Change Detection of Raster Data

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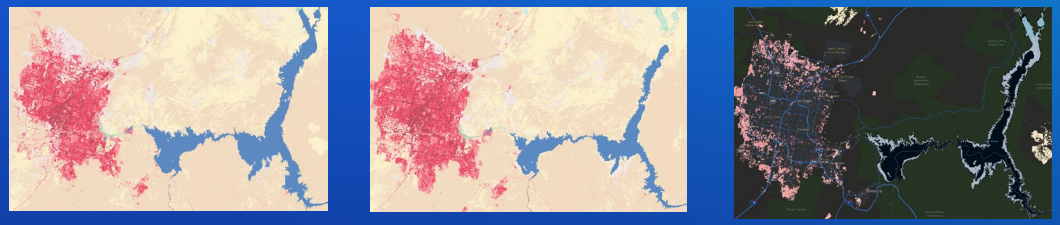
Outline

- **Overview of change detection capabilities in ArcGIS**
- **Use case demos using python**
  - Understanding changes in Amazon basin using ESA land cover data (ArcPy)
  - Analyzing timber harvest pattern using LandTrendr (ArcPy, ArcGIS API for Python)
  - Monitoring forest disturbance using CCDC (ArcGIS API for Python)

Change detection types

- **Calculate change between two times**
  - Where are the changes
  - What are the changes

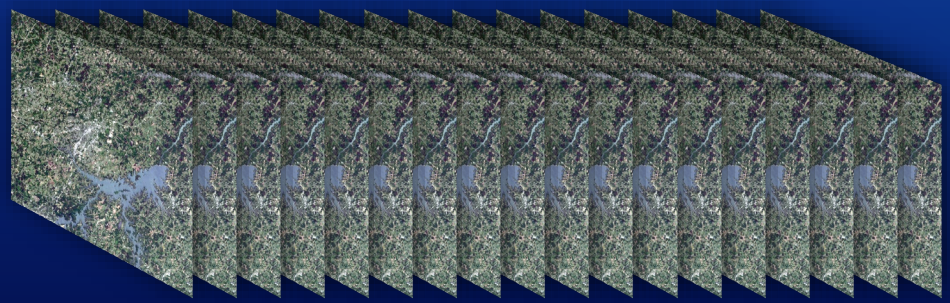


t1 t2 change

- **Detect change throughout a time series**
  - Insect infestation in forest
  - Land degradation
  - Forest recovery
  - Wildfire
  - Deforestation
  - Unban development

gradual

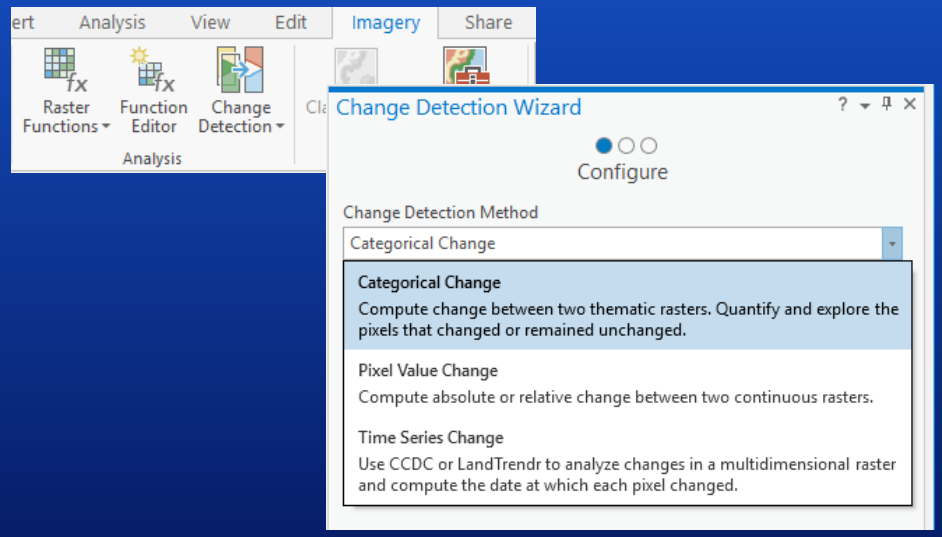
abrupt

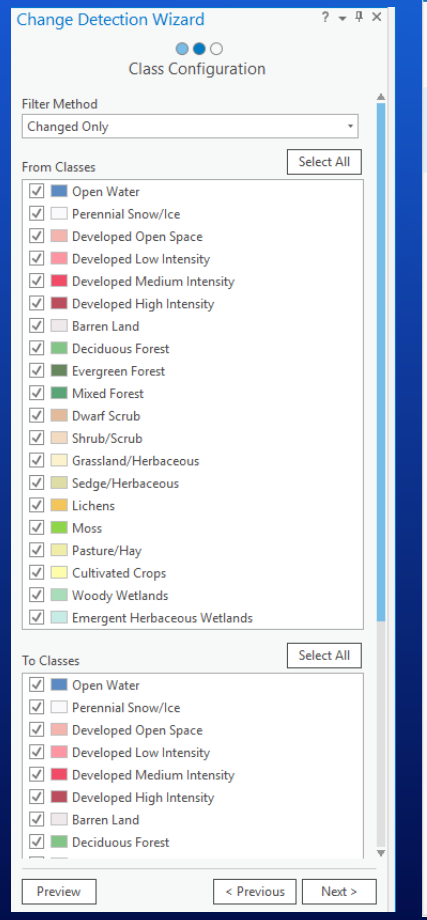


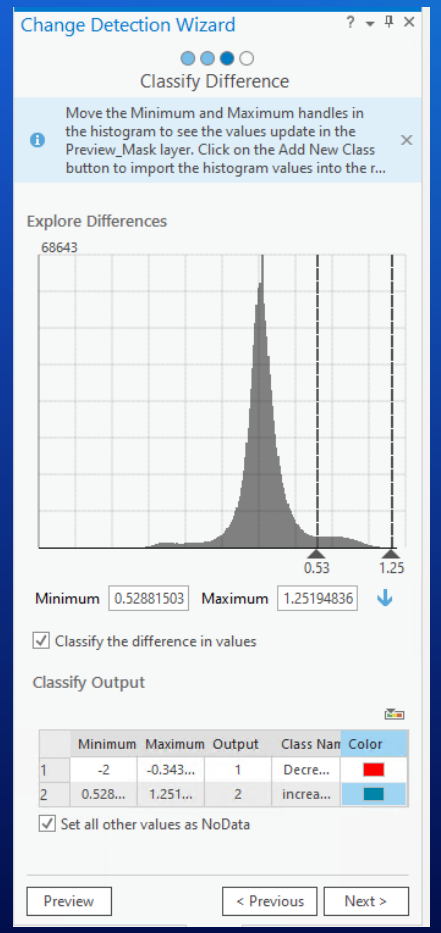
ArcGIS change detection capabilities

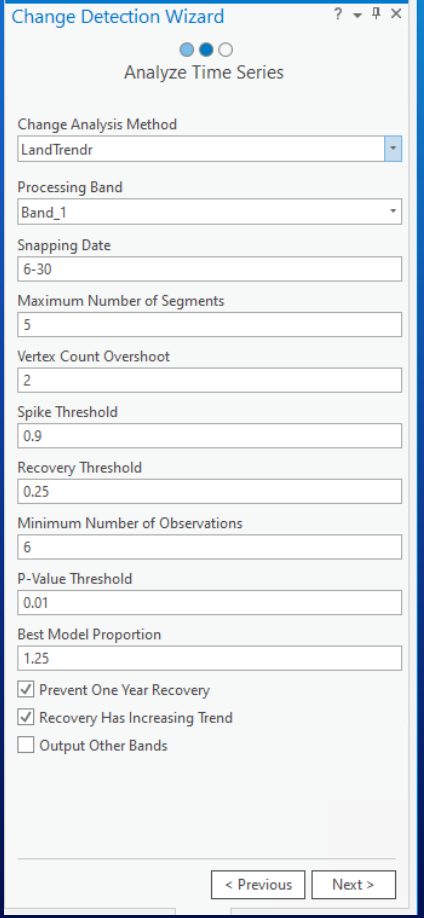
Support simple change detection and time series change detection

- **Change Detection wizard**





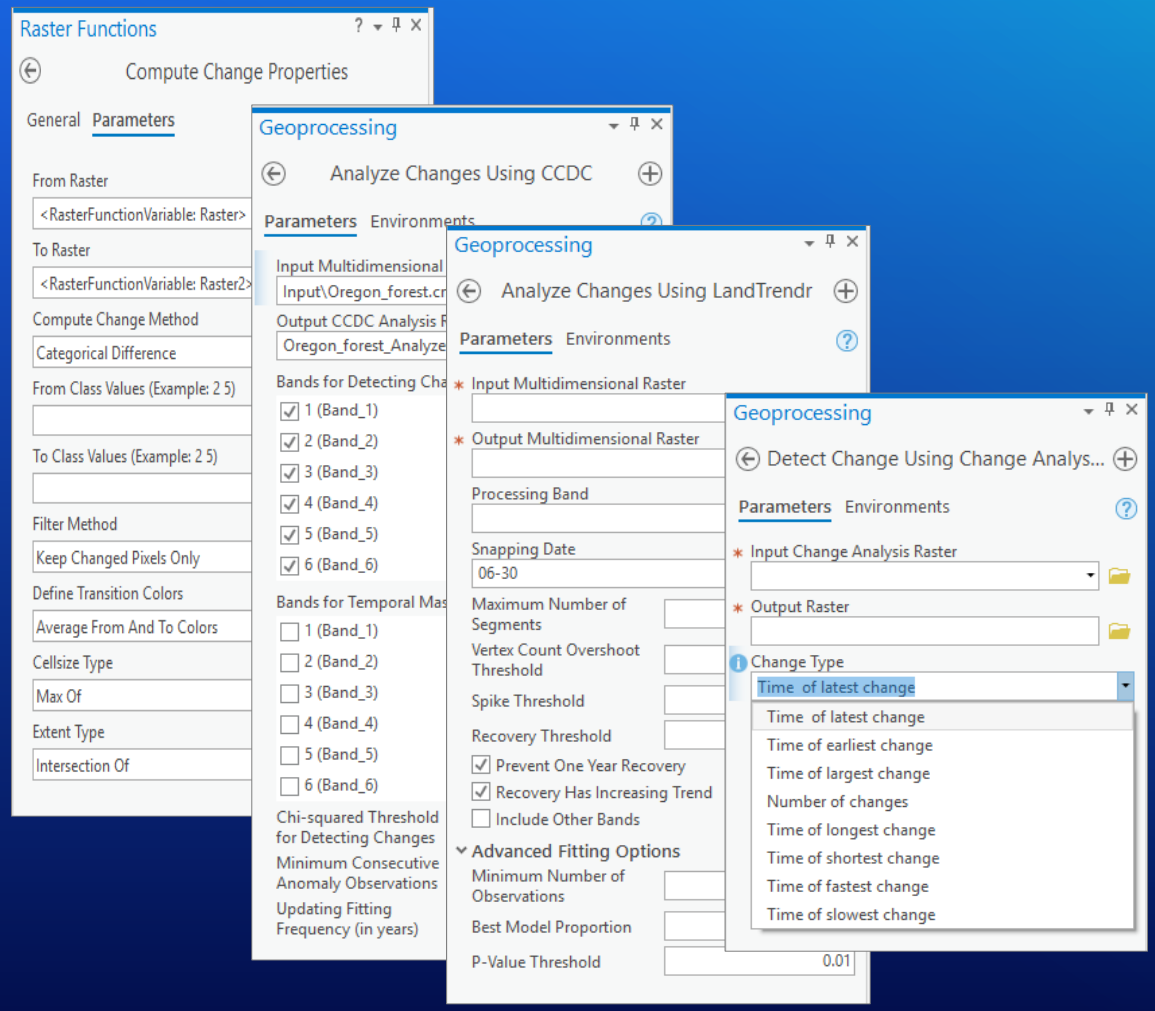




ArcGIS change detection capabilities

Tools and functions for Desktop, Enterprise, and Python

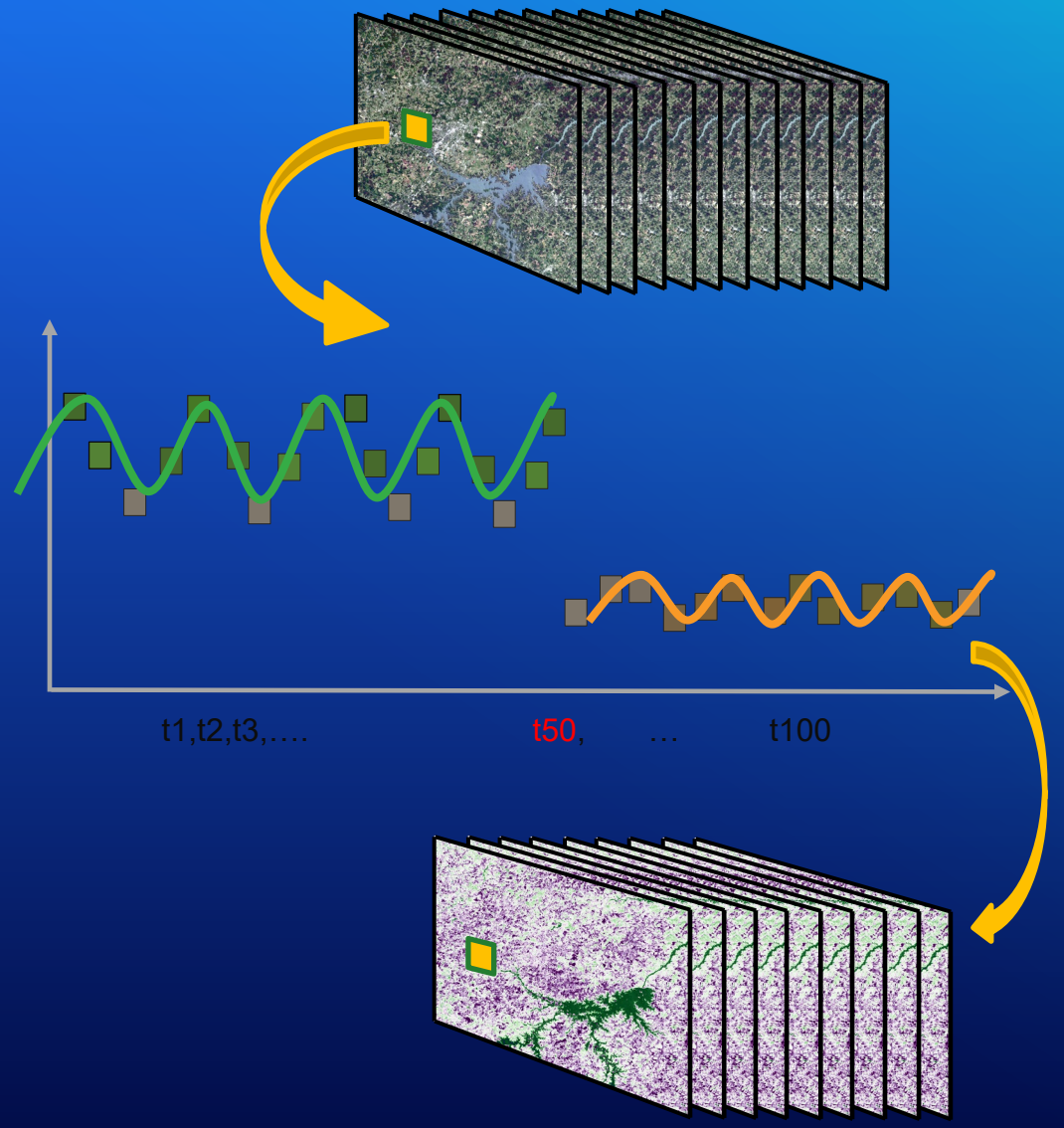
- **Detect from two images**
  - Compute Change Raster
- **Detect from time series imagery**
  - Analyze Change Using CCDC
  - Analyze Change Using LandTrendr (2.7)
  - Detect Change from Change Analysis Raster
  - Summarize Categorical Raster (2.7, Desktop only)



Detect change using CCDC algorithm

Continuous Change Detection and Classification

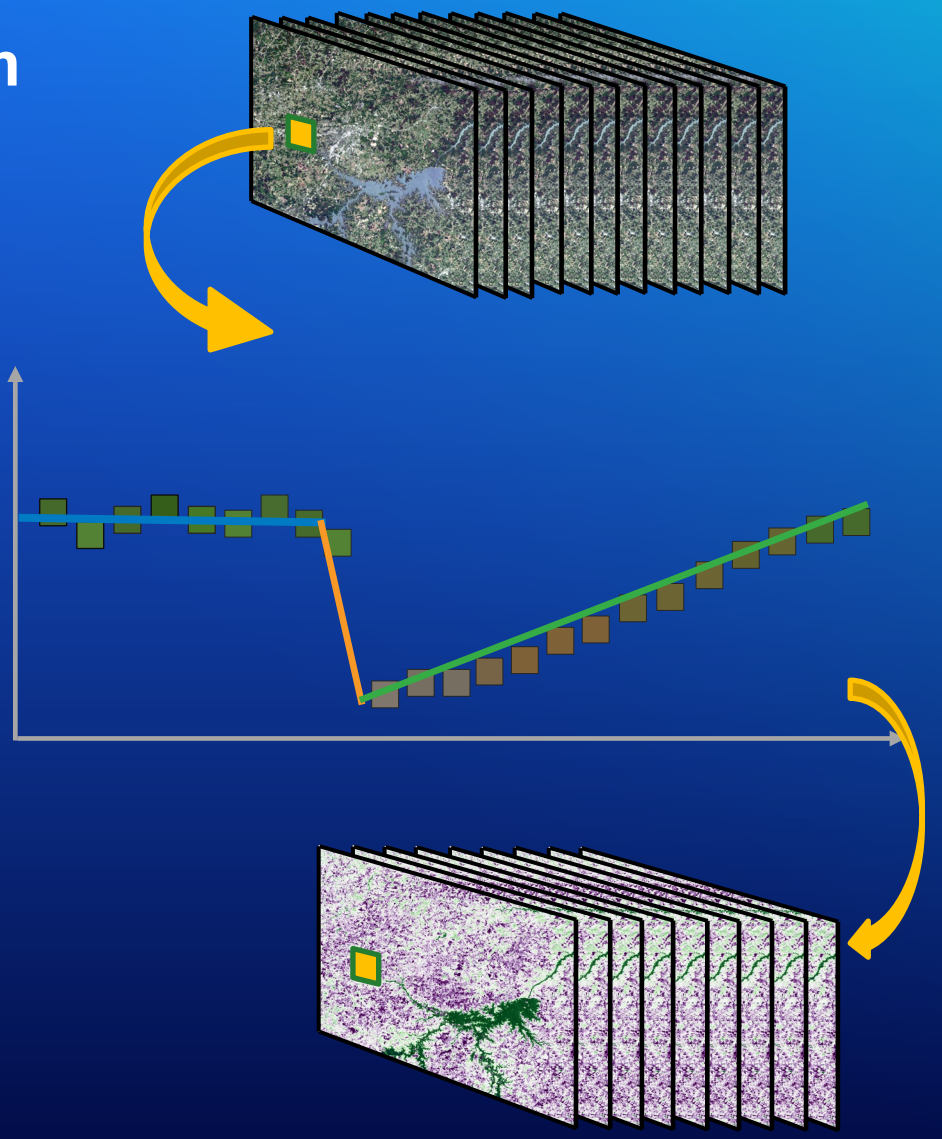
- **Analyze pixel time series**
  - All available images
- **Harmonic fitting**
  - Detect model breaks
  - Take account of seasonality
- **Output model coefficients as bands**
  - Extract change date
    - Earliest, latest, and largest changes
  - Time series classification



Detection change using LandTrendr algorithm

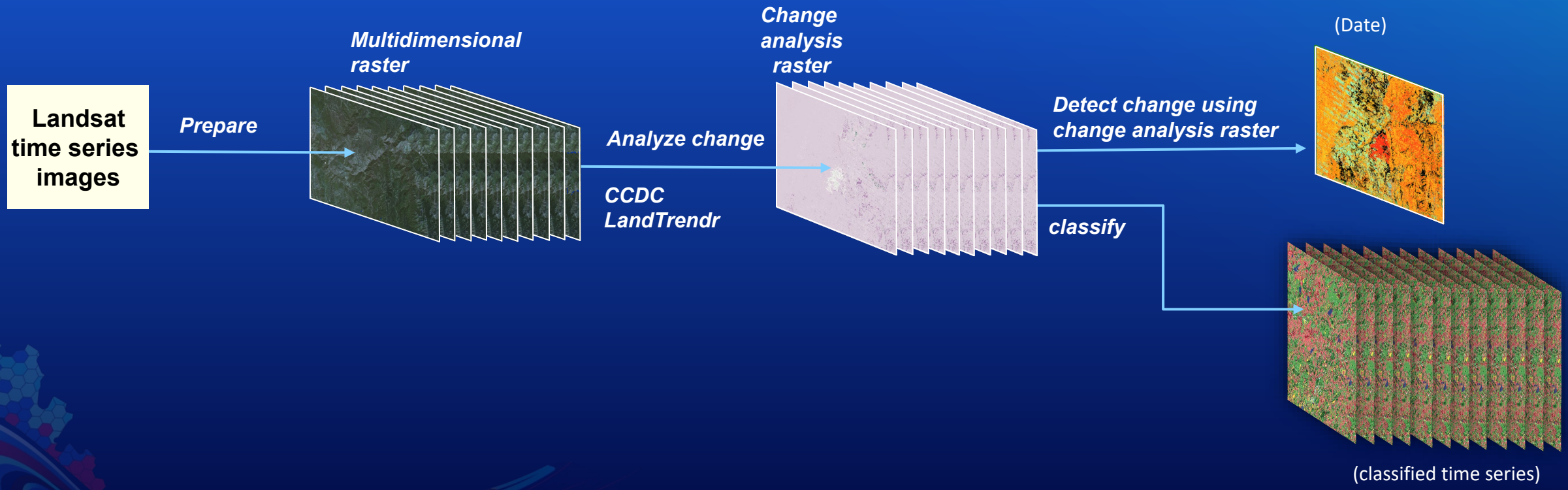
Landsat-based detection of trends in disturbance and recovery

- **Analyze pixel time series**
  - Yearly based
- **Temporal segmentation**
  - Identify vertices
  - Fit segments
- **Output model coefficients as bands**
  - Extract change based on
    - Earliest, latest, and largest changes
    - Change direction, duration, and magnitude
  - Time series classification



Time series change detection workflow

CCDC and LandTrendr



esri.com/arcgis-blog/products/arcgis-pro/analytics/create-multidimensional-raster-data

Additional resources

Sessions in Dev Summit

Working with Multidimensional Data in ArcGIS

Prediction and Trend Analysis of Raster Data

Advanced Custom Raster Processing Using Python

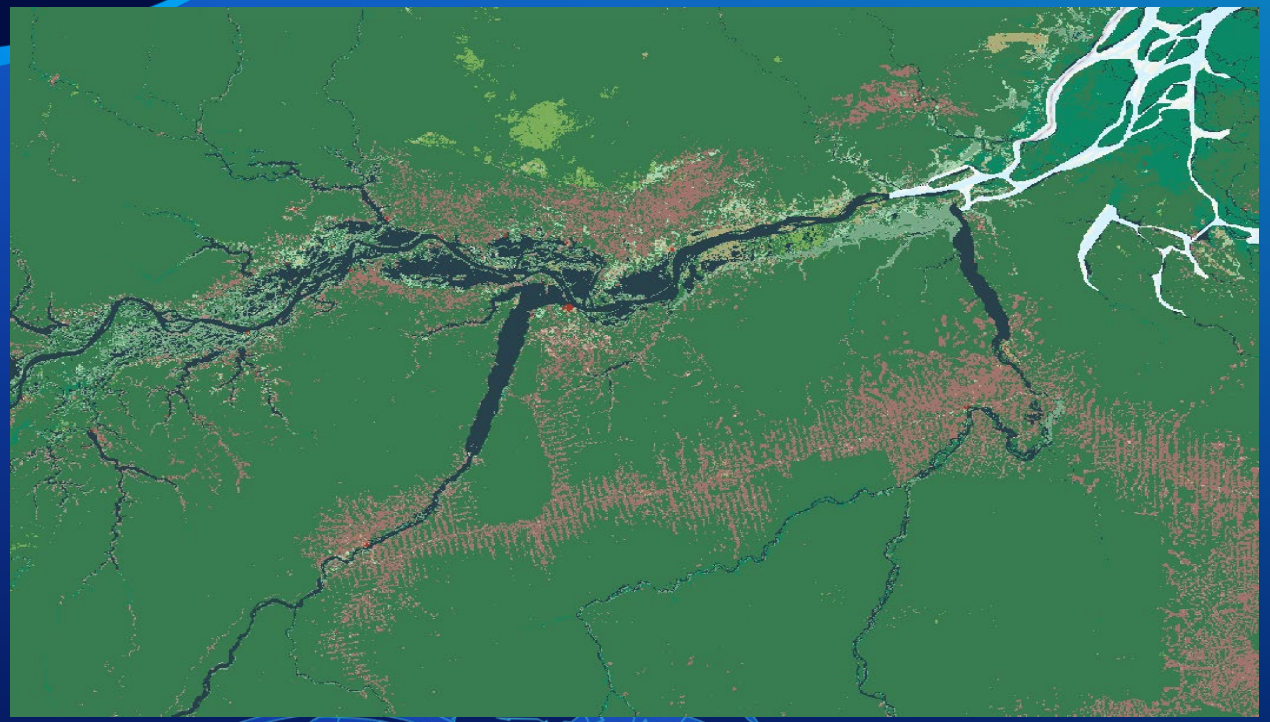
Help references

ArcPy APIs and examples

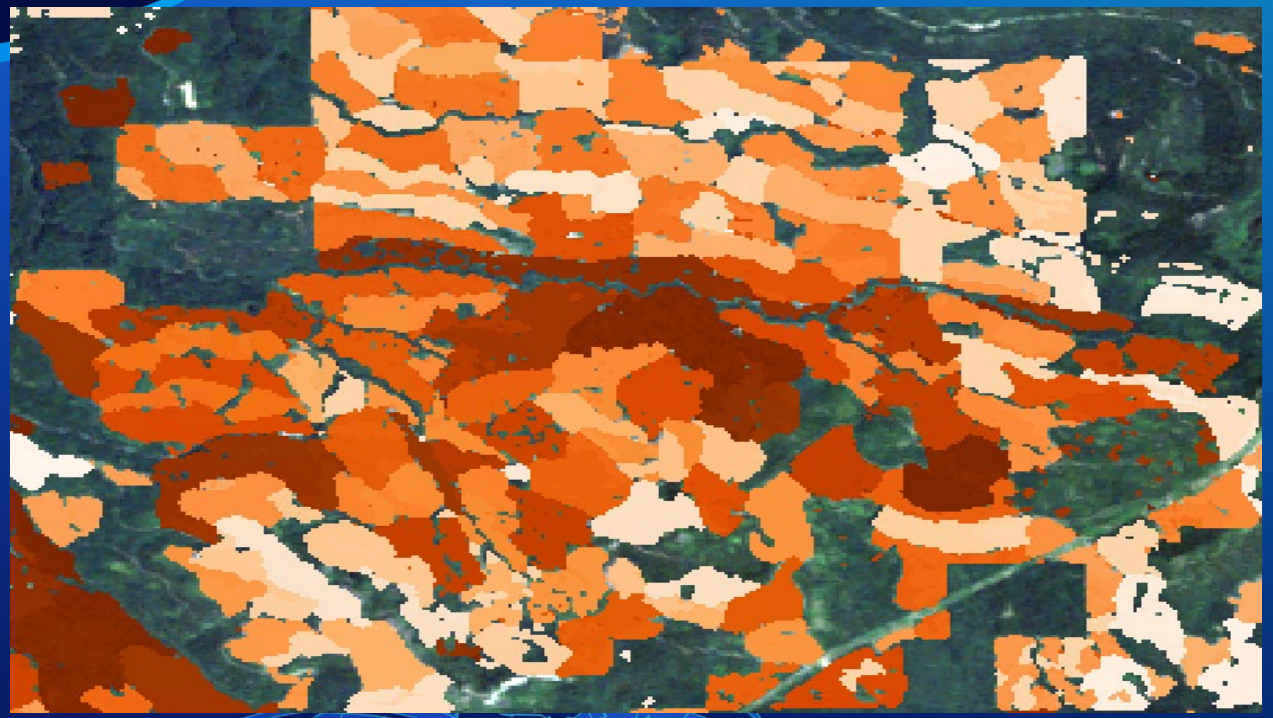
- https://pro.arcgis.com/en/pro-app/arcpy/image-analyst

ArcGIS API for Python examples

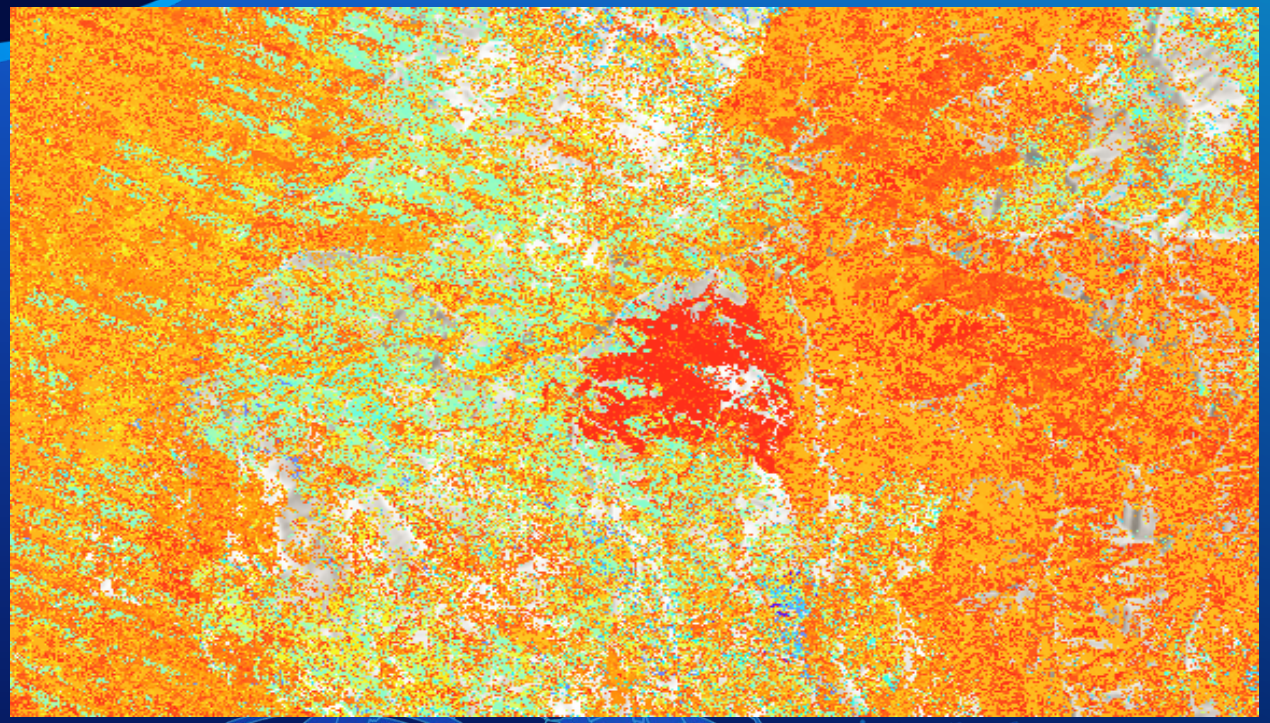
- https://developers.arcgis.com/python/api-reference/arcgis.raster.toc.html



Analyzing land cover change using ESA land cover time series



Analyze timber harvest pattern of using LandTrendr



Monitoring forest disturbance using CCDC