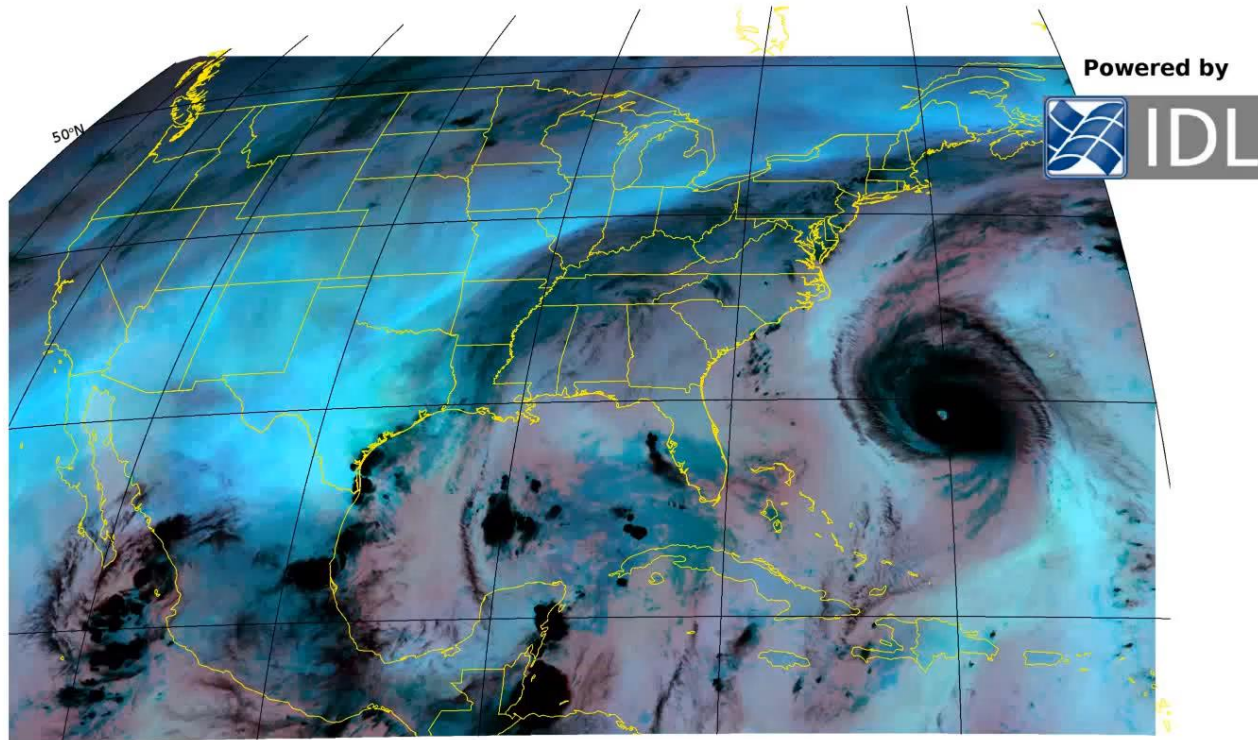
Advanced Visualizations of Complex Data



Support for GOES Data in IDL (and ENVI!)

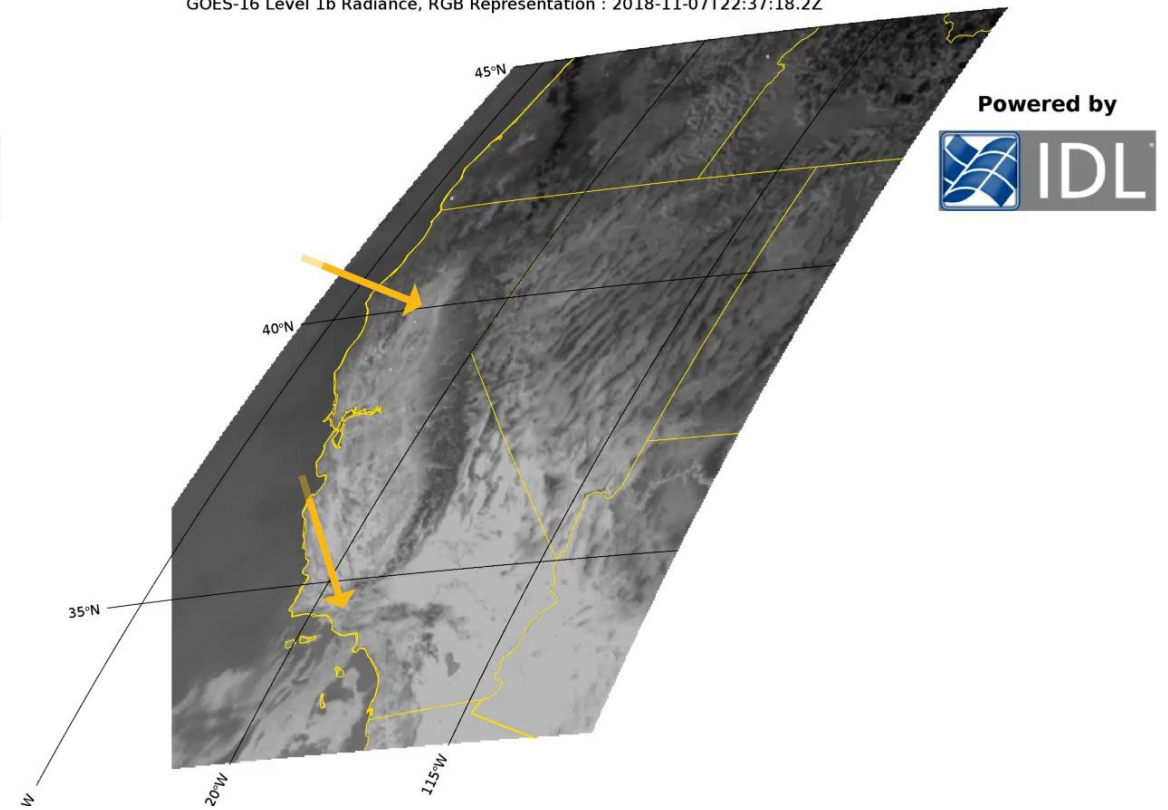


GOES-16 Level 1b Radiance, RGB Representation : 2018-09-12T10:02:12.7Z



Hurricane
Florence, 2018

GOES-16 Level 1b Radiance, RGB Representation : 2018-11-07T22:37:18.2Z



California fires,
2018

IDL-Python Bridge



Allows you to:

- Call IDL and ENVI routines from Python
- Call Python routines from IDL

Python calling IDL (and ENVI)

```
3 from idlpy import IDL
4 import numpy as np
5 import os
6
7 #start ENVI
8 e = IDL.envi(HEADLESS = 1)
9
10 # get task definition from IDL
11 task = IDL.ENVITask("BuildMosaicRaster")
12 task.INPUT_RASTERS = rasters
13 task.RESAMPLING = 'Nearest Neighbor'
14 task.FEATHERING_METHOD = 'edge'
15 task.OUTPUT_RASTER_URI = e.GetTemporaryFilename()
16 task.execute()
17
```

IDL calling Python

```
2 ; Define some IDL variables
3 labels = ['Baltam', 'Python', 'IDL', 'Other']
4 sizes = [20, 30, 40, 10]
5 colors = ['yellowgreen', 'gold', 'lightskyblue', 'lightcoral']
6 explode = [0, 0, 0.1, 0] ; "explode" the 3rd slice
7
8
9 ; Import some Python modules
10 pyplot = Python.Import('matplotlib.pyplot')
11
12 ; Call methods on the Python modules
13 pie = pyplot.pie(sizes, explode=explode, $
14     labels=labels, colors=colors, $
15     autopct='%1.1f%%', /shadow, startangle=90)
16 void = pyplot.axis('equal')
17 void = pyplot.savefig("myplot.png", dpi = 96)
18 void = pyplot.show()
```


What is ENVI?

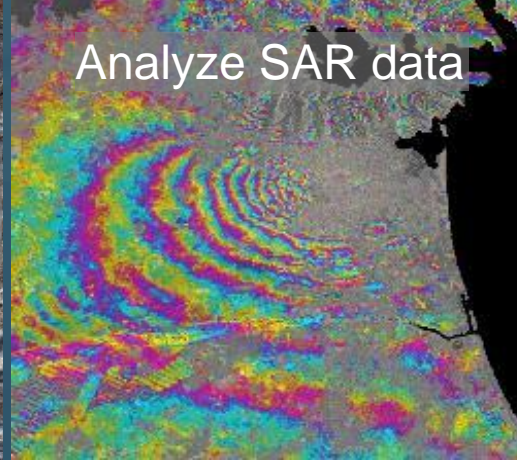
The industry standard for image processing and analysis, used to extract accurate and timely information from remotely-sensed data

ENVI has remained on the cutting edge of innovation for more three decades

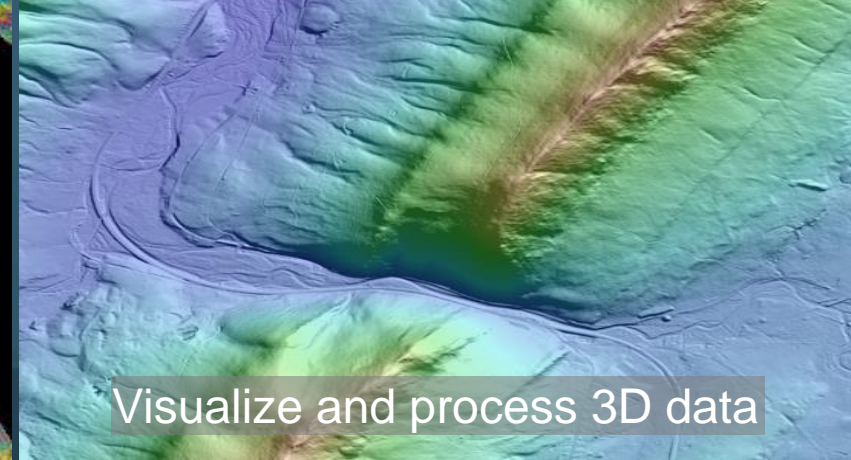
ENVI makes image analysis accessible and requires no prior experience or programming



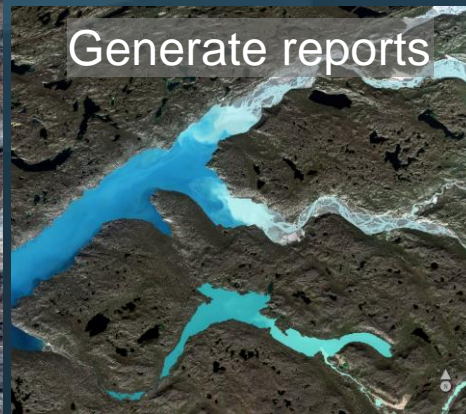
Supports >200 data formats



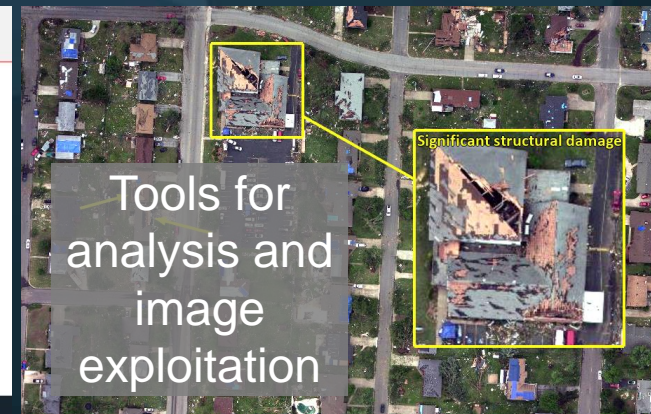
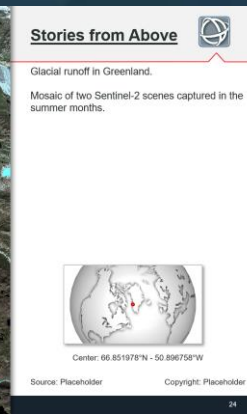
Analyze SAR data



Visualize and process 3D data



Generate reports

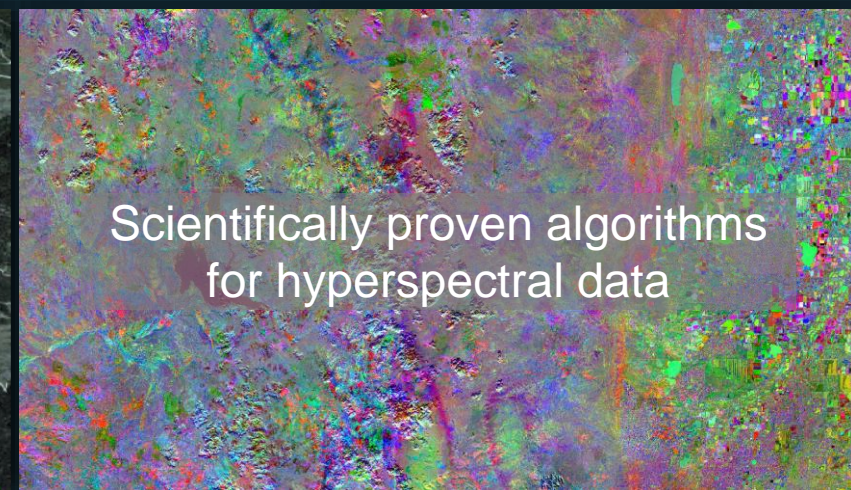


Tools for analysis and image exploitation

Significant structural damage



Change detection and precision agriculture workflows



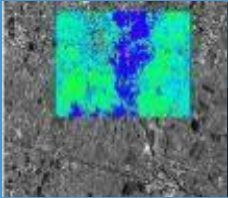
Scientifically proven algorithms for hyperspectral data

Industry Solutions



Environmental Monitoring

Land reclamation, change detection, urban growth



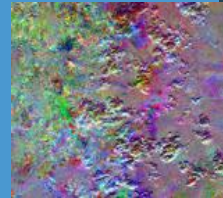
Disaster Response

Building damage, flooded area, burn area



Transportation

Monitor and manage transportation networks and infrastructure



Spectral Analysis

Material identification, sub-pixel analysis, data preparation, data transforms



Defense & Intelligence

Visualization, exploitation, data management, on-demand GEOINT and mission planning



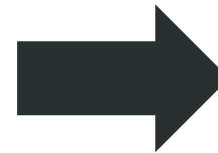
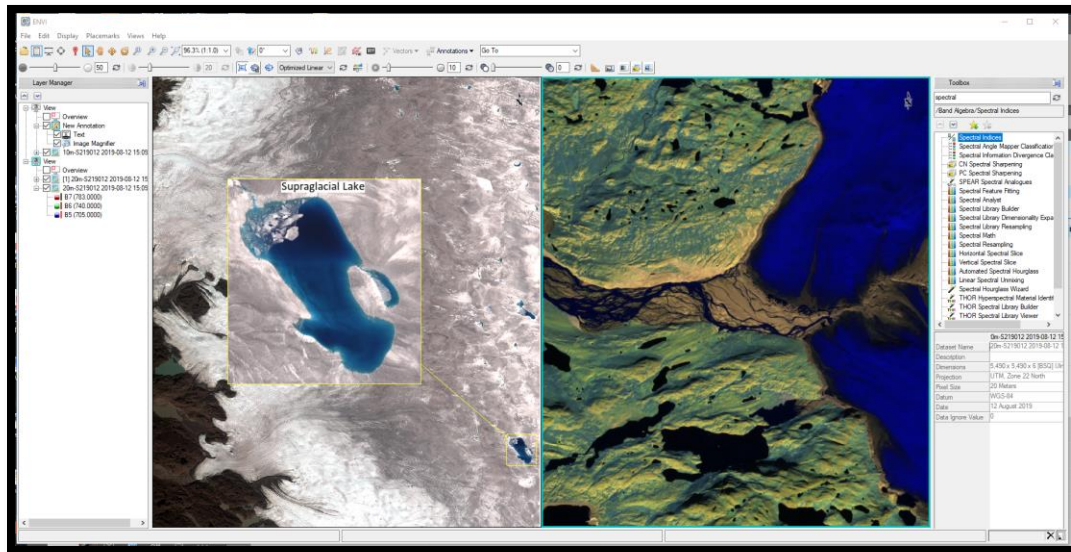
Precision Agriculture

Tailor crop management to boost yields and profits

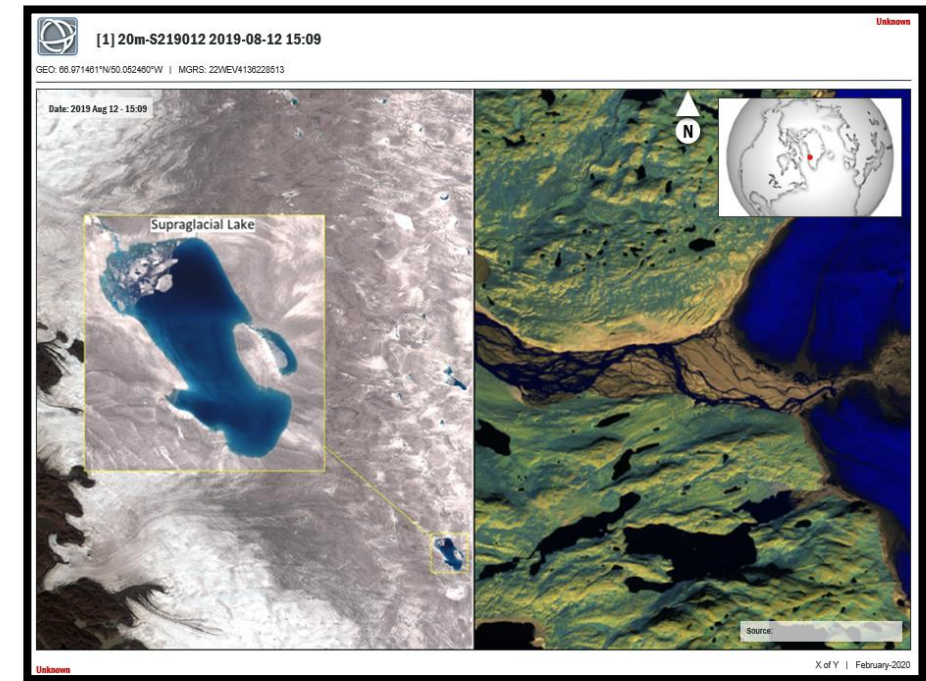
Power Point/Product Generation



ENVI's Display



PowerPoint Slide



Seamlessly capture ENVI's display and generate high-quality presentation content with a single click
Anything in ENVI's display can go to PowerPoint
Append to existing PowerPoint presentations or create a new one

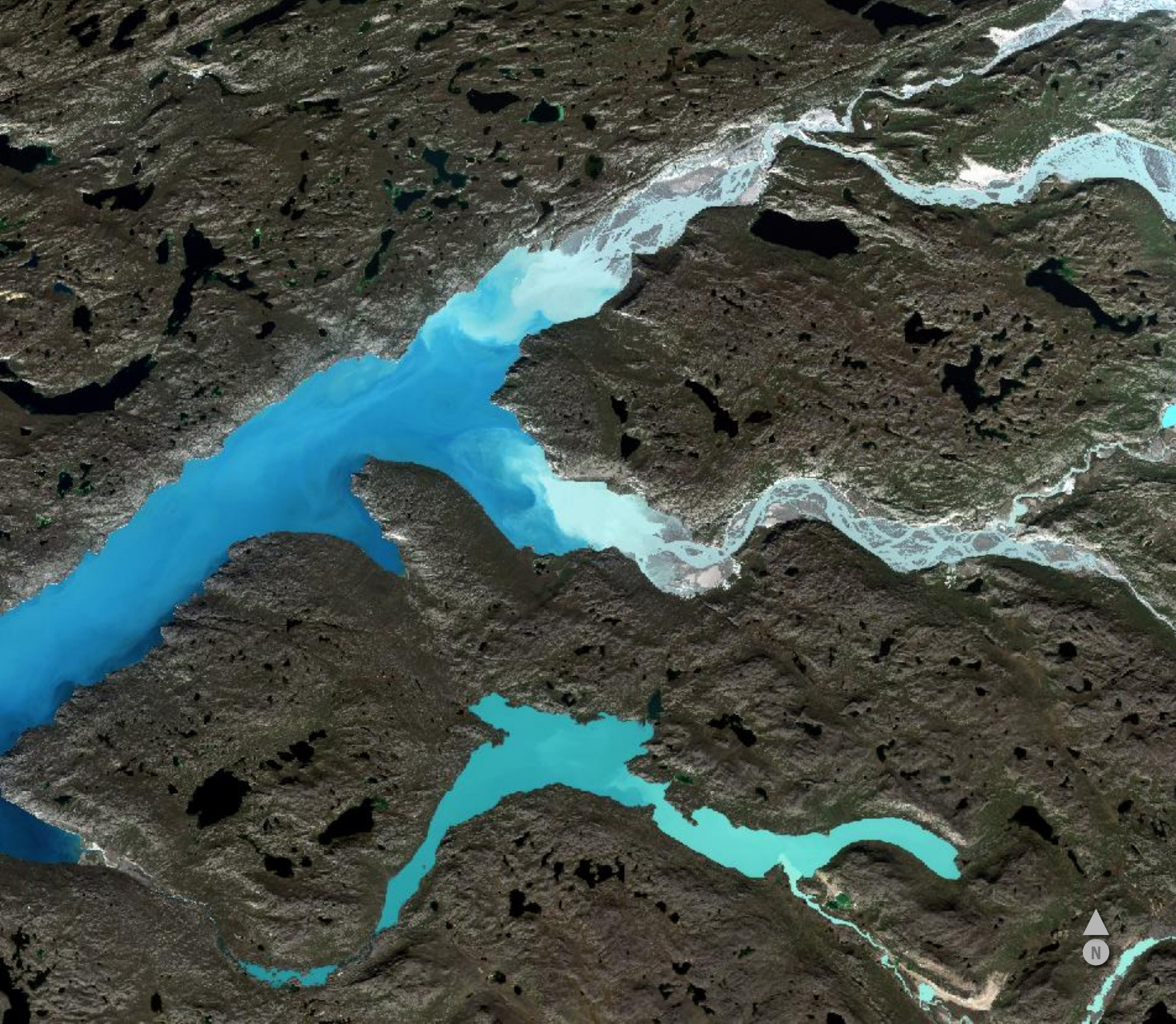
Once in PowerPoint, can edit text boxes natively
Add custom content and access all of PowerPoint's tools
Ability to import PowerPoint templates into ENVI

Stories from Above



Glacial runoff in Greenland.

Mosaic of two Sentinel-2 scenes captured in the summer months.



Center: 66.851978°N - 50.896758°W

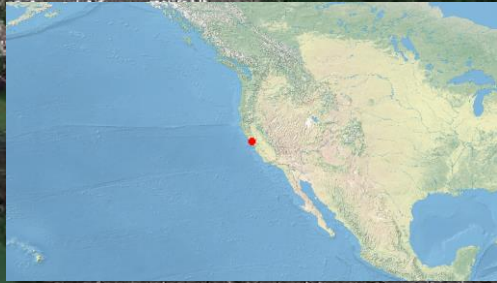
Source: Placeholder

Copyright: Placeholder

Full-screen Template



37.671236°N, 122.315508°W



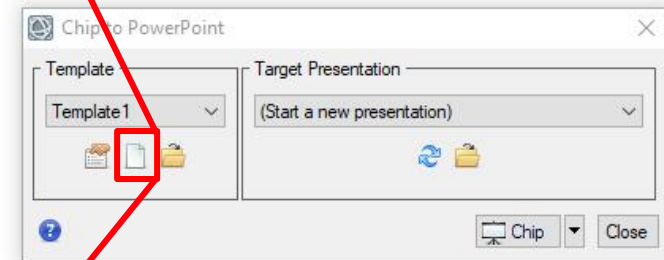
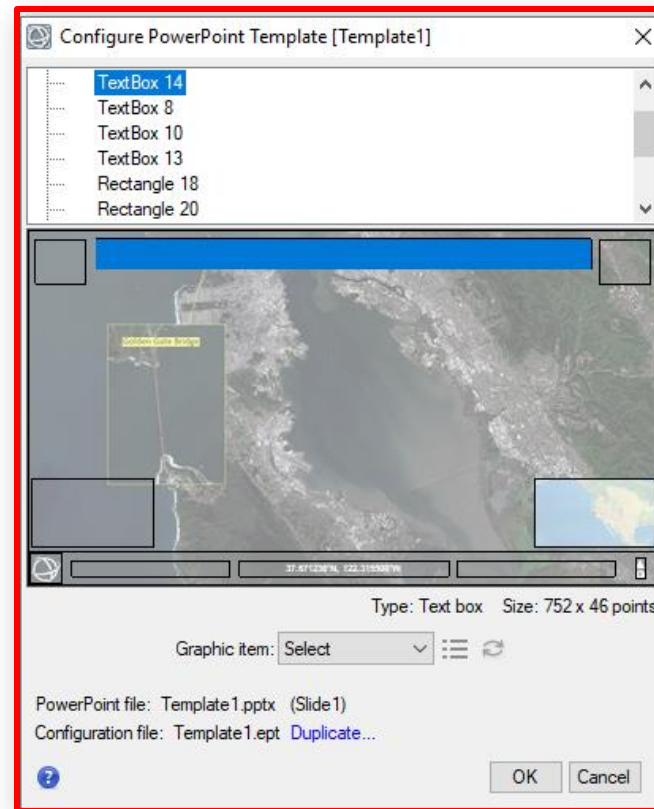
BYOT: PowerPoint Importer



Use the interactive template creator to select elements from your PowerPoint and designate what they become

Template importer allows you to add image metadata, map previews, custom text, and more

Saving the template creates a JSON file on disk that you can share with coworkers

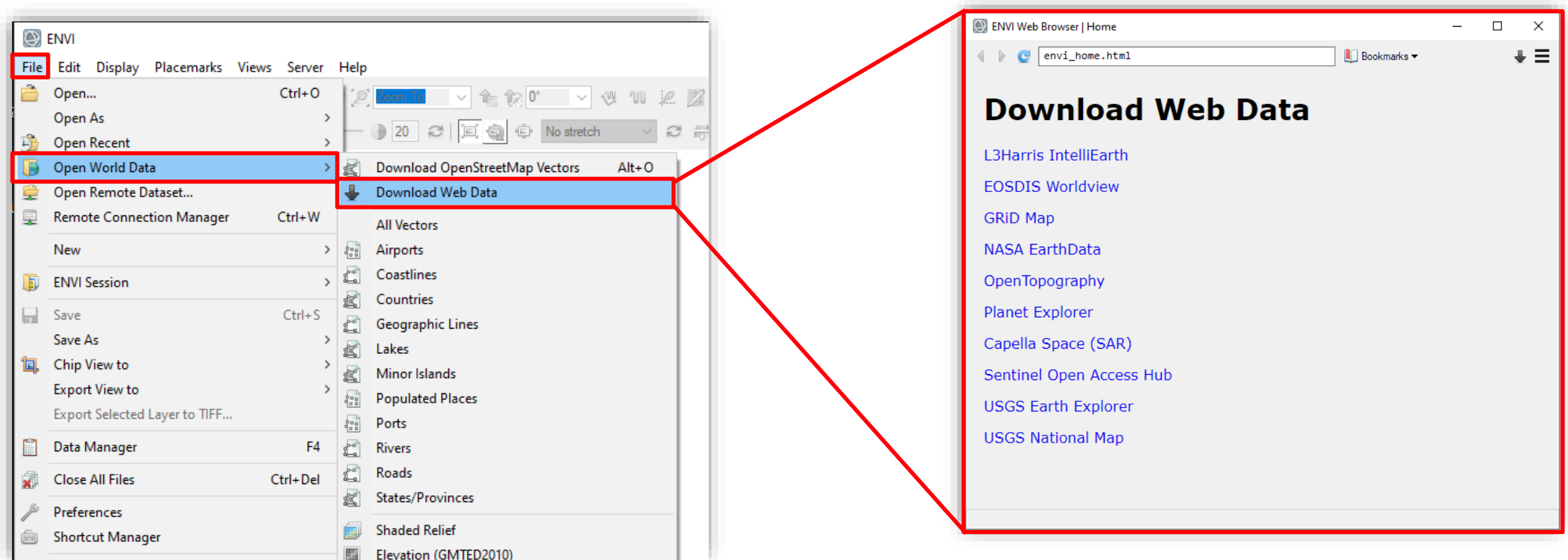


Download Web Data Tool in ENVI

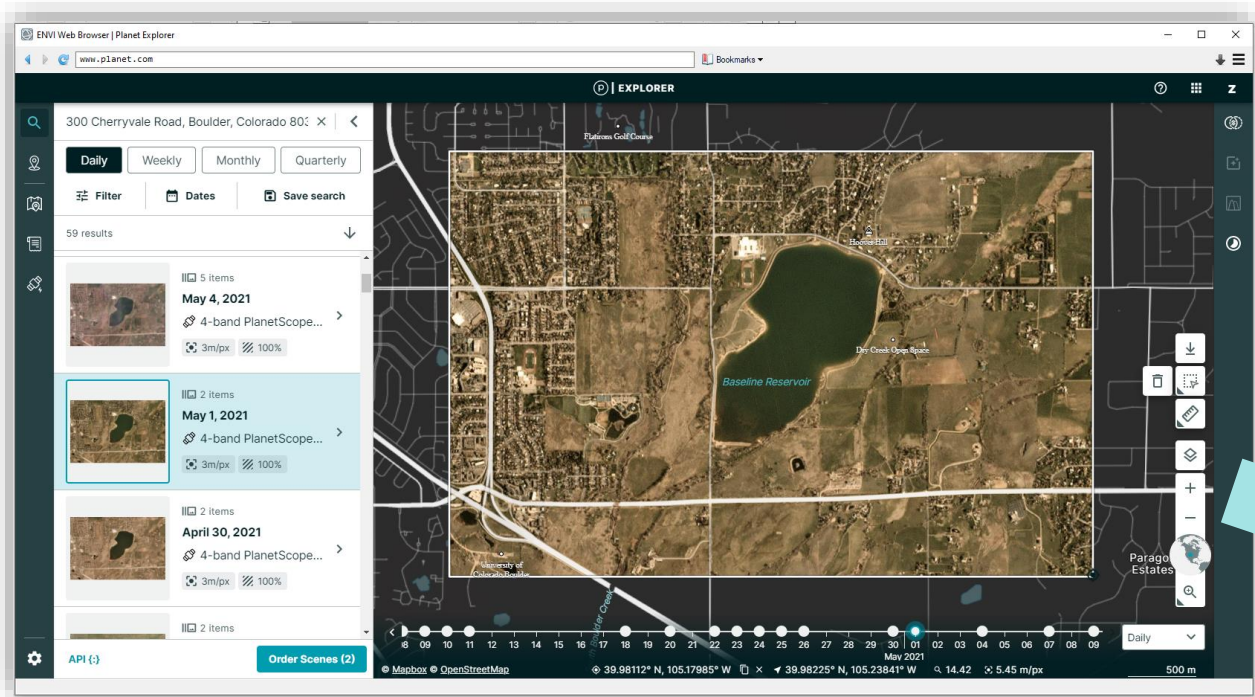


Seamlessly access and download data from the web all from within ENVI

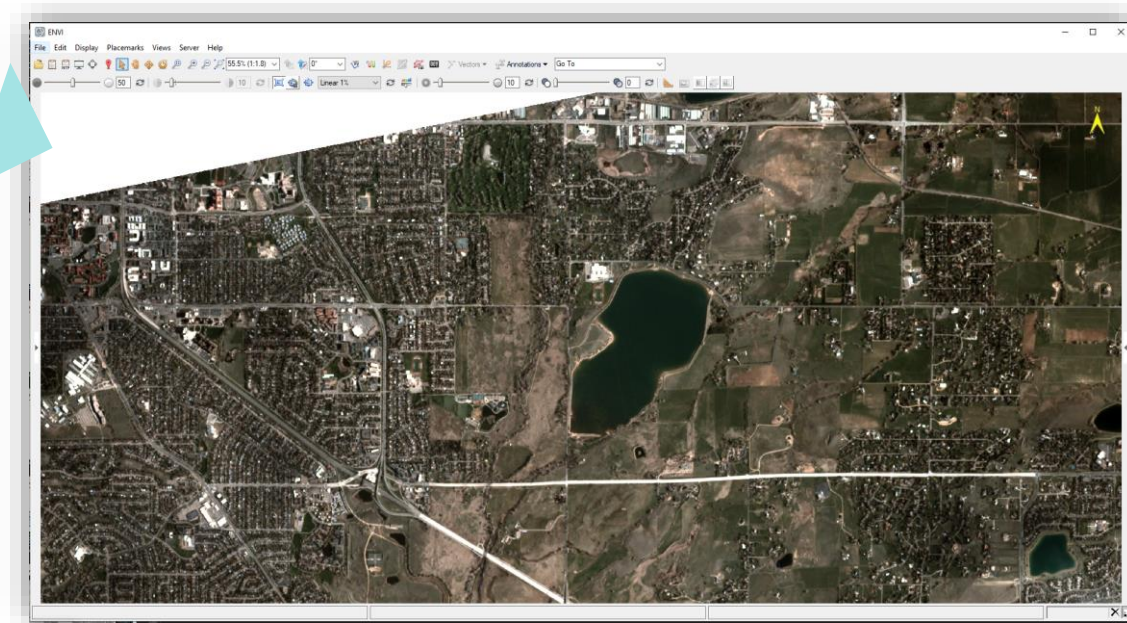
Allows you to use data-provider web applications to get the imagery you need



Download Web Data in ENVI: Planet Explorer

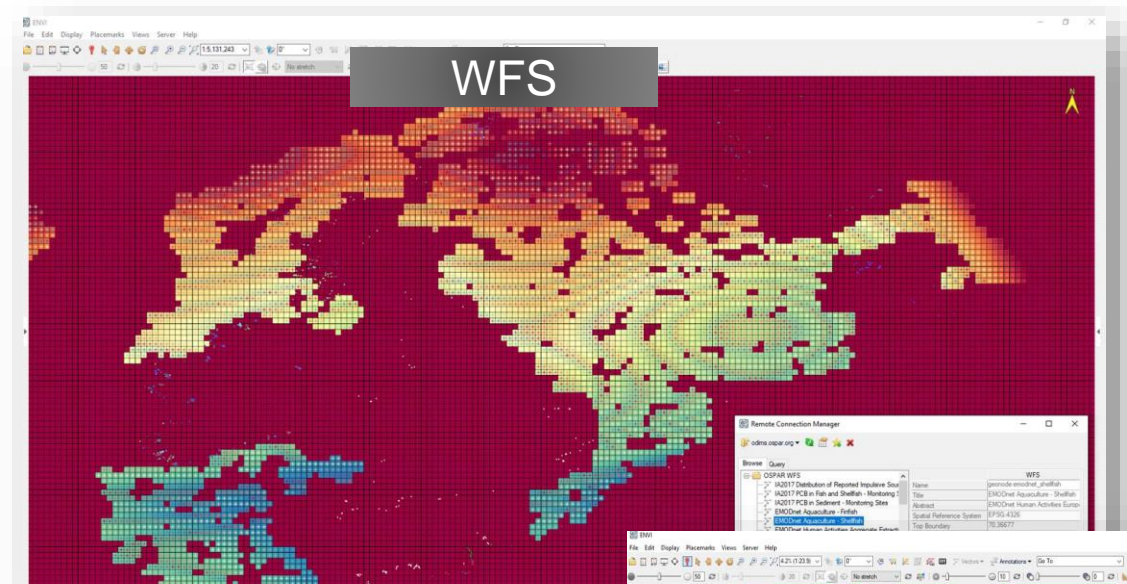


The browser manages downloads and makes it easy to open your data for analysis in ENVI

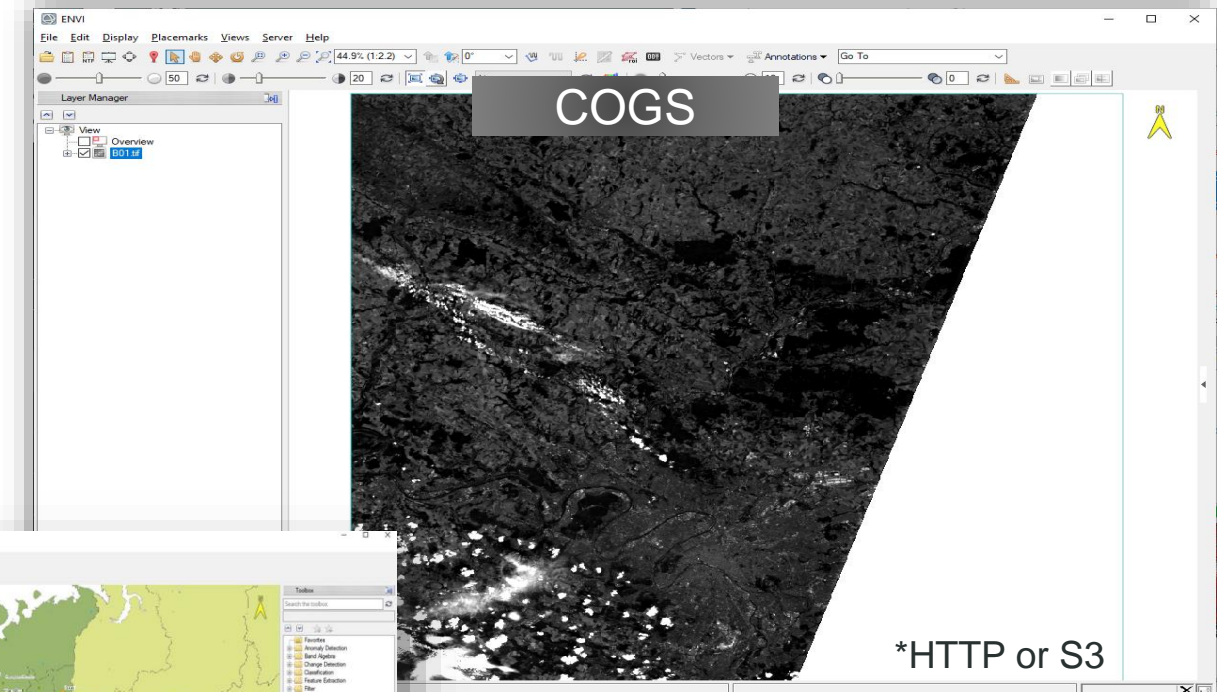


Example using the Planet Explorer website in ENVI
Can customize the list of bookmarks to add your own web-applications to the list

Data Connectivity: Updates for ENVI 5.6.1

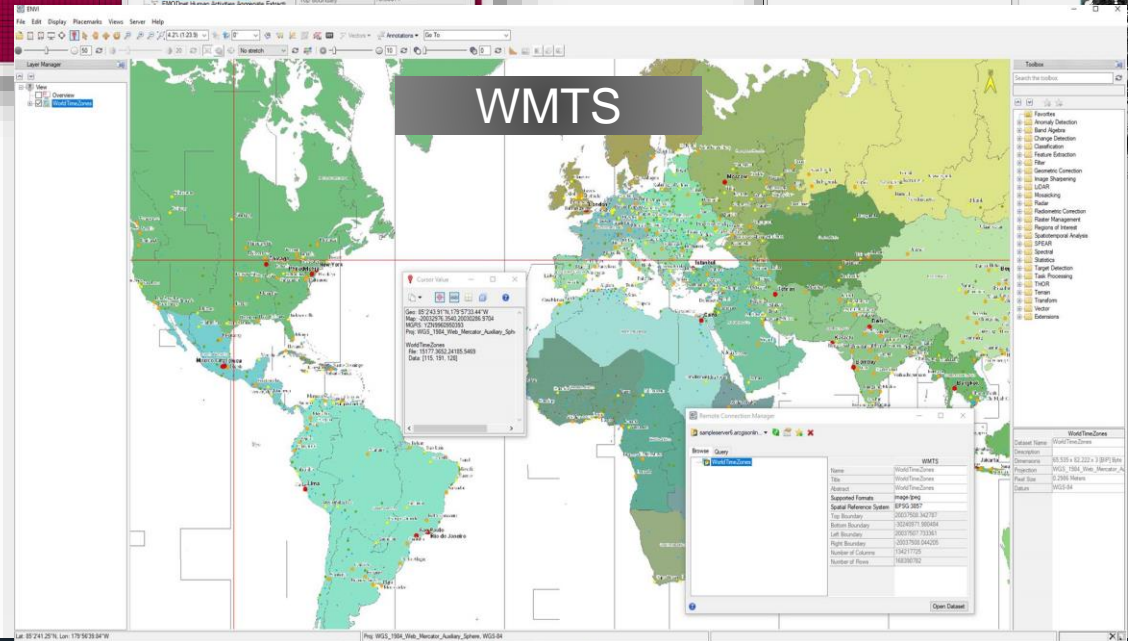


WFS



COGS

*HTTP or S3



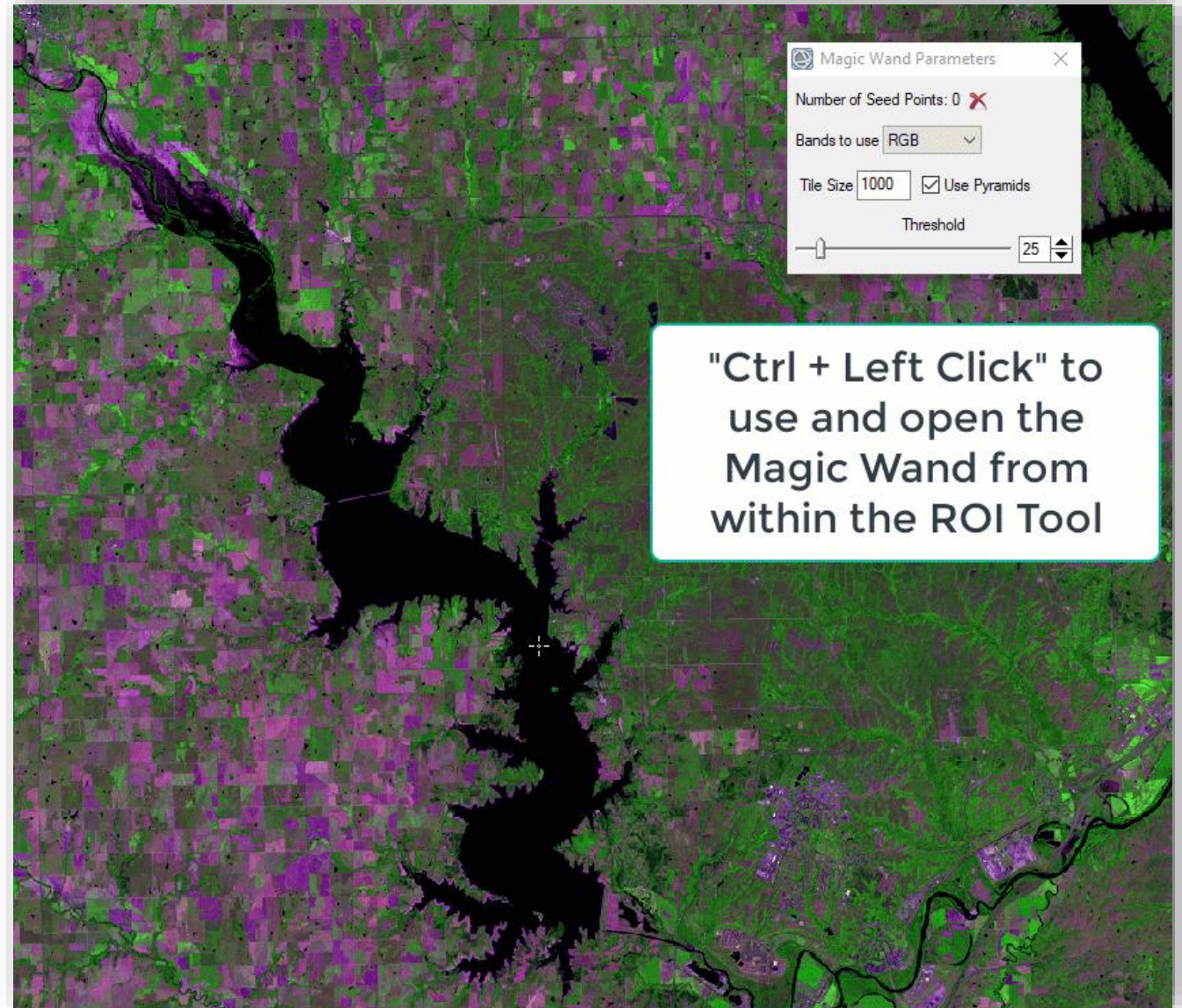
WMTS

Introducing the Magic Wand!



The Magic Wand is accessible through the ROI Tool and allows you to easily label complex shapes with a single click

This example shows how, within seconds, you can fully label a lake using the Magic Wand



Poll Question!

Powered by ENVI Tasks



ENVI includes more than 200 Tasks that represent separate, distinct processing steps for remote sensing

Think of them like blocks made out of things like radiometric calibration, spectral indices, or image classification





The ENVI Modeler: Visual Programming for Remote Sensing

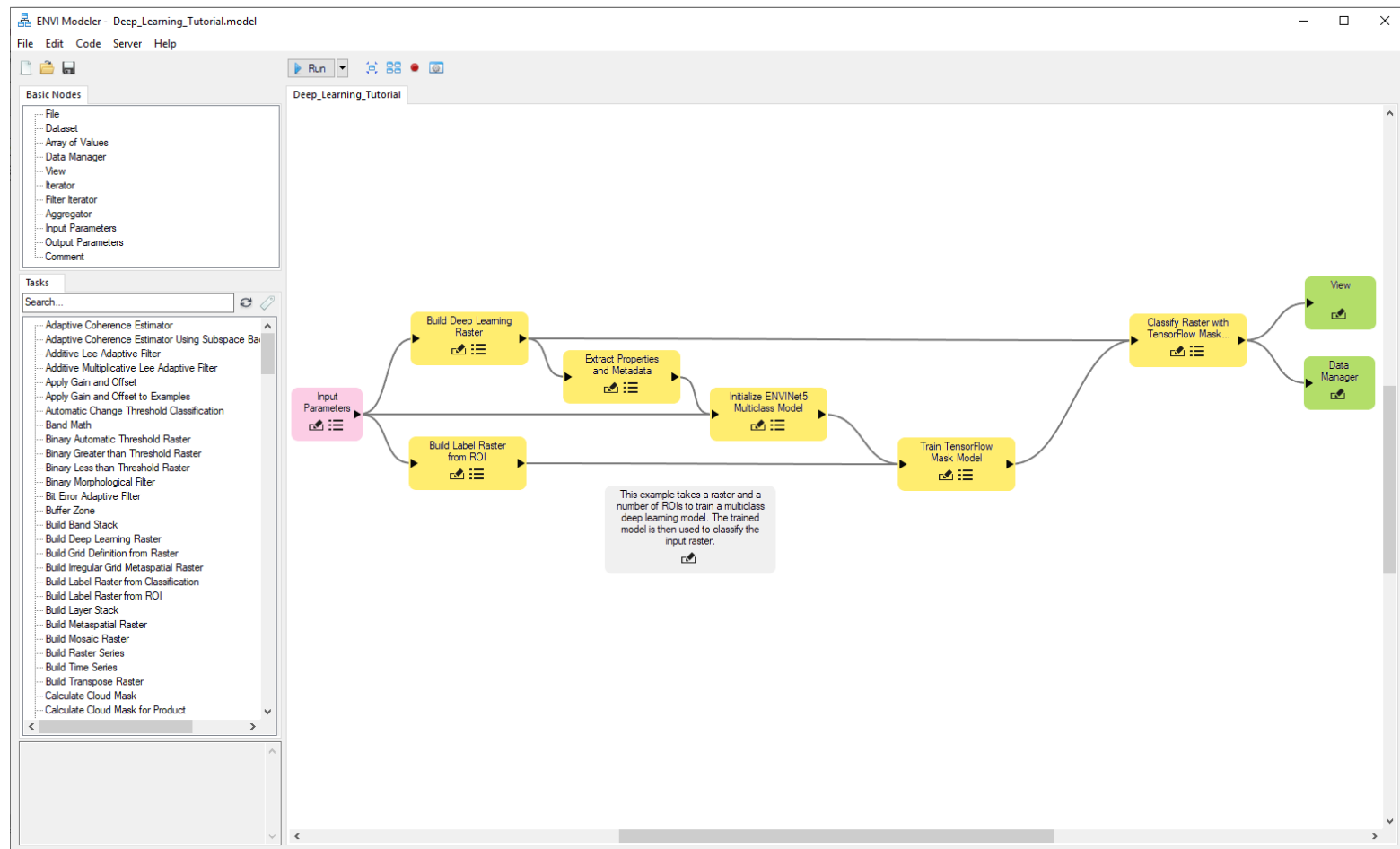
Combines the power of the ENVI API with an intuitive user interface

Use batch processing for efficient workflow and rapid results

Run workflows on ENVI Server

Generate IDL and Python programs from models

Use new models to explore algorithms and processes



ENVI Workflow API



New ENVI API to chain together ENVI Tasks and easily create step-by-step workflows for users

```
; Start the application
e = envi()

; Create an ENVIWorkflow object
workflow = ENVIWorkflow(TITLE = "Zach's Awesome Workflow")

; Add a step for selecting input data
step1 = ENVIWorkflowStep()
step1.TITLE = 'Select Input Data'
step1.task.AddParameter, ENVIParallelENVIParameter($
    NAME='INPUT_RASTER', DISPLAY_NAME='Input Raster', REQUIRED=!true)
step1.NAME = 'step_1'
step1.CALLBACK_EXECUTE = 'input_task_wrapper'

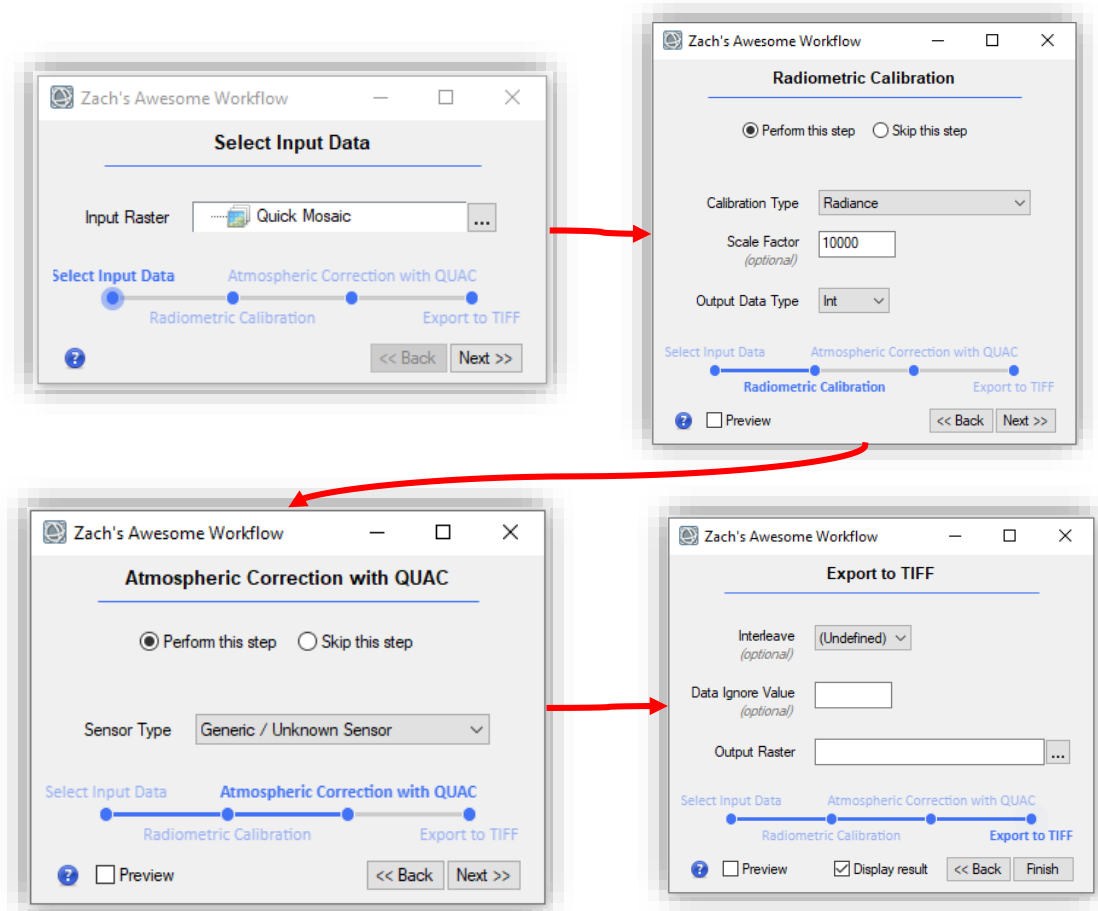
; Add a step for performing ISODATA classification
step2 = ENVIWorkflowStep()
step2.TASK = ENVITask('RadiometricCalibration')
step2.task.scale_factor = 10000
step2.task.output_data_type = 'int'
step2.CALLBACK_SKIP_STEP = 'skip_step'

; Add a step for smoothing the classification result
step3 = ENVIWorkflowStep()
step3.TITLE = 'Atmospheric Correction with QUAC'
step3.TASK = ENVITask('QUAC')
step3.CALLBACK_SKIP_STEP = 'skip_step'

; Add a step for exporting the smoothed result to TIFF format
step4 = ENVIWorkflowStep()
step4.TASK = ENVITask('ExportRasterToTIFF')

; Connect inputs and outputs
workflow.Connect, step1, 'input_raster', step2, 'input_raster'
workflow.Connect, step2, 'output_raster', step3, 'input_raster'
workflow.Connect, step3, 'output_raster', step4, 'input_raster'

; Display the workflow dialog
envi.UI.CreateWorkflowDialog, workflow
```



ENVI for Programmers



The ENVI API is easy to use, it is as simple as setting parameters in the ENVI UI

Use the ENVI Modeler to create our IDL programs that you can extend and customize

```
; find data to process
files = file_search(trainingDir, '*.dat', COUNT = nFiles)
if (nFiles eq 0) then message, 'No data found'

; allocate an array for training rasters
rasters = objarr(nFiles)

; process and make sure we have our DL raster
foreach file, files, idx do rasters[idx] = ENVIDeepLearningLabelRaster(file)

; Initialize a new model
initTask = ENVITask('InitializeENVINet5MultiModel')
initTask.NBANDS = 3
initTask.NCLASSES = 1
initTask.Execute

; shuffle
seed = 17
idx = sort(randomu(seed, nfiles))
idxTrain = idx[0:nTrain-1]
idxValidate = idx[-nValidate-1:-1]

; Get the task from the catalog of ENVITasks
trainTask = ENVITask('TrainTensorFlowMaskModel')
trainTask.INPUT_MODEL = initTask.OUTPUT_MODEL
trainTask.TRAINING_RASTERS = rasters[idxTrain]
trainTask.VALIDATION_RASTERS = rasters[idxValidate]
trainTask.CLASS_WEIGHT = [0,2]
trainTask.AUGMENT_SCALE = !false
trainTask.AUGMENT_ROTATE = !false
trainTask.EPOCHS = 50
trainTask.PATCHES_PER_EPOCH = 750
trainTask.PATCHES_PER_BATCH = 2
trainTask.PATCH_SAMPLING_RATE = 3
trainTask.SOLID_DISTANCE = [0]
trainTask.BLUR_DISTANCE = [0,0]
trainTask.LOSS_WEIGHT = 0.0
trainTask.Execute

; process all of our vvalidation rasters
foreach file, files[idxValidate] do begin
  raster = e.openRaster(file)
  classTask = ENVITask('TensorflowMaskClassification')
  classTask.INPUT_rASTER = ENVISubsetRaster(raster, BANDS=[0,1,2])
  classTask.INPUT_MODEL = trainTask.OUTPUT_MODEL
  classTask.OUTPUT_CLASSIFICATION_RASTER_URI = '!'
  classTask.execute
  e.data.add, classTask.output_classification_raster
endforeach
```

Find and open 72 rasters for ENVI Deep Learning

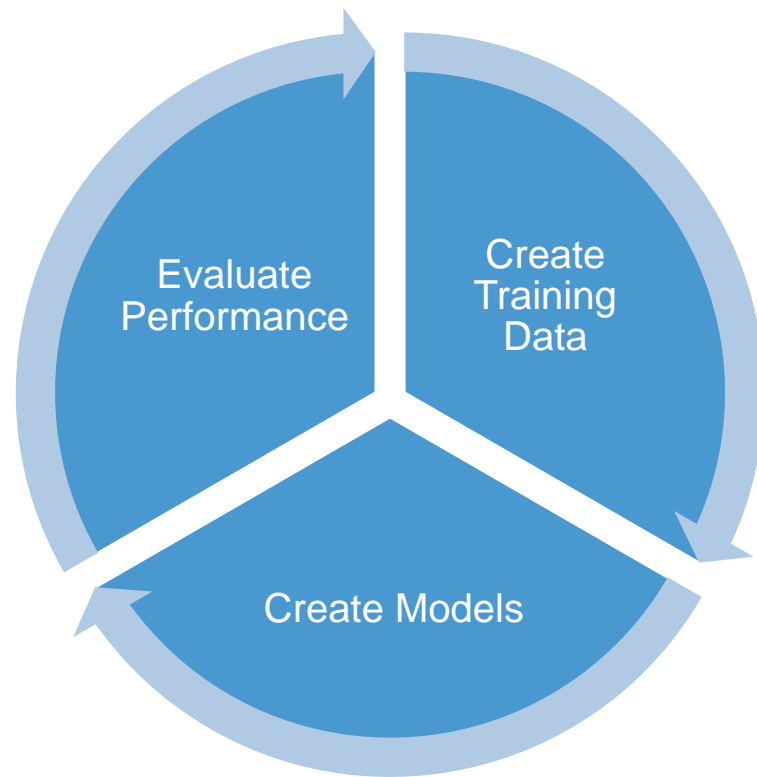
Initialize a neural network and train using TensorFlow

Classify our validation images for manual review

The ENVI Deep Learning Module



Applied deep learning for geospatial imagery in ENVI, the leading remote sensing and image analysis software



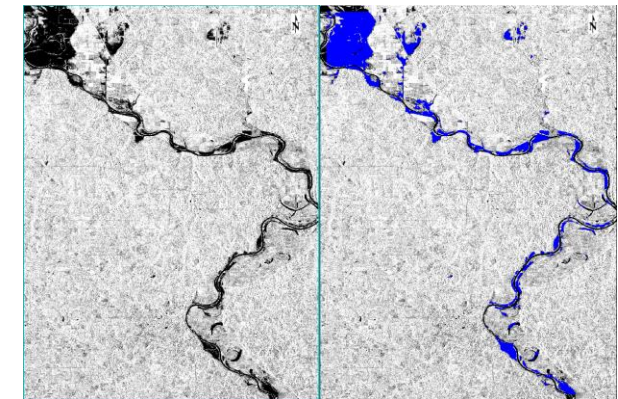
Deep learning workflow in ENVI, built on TensorFlow and Keras

Without needing to program, the capabilities include:

- Segmentation (i.e. cloud masking)
- Object detection (i.e. cars or ships)
- Linear feature extraction (i.e. roads)
- Support for nearly any image format and data modality



Assess building damage after hurricanes and tornadoes



Automated flood detection using SAR

You'll Need an NVIDIA GPU



**NVIDIA GPU card with CUDA®
Compute Capability 3.5 or higher**

<https://developer.nvidia.com/cuda-gpus>

CUDA 10 is required for the latest released version of ENVI Deep Learning (1.1.2)

CUDA 11.0 support is coming soon!

Minimum 8GB of GPU RAM recommended



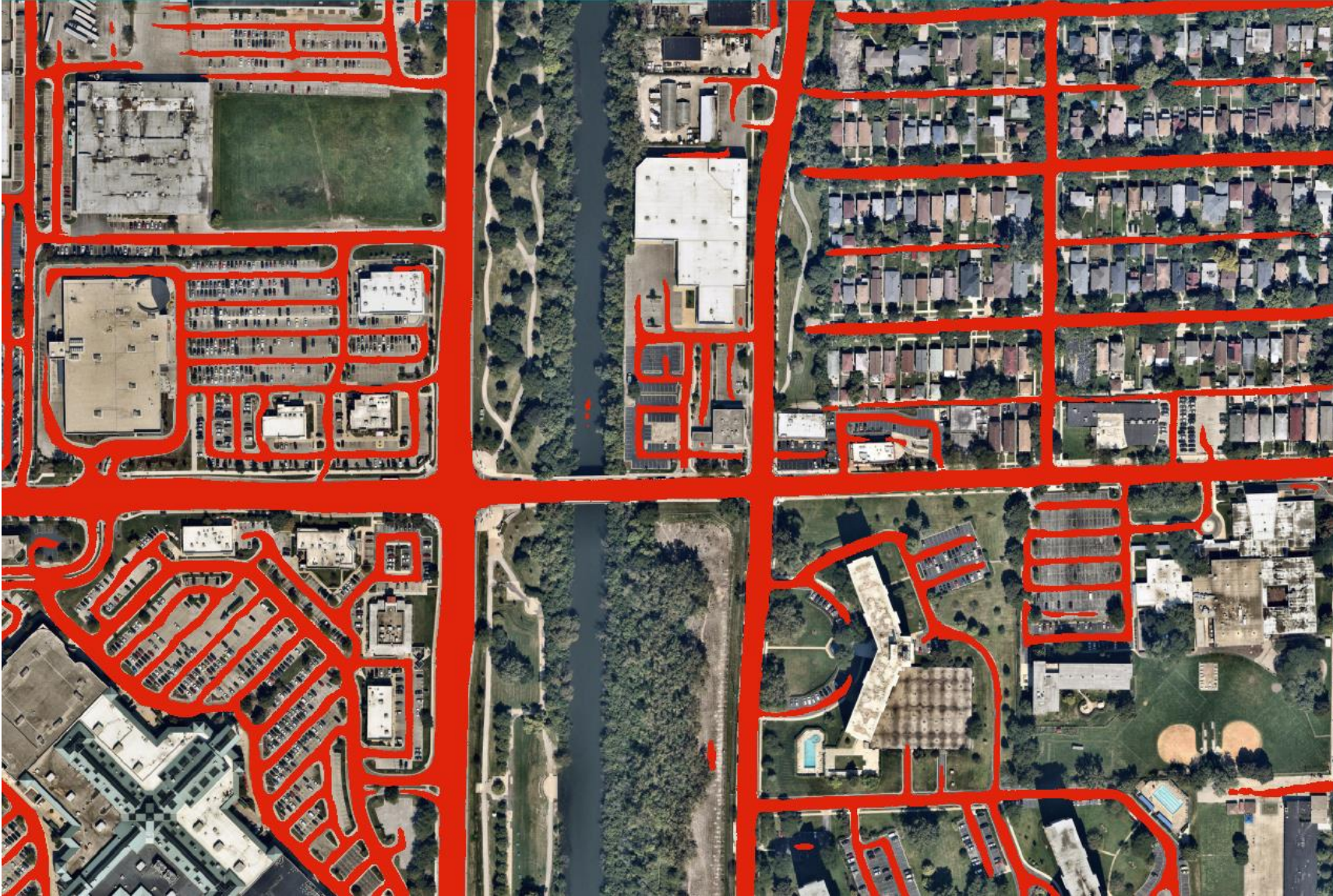
Tornado Path



36.178104°N, 86.647217°W



Road Network: Imagery



Road Network: LiDAR Derived Input



Height, intensity, and shaded relief



Results



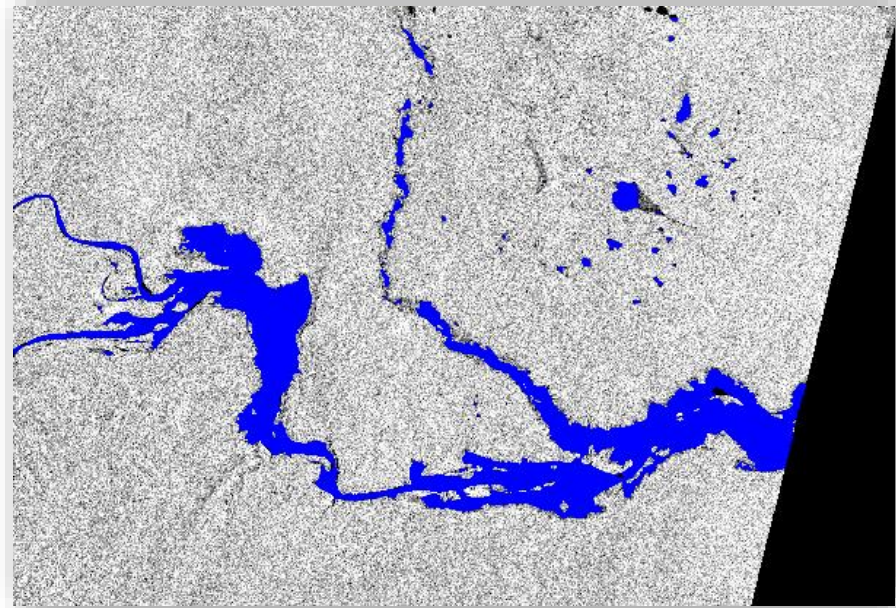
Cloud Detection



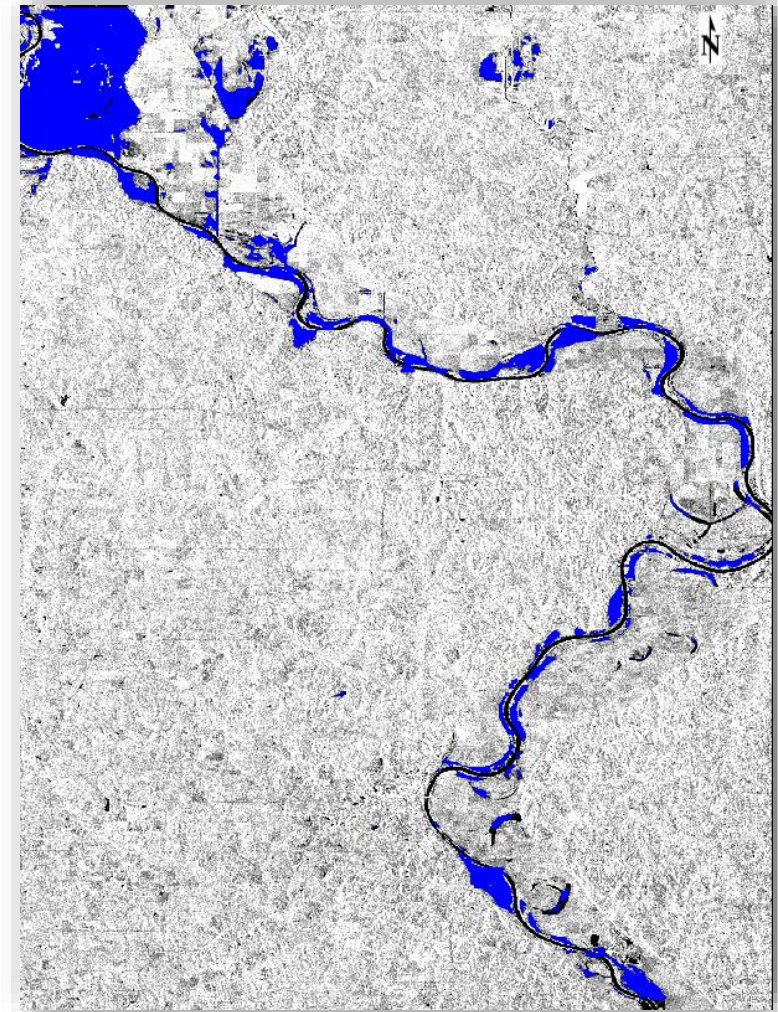
Berms – Potential SAM Sites



Deep Learning and SAR Time-Series



Flooding after Cyclone Idai in Africa

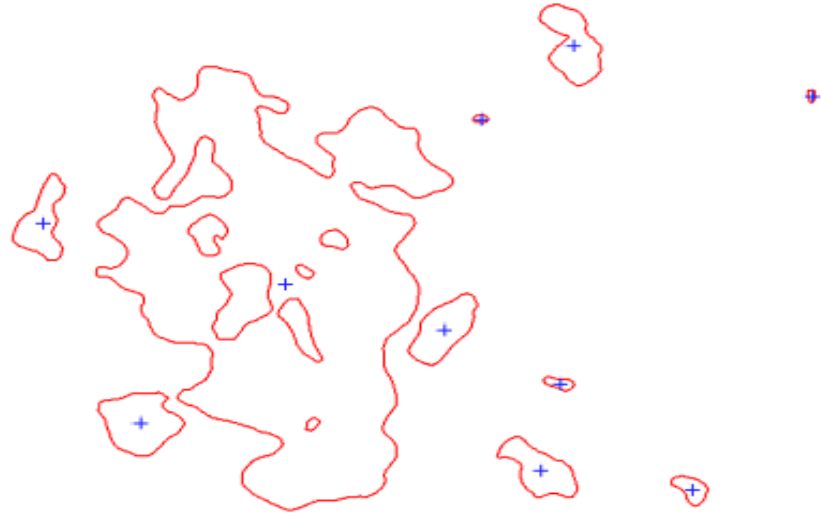


Floodwater detection in Nebraska, U.S.

New, Vector Processing Tools



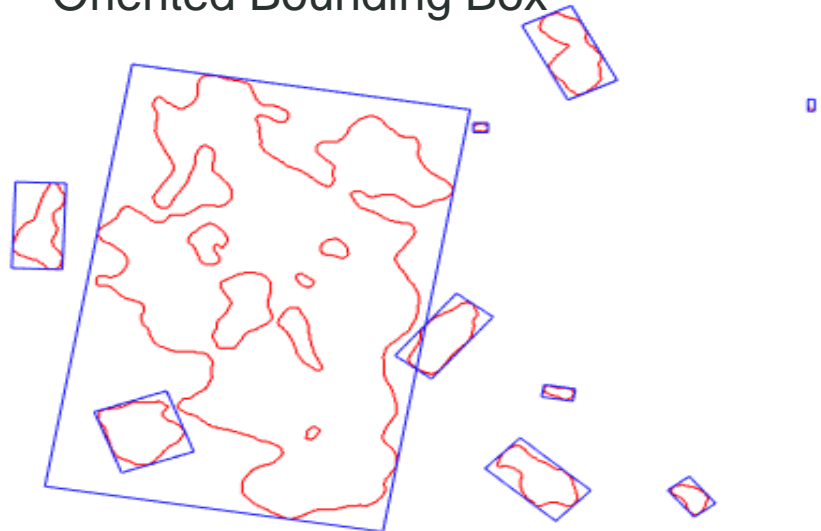
Centroids



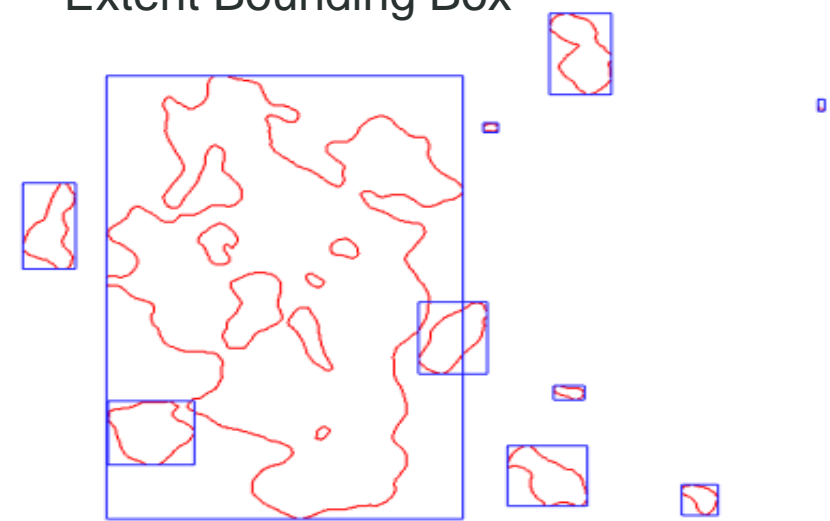
Size Filtering



Oriented Bounding Box



Extent Bounding Box

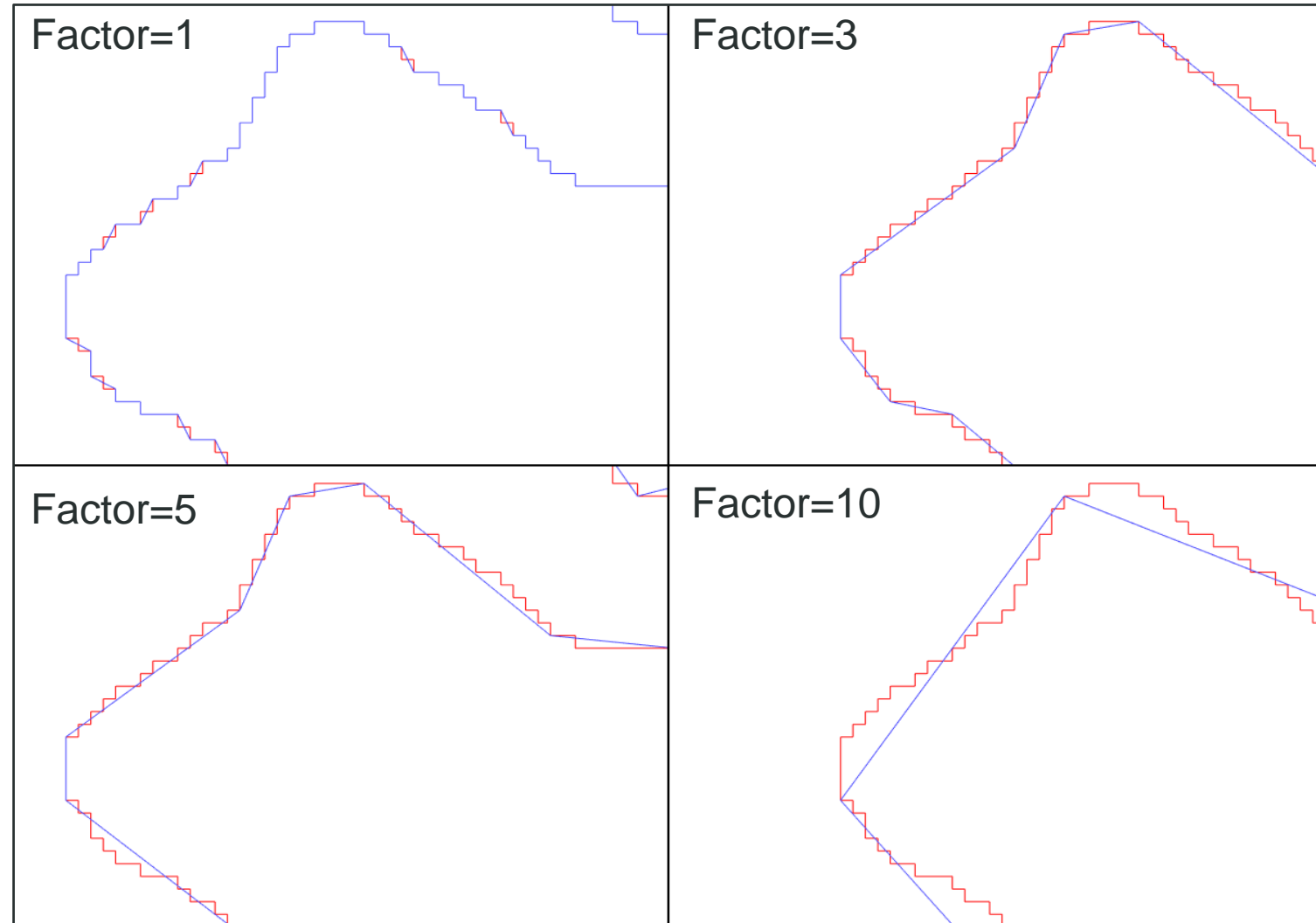


New, Vector Processing Tools: Smoothing



“Smooth Vector” tool uses the Douglas-Peucker smoothing algorithm for polylines and polygons

Pro-tip: For consistent results, make sure that your vectors have the same units (i.e. reproject shapefiles to the same coordinate system)



Publish Vectors to ArcGIS Portal



Upload Vector to ArcGIS P...

Input Vector:

Portal URL:
Use arcgis.com to publish to ArcGIS Online

Username:
Note: username is case-sensitive

Password:

Item Name (optional):

Publish Service: Yes No



Home > Cloud Detection

Details Add Edit Basemap Analysis Save Share Print Directions Measure Bookmarks Find address or place

Change Style

Cloud Detection

1 Choose an attribute to show

Add attribute

2 Select a drawing style

Types (Unique symbols)
OPTIONS

Location (Single symbol)
SELECT

DONE **CANCEL**

Clouds

Esri, HERE, Garmin, USGS, METI/NASA, NGA

ArcGIS Integration: ENVI Py

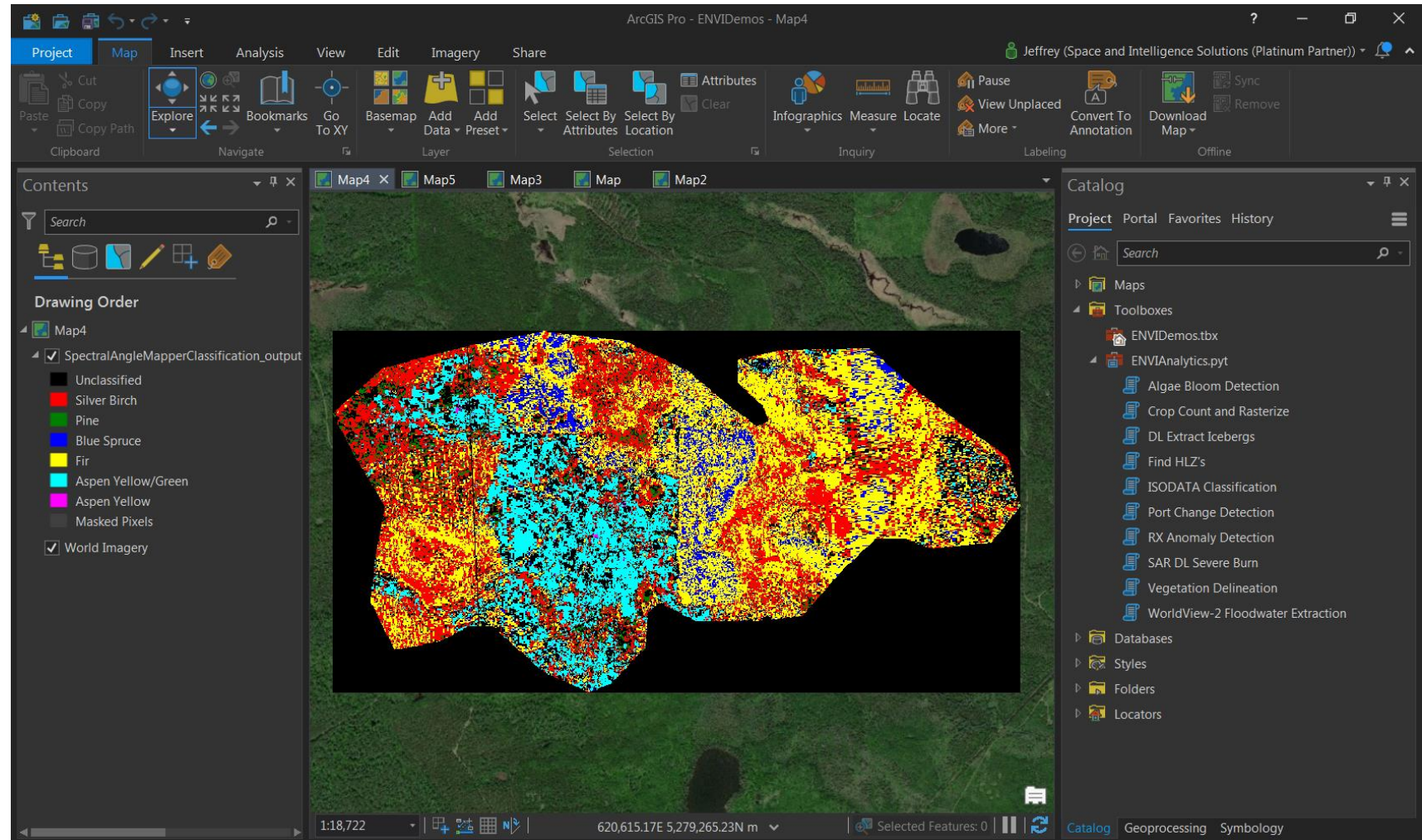


L3Harris and Esri are close partners to bring trusted ENVI analytics into ArcGIS

The ENVITask API enables ENVI analytics to run in ArcPro 2.2 or later or ArcMap 10.6 or later

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

ENVI Py leverages the ArcGIS Python support for this integration at no additional cost



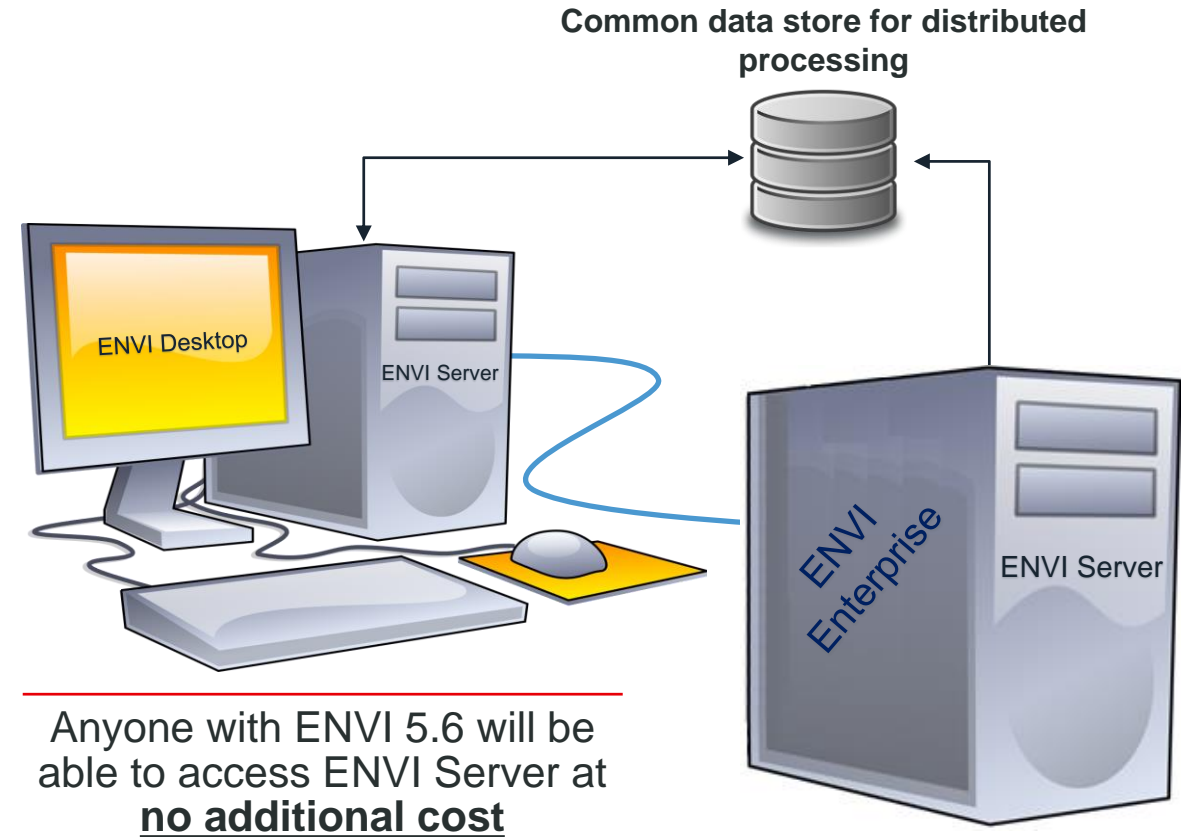
Hyperspectral image classification and the ENVI starter toolbox in ArcPro

Scale ENVI's Processing with ENVI Server



Key Benefits:

- Save time by running processes in parallel
- Run processes in the background in ENVI
- Take advantage of beefy machines and modern hardware
- Easily distribute processing to local servers with common data access
- No programming required!



Anyone with ENVI 5.6 will be able to access ENVI Server at no additional cost

ENVI is a client for ENVI Server, meaning we can connect to machines used for dedicated processing

ENVI Server in 60 Seconds

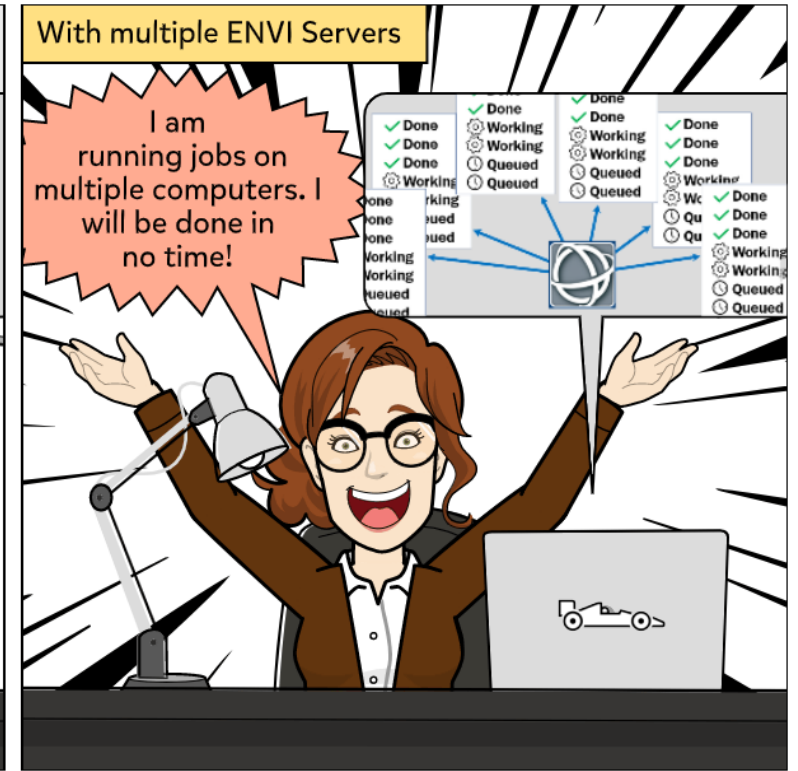
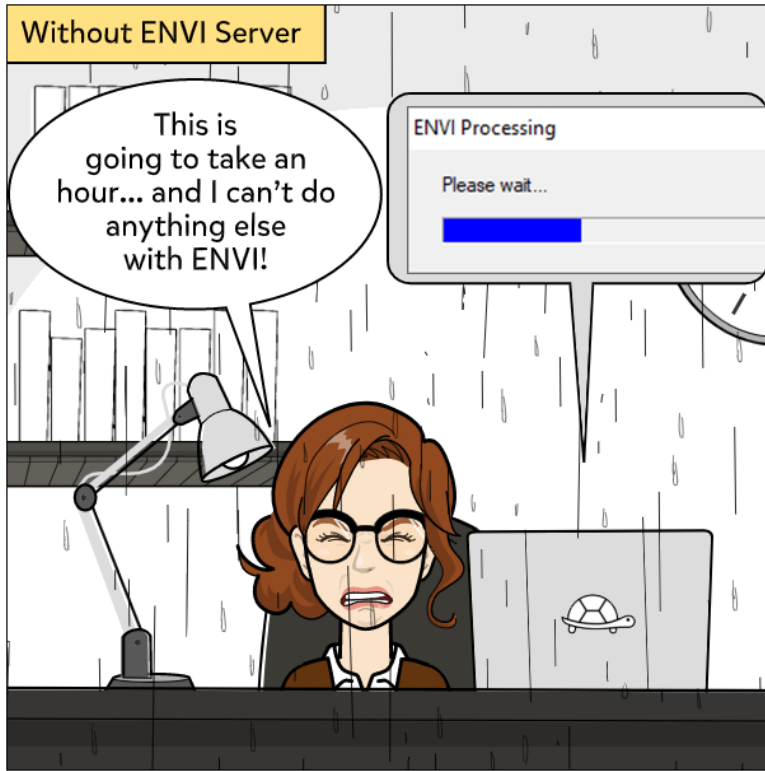


Take advantage of modern hardware

Save time by running processes in parallel

Run processes in the background in ENVI

Distribute processing to local servers with common data access



ENVI Server Use Cases



Here are a few scenarios where ENVI Server can be used

ENVI MULTITASKER

Do you want to do more than one thing at a time with ENVI?

- ENVI Server allows you to seamlessly run processing in the background while still interacting with the ENVI interface

MANY, LARGE DATASETS

Do you have lots of data to process in ENVI?

- ENVI Server lets you run multiple jobs in parallel to get through large volumes of data faster. This allows you to take advantage of modern hardware with many CPUs and Solid State Drives (SSDs)

ENVI PROGRAMMER

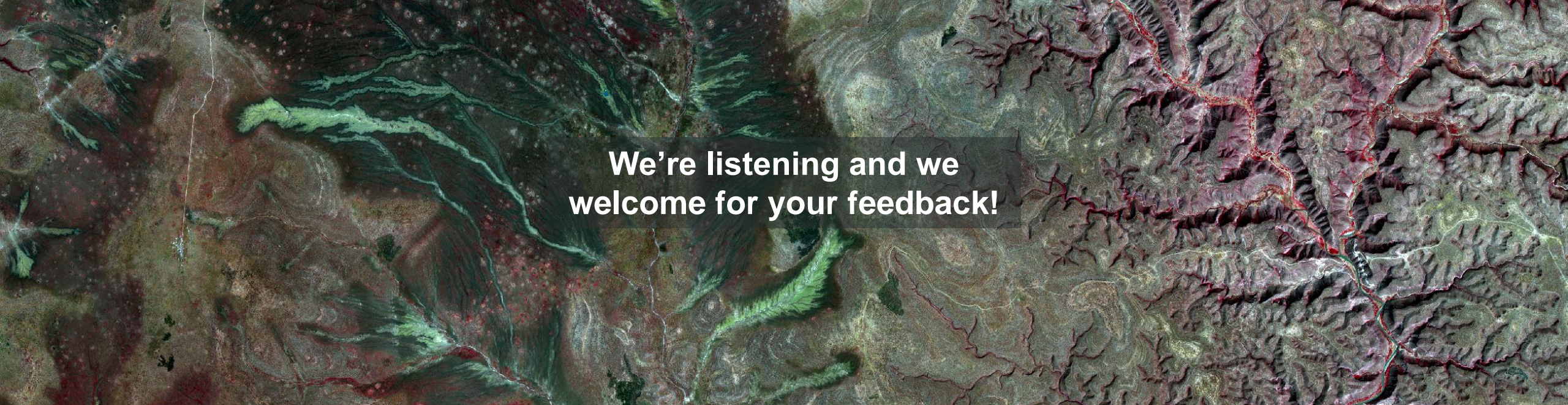
Do you use IDL and the ENVI API to do your processing?

- Easily access ENVI Server through the ENVI API in IDL. This requires minor changes to existing programs using ENVI Tasks.

DEEP LEARNING DATA PREPARATION

Do you have a lot of data that you need to prepare for deep learning?

- Create customized data preprocessing pipelines for ENVI Deep Learning to spend less time preparing data and more time training classifiers



**We're listening and we
welcome for your feedback!**

Release details: <https://www.l3harrisgeospatial.com/Support/Maintenance>

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