iDesktop 2D&3D Functions Training

Lecture: Amber Li

Content

- Buffer & Overlay Analysis
- Raster Analysis
- Organization and Application of 3D Data
- Models in 3D Scene
- Effects in 3D Scene
- 3D Analysis

PART 01

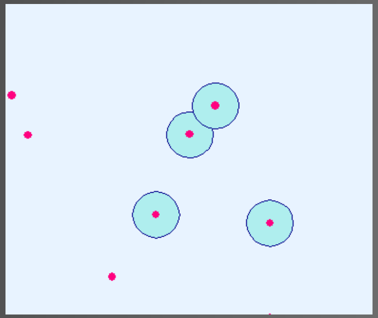
➢Buffer & Overlay Analysis

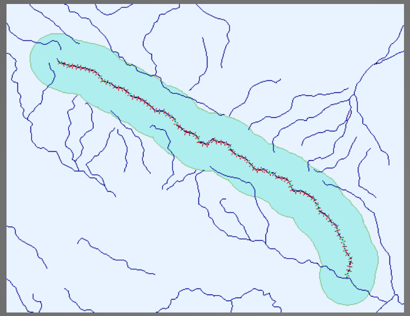
Overview

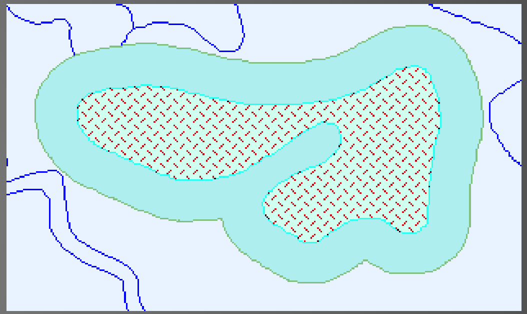
- Buffer Analysis
  - Create Buffer for Selections/ Dataset
  - Create Multiple Ring Buffer
- Overlay Analysis
  - Clip
  - Erase
  - Intersect
  - Union
  - Identity
  - XOR
  - Update

Buffer Analysis

- What is buffer?
  - The extension space created around a given object, such as a point, a line, or a polygon.



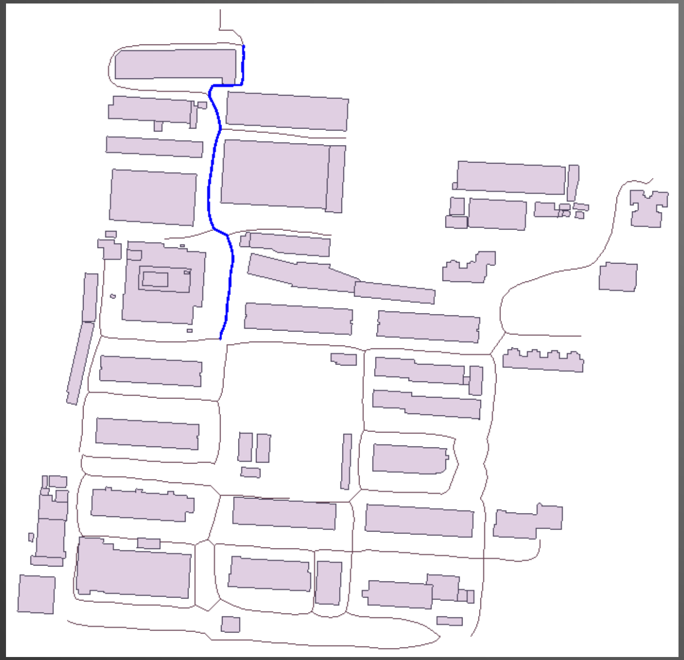


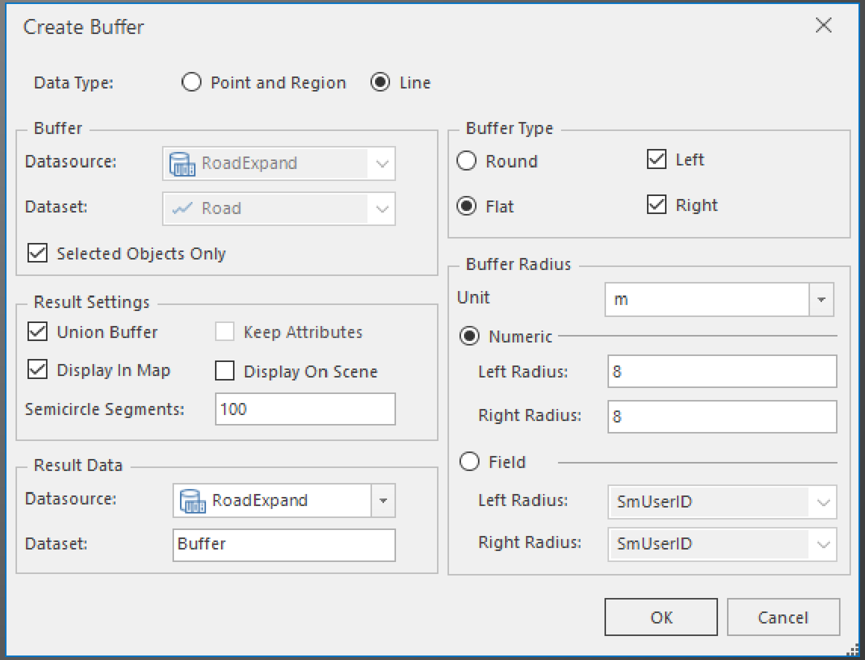


- Application Examples:
  - Create buffer for the selected road line and then use the buffer result to query residential buildings intersect with the buffer region.
  - Get affected region around some dangerous spots.
  - What neighborhoods will be affected by the flood?

Create Buffer for Selection

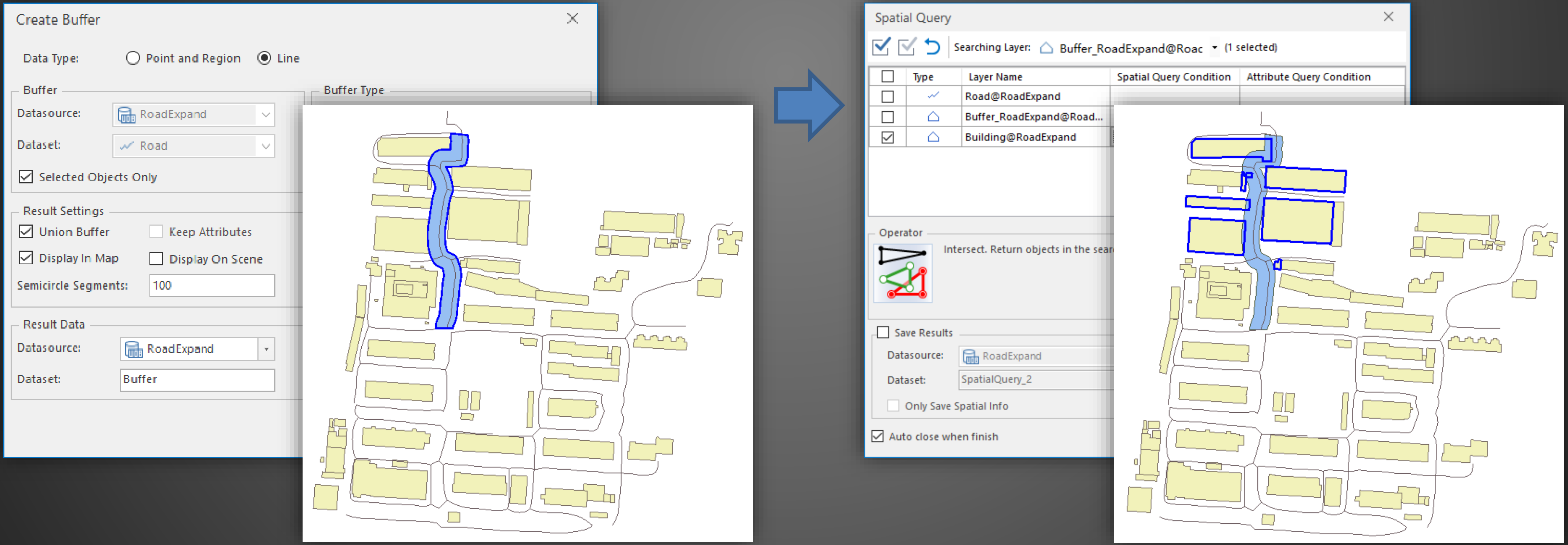
- Create buffer for point, line, or region.
- The left and right buffer radius can be different for lines.
- Union Buffer can dissolve the left and the right buffer space.
- The buffer end type for lines can be round or flat.





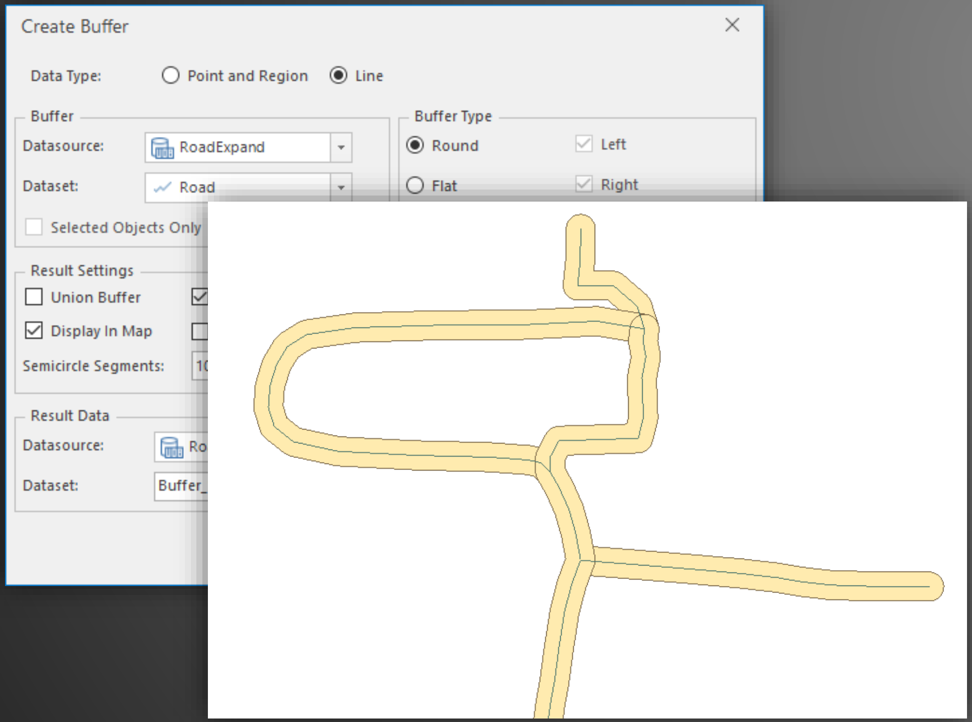
Exercise:

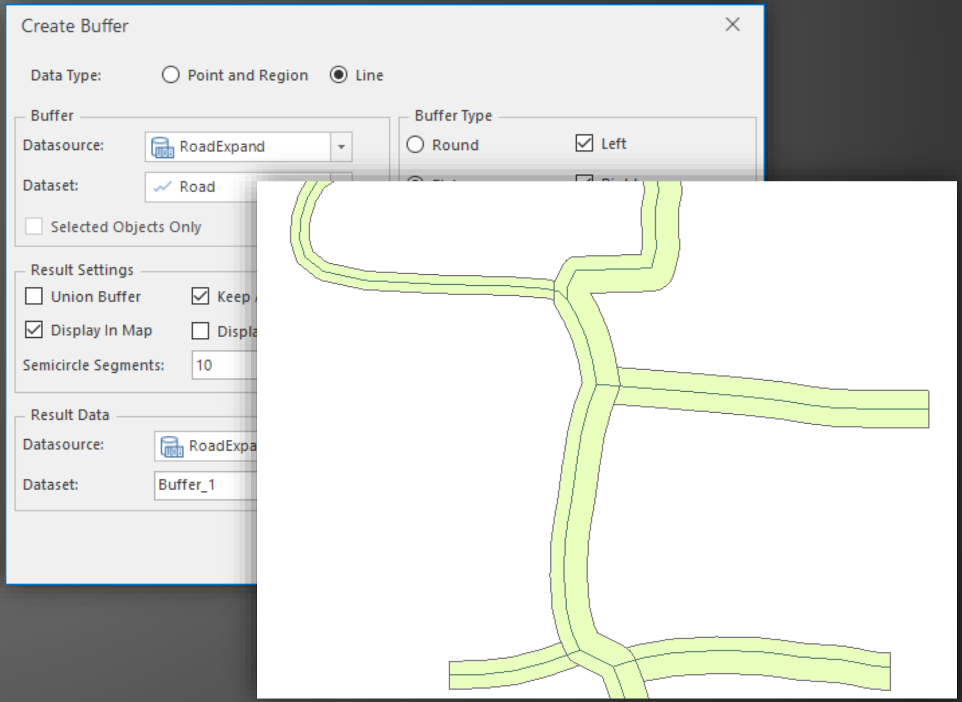
- Find buildings that will need to be demolished due to the expansion of a road.
- Use spatial query to get the affected buildings.



Create Buffer for Dataset

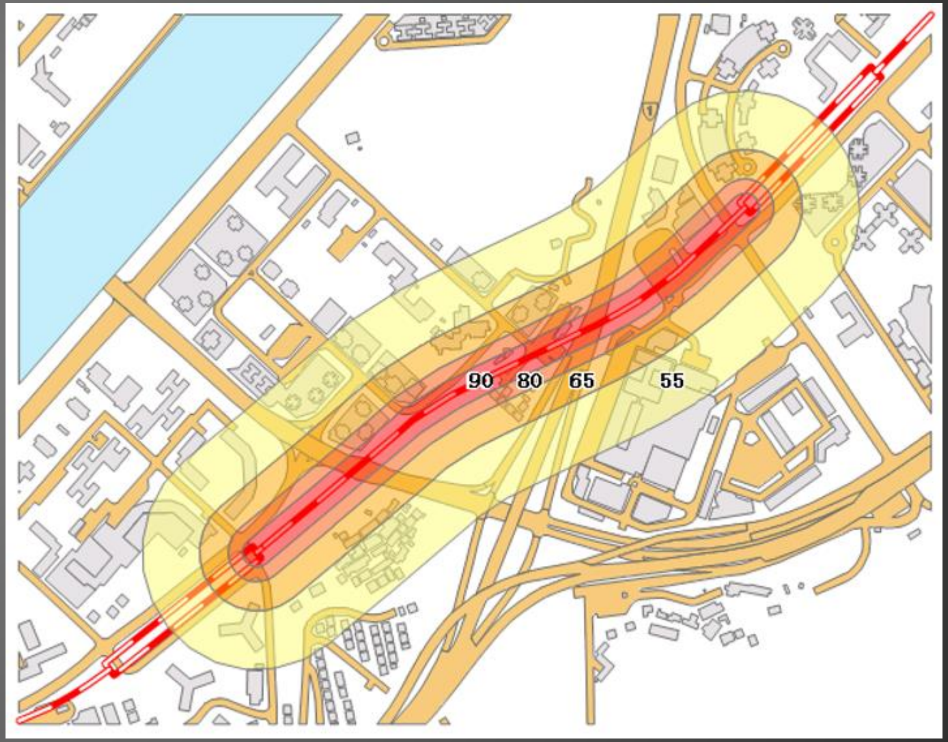
- Generate buffer region dataset for a road dataset.
- Compare Round & Flat buffet type, Numeric & Field buffer radius.





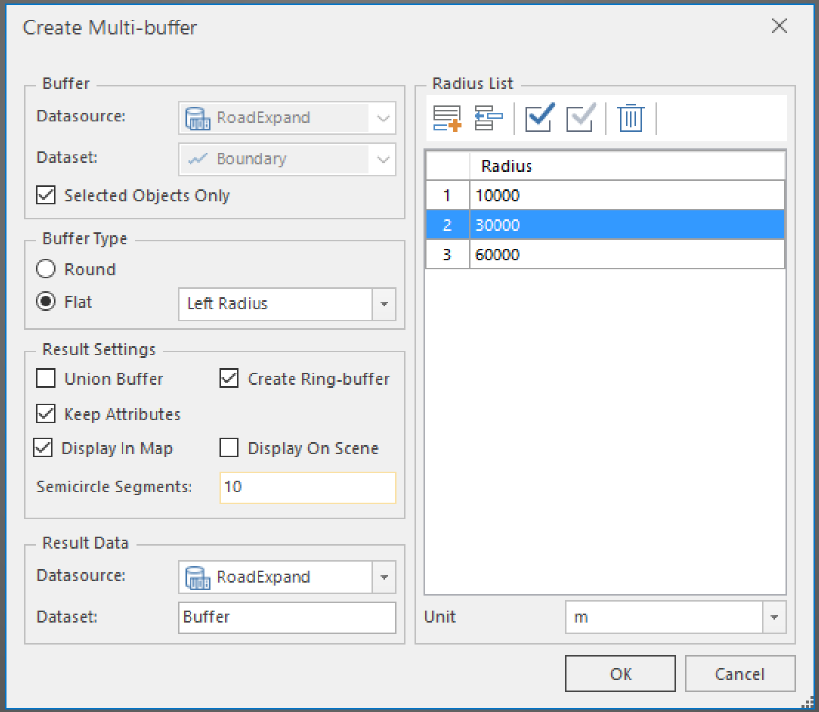
Create Multi-Buffer Zone

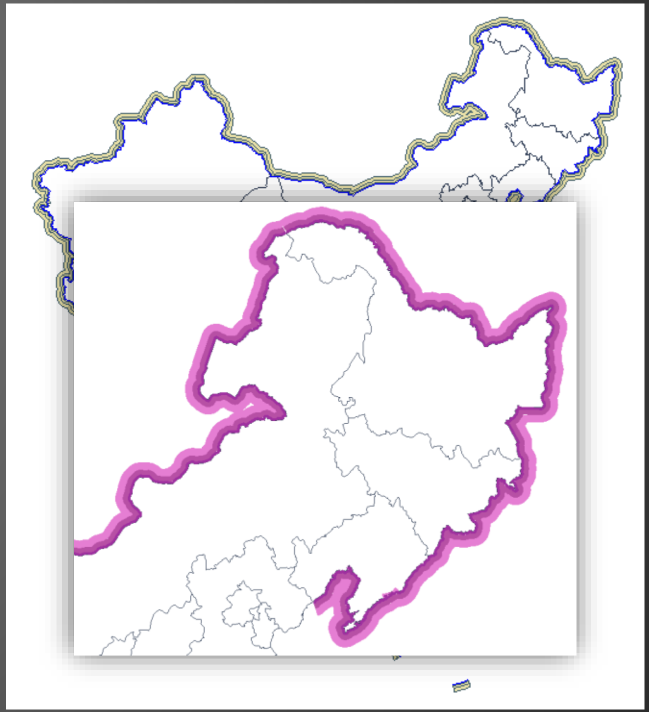
- Create multi-buffer zone for a railway line to analyze different levels of noise affection to the residential areas nearby.
- Create multi-buffer zone
  - Point, line, or region dataset
  - Several buffer radius



Exercise:

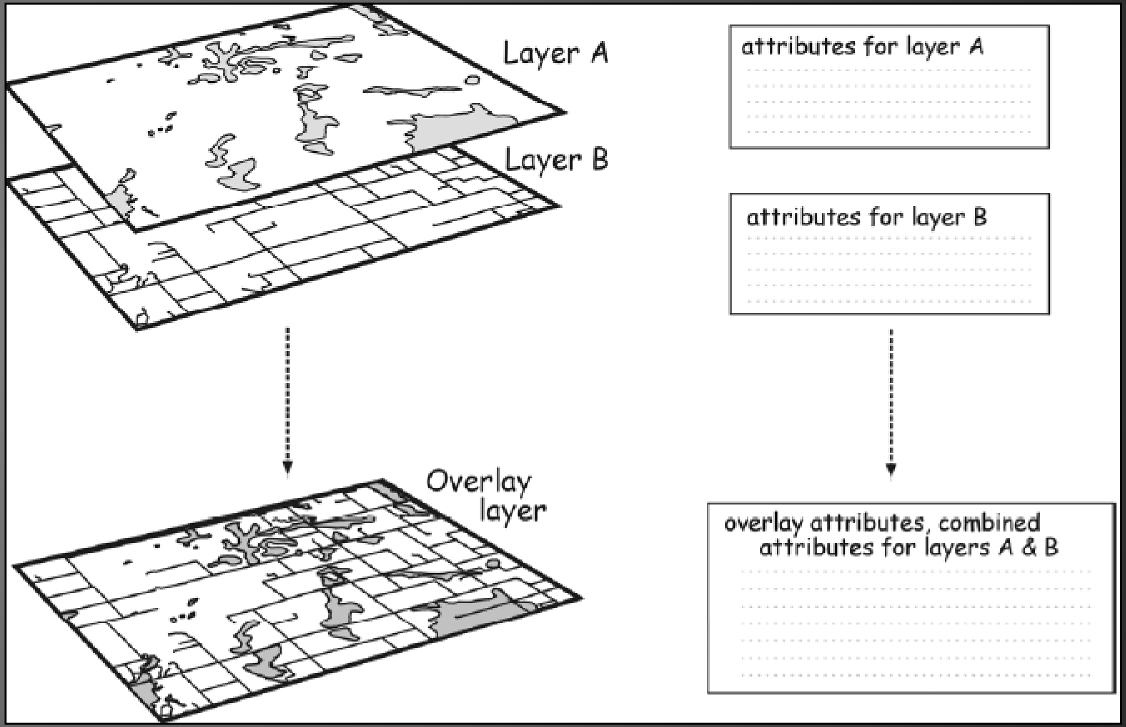
- Create gradient effects for country boundary(id=10), and make a unique map for the buffer result dataset.





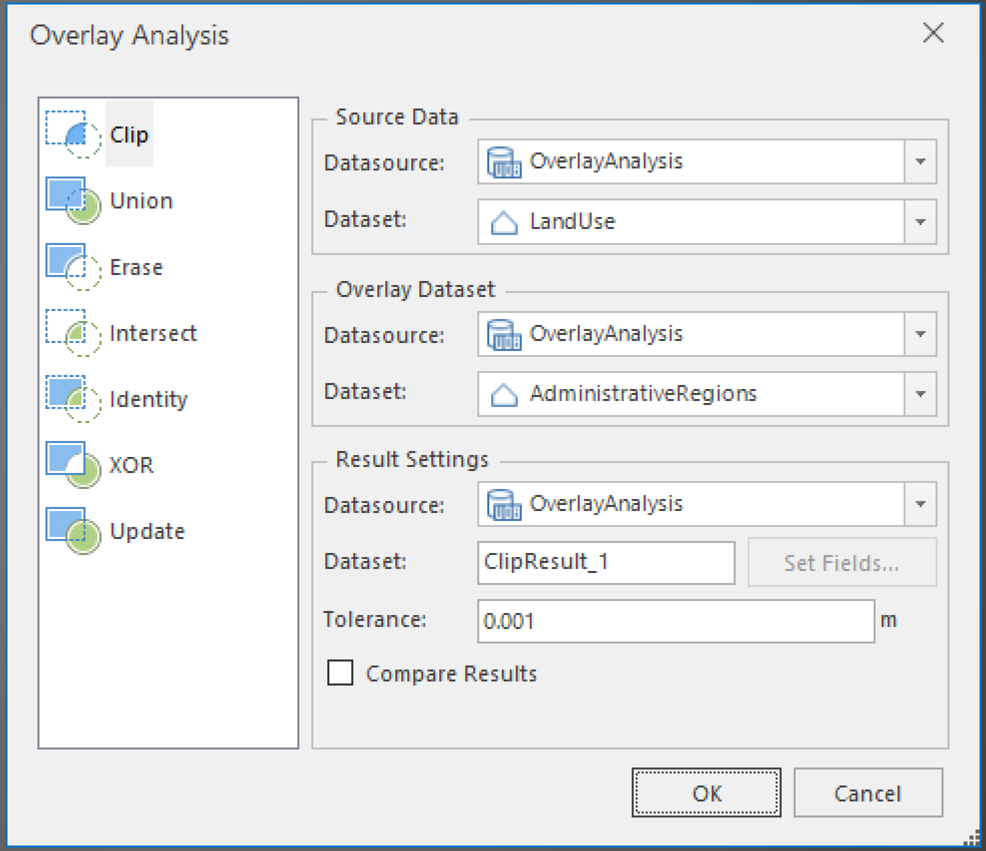
Overlay Analysis

- What's Overlay?
  - The operation of comparing variables between two datasets.
- Application Examples
  - Find out the lake distribution of a certain province.
  - With the land use data in two years, we can get the land use changed areas in these two years using Symmetrize.
  - With land use data and recovering forest distribution data, we can get the new land use data after recovering using Update.



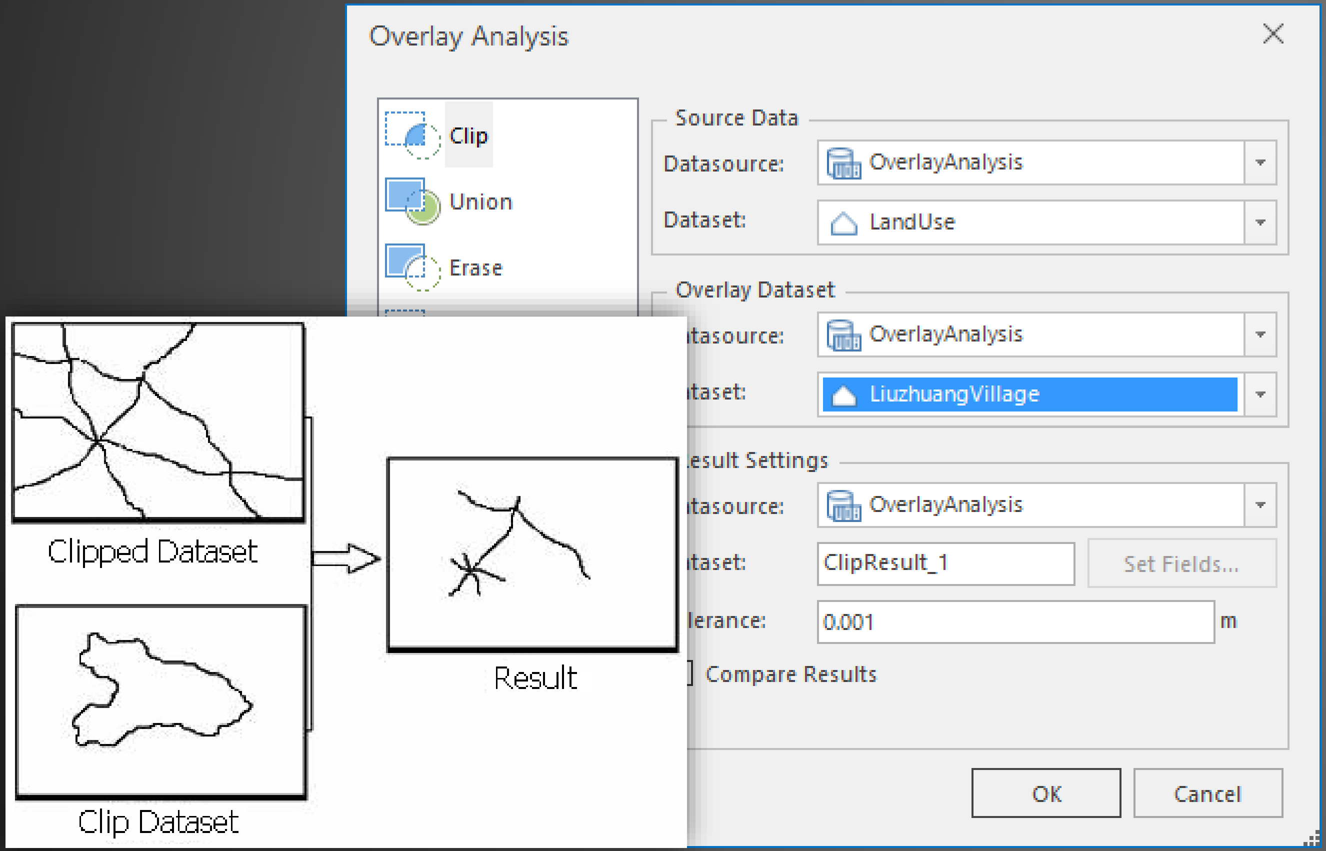
Overlay Analysis

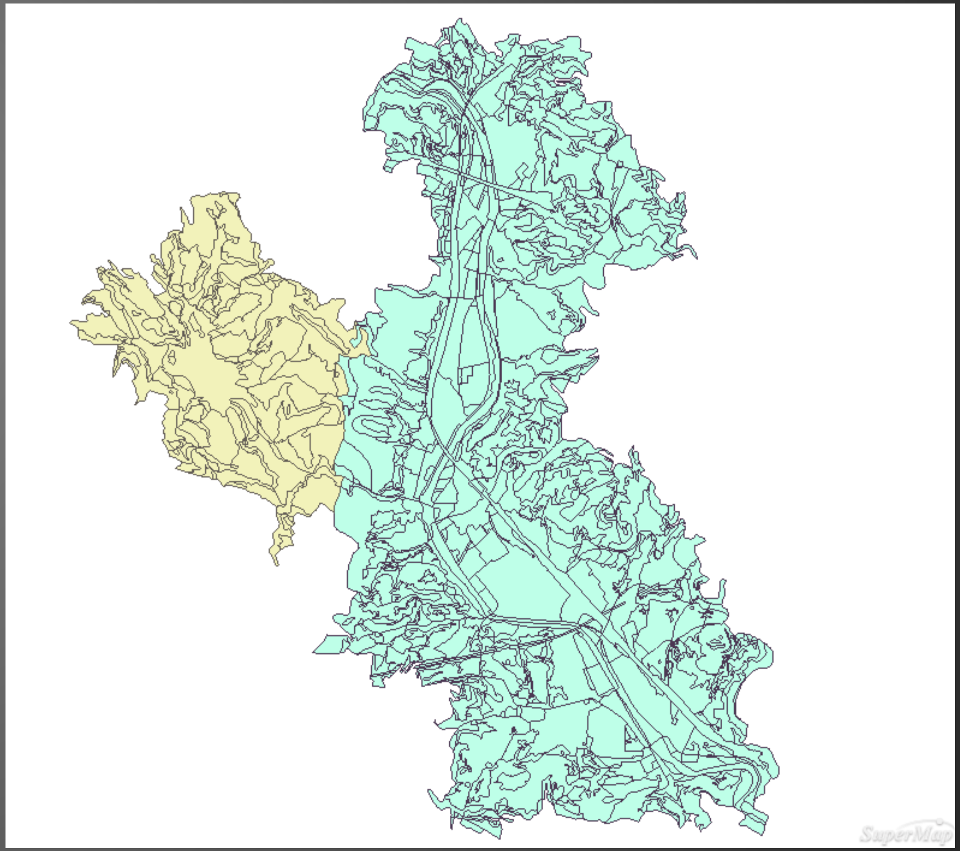
- Overlay mode
  - Clip
  - Erase
  - Intersect
  - Union
  - Identity
  - XOR
  - Update



Clip

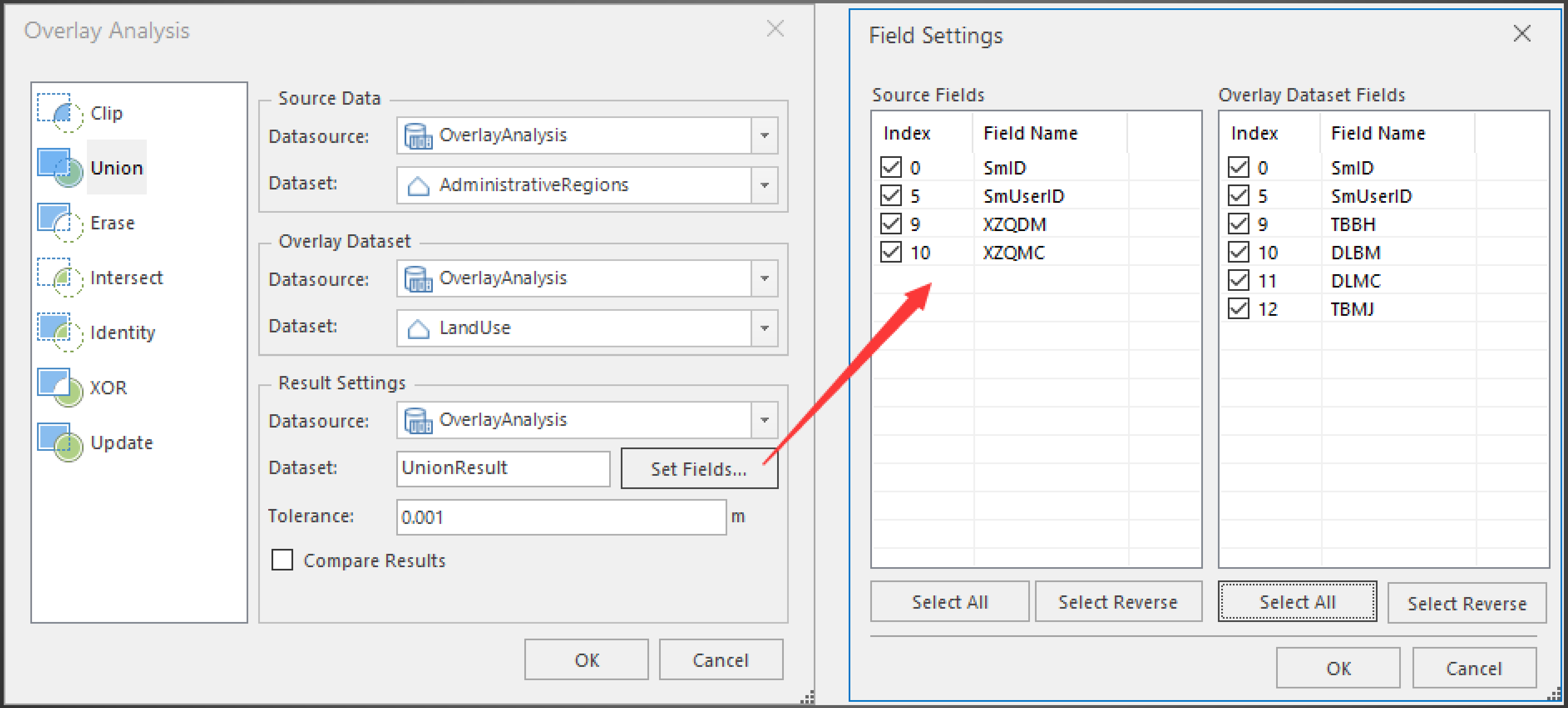
- Exercise: get land use data of Liuzhuang Village.





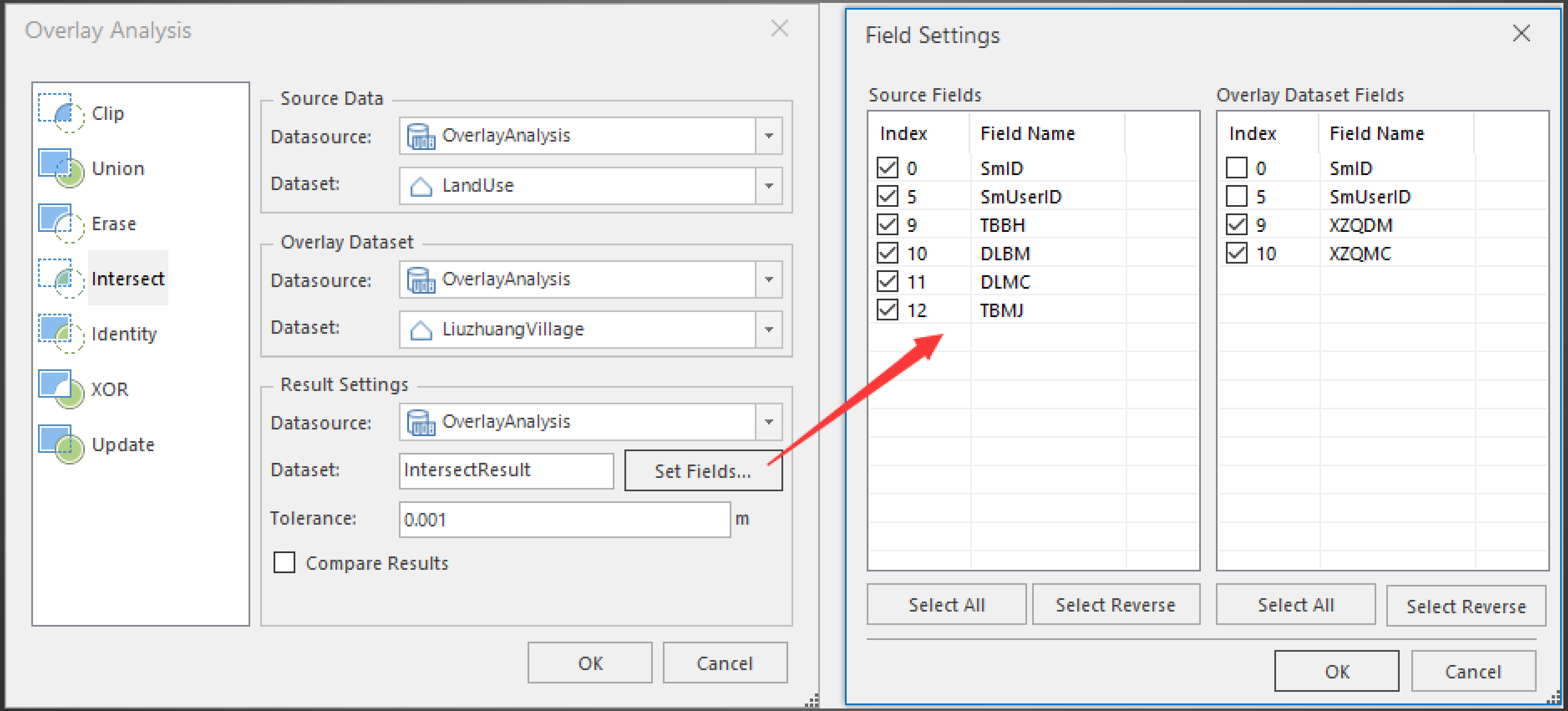
Union

- Get land use data with Administrative information



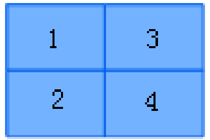
Intersect

- Get land use data with Administrative information for Liuzhuang village.



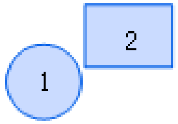
XOR (Symmetric Difference)

- Example:
  - Source dataset: land use of Beijing in 2000
  - Overlay dataset: land use of Beijing in 2005
  - Result: Land use change from 2000 to 2005.



SmID	W	P
1	A	11
2	B	12
3	C	13
4	D	14

Source Data



SmID	W	Q
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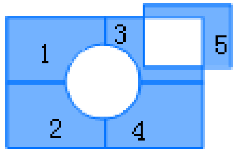
2	F	22

Overlay Data

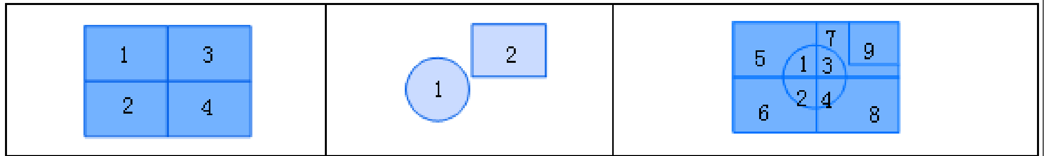


SmID	P	Q	W_1	W_2
1	11		A	
2	12		B	
3	13		C	
4	14		D	
5		22		F

Result

Identity

- Example:
  - Source dataset: Land use data of Beijing
  - Overlay dataset: Slope data of China
  - Result: Data of Beijing with land use and slope information



SmID	W	P
1	A	11
2	B	12
3	C	13
4	D	14

Source Data

SmID	W	Q
1	E	21
2	F	22

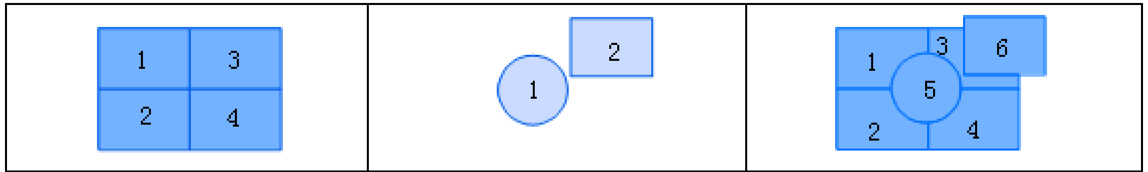
Overlay Data

SmID	P	Q	W_1	W_2
1	11	21	A	E
2	12	21	B	E
3	13	21	C	E
4	14	21	D	E
5	11		A	
6	12		B	
7	13		C	
8	14		D	
9	13	22	C	F

Result

Update

- Example:
  - Source dataset: land use data of China
  - Overlay dataset: farmland areas need to be converted to forestry
  - Result: land use after conversion



SmID	SmUserID	W
1	1	A
2	2	B
3	3	C
4	4	D

Source Data

SmID	SmUserID	W
1	5	E
2	6	F

Overlay Data

SmID	W
1	A
2	B
3	C
4	D
5	E
6	F

Result

PART 02

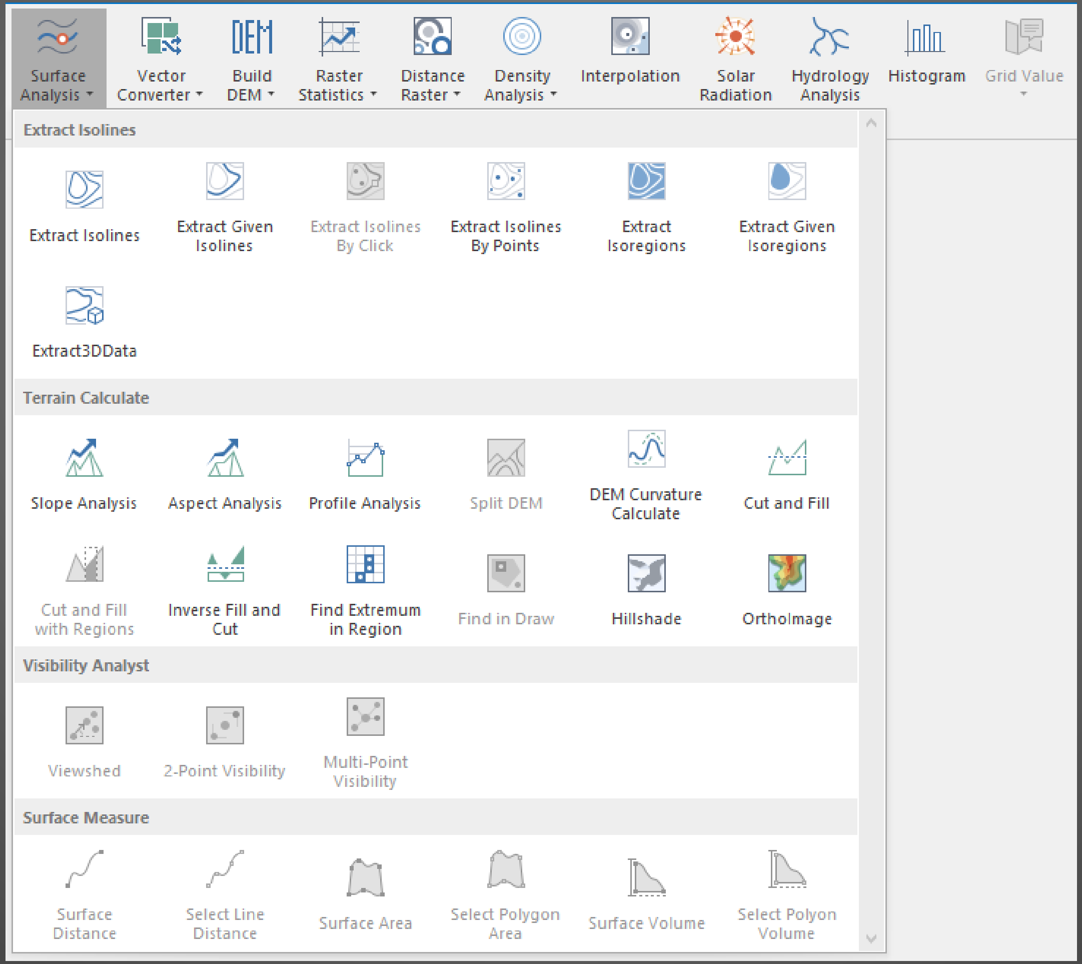
➢ **Raster Analysis**

Overview

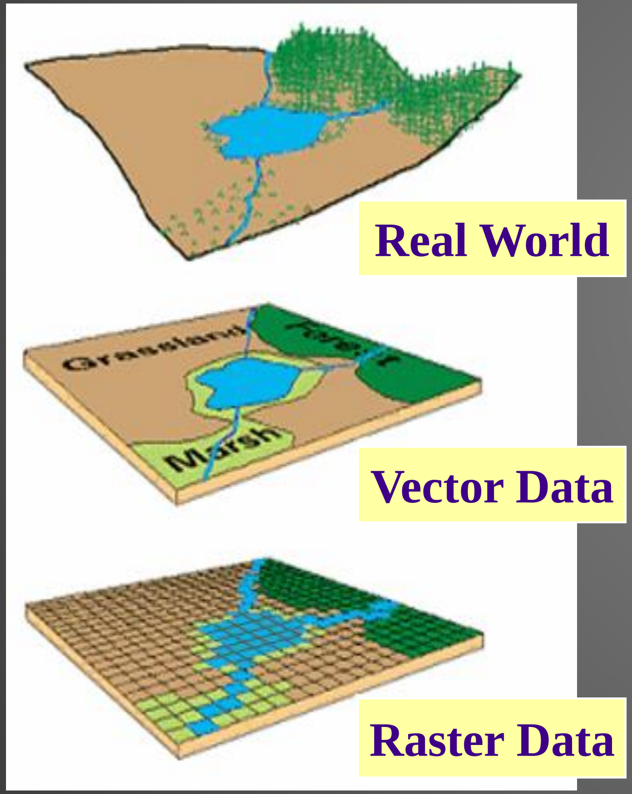
- Raster Dataset Types
- Interpolate to Raster (IDW, Kriging & Spline)
- Surface Analysis
  - Isolines /Isoregions
  - Slope / Aspect
  - Orthographic Image & HillShade
  - Surface Area & Distance
  - Identify Value

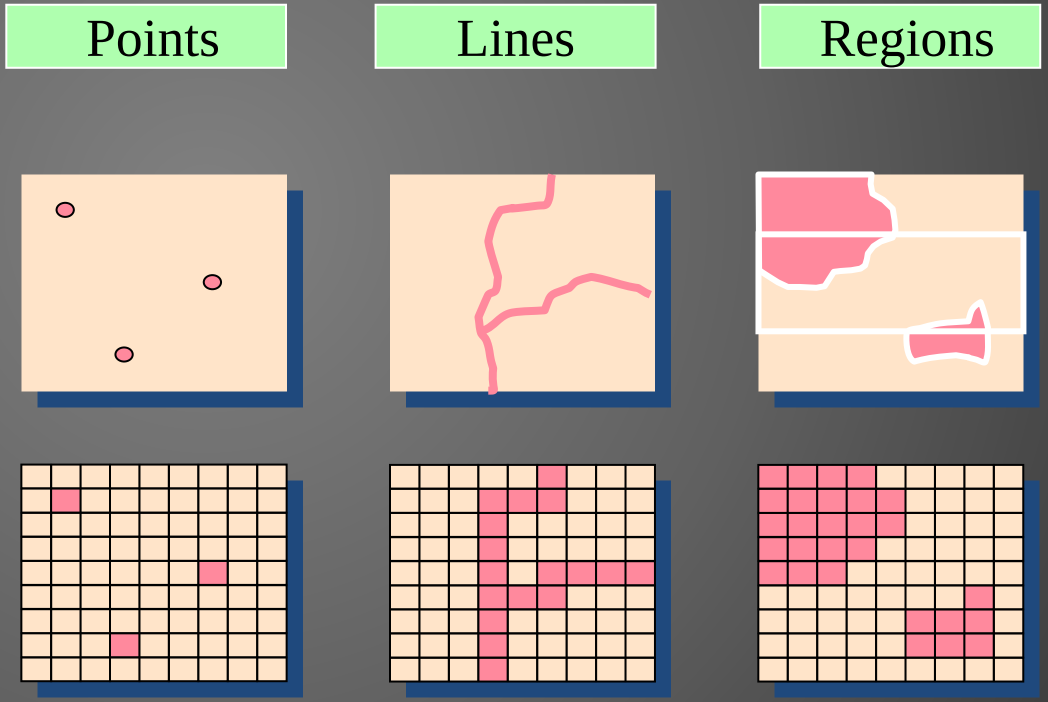
Raster Analysis

- Analysis based on raster dataset.



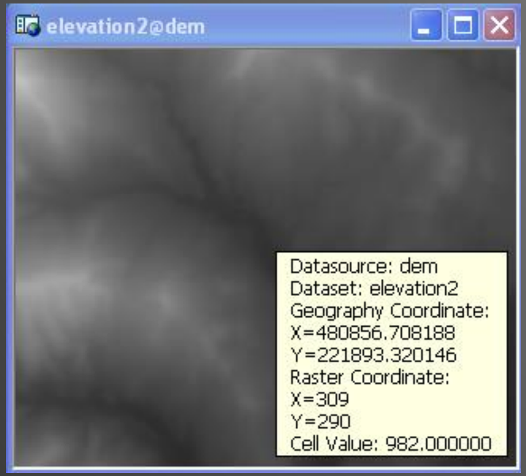
Raster Data Structure

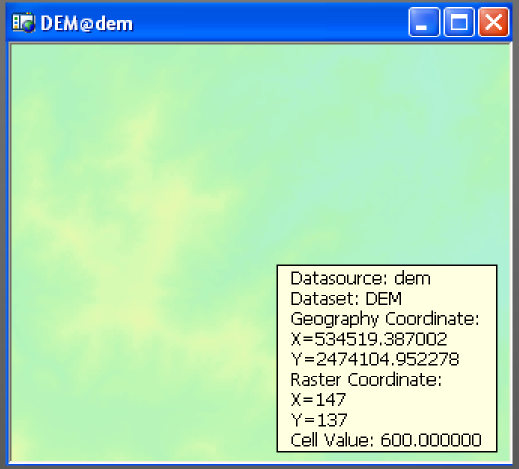




Raster Dataset Types

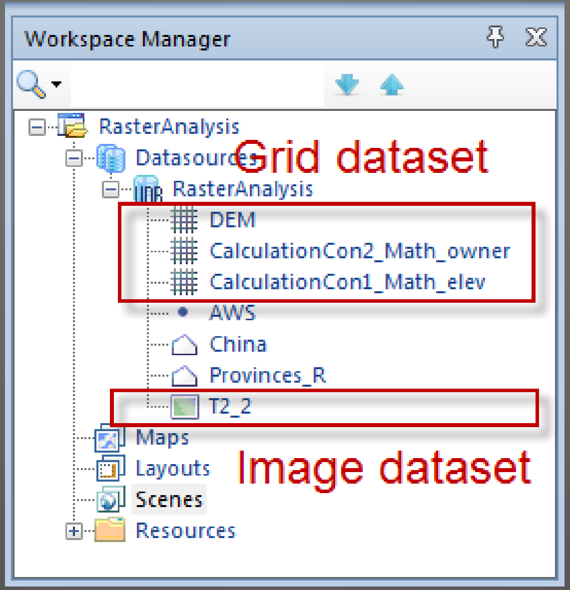
- DEM Model: Pixel values represent elevation information.
- Grid Data: Pixel values represent business information, such as temperature, rainfall value.
- Image Data: Remote Sensing Image, satellite image, aerial photo, or other photos.





Raster Dataset Types

- DEM dataset and Grid dataset are the main datasets used for Grid Analysis.
- Only several Grid Analysis functions can be used for Image dataset, such as Resample.

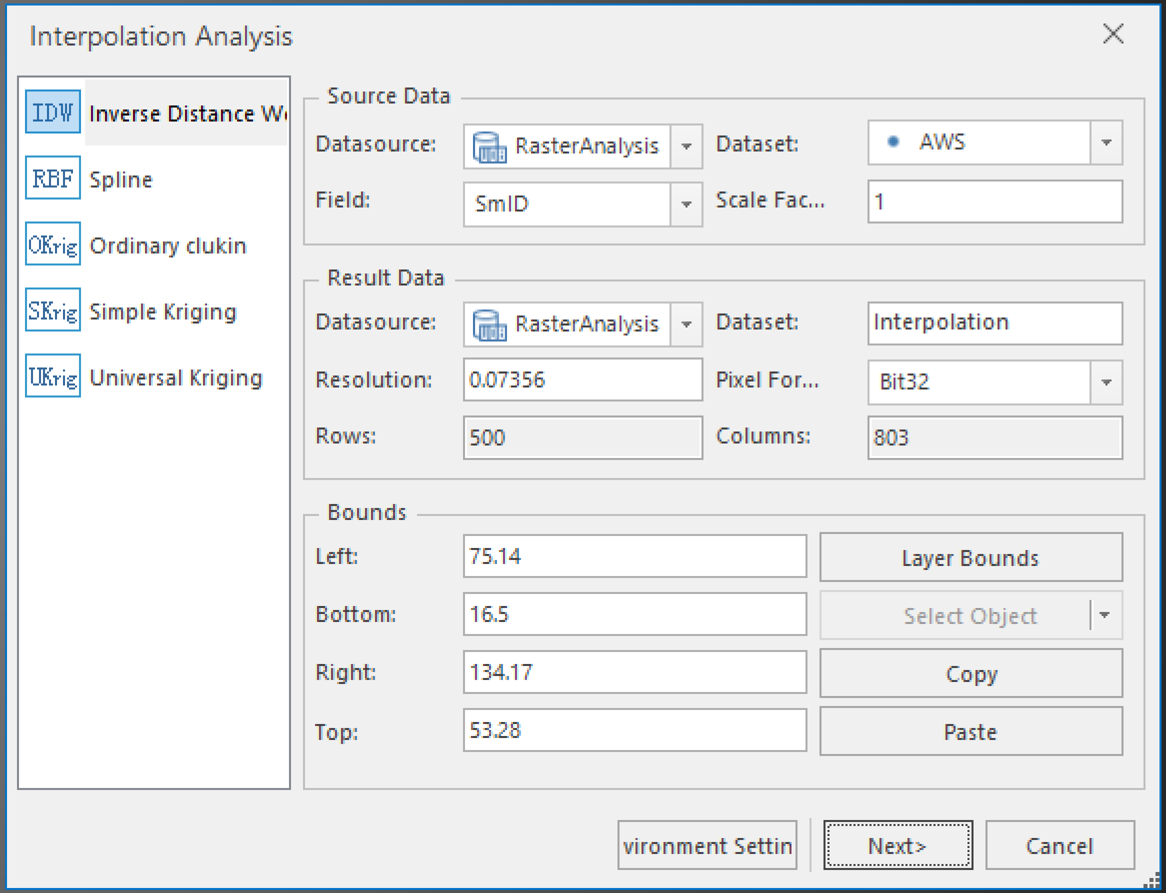


Interpolate to Raster

- Purpose: Get a raster dataset based on a point dataset.
- Estimate the cell values using interpolation method and get the correlations between point values.
- Interpolate field type should be numeric.
- Application Example
  - Get rainfall Isolines based on the collected rainfall data in some observation points.

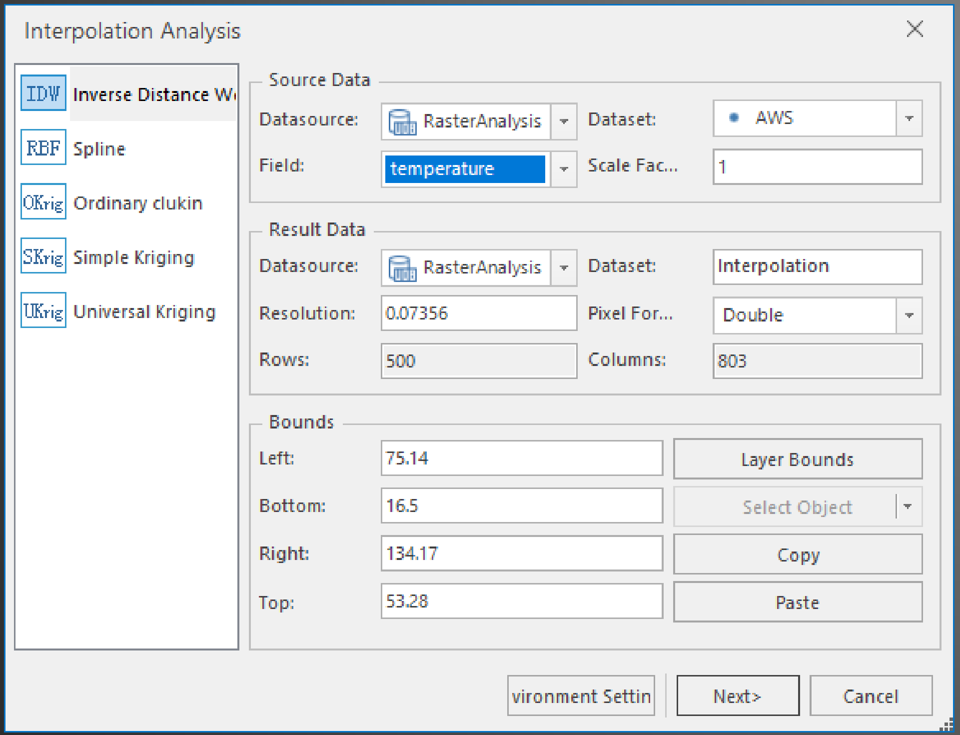
Interpolation to Raster

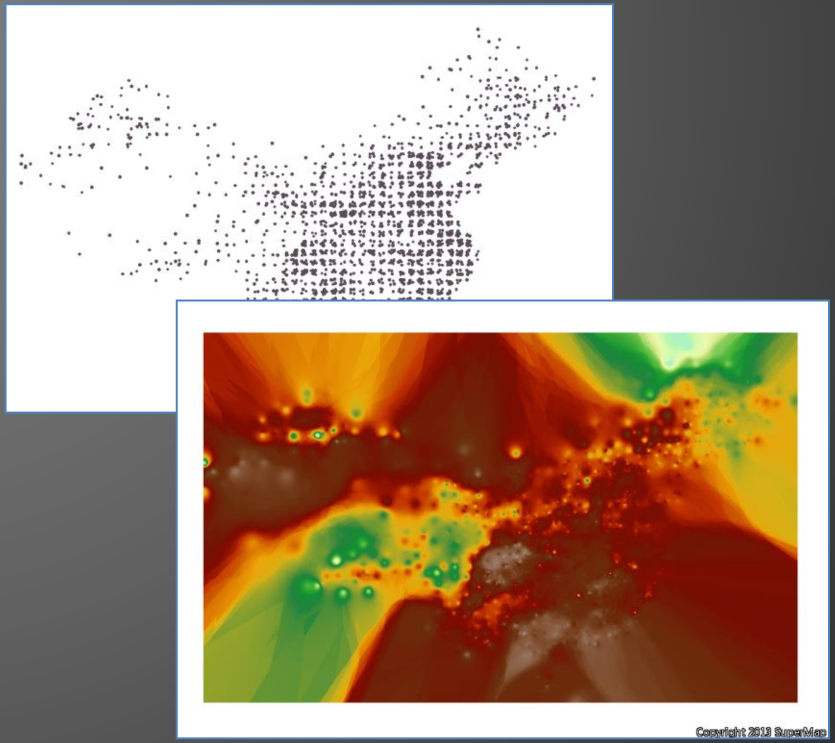
- Interpolation method
  - – Inverse Distance Weighted (IDW)
  - – Spline Interpolation
  - – Kriging
    - Ordinary Kriging
    - Simple Kriging
    - Universal Kriging



Exercise:

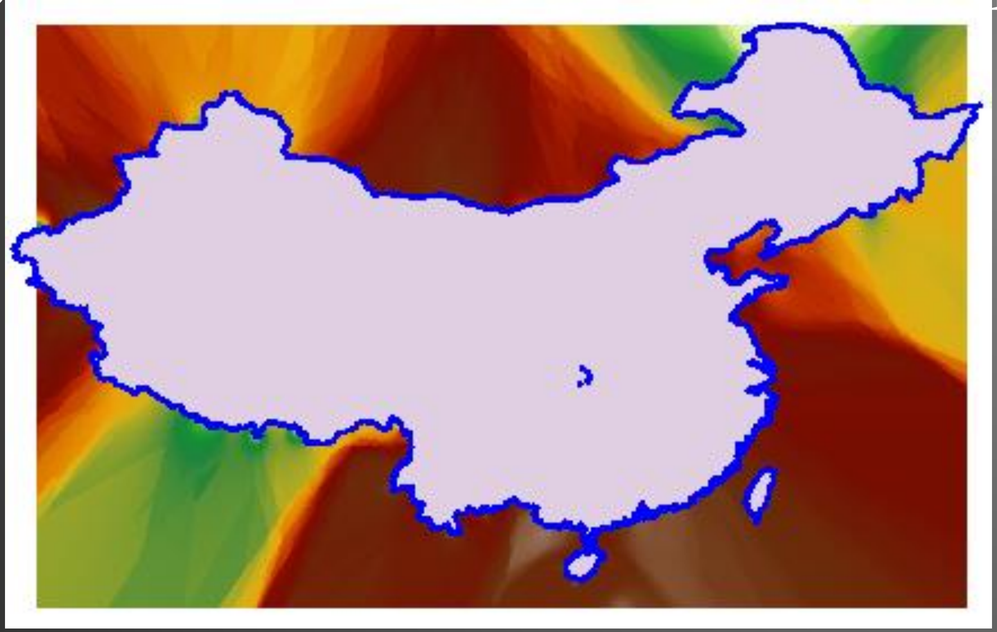
- Get a raster dataset based on the point dataset “AWS”, use the field “temperature” for interpolation.
- Data for Exercise: \Data\RasterAnalysis.udb.

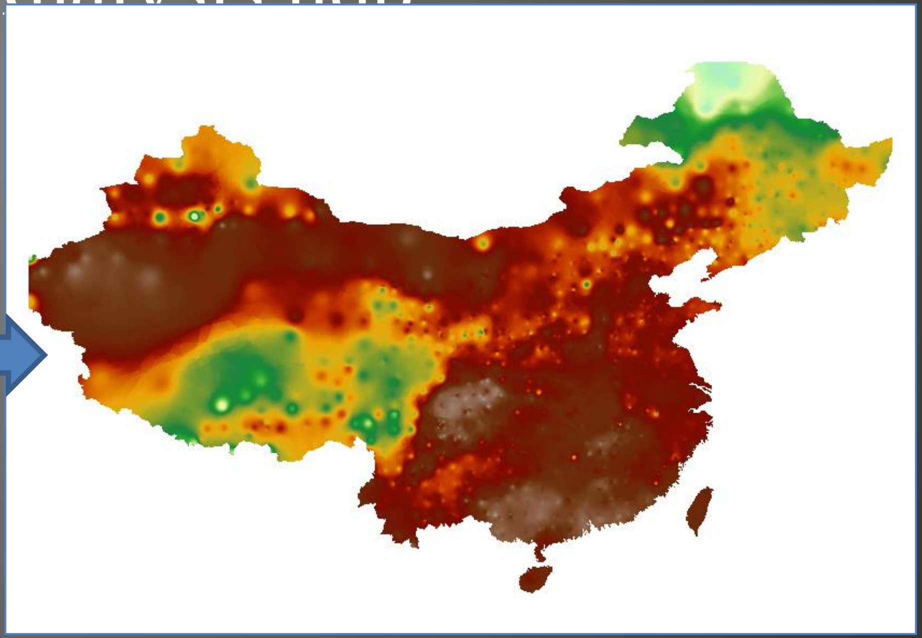




Exercise:

- Clip the interpolation result dataset using region dataset "China".
- Data for Exercise: \Data\RasterAnalysis.udb

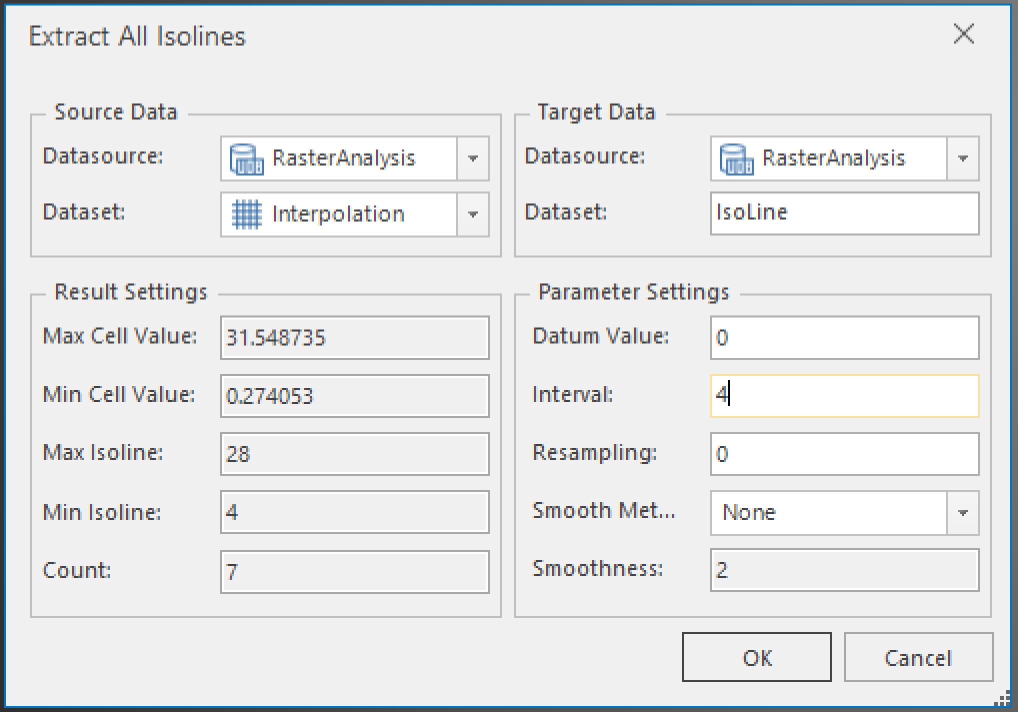


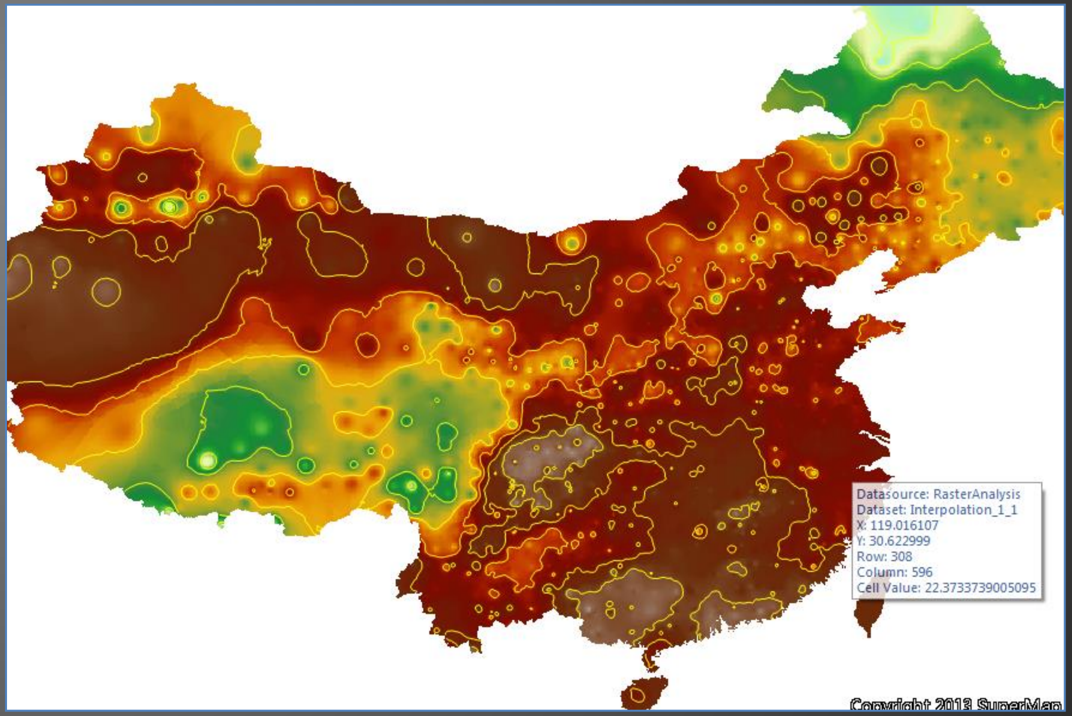


Use Grid Value to query raster values.

Extract Isolines

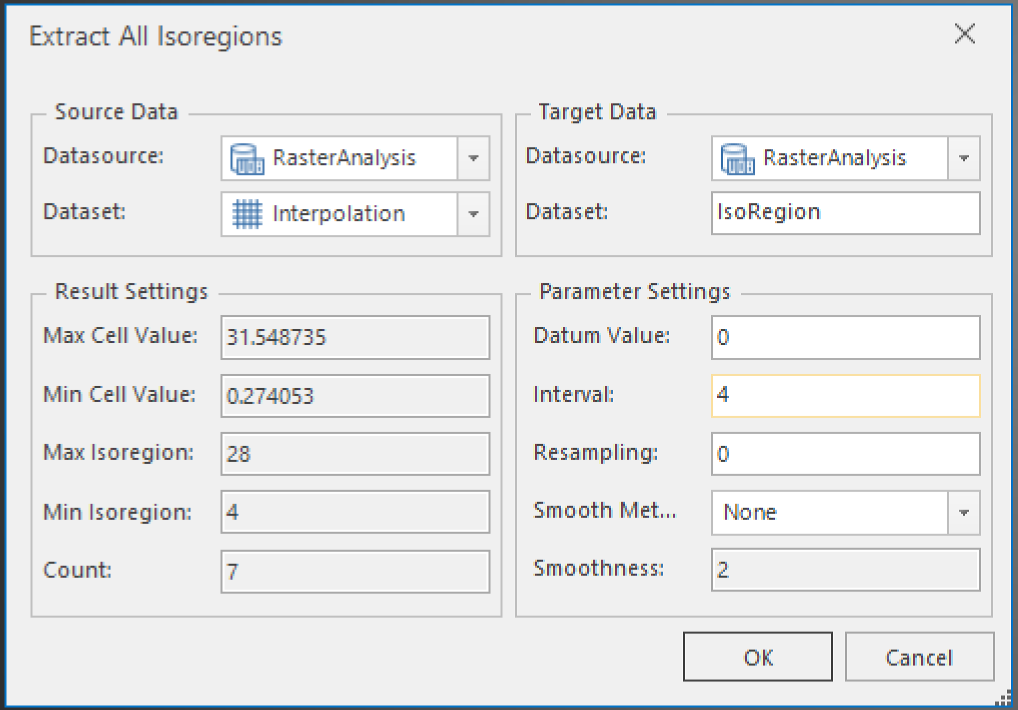
- Extract isolines that meet the conditions on the raster surface.
- Data for Exercise: \Data\RasterAnalysis.udb.

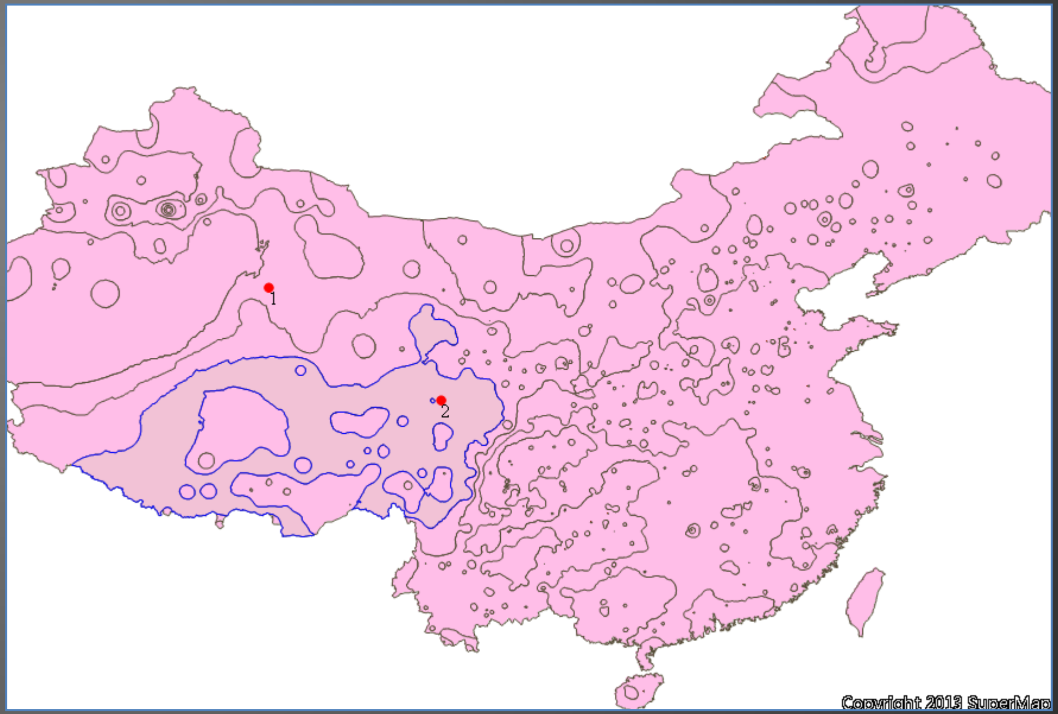




Extract Isoregions

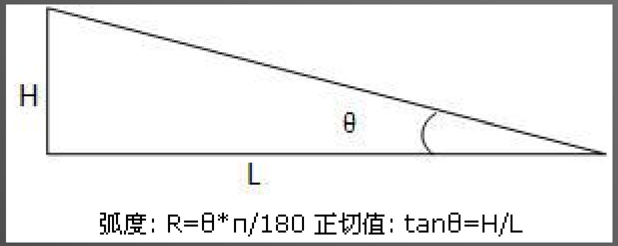
- Extract isoregions that meet the conditions on the raster surface.
- Data for Exercise: \Data\RasterAnalysis.udb.

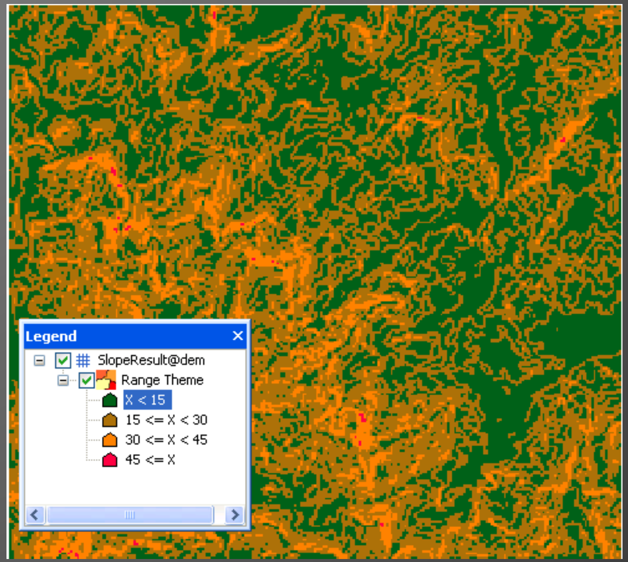




Slope

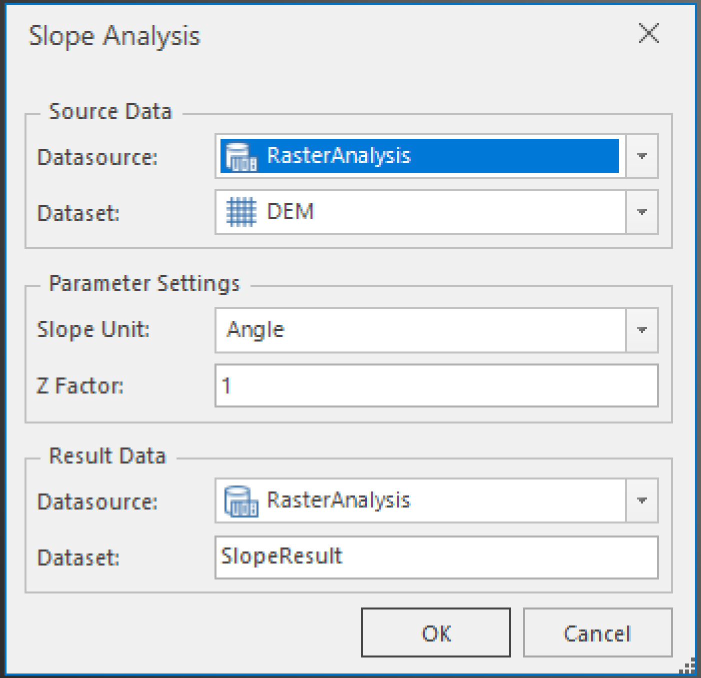
- Slope reflects the oblique degree (It's the angle between the tangent passing a point on the surface of the earth and the horizontal flat).
- The value of each cell represents the degree of slope, the larger the value is, the more oblique the slope is.
- Application Example
  – Water and soil lose research

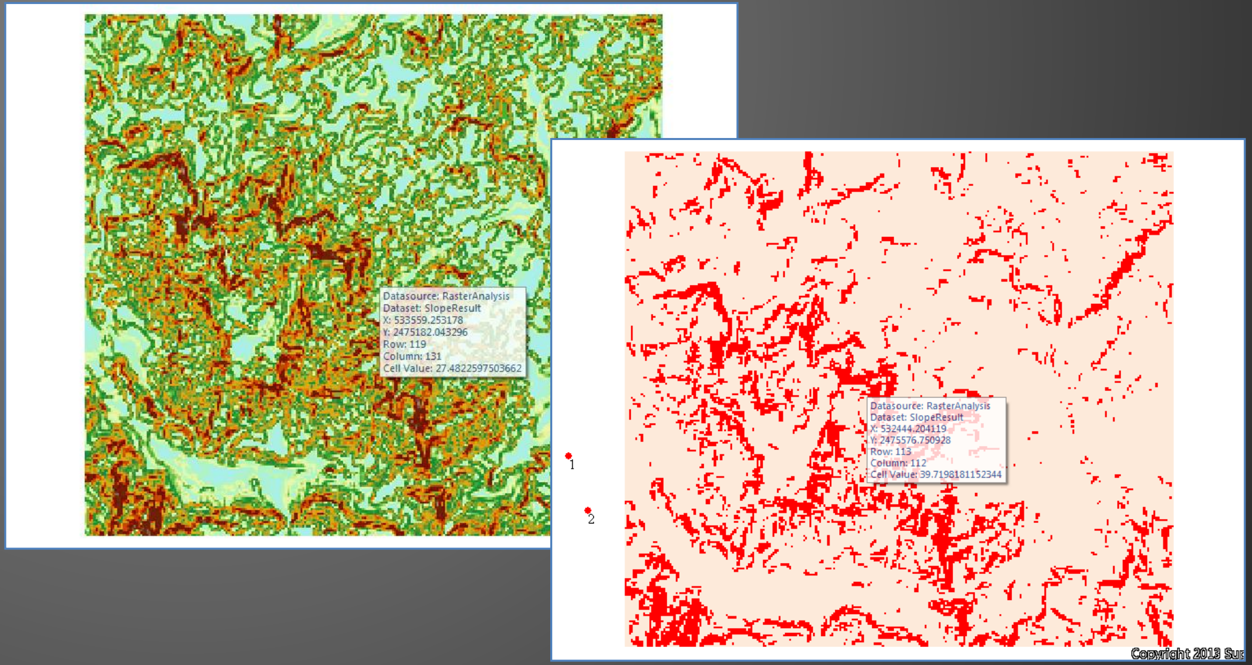




Exercise:

- Calculate the slope value for the dataset "DEM".
- Make a range map for the slope result.
  - The red pixels' slope value are more than 30 degree.





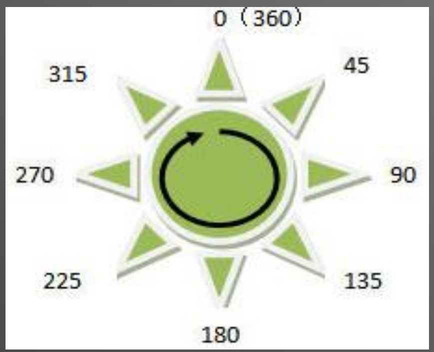
Aspect (Slope Direction)

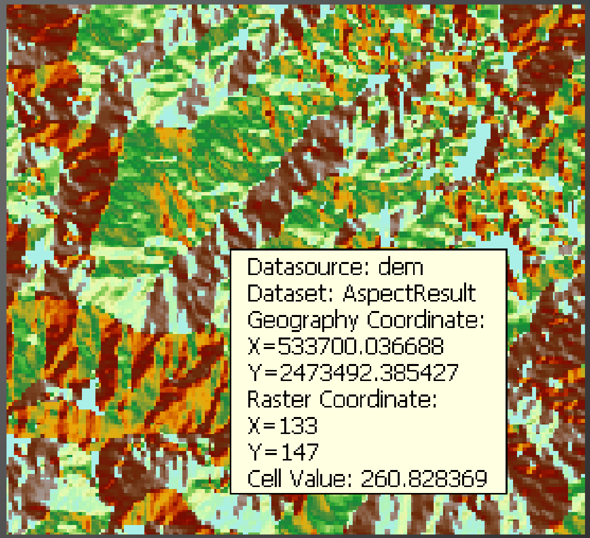
– Application Example: Pay attention to some area in specified slope direction, such as the area which face south.

– The value of each cell represents the steepest downslope direction from each cell to its neighbors.

– The slope direction value is calculated clockwise from due North, and the slope direction ranges from 0 to 360.

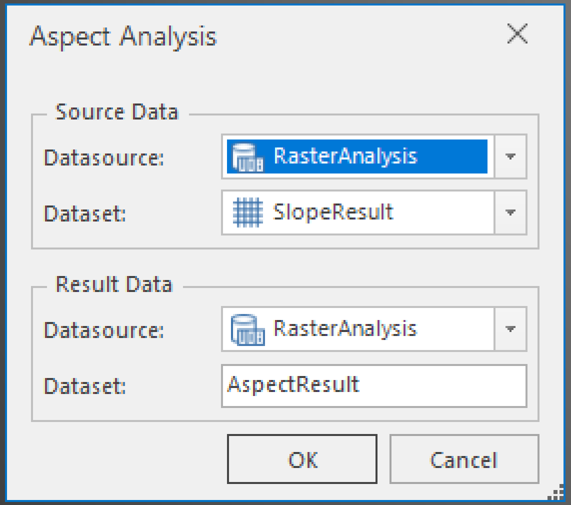
North

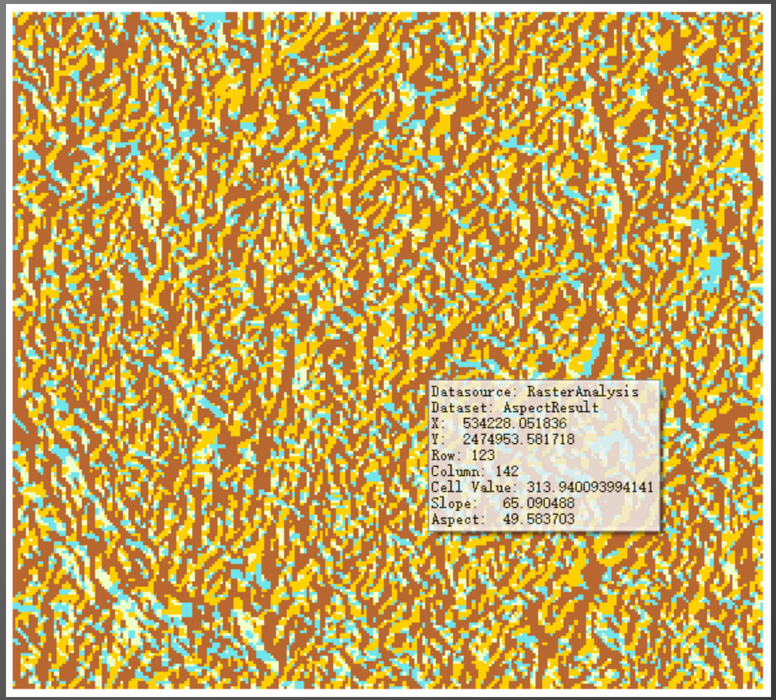




Exercise:

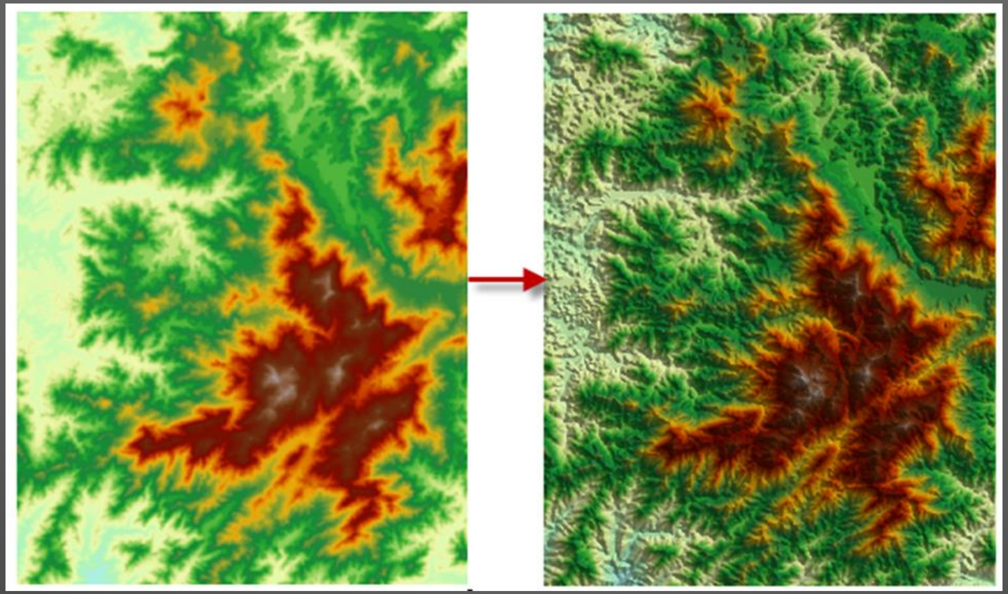
- Calculate the slope direction for the “DEM” dataset.
- Make a range map for the aspect result.
- Data for Exercise: \Data\RasterAnalysis.udb.





Ortho Image

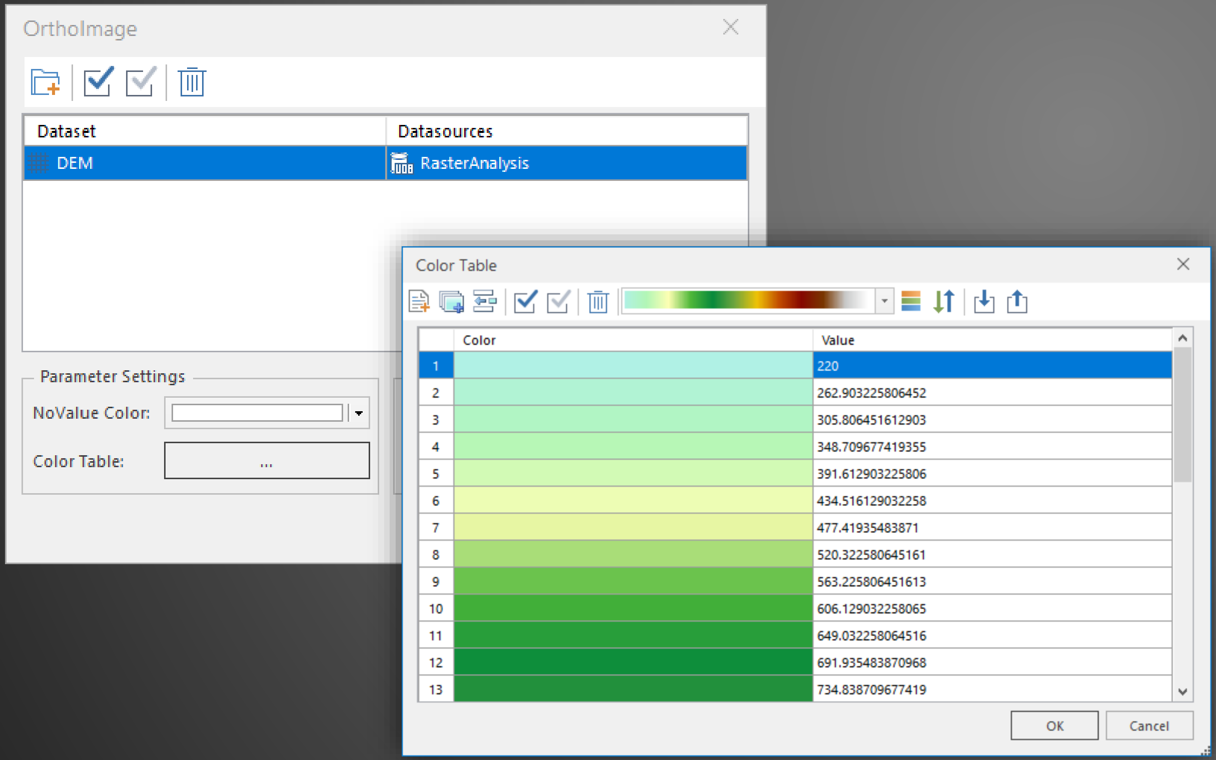
- Orthographic Image
  - Show the variation of grid values by variation of colors, such as elevation.
- The result looks like 3D data.

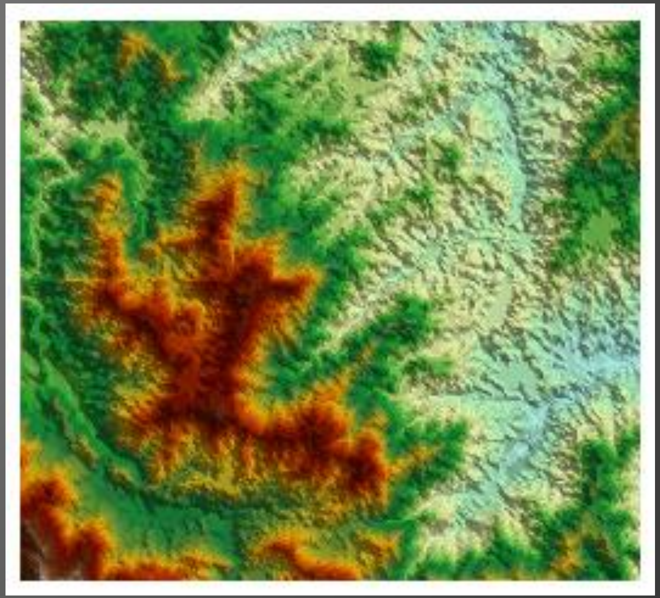


SuperMap

Exercise:

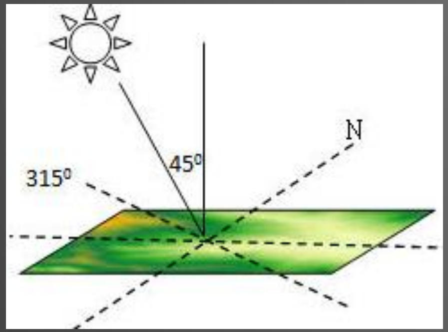
- Make an orthographic image for dataset “DEM”.
- Data for Exercise: \Data\RasterAnalysis.udb.

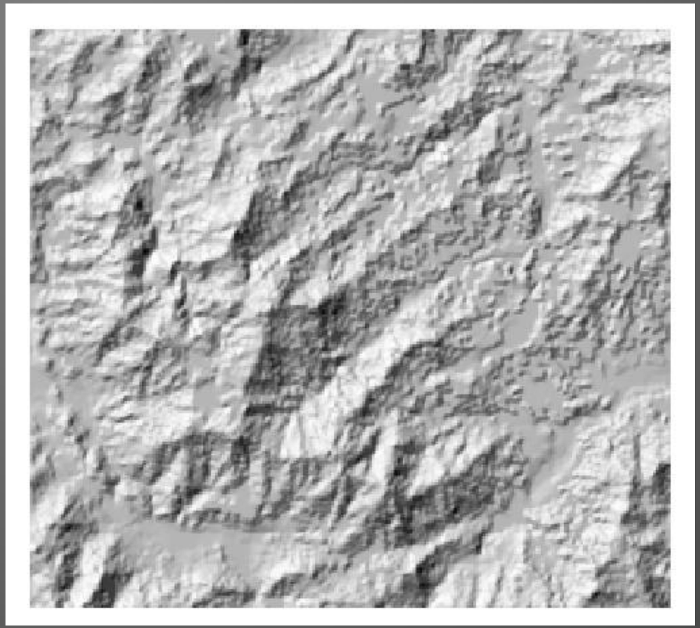




Hillshade

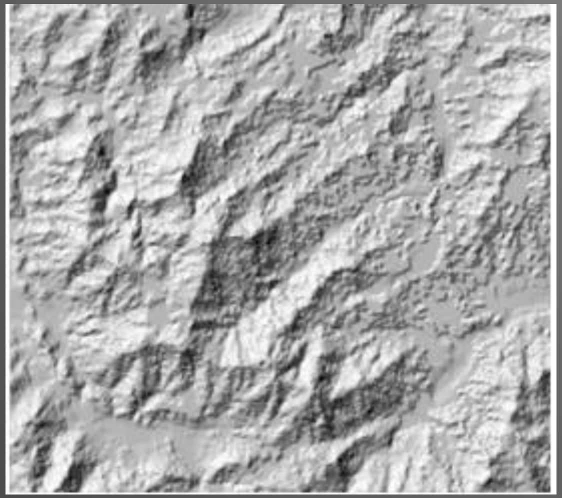
- Determine the illumination of each cell to enhance 3D effects.
- Creates a shaded relief view from a DEM dataset or a grid dataset by considering the illumination angle of the light source.

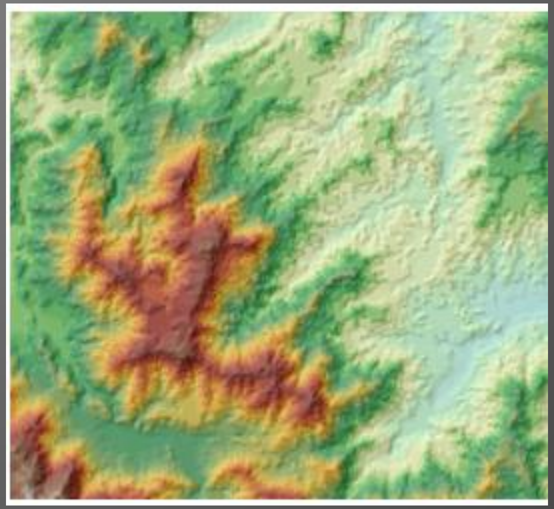




Exercise:

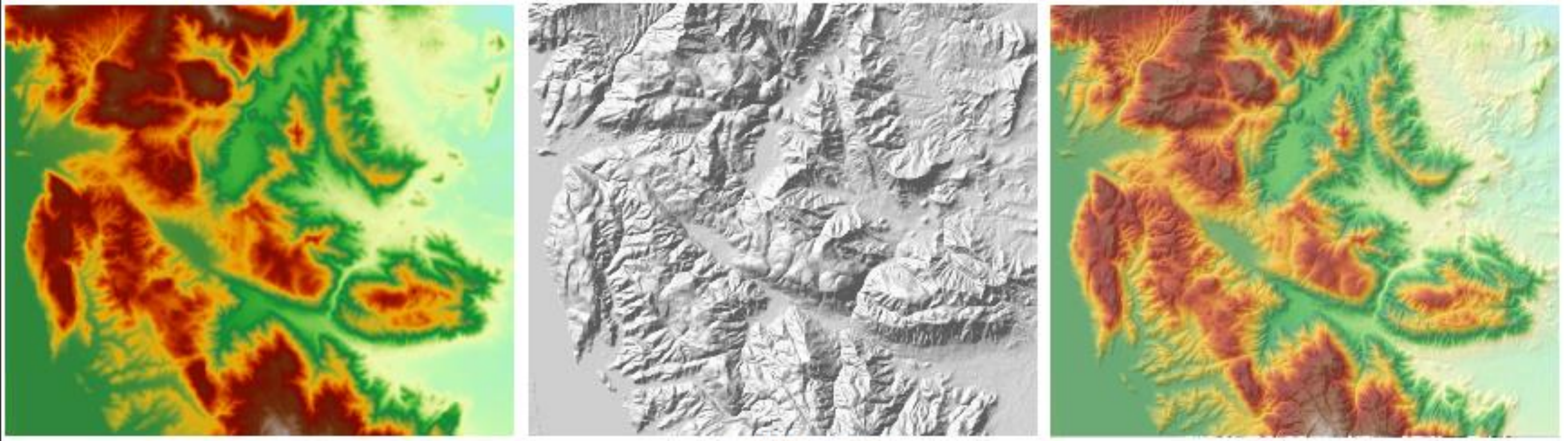
- Make a 3D hillshade map for dataset “DEM”.
- Overlay hillshade result map with the original DEM dataset, set the DEM layer transparency as 35.
- Data for Exercise: \Data\RasterAnalysis.udb.





Ortho Image & Hillshade

- Ortho Image: Get illumination intensity through the elevation of surrounding cells, then perform orthorectification to get 3D effects.



Original raster map　　Hillshade map　　Overlaid map

PART 03

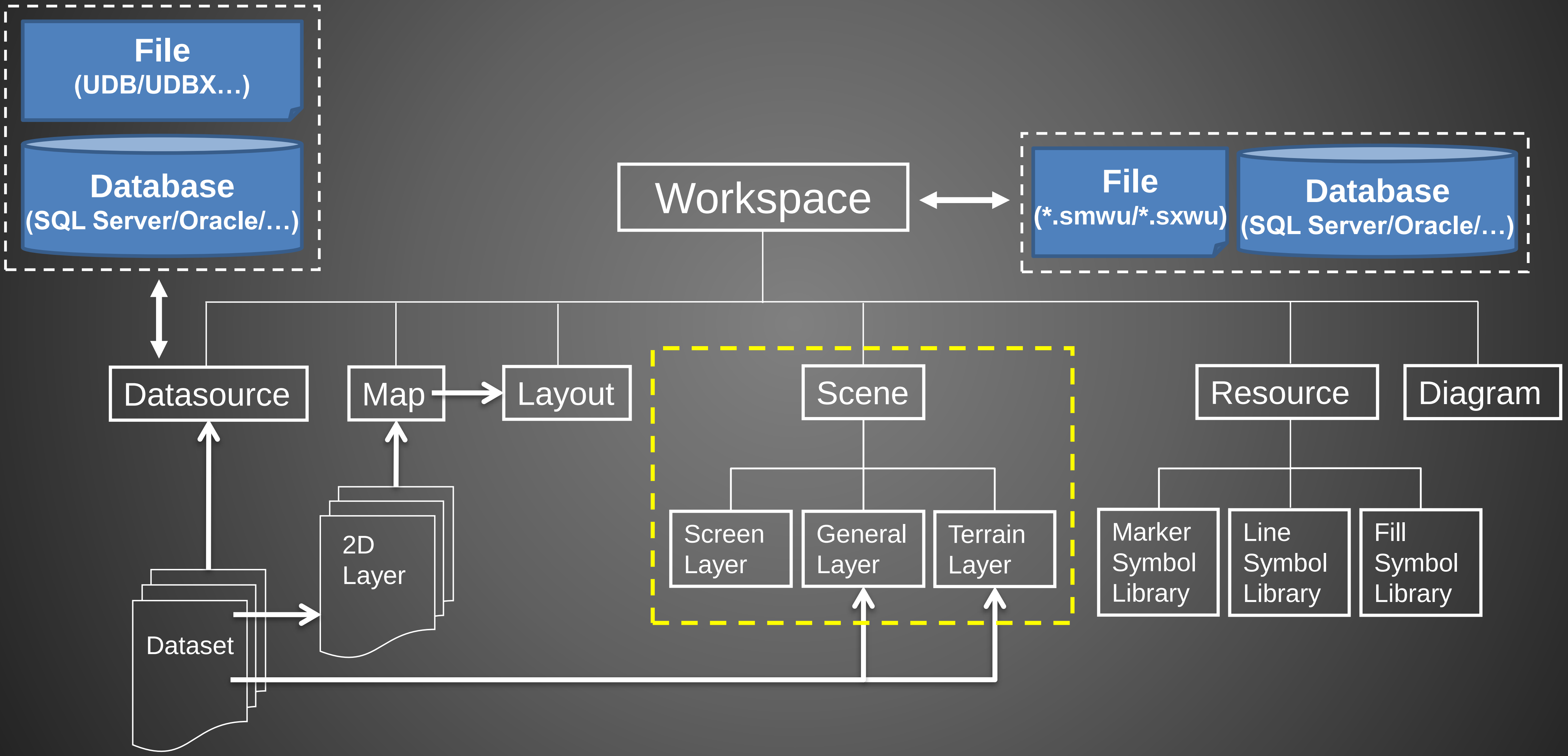
➢Organization of 3D Data

Overview

SuperMap

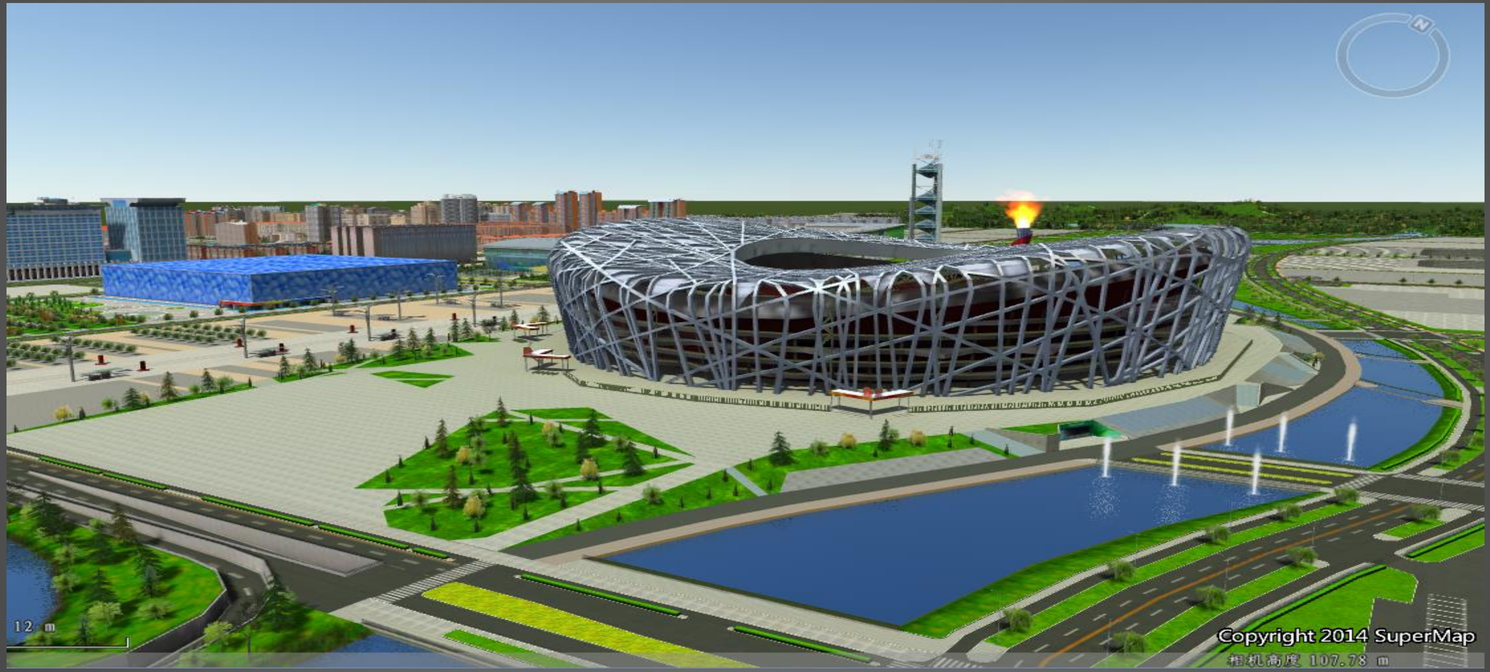
1. Data Structure
2. 3D Scene Introduction
3. Browsing 3D Scene
4. 3D Layer Organization
5. 3D Flying

Data Structure



3D Scene Introduction

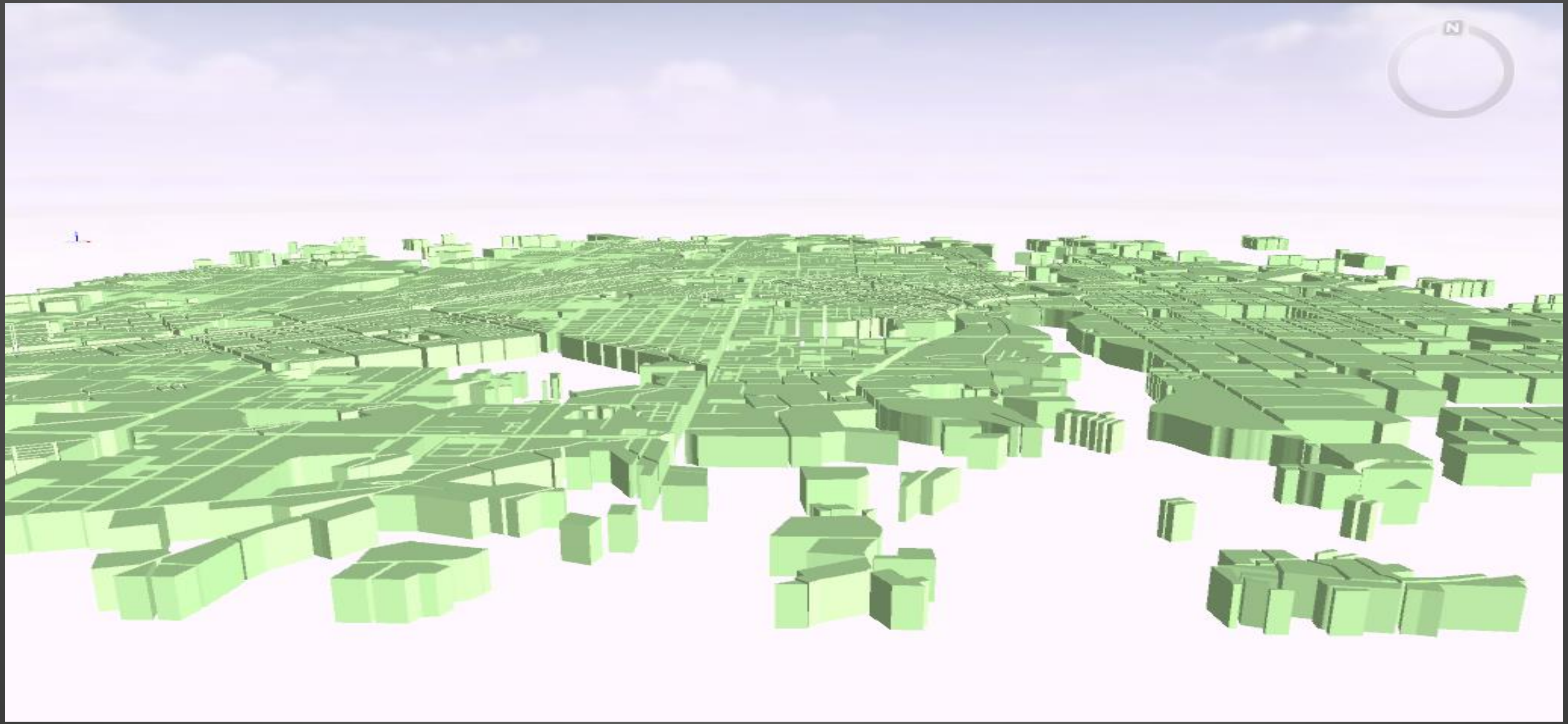
- The 3D scene uses virtualized technology to simulate various geographic features and their spatial relationships in the real world.



- There are two view modes of 3D scene, a plane scene and a spherical scene.

Plane Scene

- The surface of the earth is spread out into a plane to load and display features.
  - Planar Coordinate System data and Projected Coordinate System data are supported
  - To display the ocean, atmosphere, graticule or graticule label are not supported

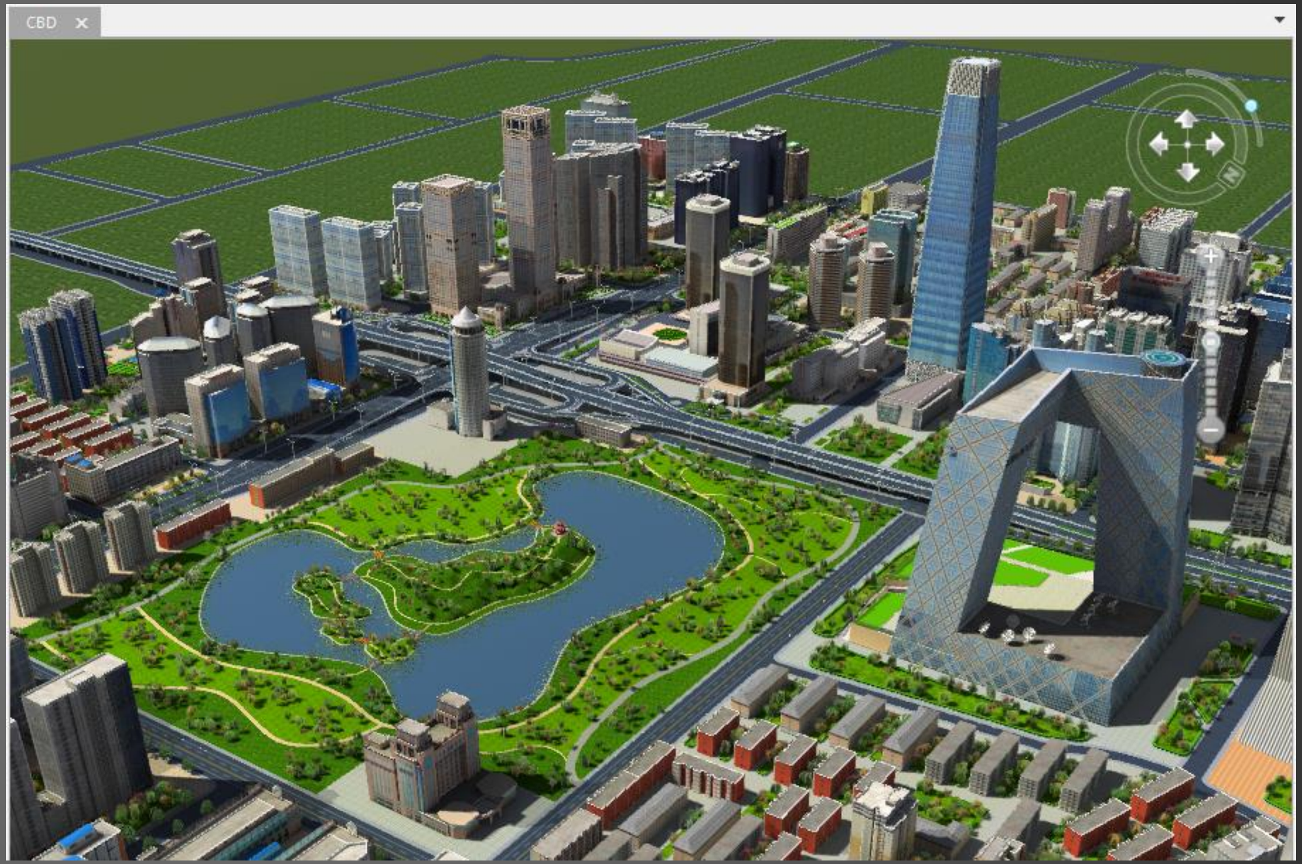


Spherical Scene

- The spherical scene simulates the surface of the earth with a sphere.

Browsing 3D Scene

- Use compass, keyboard or mouse
- Control the display scene elements
- Browse features' properties
- Measure in the scene



3D Layer Organization

- Screen Layer
  - Static graphics such as logo, descriptions...
- General Layer
  - 2D data (point, line, polygon, text, CAD, map…)
  - 3D data (3D point, 3D line, 3D polygon, model, image, grid…)
  - Cached data (image, grid, vector, map, model and OSGB cache…)
  - Service layer
  - KML layer
- Terrain Layer
  - DEM, grid, terrain cache

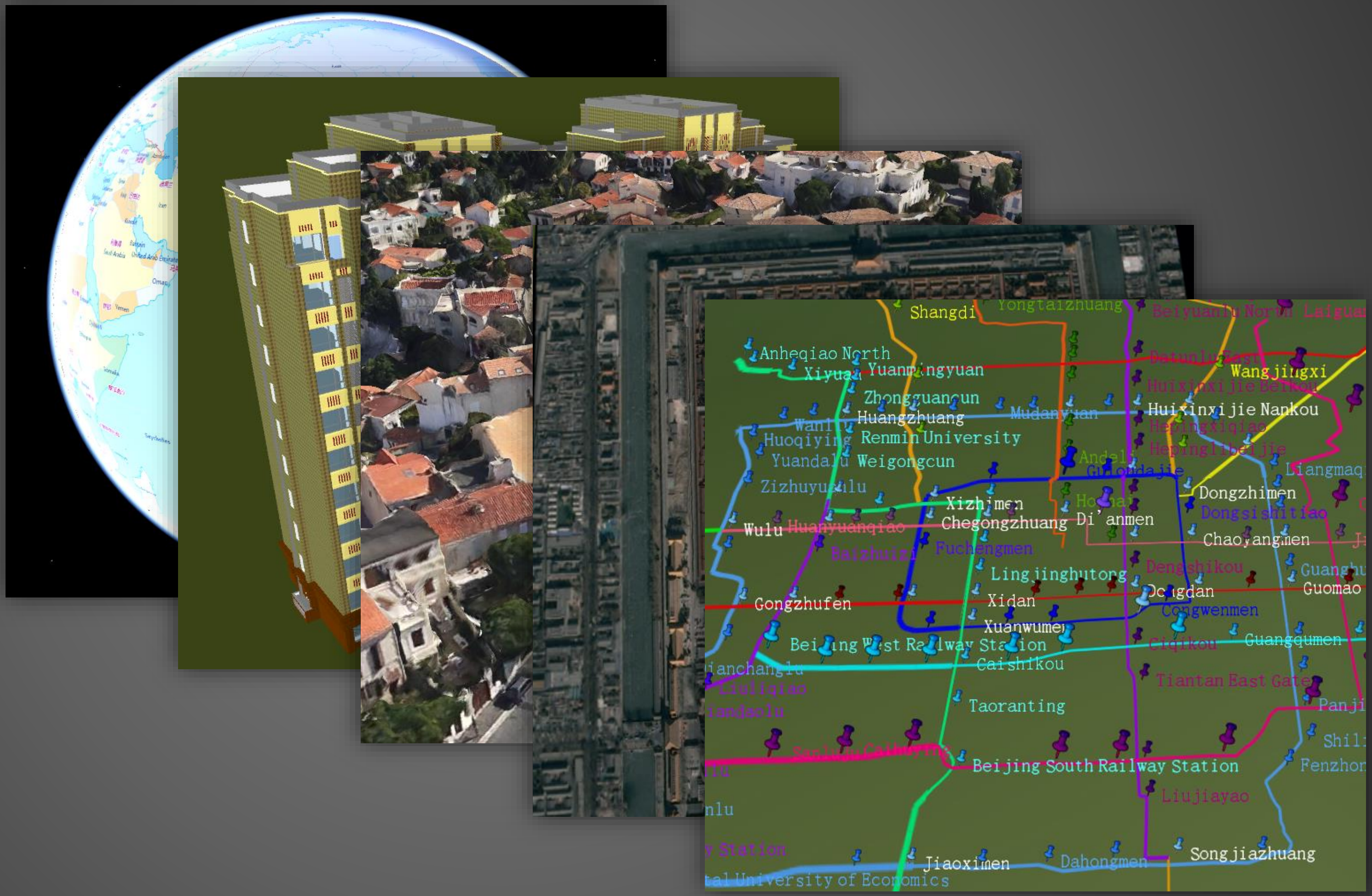
Adding Screen Layer

- Watermark, logo, label, etc.
- Supported format
  - *.PNG, *.JPG, *.JPEG, *.BMP
- Use screen coordinates
  - No geographic meaning
  - Static relative to 3D window
- Exercise
  - Add the logo of SuperMap

SuperMap

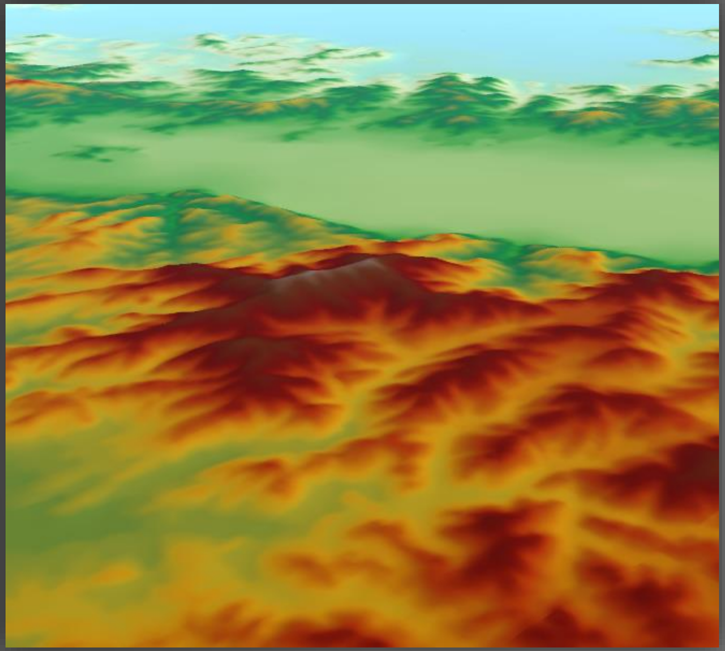
Adding General Layer

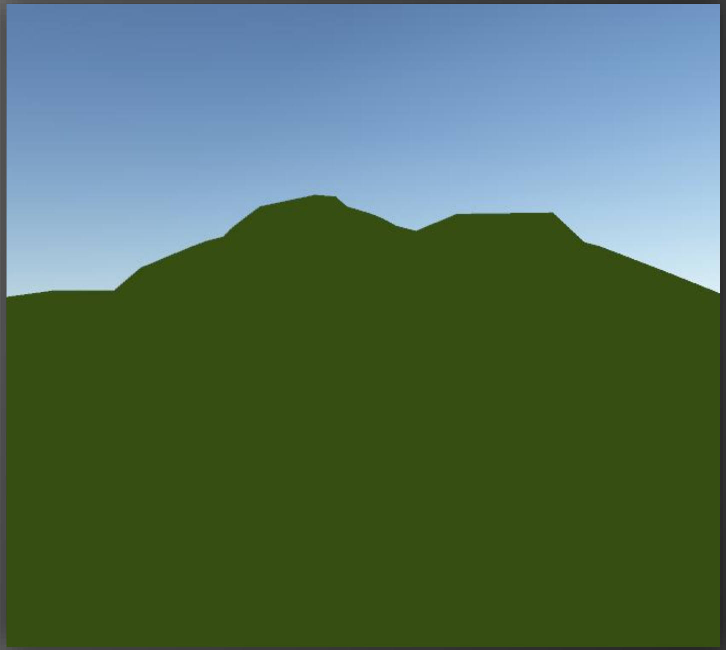
- Exercise
  1. Map
  2. Model
  3. OSGB cache
  4. image dataset
  5. KML file



Adding Terrain Layer

- Exercise
  - Grid
  - Terrain cache

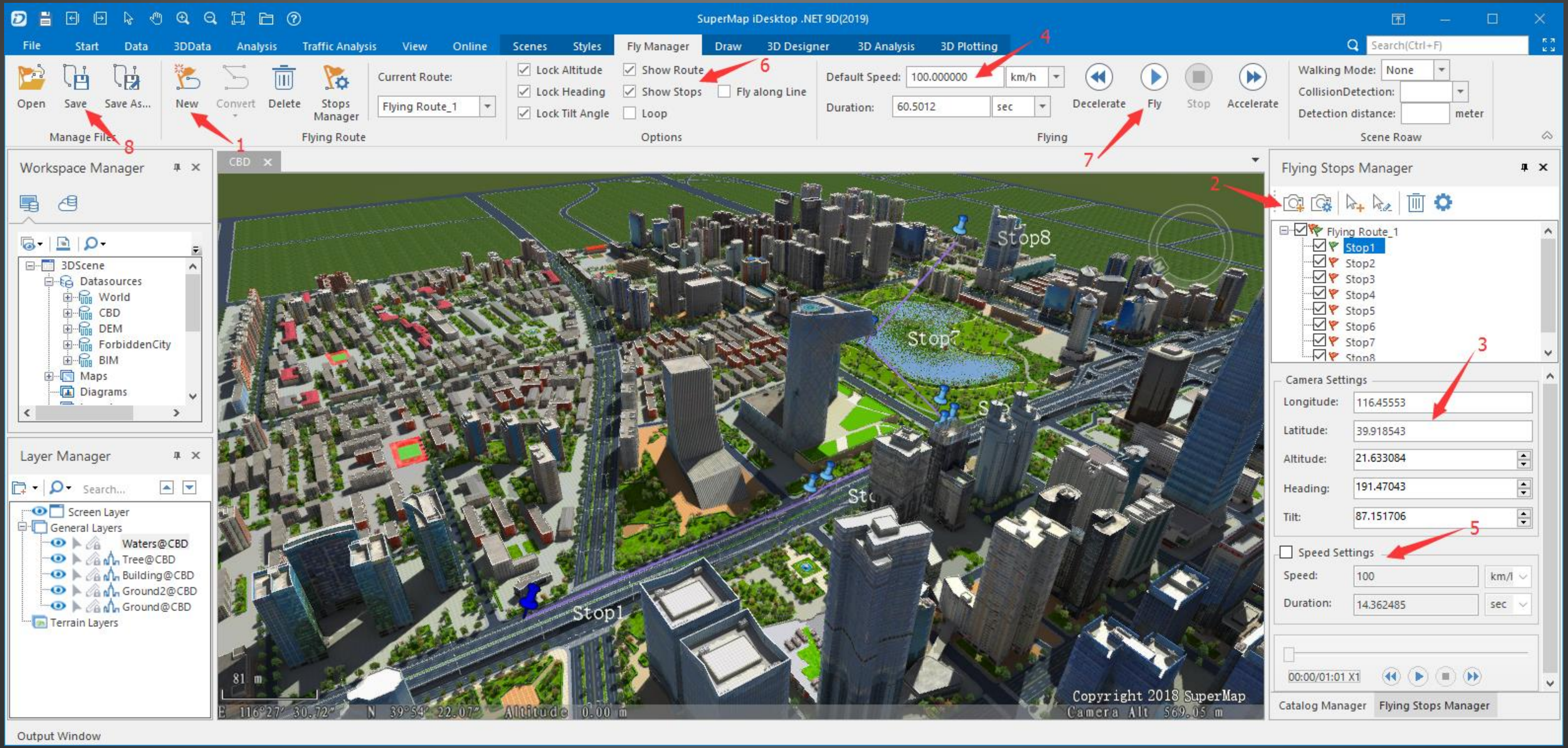




SuperMap

3D Flying

- Exercise
  - Add a new flying route in a 3D scene, edit it, start to fly, decelerate, accelerate, pause, stop and save it



SuperMap

PART 04

➢Models in 3D Scene

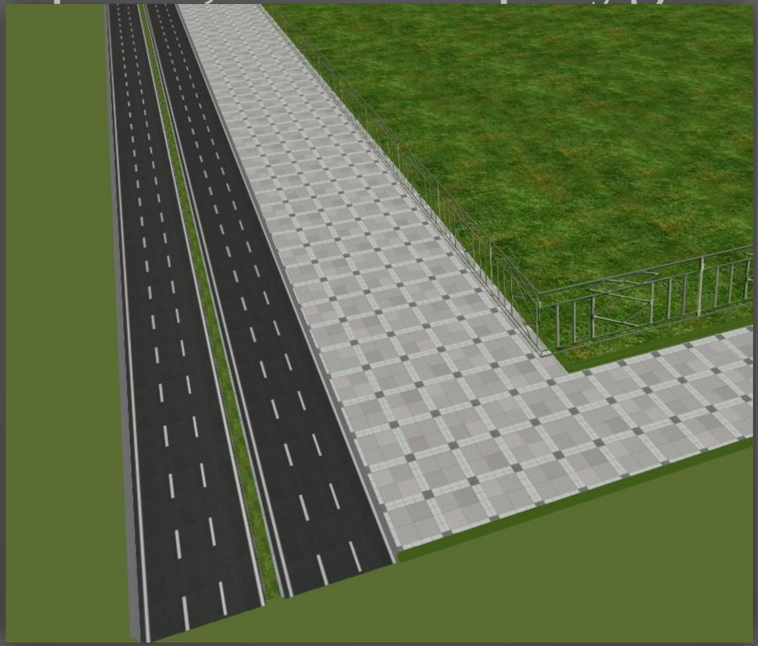
Overview

- 3D Symbolization
- Rapid Modeling by Vector Stretching
- 3Ds Max Model
- Animation Model
- Oblique Photogrammetry Model
- BIM

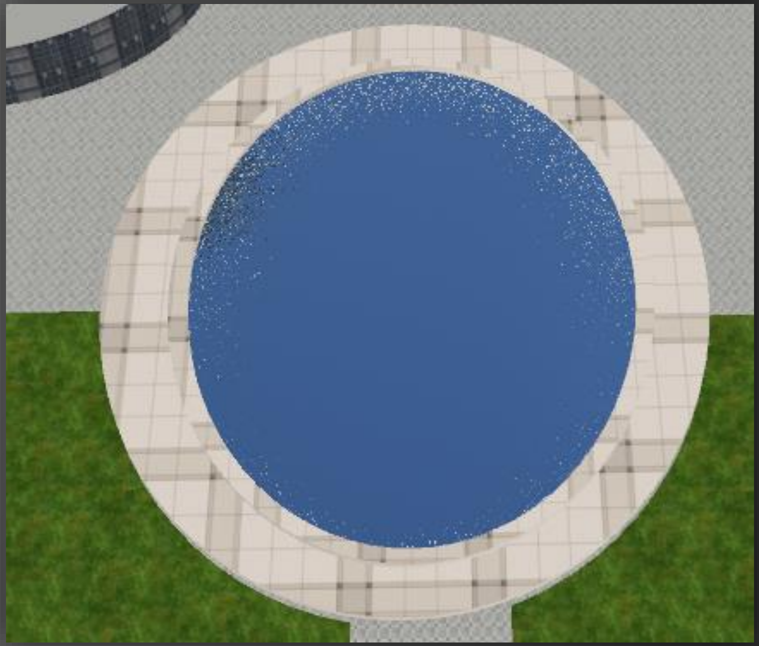
3D Symbolization

- Vector rendering
  - 3D Symbolization of point, line and polygon

Symbolize 2D Point



Symbolize 2D Line



Symbolize 2D Polygon

Exercise:

- Data for exercise: \Data\RapidModeling\Rapidmodeling.smwu
- Open RapidModeling workspace, add all datasets in the RapidModeling datasource into a new spherical scene and reorder the layers
- Render the StreetLamp point layer by Right Click -> Layer Style Settings…
- Import the marker symbol library from the Data\SymbolResources to help rendering
- Render the Tree point layer by Right Click -> Create Thematic Map…
- Render the Car point layer and the Trashcan point layer

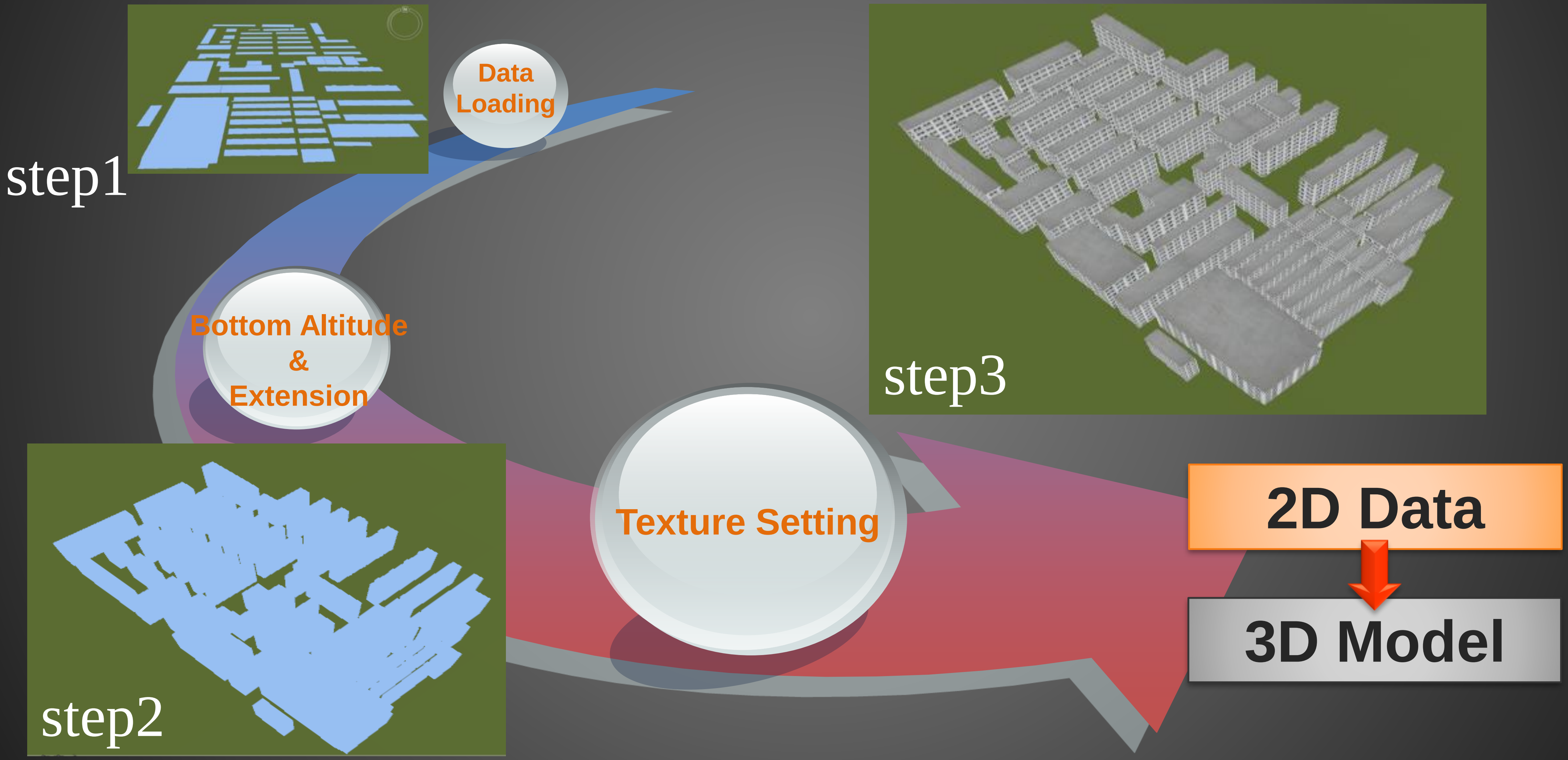
Exercise:

- Render the Road layer by Right Click -> Layer Style Setting…
- Import the line symbol library from the Data\SymbolResources to help rendering

- Render the Water layer by Right Click -> Layer Style Setting…
- Import the fill symbol library from the Data\SymbolResources to help rendering
- Set the Water layer's Altitude Mode under the Styles menu to Absolute

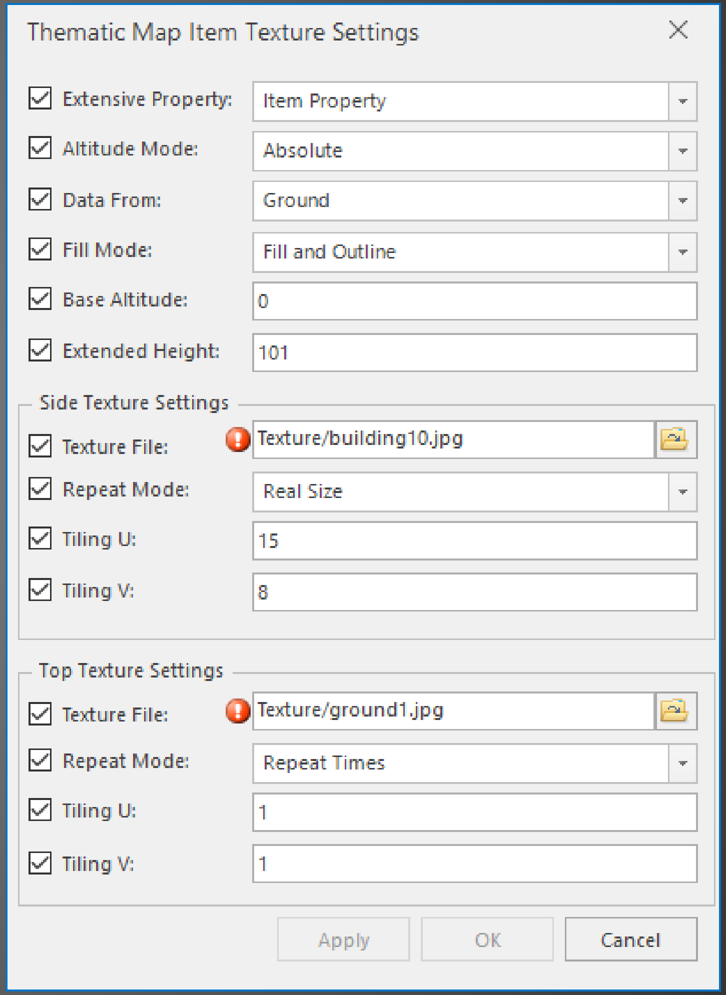
- Render the ParkingSpace layer

Rapid Modeling By Vector Stretching



Exercise:

- Make some models by vector stretching.
  - Fence layer
  - Building_2 layer
  - Ground layer
  - PoolEdge layer
- Make unique thematic map, stretch each item and set their textures
  - Building_1 layer



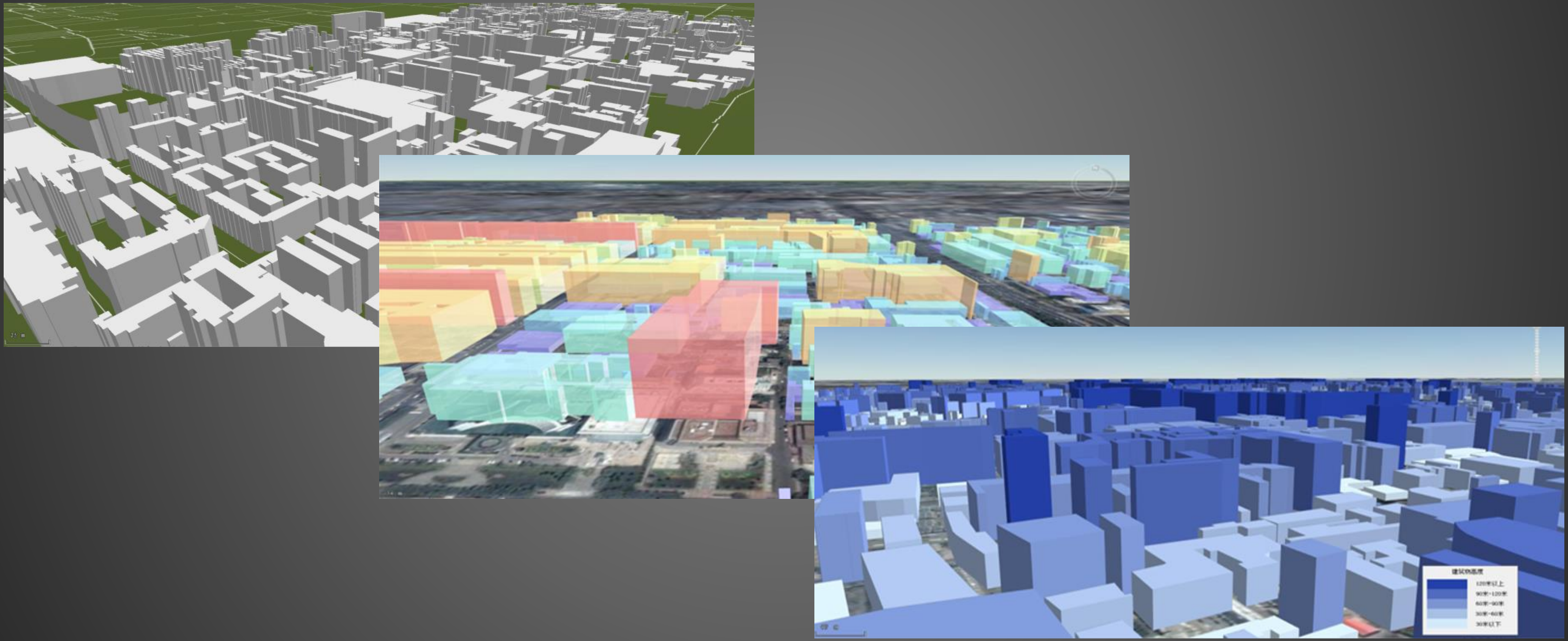
Preparation for vector stretch Modeling

- Data preparation：
  - 1. Make/Get the 2D vector dataset
  - 2. Take the texture images of actual buildings
  - 3. Edit the texture images in Photoshop, especially the pixels
  - 4. Add fields for datasets and edit their values like:

    bottom altitude, extension height, top and side texture paths, etc.

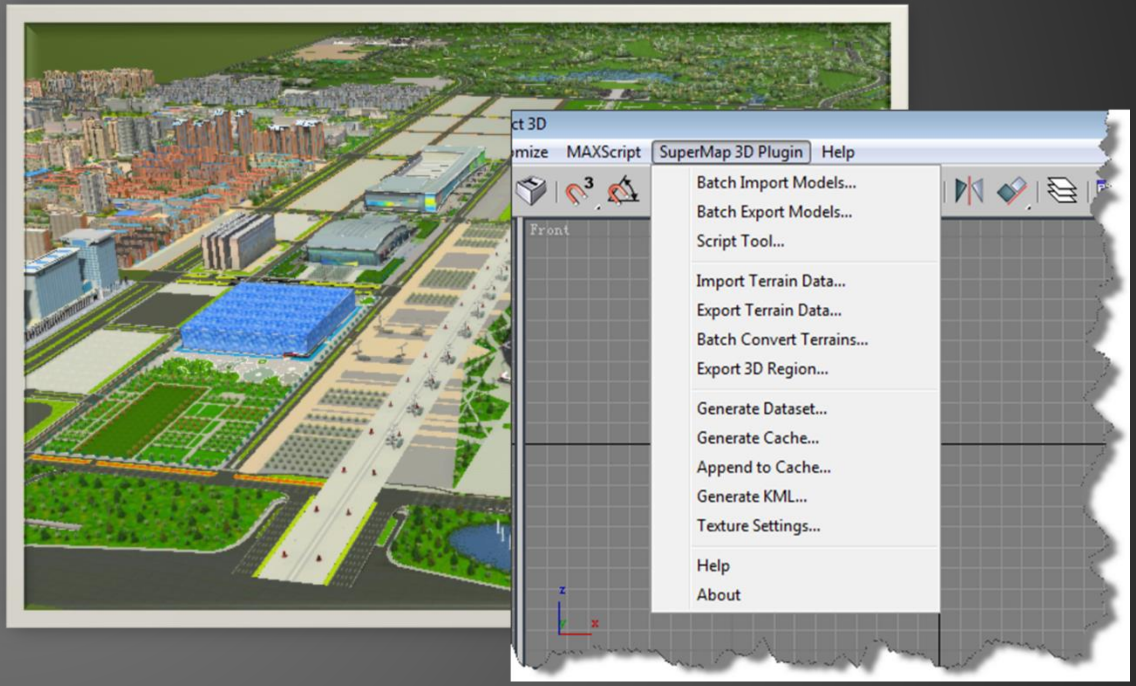
Rapid Modeling By Vector Stretching

- Applicable to the data of large and non-important area

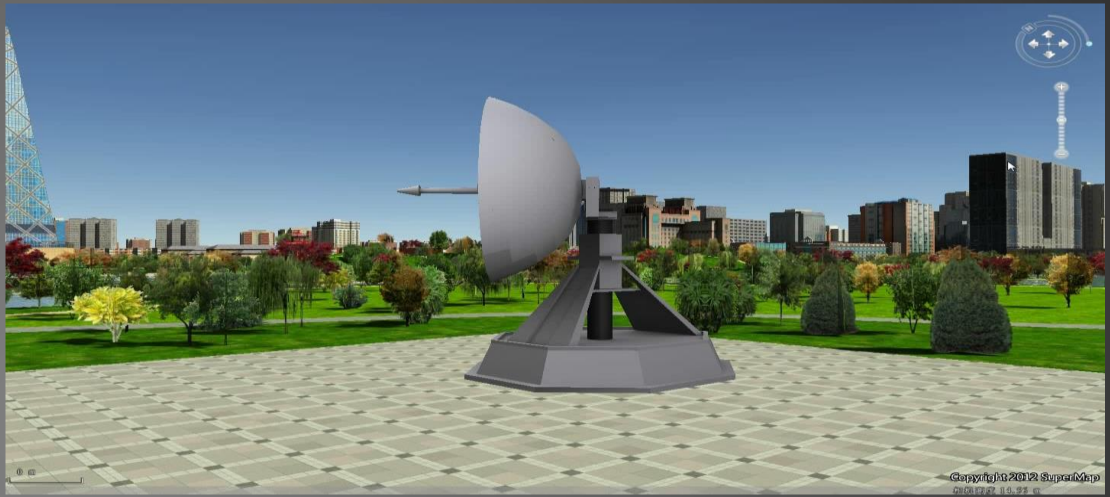


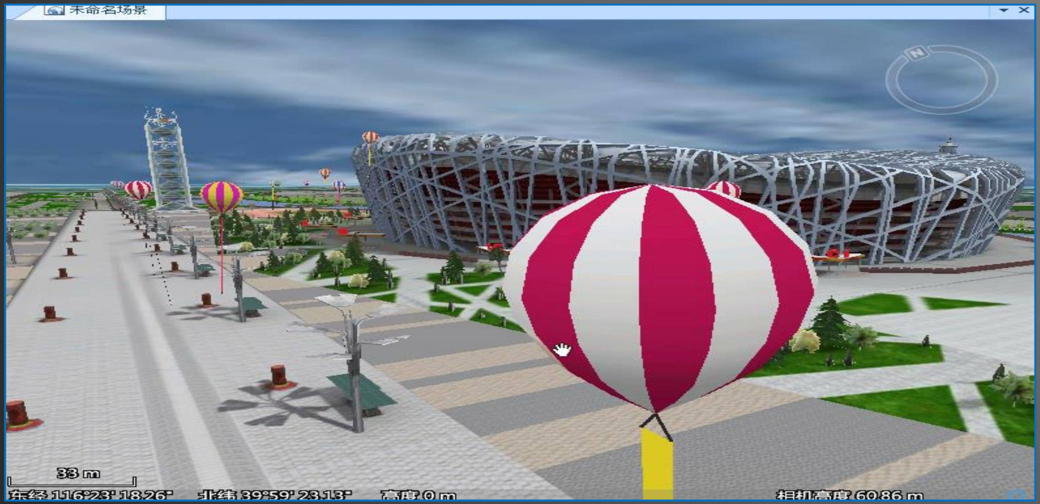
3Ds Max Model

- Applicable to important buildings in a small area
- Process to apply the 3Dx Max model
  - Make models in 3Ds Max
  - Install SuperMap 3D Plugin in 3Ds Max
  - Export models into the dataset saved in a file datasource
  - Add the dataset which stores models into a 3D Scene
- Download link:
  - http://support.supermap.com.cn/DownloadCenter/ProductAuxiliary.aspx



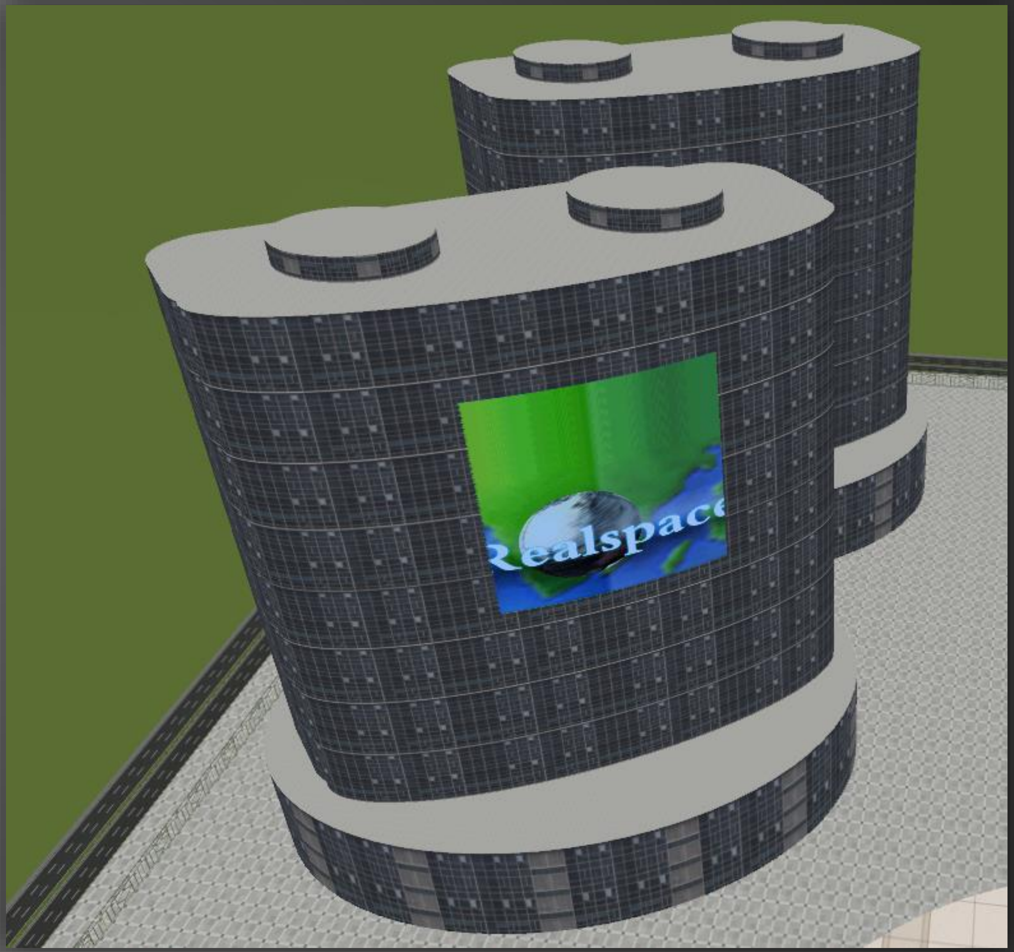
Animation Model





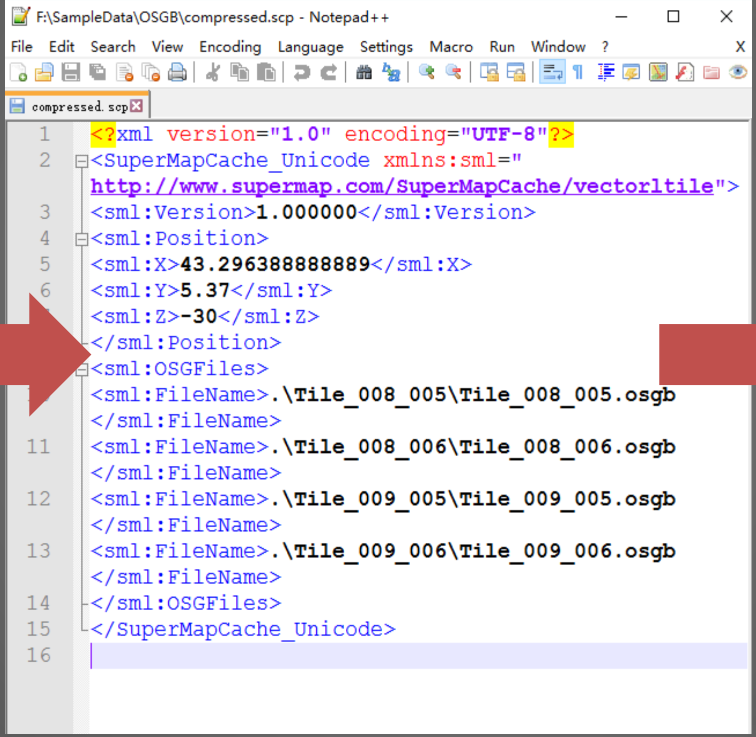
Exercise:

- Render the Adboard layer by vector stretching
  - Set the layer’s Altitude Mode to Absolute
  - Set its Bottom Altitude as 80
  - Set its Extension value as 50
  - Set its texture path as: \Data\RapidModeling\Texture\Realspace.gif



Oblique Photographic Model

- S3M/OSGB files -> Generate OSGB Config File -> Add OSGB

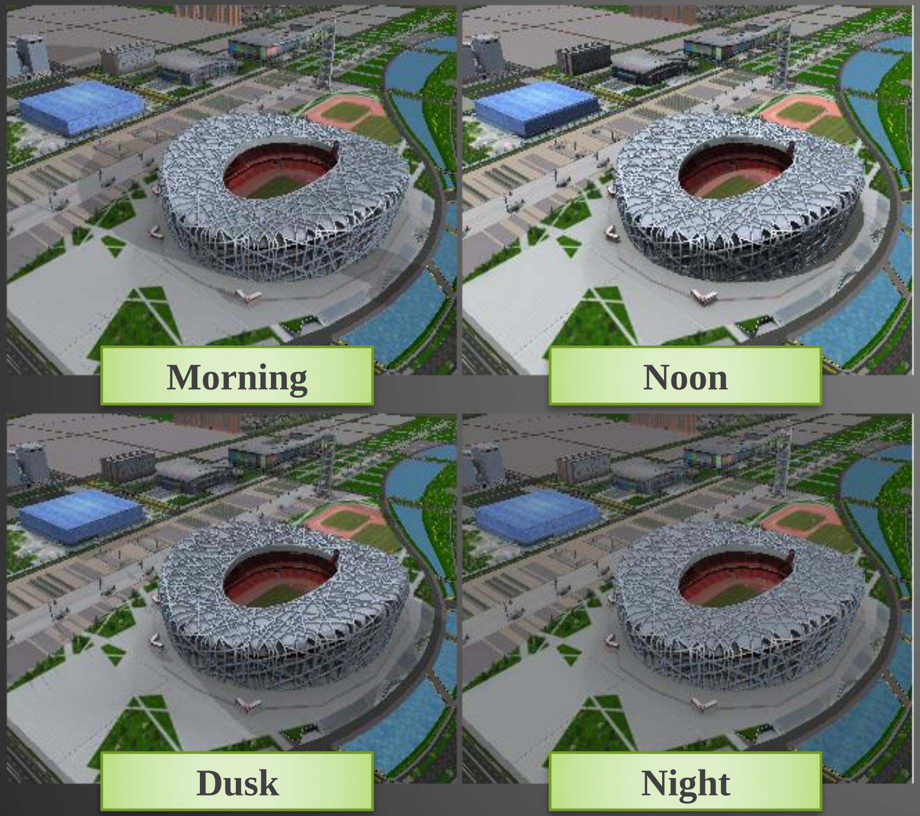


PART 05

➢ **Effects in 3D Scene**

Overview

- Sunshine effects



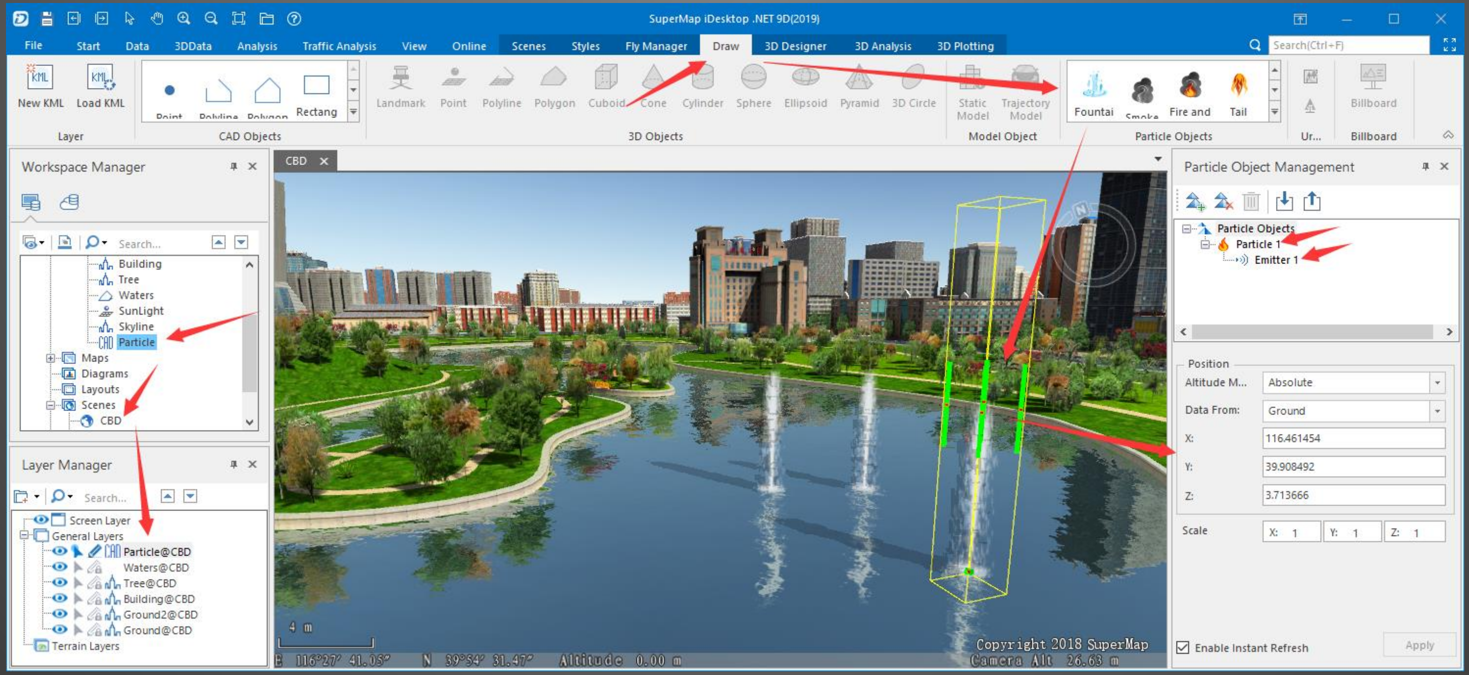
- Particle effects

Sunshine effects

1. Open the CBD workspace under the installation directory\SampleData\3D\CBDDataset
2. Add the Building dataset into a spherical scene
3. Turn on the sun effects
4. Building layer ->Right Click ->Enable Shadow ->Display All Shadows
5. Adjust the timeline under the Trajectory to view the sun effects of different times

Particle effects

1. Open the CBD scene and locate to the water area
2. Create a new CAD dataset named Particle and confirm its coordinate system is consistent with others
3. Add the Particle dataset into the CBD scene and set the layer to editable
4. Choose the Fountain which is in the Particle Objects collection under the Draw menu
5. Click in the scene to add one or more foundations
6. Select an object ->Right click ->Properties to modify its settings



PART 06

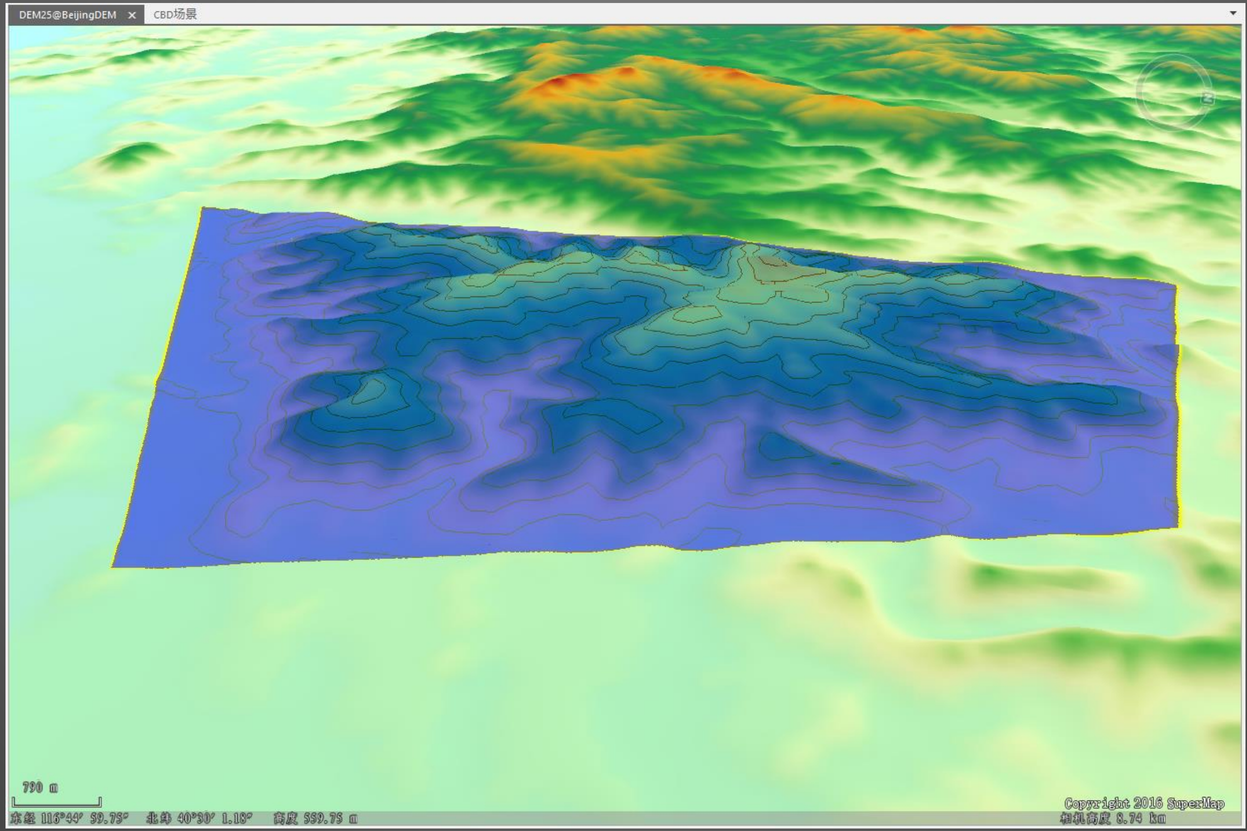
➢3D Analysis

Overview

- Isoline Analysis
- Slope and Aspect Analysis
- Flood Analysis
- Visibility Analysis
- Viewshed Analysis
- Sunlight Analysis
- Profile Analysis
- Skyline Analysis

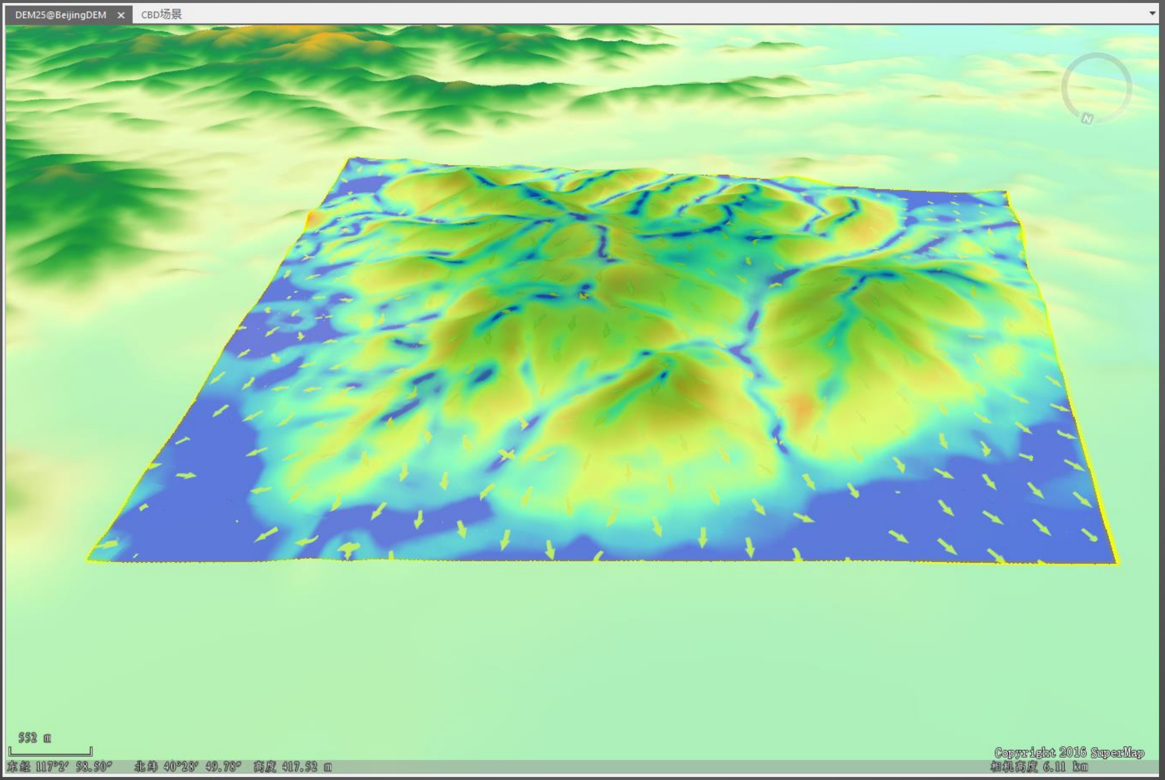
Isoline Analysis

- Isoline is the mostly-commonly used method to represent a surface on a map.



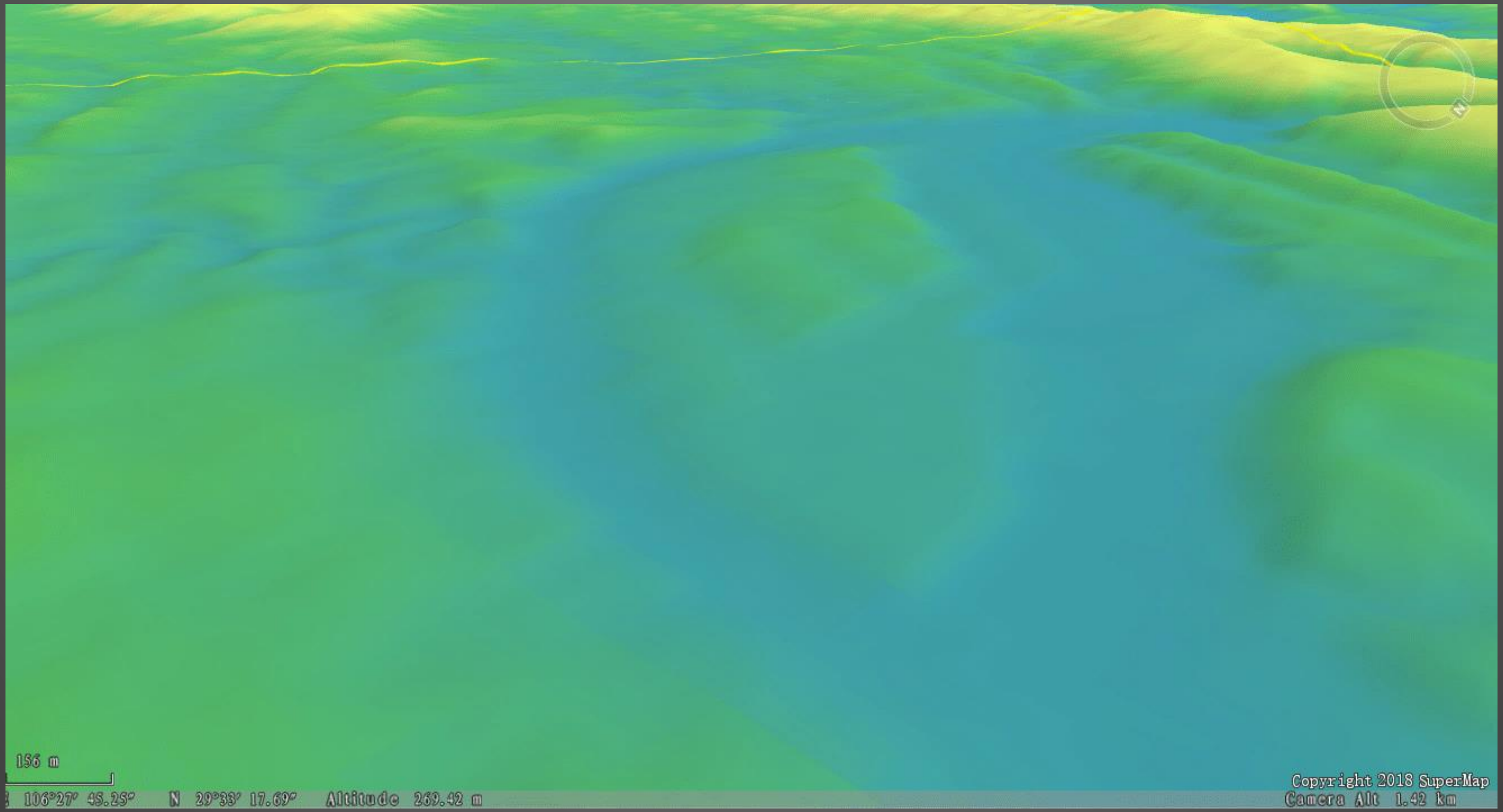
Slope and Aspect Analysis

- Slope is the gradient (steepness) of a unit of terrain. The aspect identifies the downslope direction of the maximum rate of change in value from each cell to its neighbors.



Flood Analysis

- Used to simulate the flooding process over a duration of time with the specified speed and within the maximum/minimum elevations.



Visibility Analysis

- Often used in 3D analysis, this function is used to determine whether certain locations in a 3D scene are visible to the observer location.

Viewshed Analysis

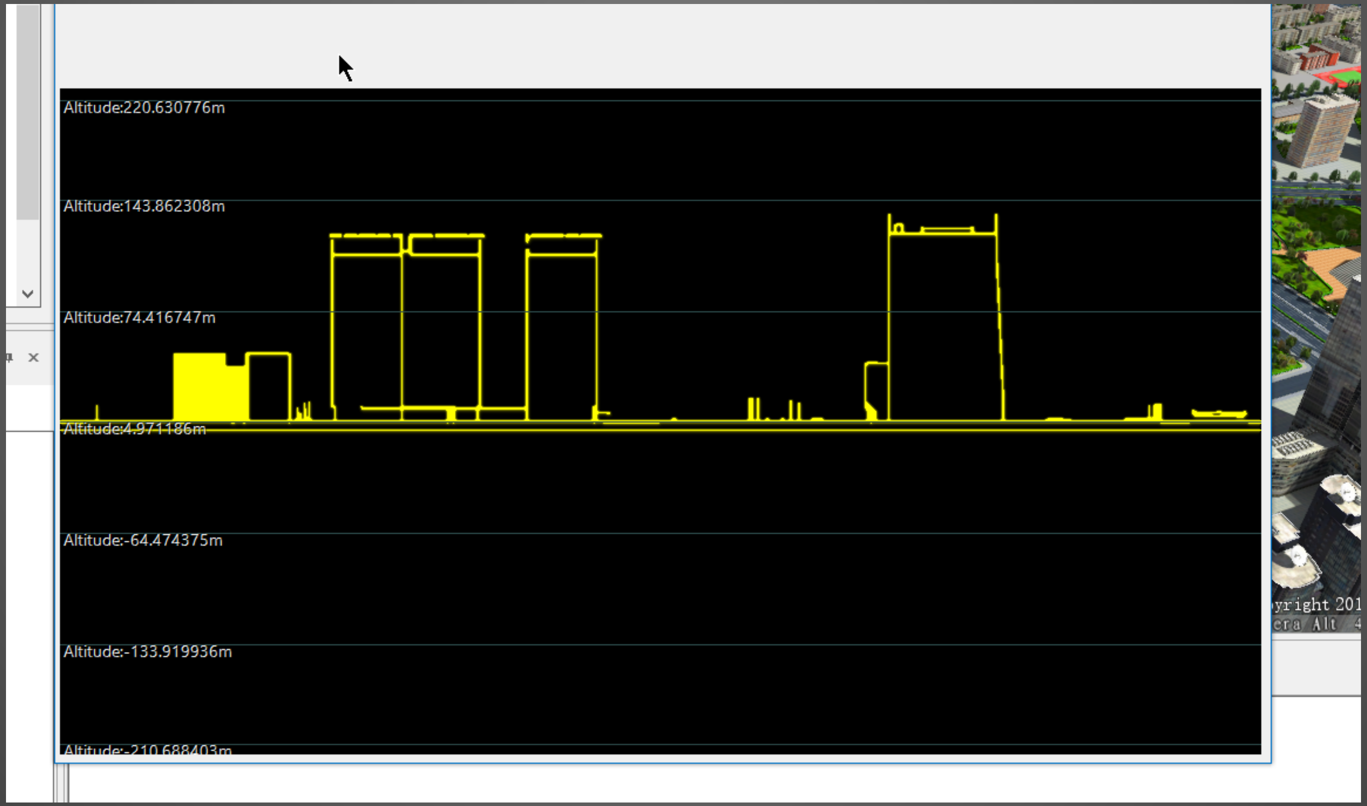
- This function is used to identify all the visible and invisible ranges in the analysis area of a scene.

Sunlight Analysis

- This analysis is used to calculate the duration of sunlight in a period of time within an extent defined by longitude and latitude.

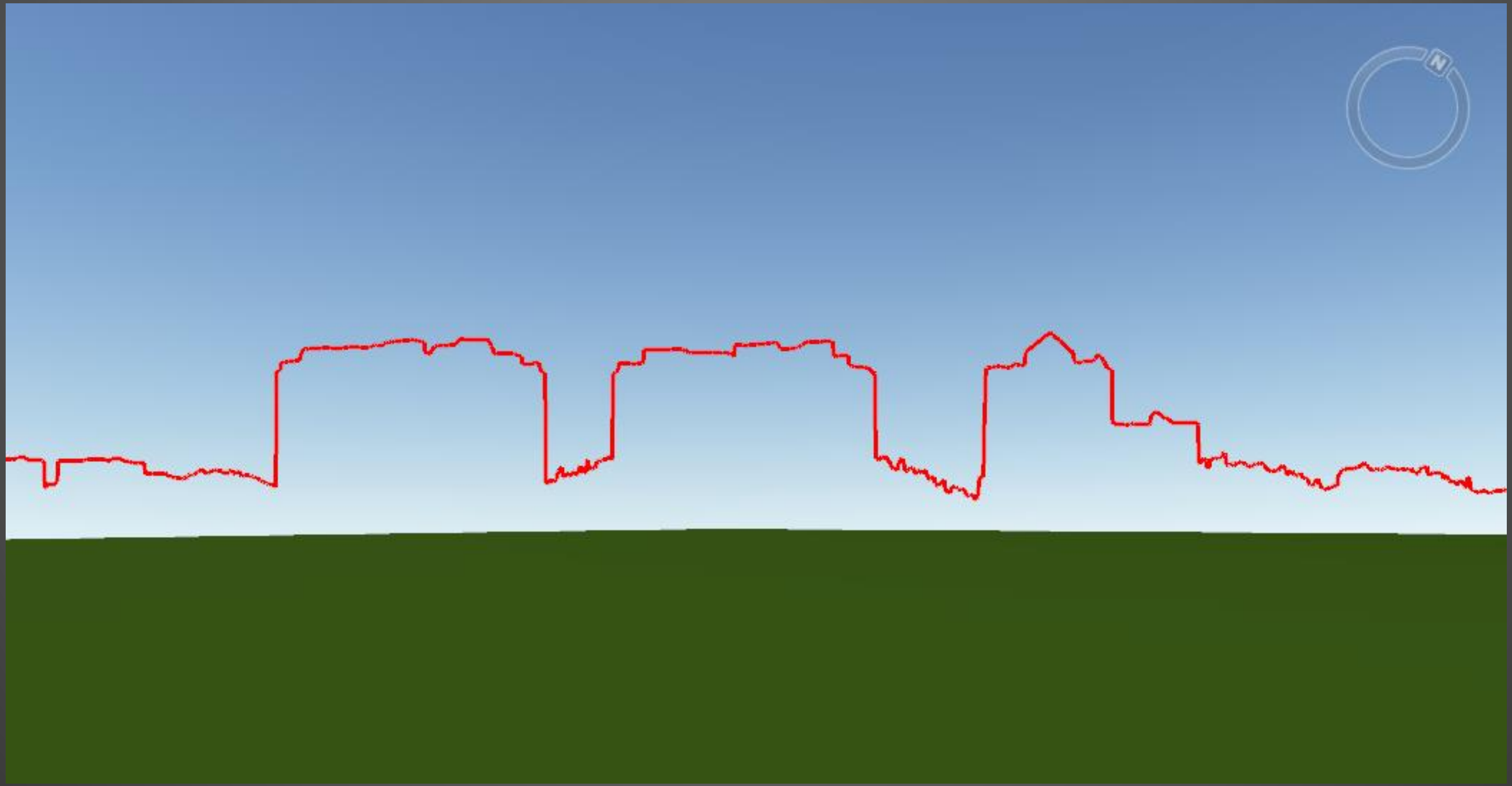
Profile Analysis

- Profile shows the change of elevation along the line (section).



Skyline Analysis

- This function will allows the generation of the boundary between the building tops and the sky from the observer point.



Thank you