Working with Elevation Services

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Outline

• ArcGIS Online World Elevation & 3D Elevation Cache for Pro
  • What is included?
    - Data and Tools
  • How can I use it?
    - Modes of use
    - Client Applications
  • What are the details?
    - Technical and Legal
ArcGIS Online World Elevation & “Terrain 3D” for 3D Visualization

- **ArcGIS Online World Elevation**
  - Supports analysis & visualization
  - Accessed using REST calls defined by REST API (2D AOI, polyline, or points…)

- **Terrain 3D cached elevation service**
  - Optimized to quickly generate an oblique 3D perspective view (multiresolution)
  - Not intended for analysis
  - Automatically connected into ArcGIS Pro
Data sources

World Elevation Services - Data Sources

Public domain elevation data – 2+ TB

1 km Bathymetry (GEBCO)
250m GMTED
90 m SRTM & EarthEnv-DEM90
30 m SRTM (most of world)
30 m NED (North America)

12m Airbus (global)
10 m (USA, Norway, Austria)

Many datasets < 10m
• USA, Denmark, Finland, Spain,
• UK, Netherlands, Austria

…more coming each year

http://esriurl.com/ElevationCoverageMap
More elevation data - Arctic DEMs

- Different data source, different image service
- Details later in presentation
“How can I use these services?”

• Usage Modes
  - Visualization
  - Data Values
  - Geoprocessing

• Client Applications
  - ArcMap, ArcGIS Pro, ArcGIS Online, Custom web apps

• End Users vs. Developers
Modes of Use
ArcGIS Online World Elevation
Usage Modes

- Visualization
  - Hillshade (Grayscale, Elevation Tinted)
  - Slope Map & Aspect Map
Usage Modes

• Visualization
  - Hillshade (Grayscale, Elevation Tinted)
  - Slope Map & Aspect Map

• Data Values
  - Orthometric & Ellipsoidal Height - for Orthorectification, Local Analysis…
  - Slope & Aspect
Usage Modes

- **Visualization**
  - Hillshade (Grayscale, Elevation Tinted)
  - Slope Map & Aspect Map

- **Data Values**
  - Height
  - Slope & Aspect

- **Server-side Geoprocessing Services**
  - Viewshed, Profile, Statistics, Watershed, Trace Downstream
Services

• Image services: elevation values & derived products
  - Terrain
  - TopoBathy
  - Dedicated NED 30m (USA)

• Server-side Geoprocessing (GP) services
  - Profile
  - Summary Statistics
  - Viewshed
  - Watershed (Hydro)
  - Trace Downstream (Hydro)

Mode of access depends on the app
Using World Elevation
ArcGIS Pro 2.2
Client Applications

- ArcGIS Online web map
Client Applications

- ArcGIS Online web map
- ArcGIS Pro, ArcMap (10.1.1 or later)
Client Applications

- ArcGIS Online web map
- ArcGIS Pro, ArcMap (10.1.1 or later)
- Custom web applications
  - Cartography
  - Data for elevation analysis
  - Custom geoprocessing
  - ArcGIS API’s vs. OGC (WMS, WCS – limited functionality)
  - Web AppBuilder
    - See additional widgets specifically for imagery http://esriurl.com/WABIS
Connecting and Using – ArcGIS Pro

Default is Terrain (orthometric height, 32 bit float)

May want to use DRA (Dynamic Range Adjustment) if viewing Terrain values
Elevation products on demand via Processing Templates

- 9 Raster Functions to create on-the-fly products
Connecting and Using (other apps)

1. Start in ArcGIS Online Group: “Elevation Layers”
   - Base image service is “Terrain”
   - Or choose layer preconfigured with Raster Function
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2. Start in ArcGIS Online Web Map
   - “Add” from Living Atlas, “Terrain”

3. OR Start in ArcMap
   - “Add Data” from ArcGIS Online, “Terrain”
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• Authentication required
  - ArcGIS, AGOL map:
    - ArcGIS Online Subscription Account
    - Custom REST-based apps
      - Acquire token
      - Pass token in REST request
Arctic elevation
Arctic elevation service and web app

- Overlapping DSMs generated by the POLAR GEOSPATIAL CENTER (PGC) from Digital Globe WorldView satellite imagery
  - Attributed with acquisition date
  - Resolutions 2, 5 and 8 meters
  - Polar projection WGS_1984_EPSG_Alaska_Polar_Stereographic

http://esriurl.com/ArcticElevationServices (group)
http://esriurl.com/ArcticDEMExplorer (app)
http://esriurl.com/ArcticDEMChange (app)

Data courtesy of https://www.pgc.umn.edu/ and http://www.digitalglobe.com
Arctic DEM Change App

Pick a point to get a height graph through time

“See Change” to compare 2 dates

http://esriurl.com/ArcticDEMChange
ArcGIS Online
Terrain service
A few important details
Terms of Use

- Must log in with ArcGIS Online Subscription account

- Services with no cost in terms of AGOL Credits:
  - Image services & functions (elevation, hillshade etc.)
  - ElevationSync analysis: Profile (max 100 points; ‘sync’ = synchronous)

- Geoprocessing services that will consume Credits:
  - Hydrology analysis: Trace Downstream and Watershed
  - Elevation analysis: Profile, Summarize Elevation, and Viewshed (These are asynchronous; Profile max 1000 points)
    - 1 credit per 1000 features!
Resources

World Elevation group on ArcGIS Online:  http://esriurl.com/6548

FAQs for World Elevation services: http://esriurl.com/ElevationFAQ

Community Elevation Contributions: http://esriurl.com/CommunityElevation

For developers:

AGOL elevation analysis: https://developers.arcgis.com/rest/elevation/

Export AOI: http://esriurl.com/ImageServiceREST

Image Service Widgets for Web AppBuilder: http://esriurl.com/WABIS

Open for questions… cbenkelman@esri.com

Note different APIs
Adding custom elevation into ArcGIS Pro

Optional Demo, if time permits