Ortho Mapping in ArcGIS

Hong Xu, Jay Chen

Outline

- ArcGIS ortho mapping platform
- Ortho mapping in ArcGIS Pro
- Ortho mapping in ArcGIS Enterprise
- Q/A

What is Ortho Mapping?

A process that corrects for geometric distortions inherent in remotely sensed imagery to produce ortho imagery products

Satellite, drone, and aerial photograph

Raw images

Ortho Mapping

Mapping and analysis with imagery in GIS

Ortho imagery products

Ortho Mapping within ArcGIS Platform

Ortho mapping is a capability in many ArcGIS software products

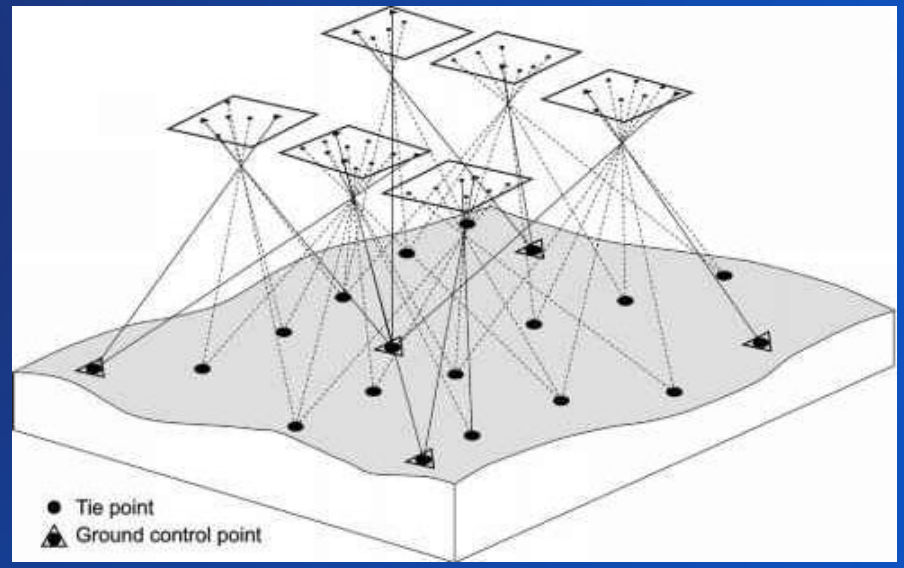
Products	Supported data	Capabilities
ArcGIS Pro Ortho Mapping	Drone, satellite, aerial	DSM, DTM, othomosaic
Drone2Map	Drone	DSM, DTM, othomosaic, mesh
Enterprise Ortho Mapping (ArcGIS Enterprise + Image Server)	Drone, satellite, aerial	DSM, DTM, othomosaic

Key Techniques Involved in Ortho Mapping

Block Adjustment

- **Automatic tie point generation using image matching technique**

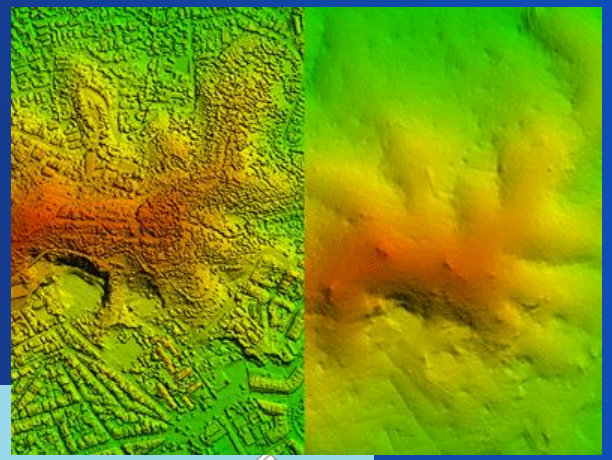
- **Triangulation**
  - **Rational Polynomial Coefficients (RPC)**
  - **Frame Camera**



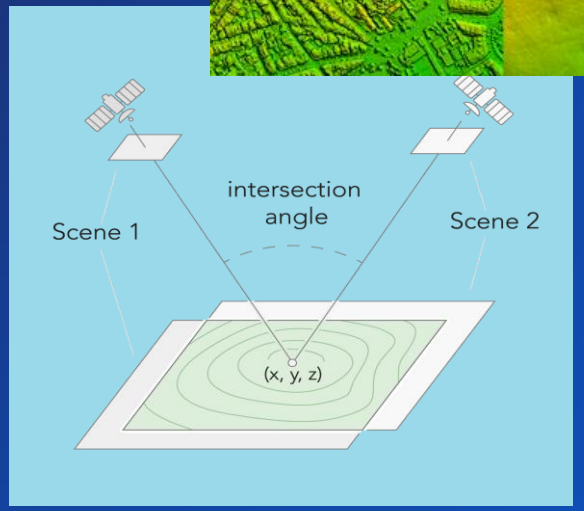
Key Techniques Involved in Ortho Mapping

Orthorectification

- **Elevation determines your map accuracy**



- **Support DTM or DSM generation**
  - **Generate point clouds from stereo pairs**
    - **ETM, SGM, or MVM**
  - **Interpolate DSM or DTM from point clouds**

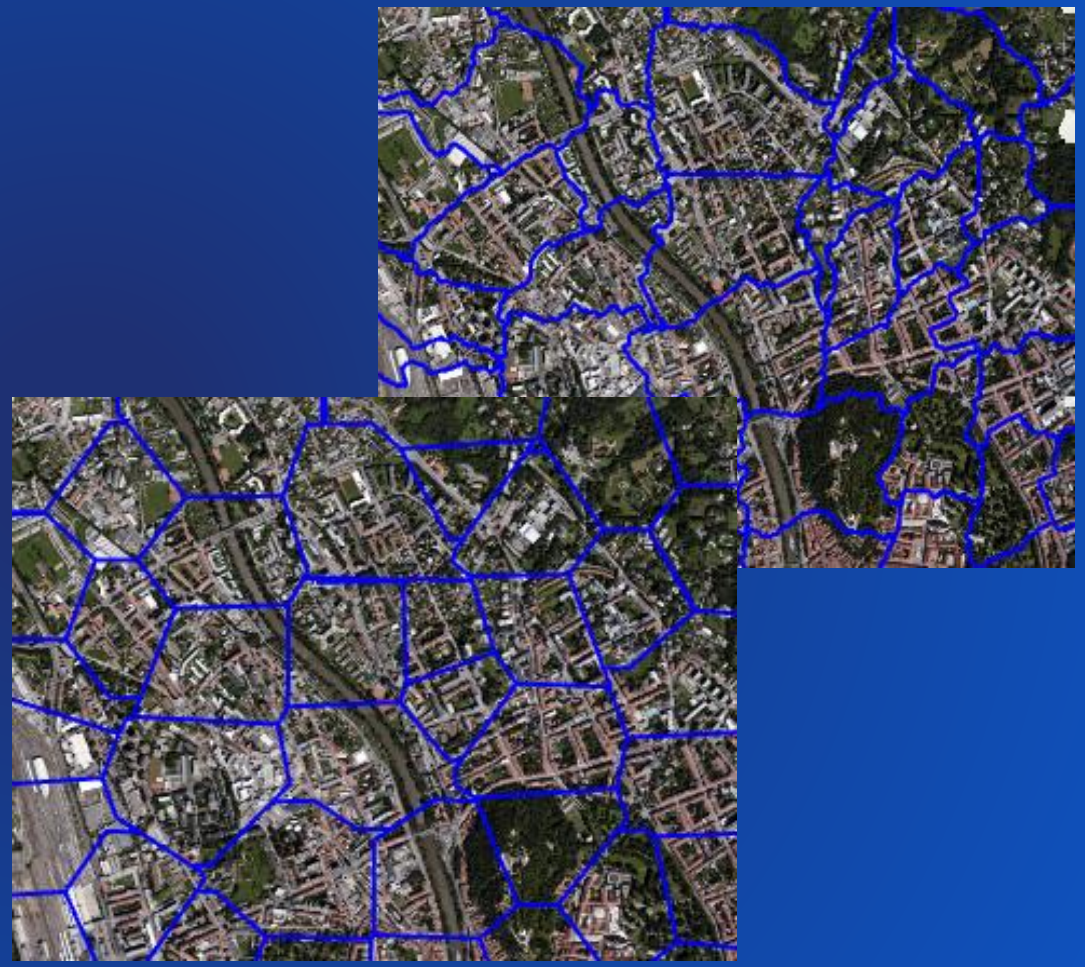


Key Techniques Involved in Ortho Mapping

Color balancing and seamline generation

- **Color balance**
  - **Balance between images**
  - **Balance to a target image**
- **Seamline generation**
  - **Voronoi**
  - **Disparity**

  - **Edit using feature topology editing**

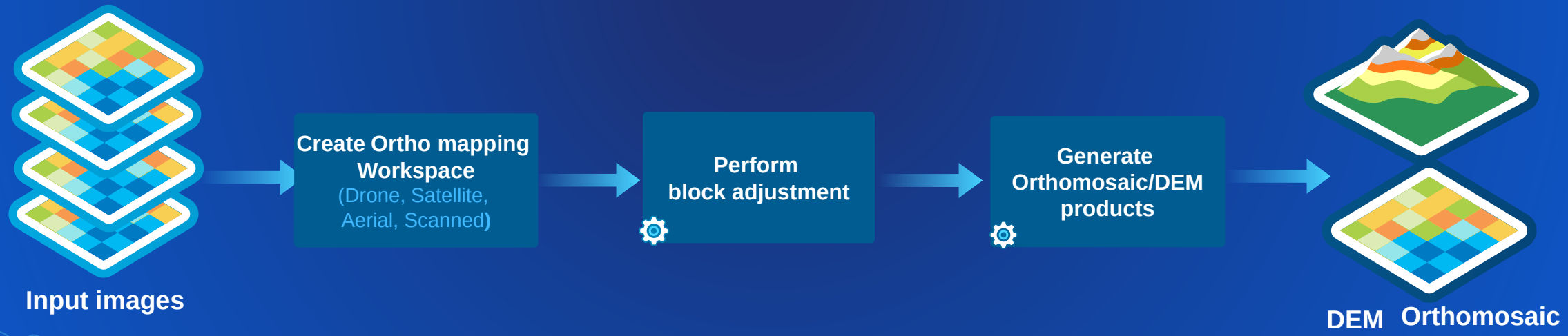


Ortho Mapping in ArcGIS Pro

Pro Ortho Mapping - User Experience

Fully automatic and guided workflow

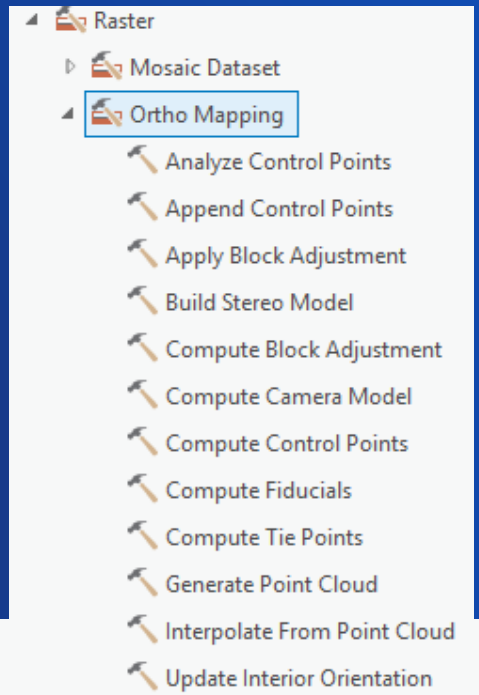
- **Ortho mapping workspace driven**
  - **Drone workspace**
  - **Satellite workspace**
  - **Aerial- digital workspace**
  - **Aerial – scanned workspace**

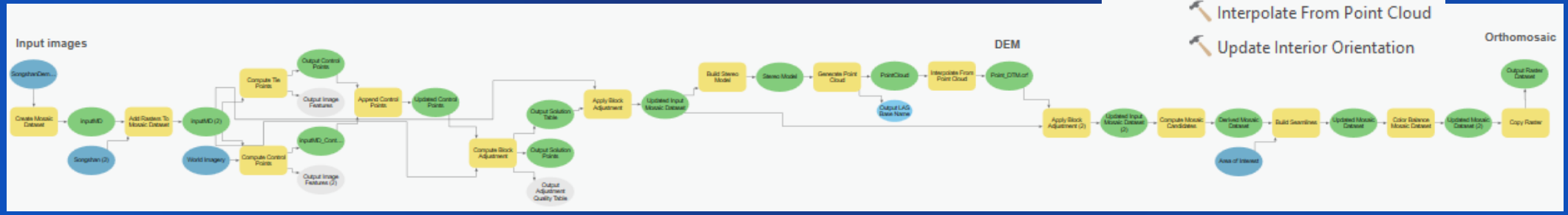


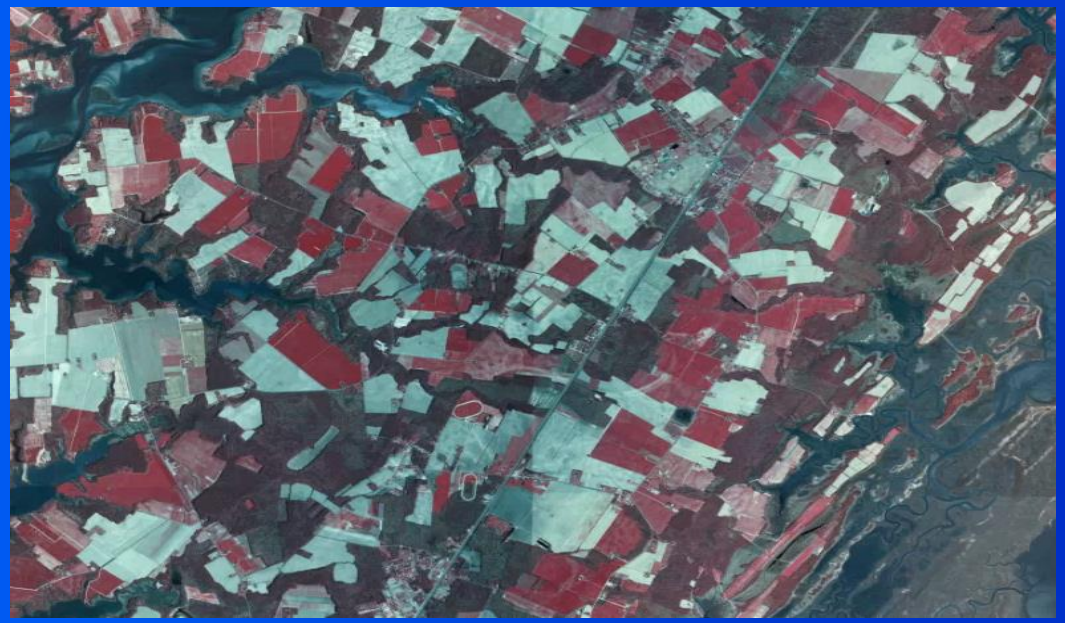
Pro Ortho Mapping – Geoprocessing Tools

For automation and advanced workflows

- **GP models**
- **Python scripting**







Demo: generate ortho mosaic from scanned images

Processing Scanned Images

Data: 4 scanned images

- **Create workspace from**
  - **EO: X, Y, Z, Kappa**
  - **Camera: focal length, pixel size, fiducials**
- **Preprocessing**
  - **Compute fiducial points**
  - **Refine interior orientation**
- **Adjust**
  - **Import GCPs**
- **Generate ortho mosaic**

Digital Aerial Imagery Workflow

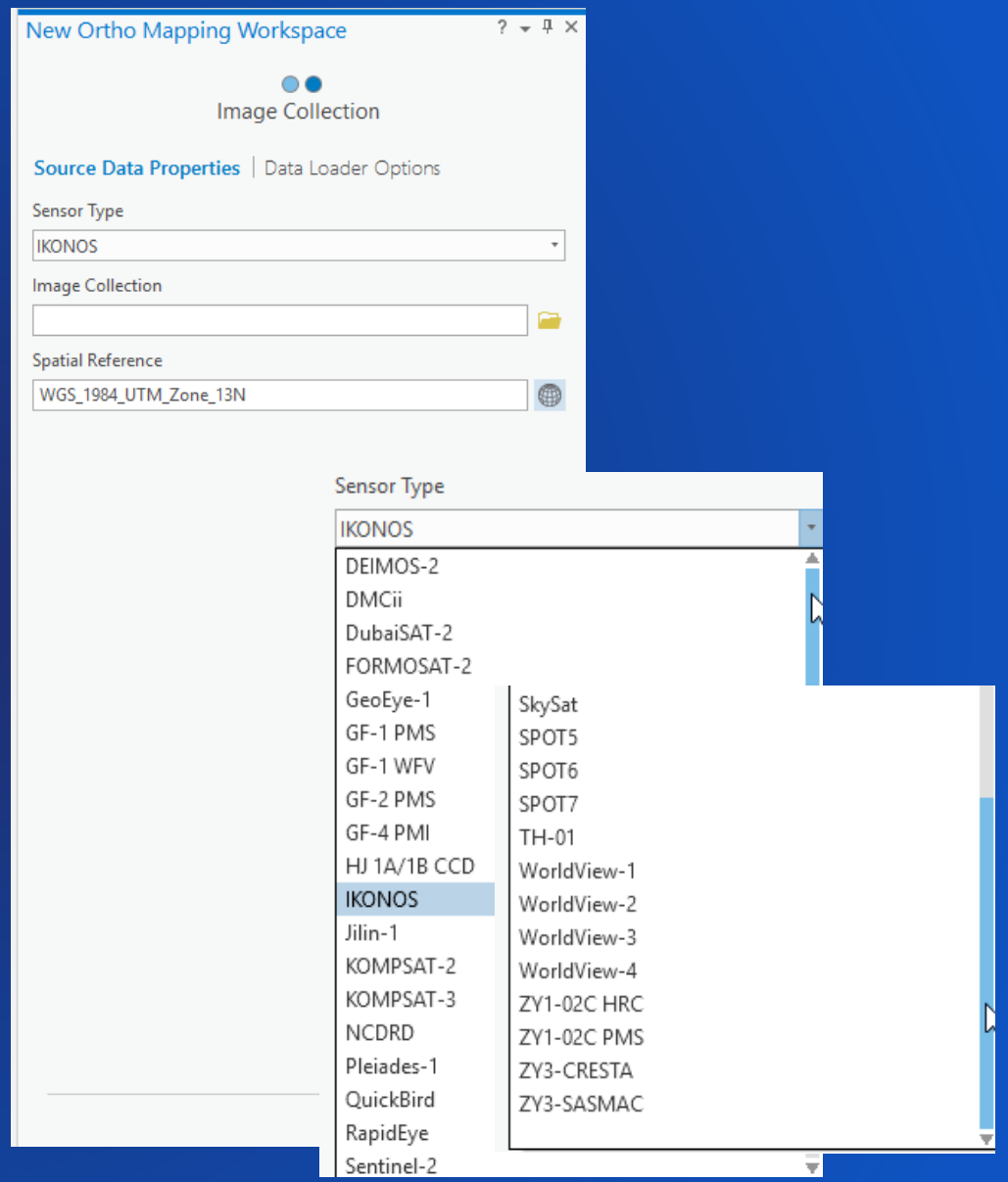
Create workspace from camera table and frame table

- **Aerial images acquired with POS system**
  - **Such as DMC II, Ultracam, Applanix, etc.**
- **Input**
  - **Frame table (EO)**
    - **Perspective X, Y, Z, Omega, Phi, kappa**
  - **Camera table**
    - **Focal length, pixel size, principal point distortions**

Satellite Workflow

Create ortho mapping workspace from a collection of images

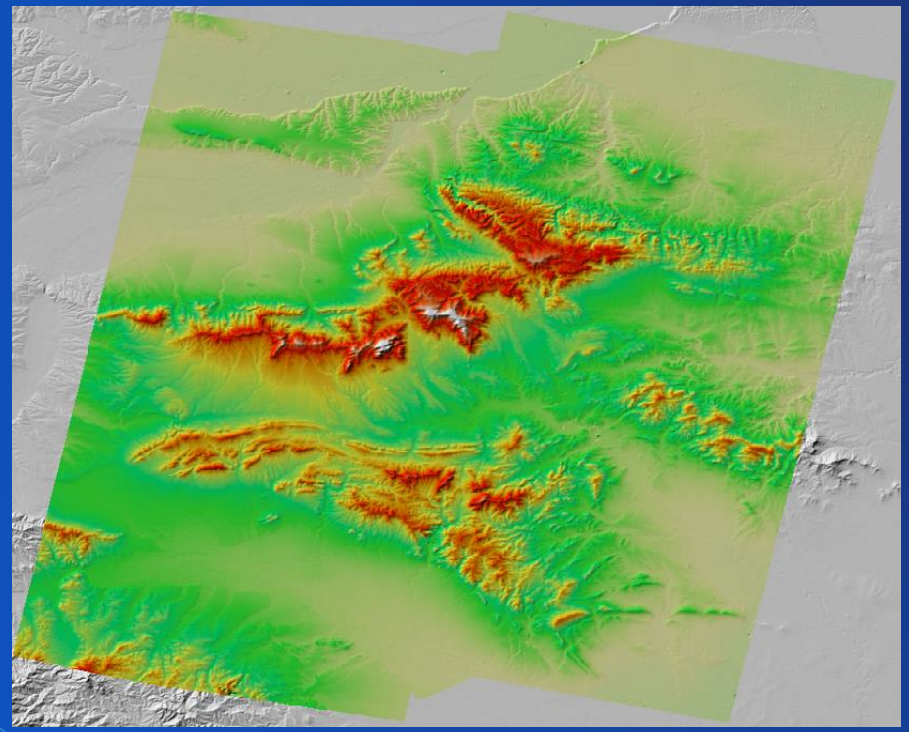
- **Input**
  - **Images with RPC camera model**
  - **A local elevation dataset**
  - **GCPs**
- **Processing template**
  - **Panchromatic**
  - **Multispectral**
  - **Pansharpened**
  - **Etc.**



Satellite Workflow

ZY3 images, 16 scenes (forward, backward, and nadir images)

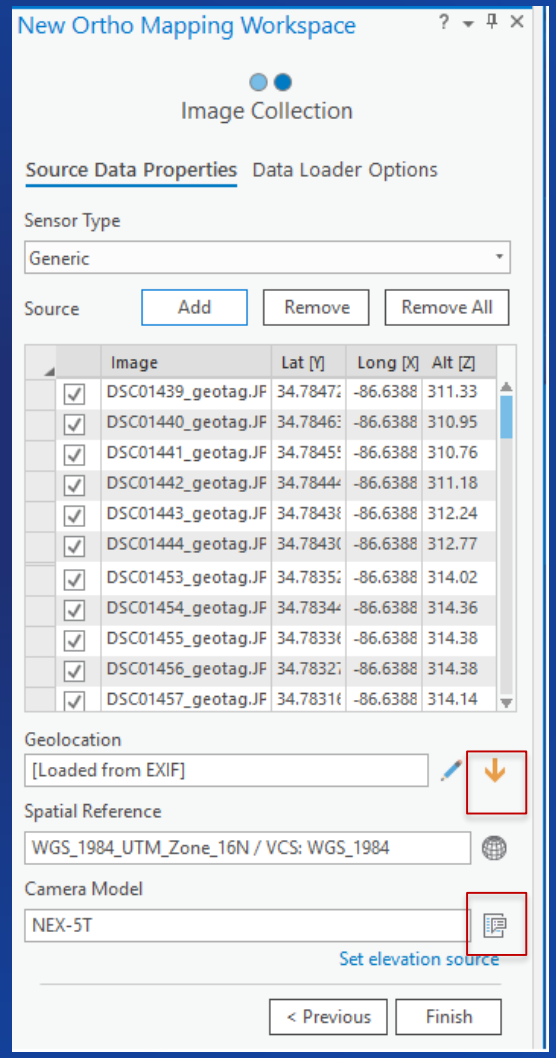
- **Generated DTM, pansharpen orthomosaic**

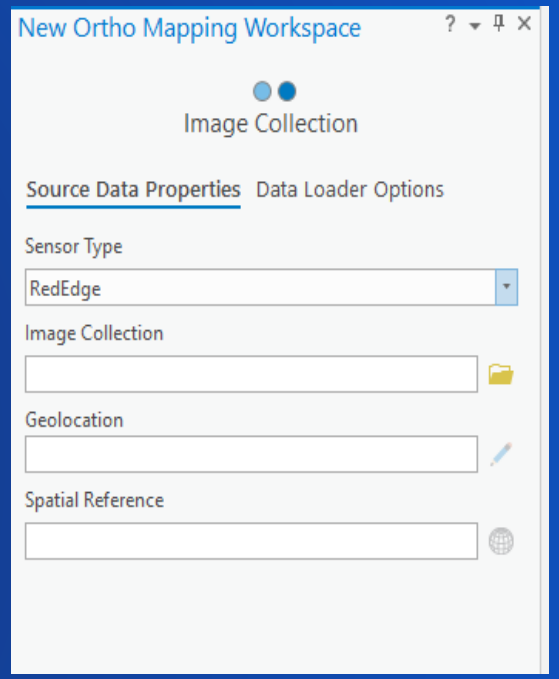


Drone Workflow

Create workspace

- **Input**
  - Images with internal GPS (EXIF)
  - Or external GPS table
- Support most major cameras
  - Allow user to define
- Multi-sensor drones (2.4)
  - RedEdge and Altum

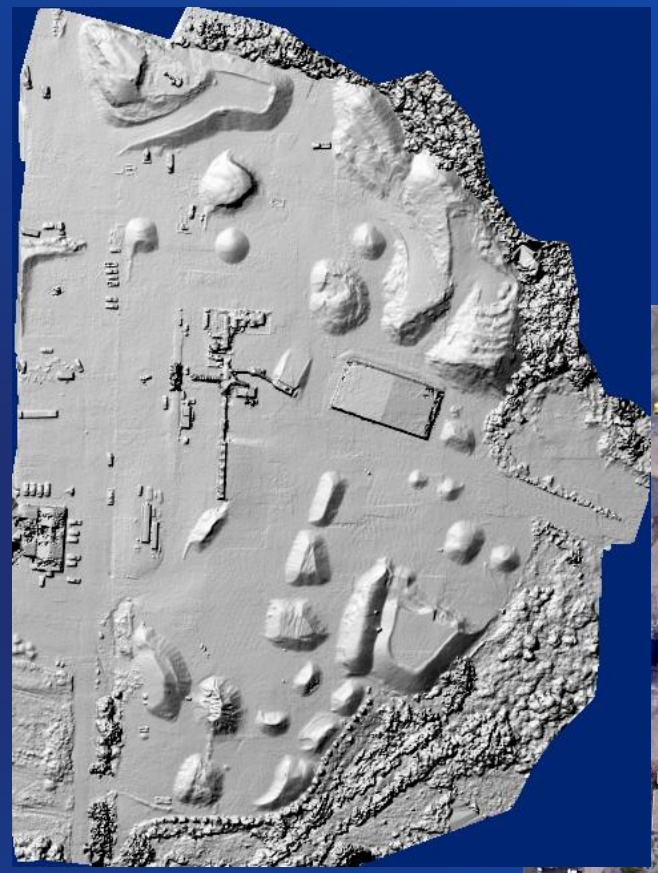


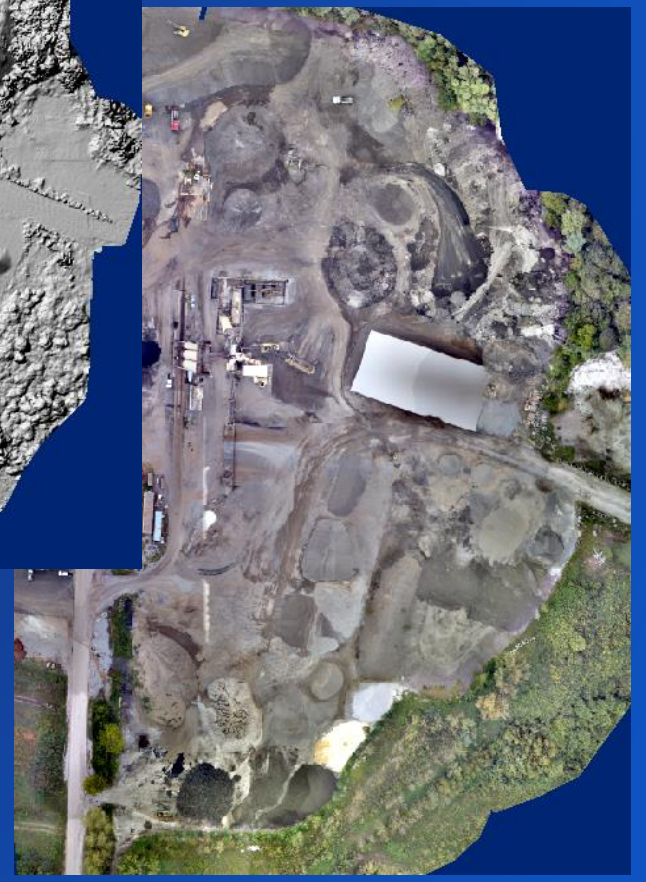


Drone Workflow

Example: 225 images, GSD=0.016

- Orthomosaic and DSM

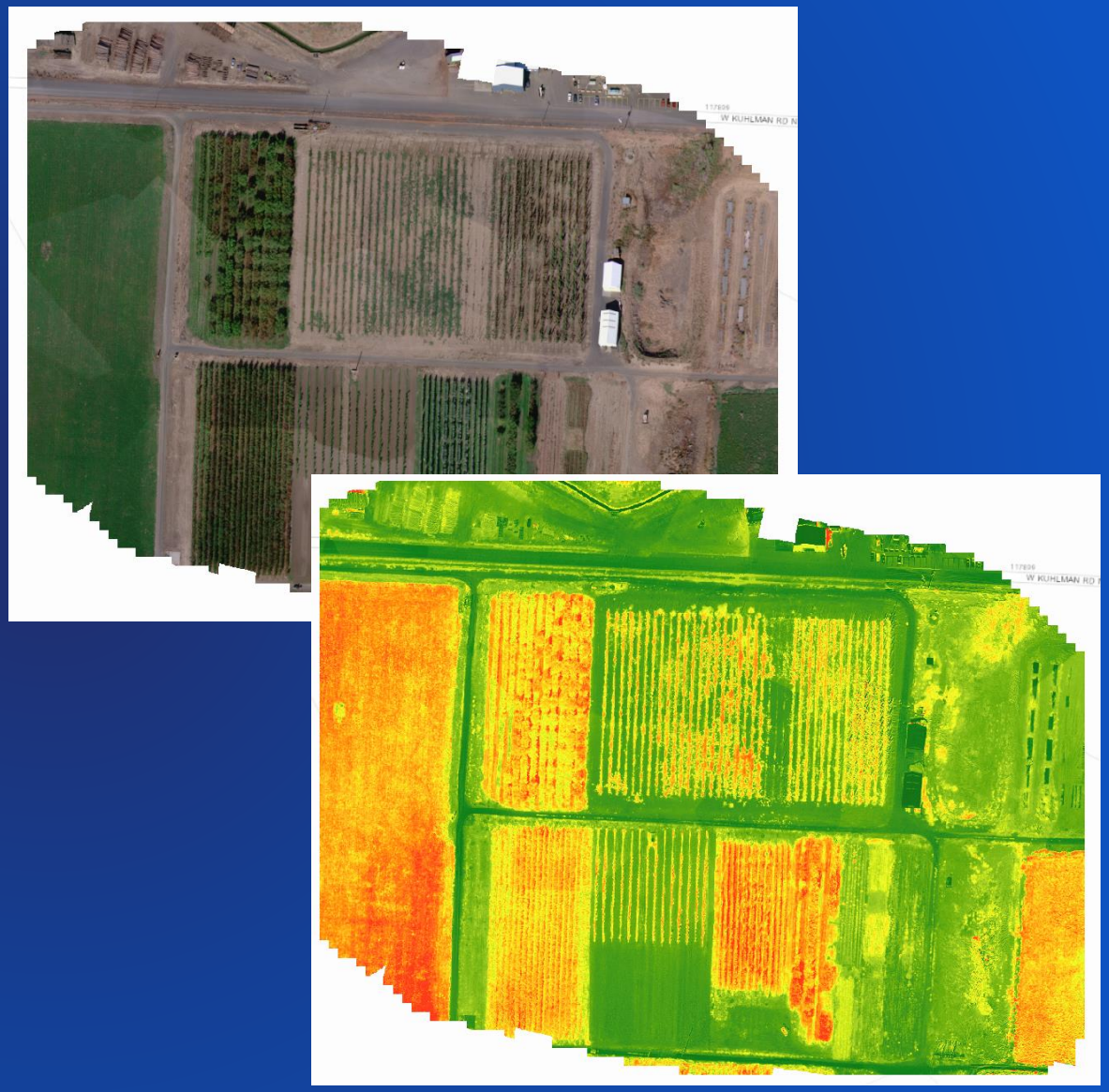




Drone Workflow

Example: processing Altum dataset

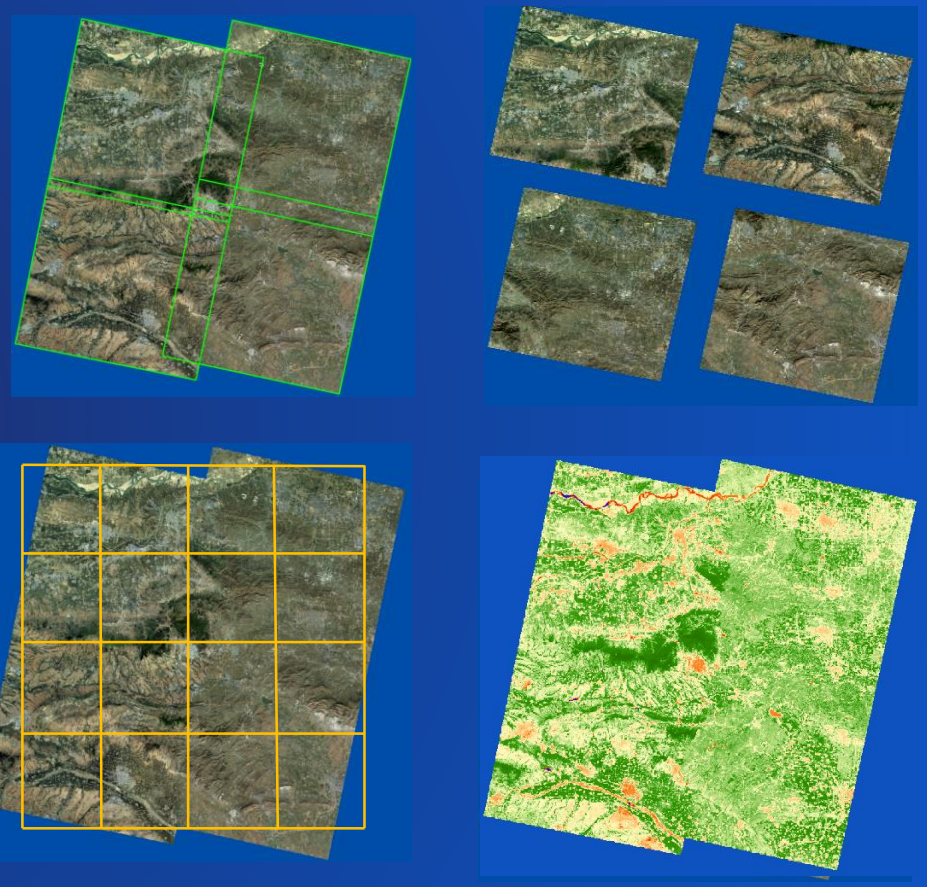
- **Adjust (tie point generation, band alignment, triangulation)**
- **produce surface reflectance and NDRE index map**



More on Ortho Mapping Products

Ortho Mapping is part of ArcGIS Pro

- Ortho mosaic dataset
- Ortho photos
  - Export Mosaic Dataset Items tool
- Ortho image tiles
  - Split Raster tool
- Tile caches
  - Manage Tile Cache tool
- Index map using raster functions
- Measure Volume using DEM (2.4)



What’s Coming Next

- Pro 2.5
  - Tie Point Editor and Image Inspector
  - SRTM setup for users to download
  - Workflow document with sample datasets
  - Improve ortho mapping engine and user experience enhancement

Ortho Mapping in ArcGIS Enterprise

Ortho Maker – Workflow Simplified

Upload Drone Imagery

Perform Block Adjustment

Create Products

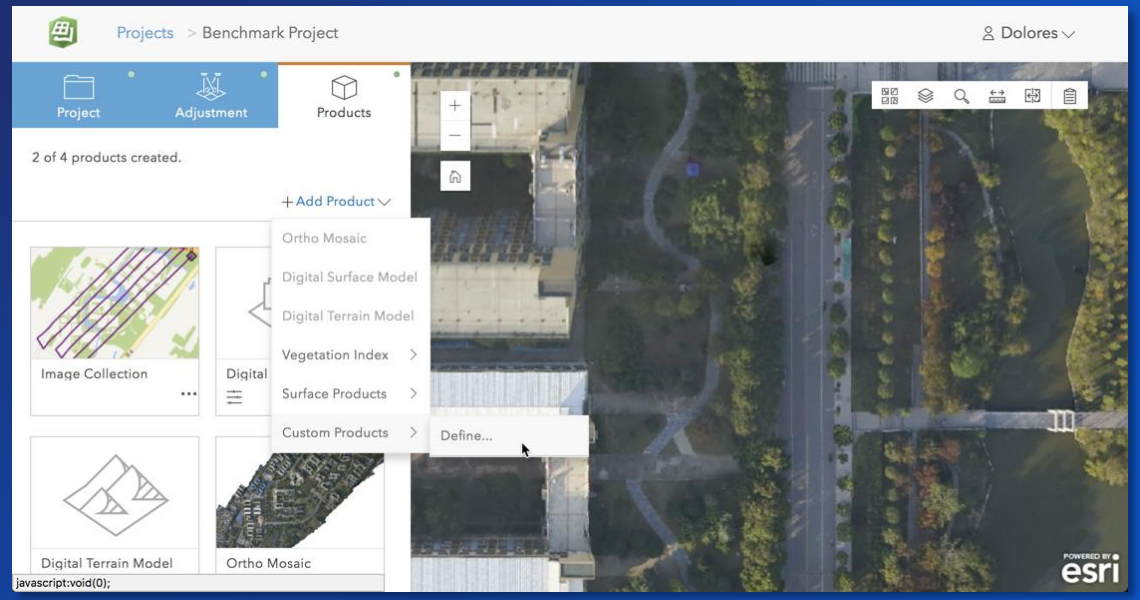
…as easy as 1-2-3, manual or automatic

ArcGIS Enterprise Ortho Mapping Offerings

- ArcGIS Pro as client
- Ortho Maker
  - Provided as capability in ArcGIS Enterprise, NOT a product
  - Requires ArcGIS Image Server to Provide Ortho Mapping Services
  - Supports Drone Imagery
- Develop Story and API
  - ArcGIS API for Python
  - Suitable for Ortho Mapping Automation/Integration

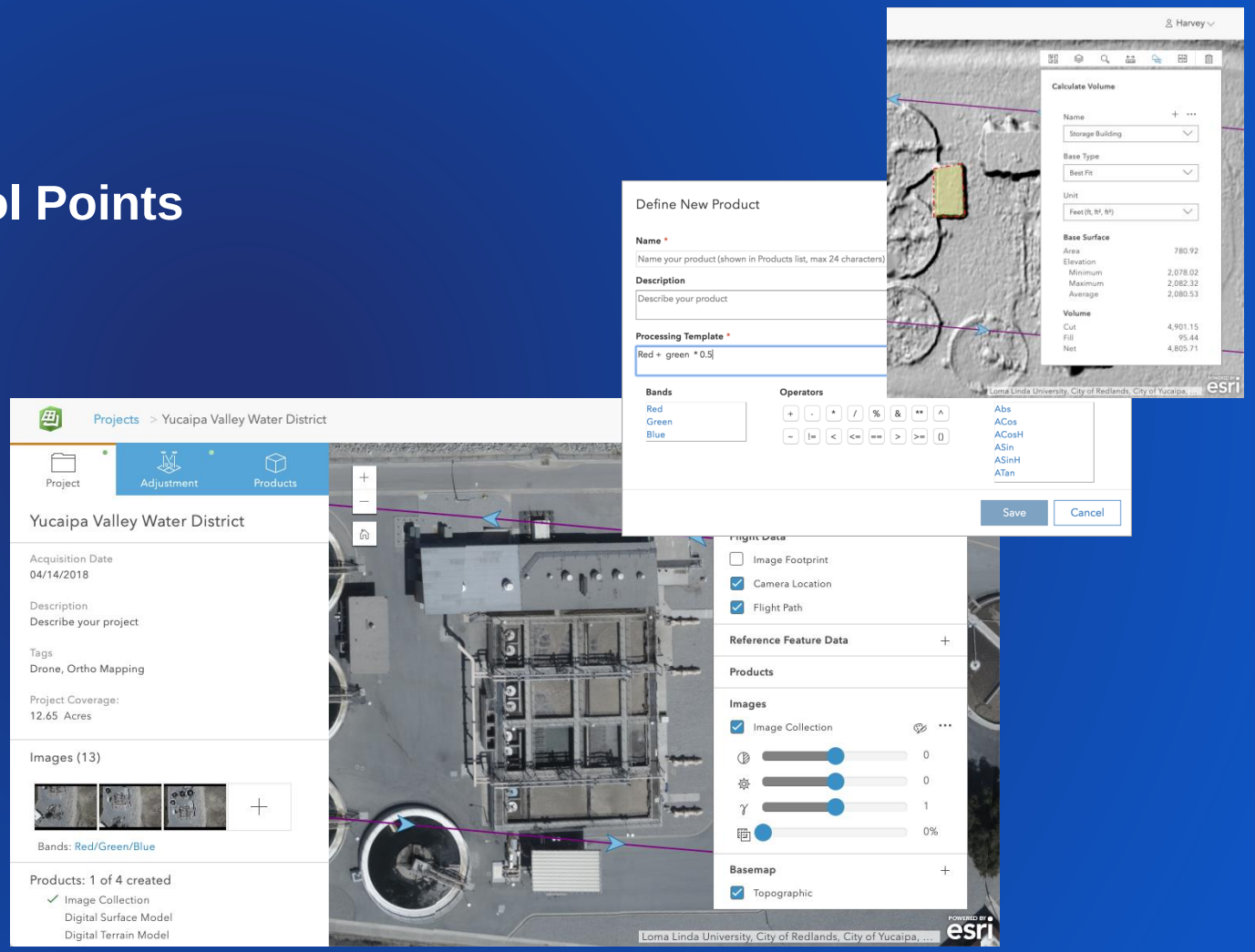
Ortho Maker – Key Benefits

- Seamless Integration with ArcGIS Enterprise + ArcGIS Image Server
- Focused UX for both Professionals and Non-Professionals
- Supports Templates for Re-using Processing/Product Settings
- Products accessible as Image Service Items for Collaboration
- Scalable



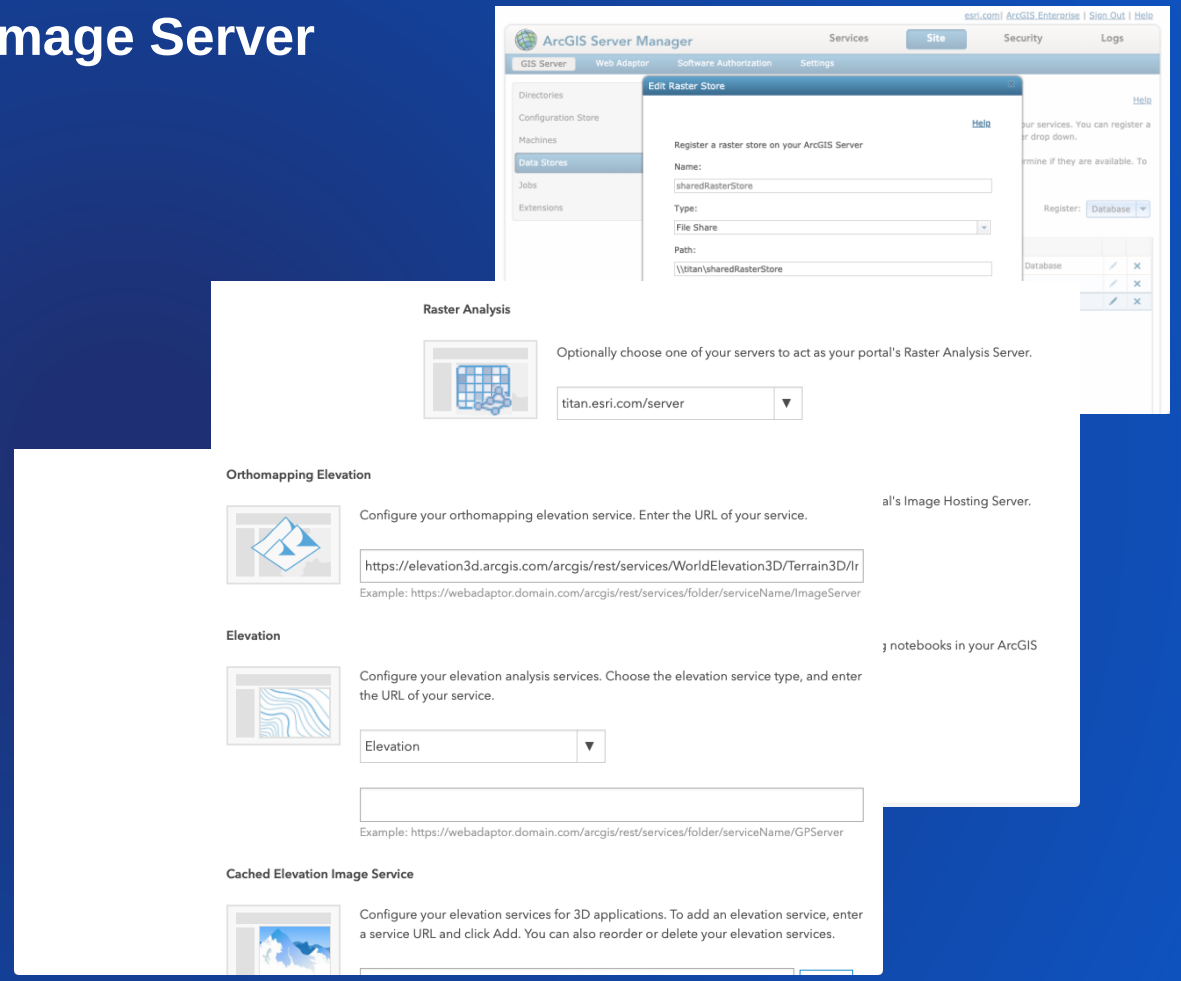
Ortho Maker – Capabilities

- Block Adjustment
- Refinement using Ground Control Points
- Built-in Products
  - Ortho Mosaic, DSM, DTM …
- Custom Products
- Sharable Templates
- Volume Calculation
- Report generation as PDF



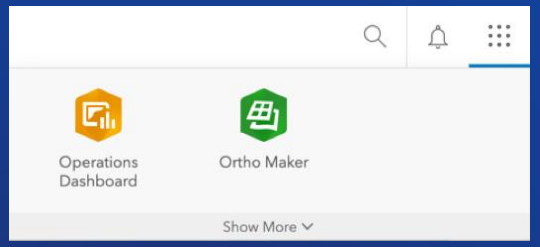
Ortho Maker - Configuration

- Requires ArcGIS Enterprise + ArcGIS Image Server
- Configurations
  - Raster Analytics
  - File Share Raster Data Store
  - Set Ortho Mapping Elevation Service
- Publisher Account
  - Content creation/edit/deletion
  - Service Publishing

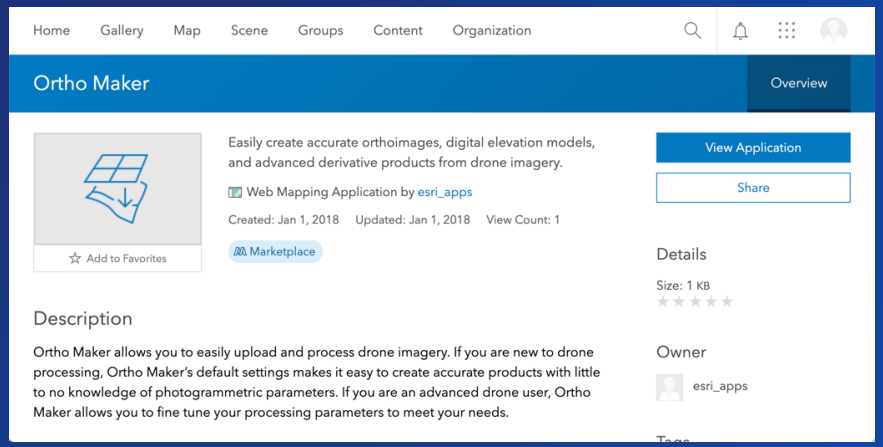


Ortho Maker – How to Access the App?

- App Launcher



- Ortho Maker App Item



- https://<portalURL>/<webAdaptor>/apps/orthomaker

Ortho Maker Demo

Presenter(s)

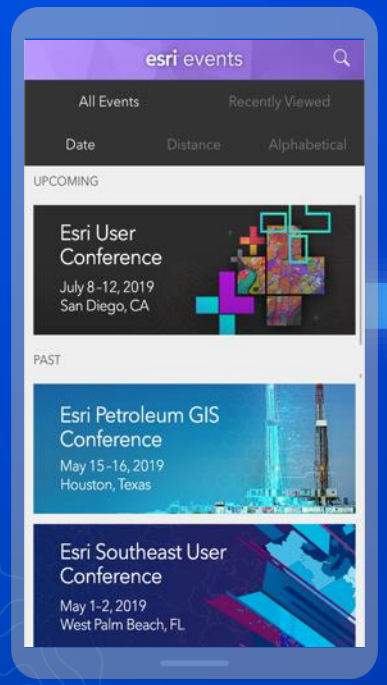
Ortho Maker – What's Next

- ArcGIS Enterprise
  - Support Images from Data Store
  - Support RedEdge/Altum
  - Data Quality Checking
  - and more…
- SaaS offering for ArcGIS Online

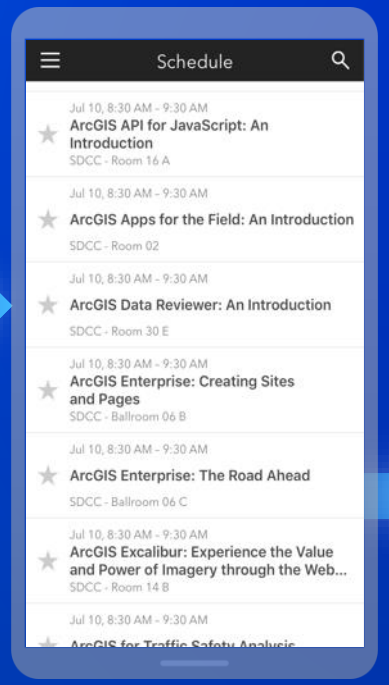
- **We would like to hear from you!**
  - **Please email orthomaker@esri.com**

Please Share Your Feedback in the App

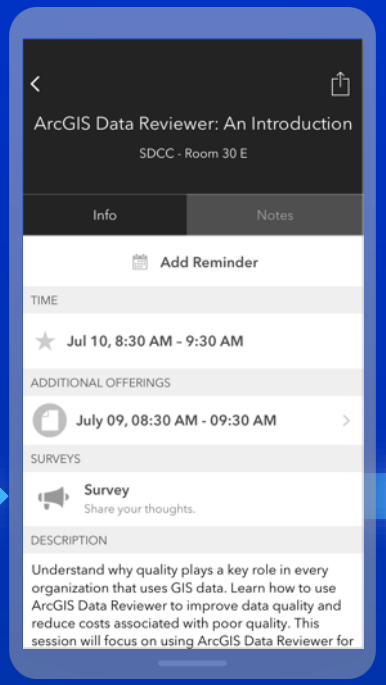
Download the Esri Events app and find your event



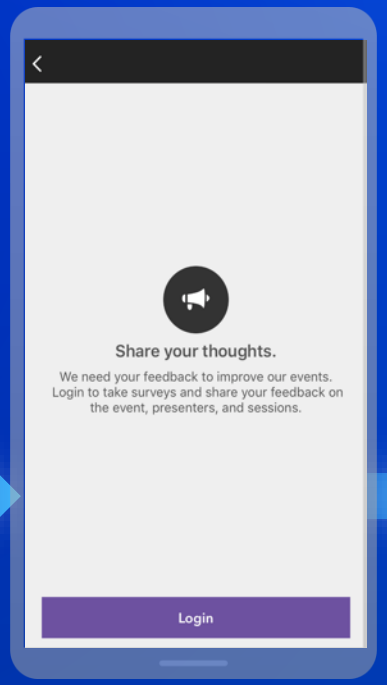
Select the session you attended



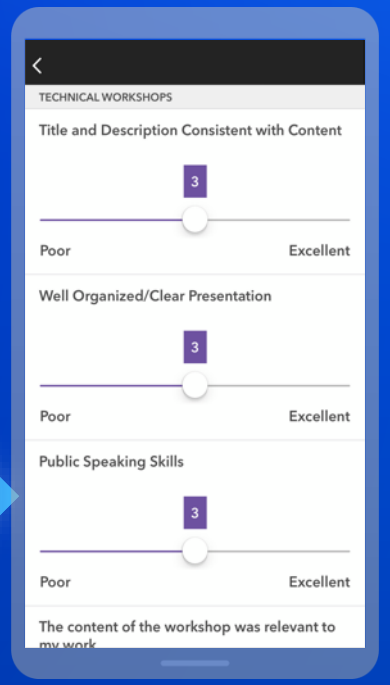
Scroll down to “Survey”



Log in to access the survey



Complete the survey and select “Submit”



See Us Here

WORKSHOP	LOCATION	TIME FRAME
• Drone2Map: An Introduction	• SDCC – Ballroom 06E	• 8:30 am – 9:30 am, Wednesday
• ArcGIS Pro: Best Practices for Managing and Serving Processed Ortho Imagery	• SDCC – Expo Demo Theater 02	• 11:15 am – 12:00 pm, Wednesday
• Creating Orthoimagery From Aerial and Satellite Imagery	• SDCC – Expo Demo Theater 02	• 2:30 pm – 03:15 pm, Wednesday
• ArcGIS Enterprise: Deploying Distributed Raster Analytics	• SDCC – Room 05 A	• 8:30 am – 9:30 am, Thursday
• Managing and Serving Elevation and Lidar Data	• SDCC – Expo Demo Theater 02	• 11:15 am – 12:00 pm, Thursday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