

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

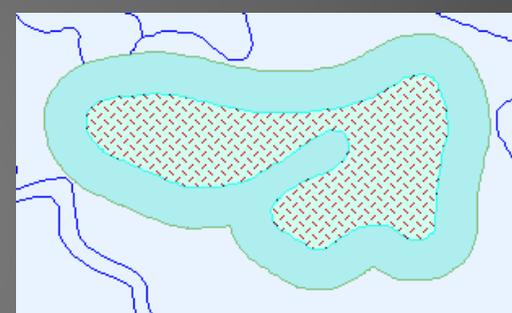
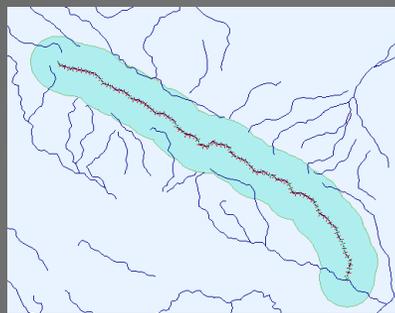
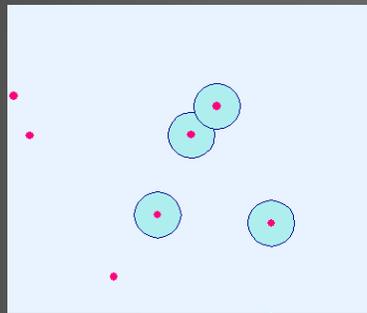
➤ **Buffer & Overlay Analysis**

Overview

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

Buffer Analysis

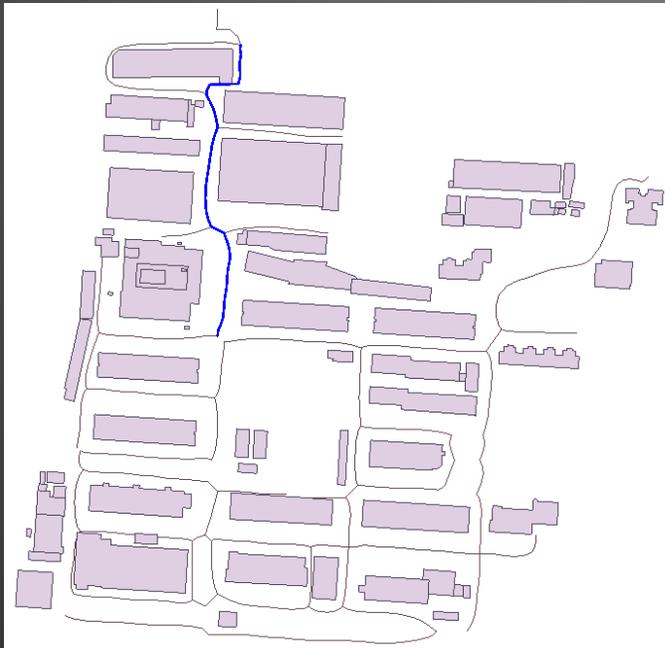
- What is buffer?
 - The extension space created around a given object, such as a point, a line, or a polygon.



- 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.



Create Buffer ✕

Data Type: Point and Region Line

Buffer

Datasource:

Dataset:

Selected Objects Only

Buffer Type

Round Left

Flat Right

Result Settings

Union Buffer Keep Attributes

Display In Map Display On Scene

Semicircle Segments:

Buffer Radius

Unit:

Numeric

Left Radius:

Right Radius:

Result Data

Datasource:

Dataset:

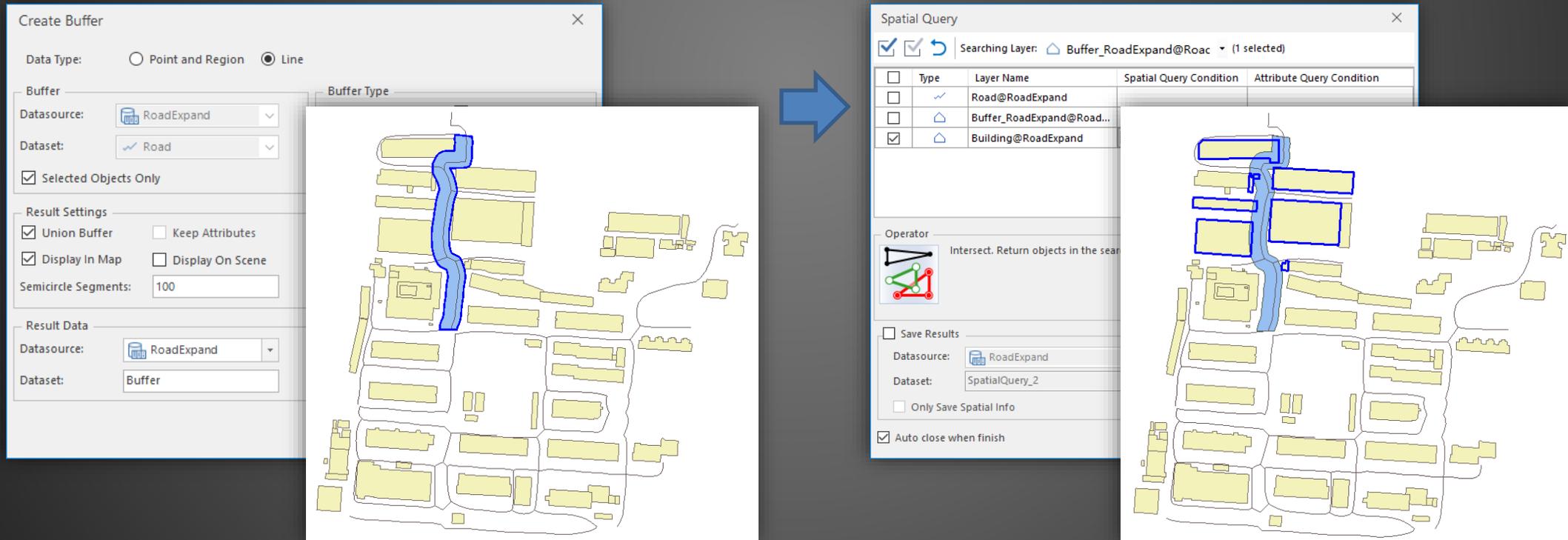
Field

Left Radius:

Right Radius:

Exercise:

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



The image illustrates the workflow for finding buildings affected by road expansion in SuperMap. It consists of three main parts:

1. Create Buffer Dialog: This dialog is used to create a buffer around a road. The 'Data Type' is set to 'Line'. The 'Datasource' is 'RoadExpand' and the 'Dataset' is 'Road'. The 'Buffer Type' is set to 'Line'. The 'Result Settings' include 'Union Buffer', 'Display In Map', and 'Semicircle Segments' set to 100. The 'Result Data' is set to 'Buffer'.

2. Map with Buffer: A map showing a road network with a blue buffer zone around a specific road segment. The buildings are represented by yellow polygons.

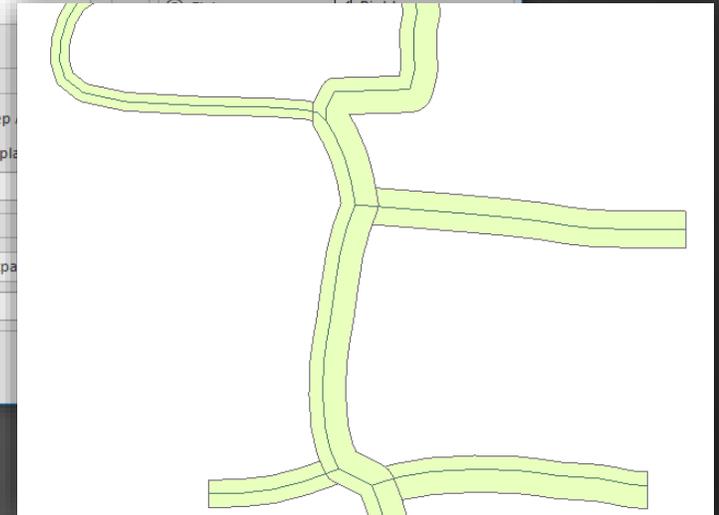
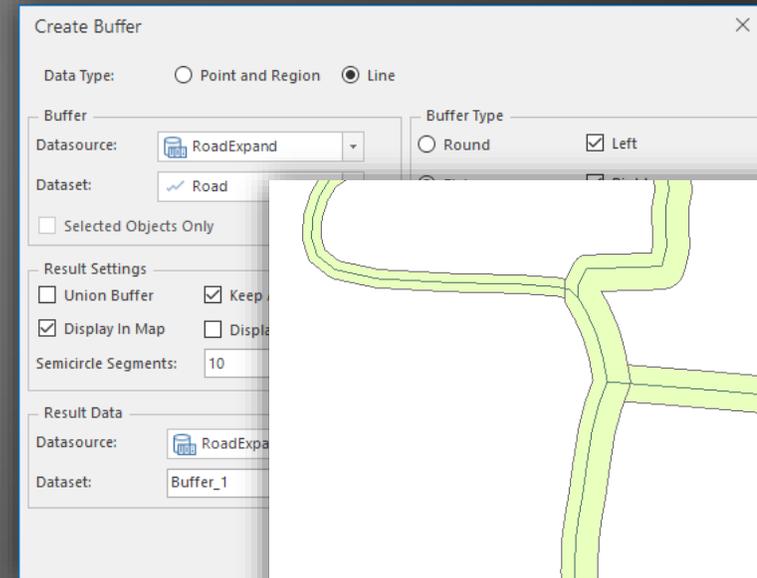
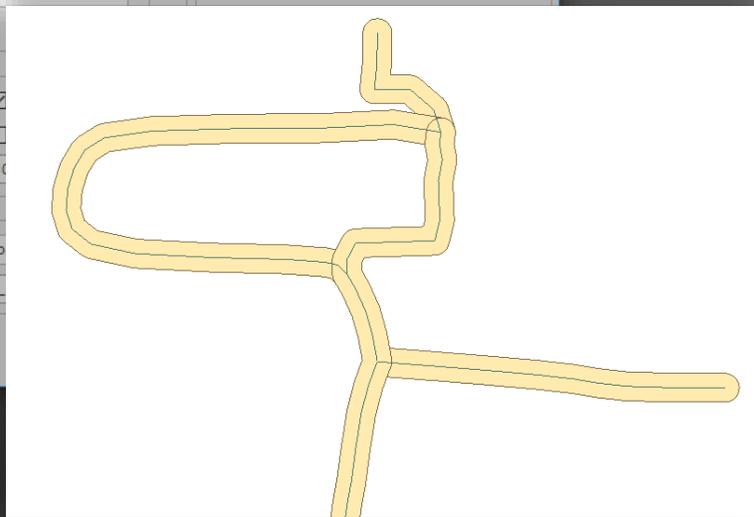
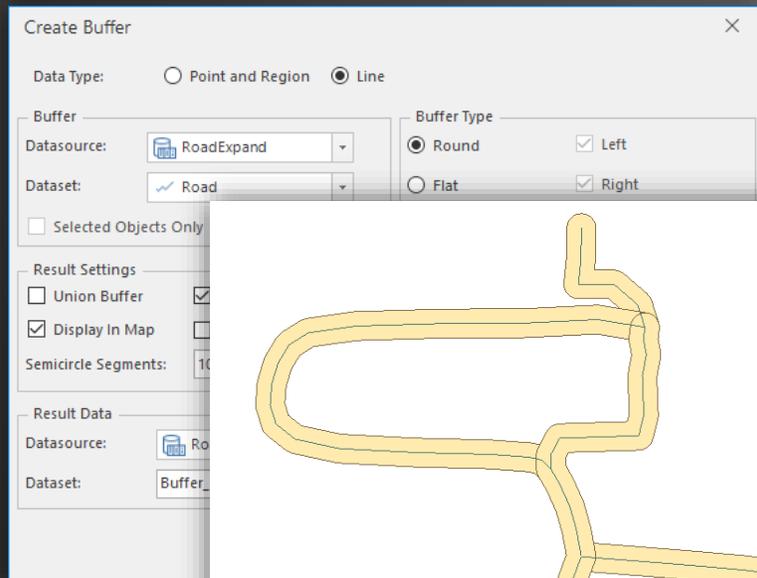
3. Spatial Query Dialog: This dialog is used to perform a spatial query. The 'Searching Layer' is 'Buffer_RoadExpand@Roac' (1 selected). The 'Operator' is 'Intersect. Return objects in the search area'. The 'Save Results' section is checked, and the 'Dataset' is 'SpatialQuery_2'. The 'Auto close when finish' option is also checked.

Type	Layer Name	Spatial Query Condition	Attribute Query Condition
<input type="checkbox"/>	✓ Road@RoadExpand		
<input type="checkbox"/>	△ Buffer_RoadExpand@Road...		
<input checked="" type="checkbox"/>	△ Building@RoadExpand		

4. Map with Results: A map showing the result of the spatial query. The buildings that are intersected by the buffer zone are highlighted in blue, indicating they are affected by the road expansion.

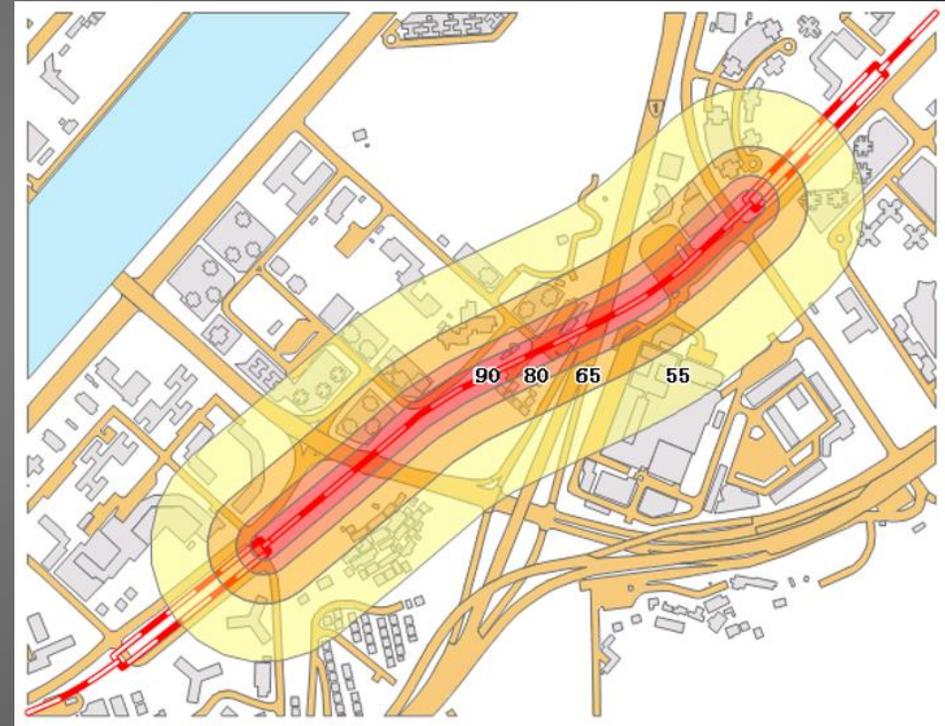
Create Buffer for Dataset

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



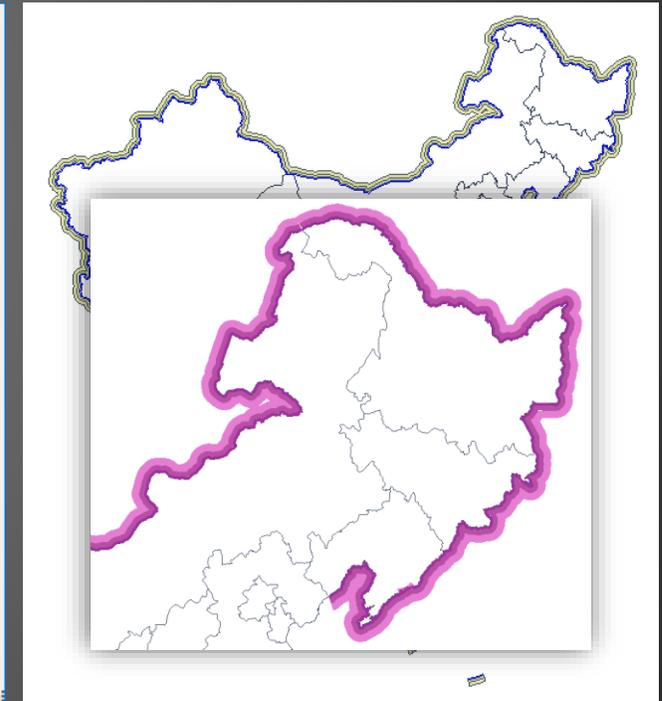
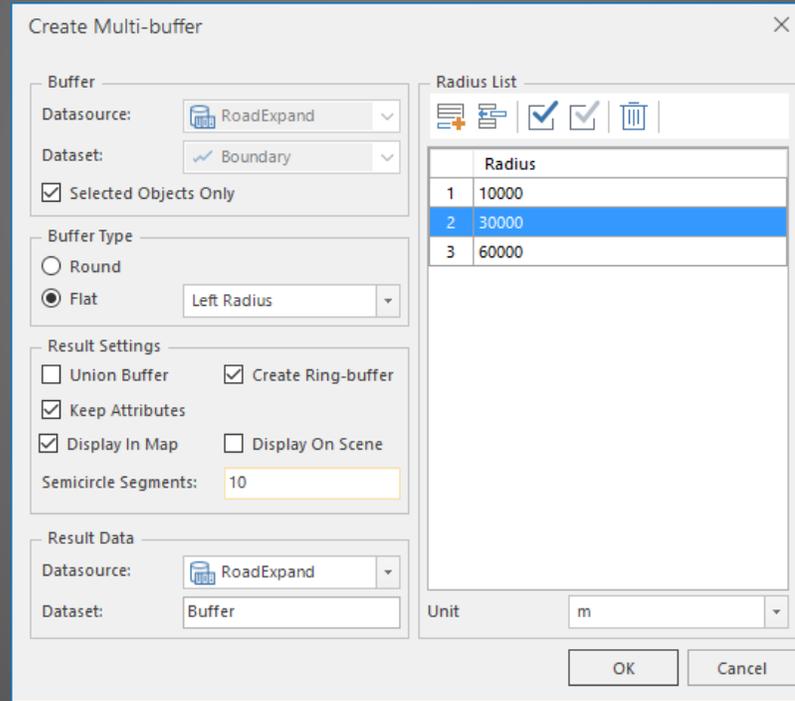
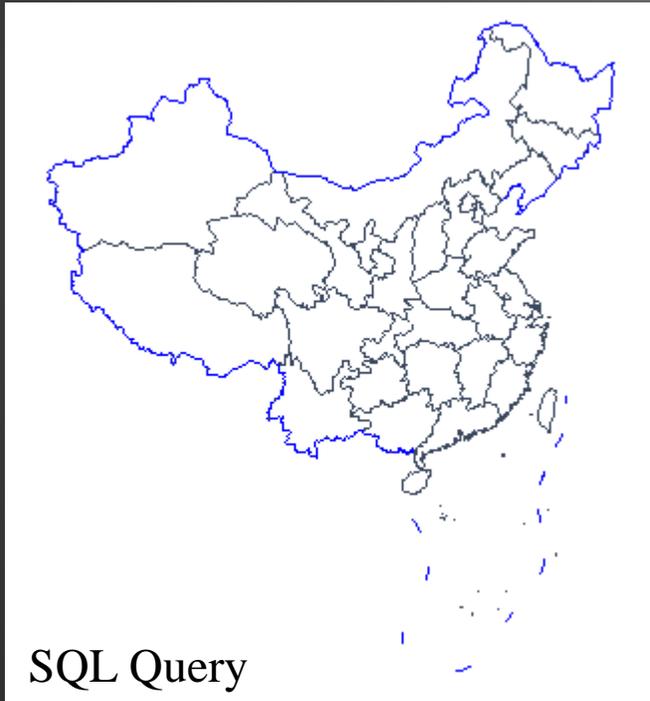
Create Multi-Buffer Zone

- 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



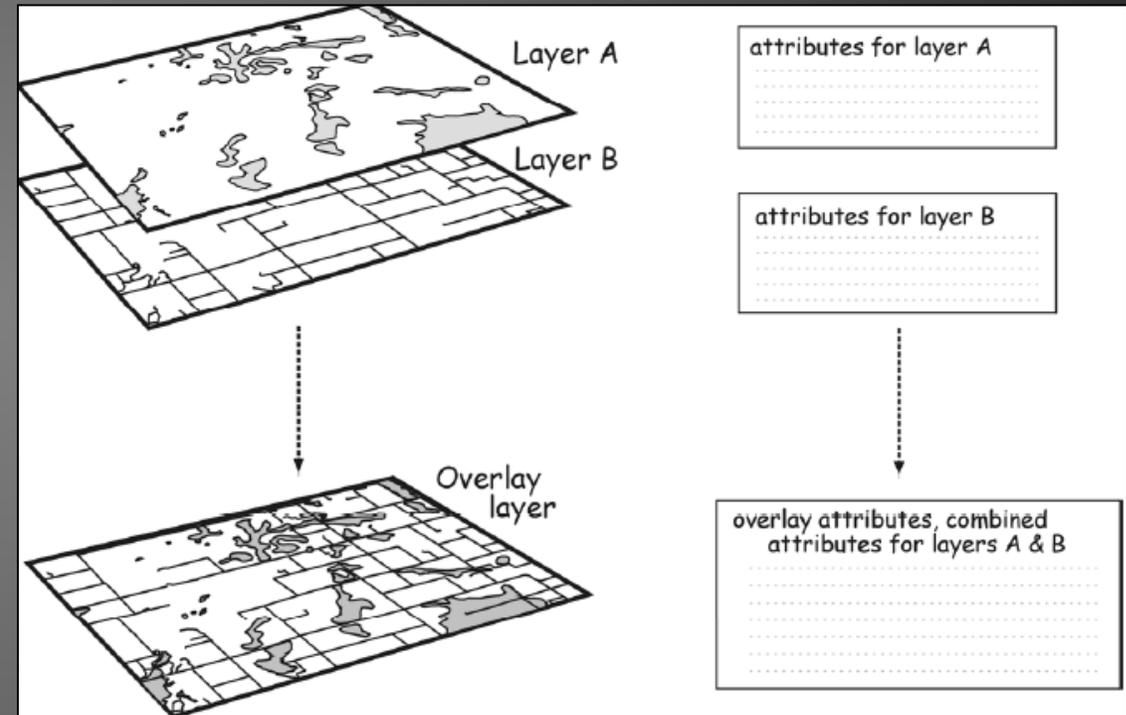
Exercise:

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



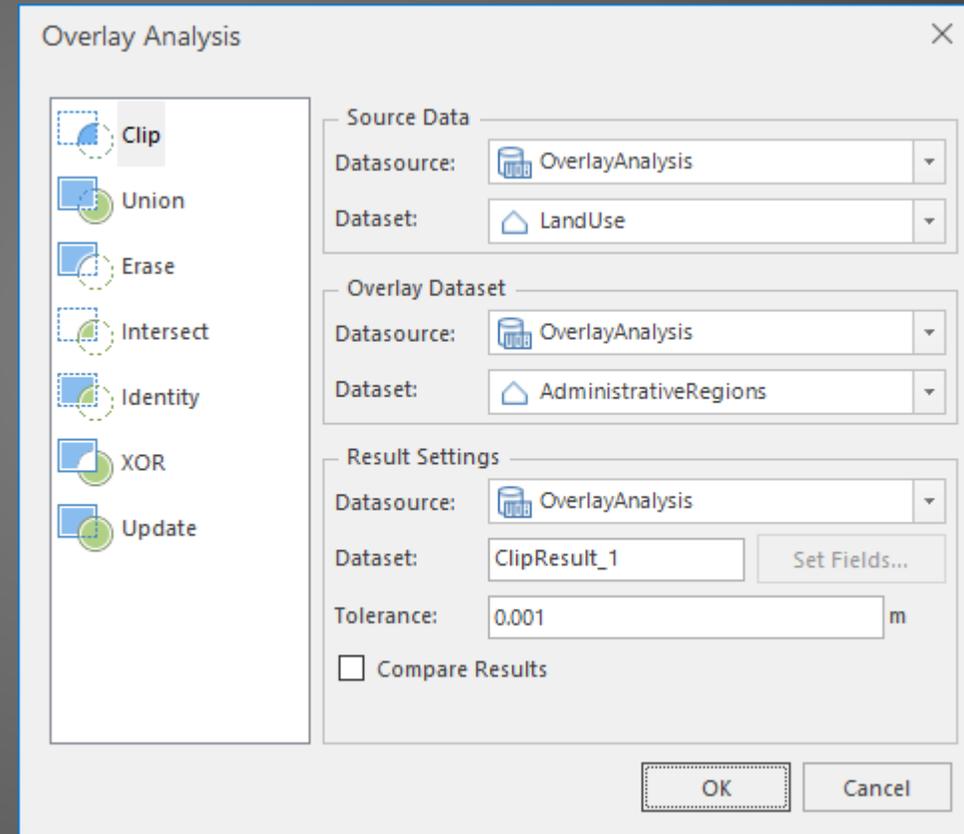
Overlay Analysis

- 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



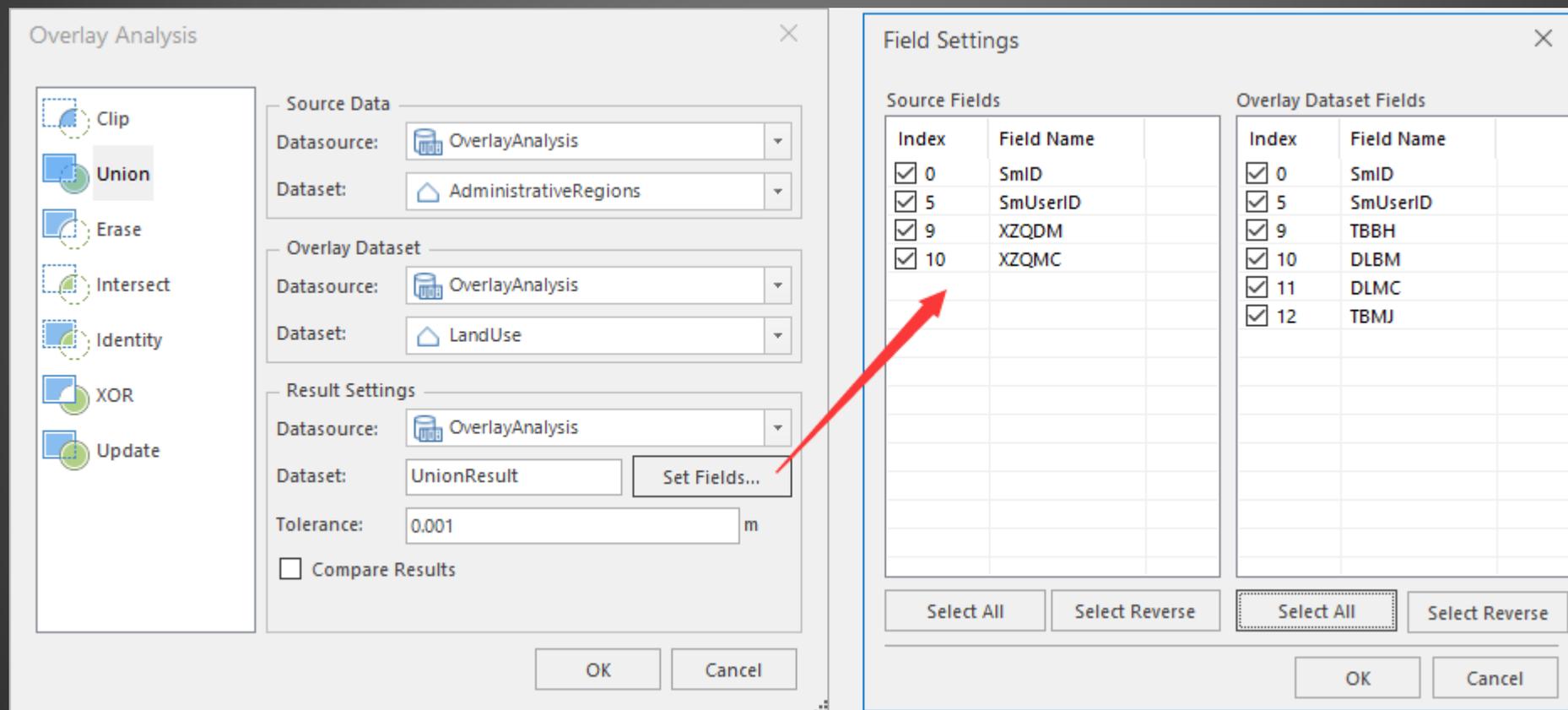
Clip

- Exercise: get land use data of Liuzhuang Village.

The diagram illustrates the 'Clip' operation in two parts. On the left, a schematic shows a 'Clipped Dataset' (a network of lines) and a 'Clip Dataset' (an irregular polygon). An arrow points from these two inputs to a 'Result' box containing the network of lines that have been cut by the polygon. On the right, a screenshot of the 'Overlay Analysis' dialog box shows the 'Clip' tool selected. The 'Source Data' section is set to 'OverlayAnalysis' and 'LandUse'. The 'Overlay Dataset' section is set to 'LiuzhuangVillage'. The 'Result Settings' section is set to 'ClipResult_1' with a 'Tolerance' of '0.001 m'. The 'OK' and 'Cancel' buttons are visible at the bottom. To the right of the dialog box is a map showing the result of the clip operation: a network of lines (roads or rivers) overlaid on a land use map, with the lines within the village boundary highlighted in yellow.

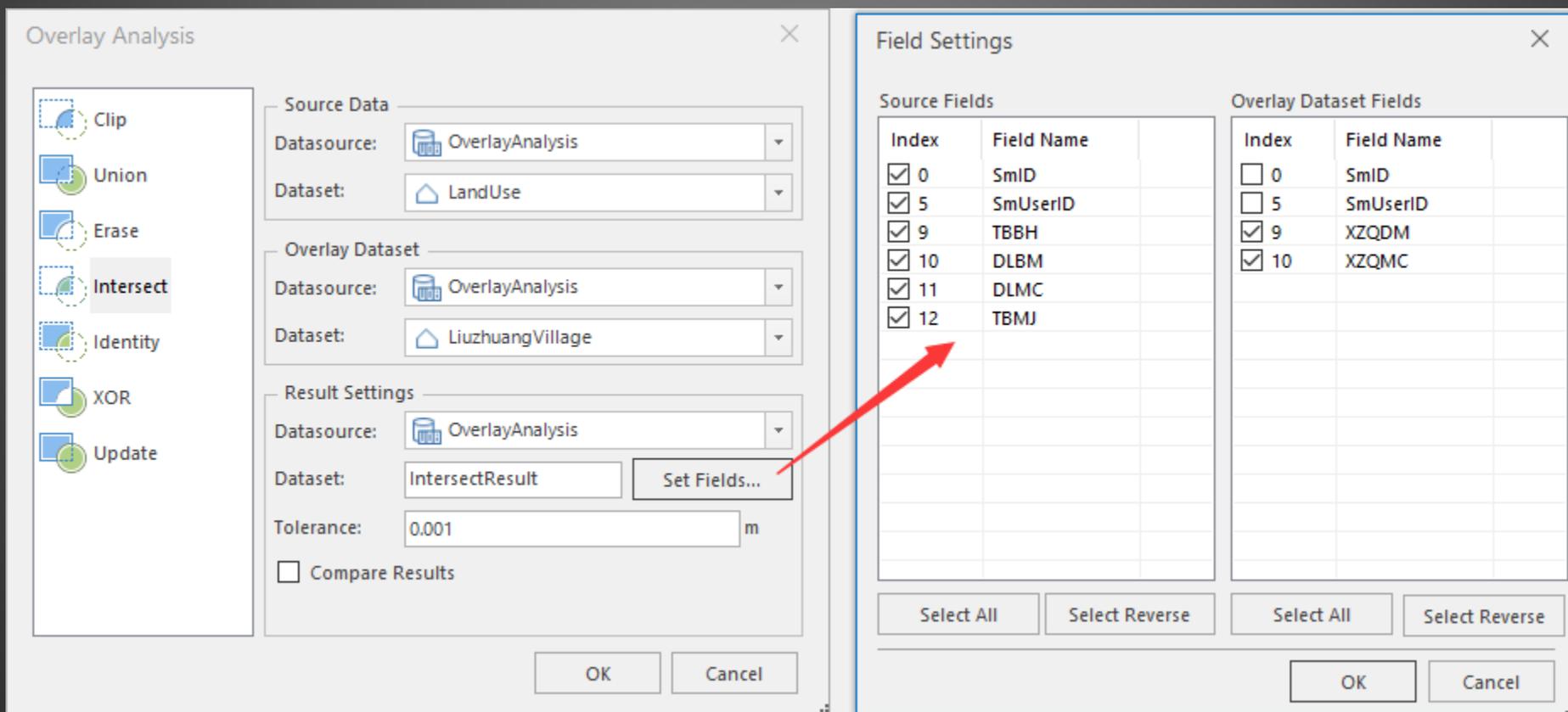
Union

- Get land use data with Administrative information



Intersect

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



Overlay Analysis

Source Data
 Datasource: OverlayAnalysis
 Dataset: LandUse

Overlay Dataset
 Datasource: OverlayAnalysis
 Dataset: LiuzhuangVillage

Result Settings
 Datasource: OverlayAnalysis
 Dataset: IntersectResult **Set Fields...**
 Tolerance: 0.001 m
 Compare Results

Field Settings

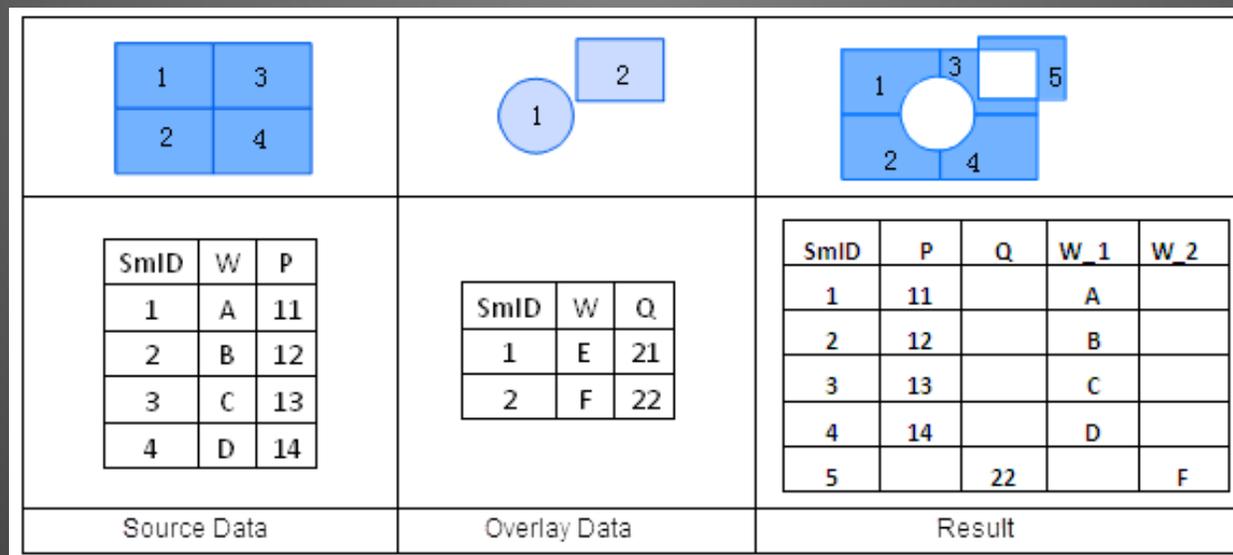
Source Fields		Overlay Dataset Fields	
Index	Field Name	Index	Field Name
<input checked="" type="checkbox"/> 0	SmID	<input type="checkbox"/> 0	SmID
<input checked="" type="checkbox"/> 5	SmUserID	<input type="checkbox"/> 5	SmUserID
<input checked="" type="checkbox"/> 9	TBBH	<input checked="" type="checkbox"/> 9	XZQDM
<input checked="" type="checkbox"/> 10	DLBM	<input checked="" type="checkbox"/> 10	XZQMC
<input checked="" type="checkbox"/> 11	DLMC		
<input checked="" type="checkbox"/> 12	TBMJ		

Select All Select Reverse Select All Select Reverse

OK Cancel

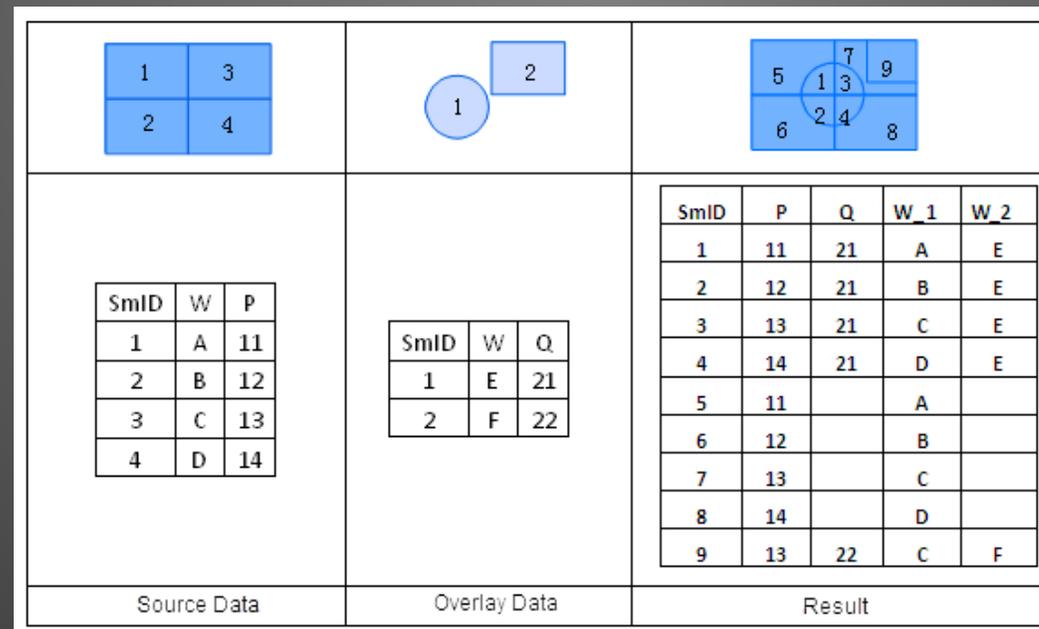
XOR (Symmetric Difference)

- 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.



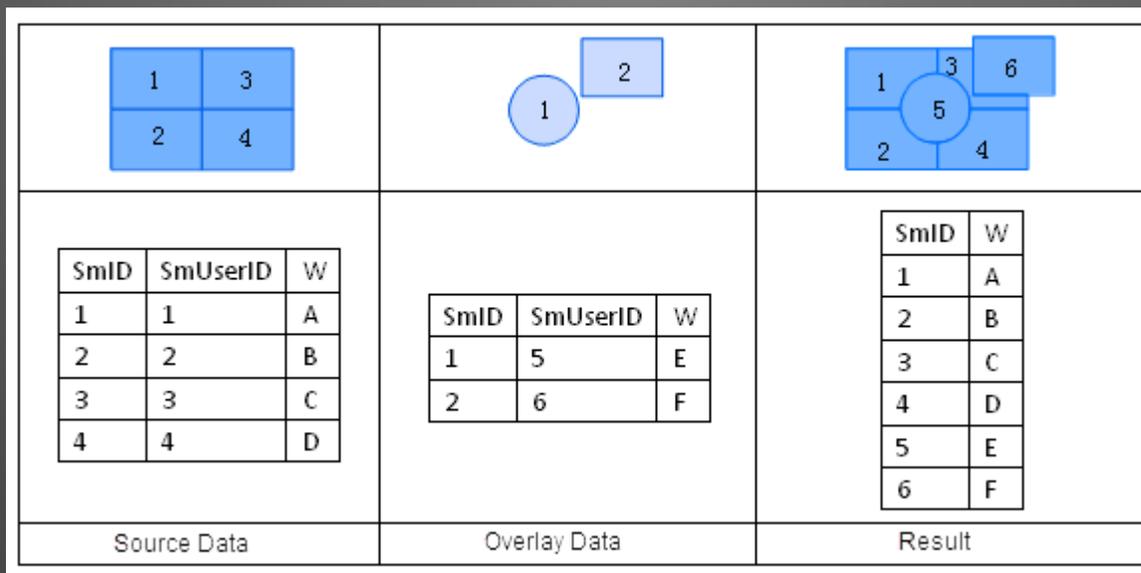
Identity

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



Update

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





PART 02



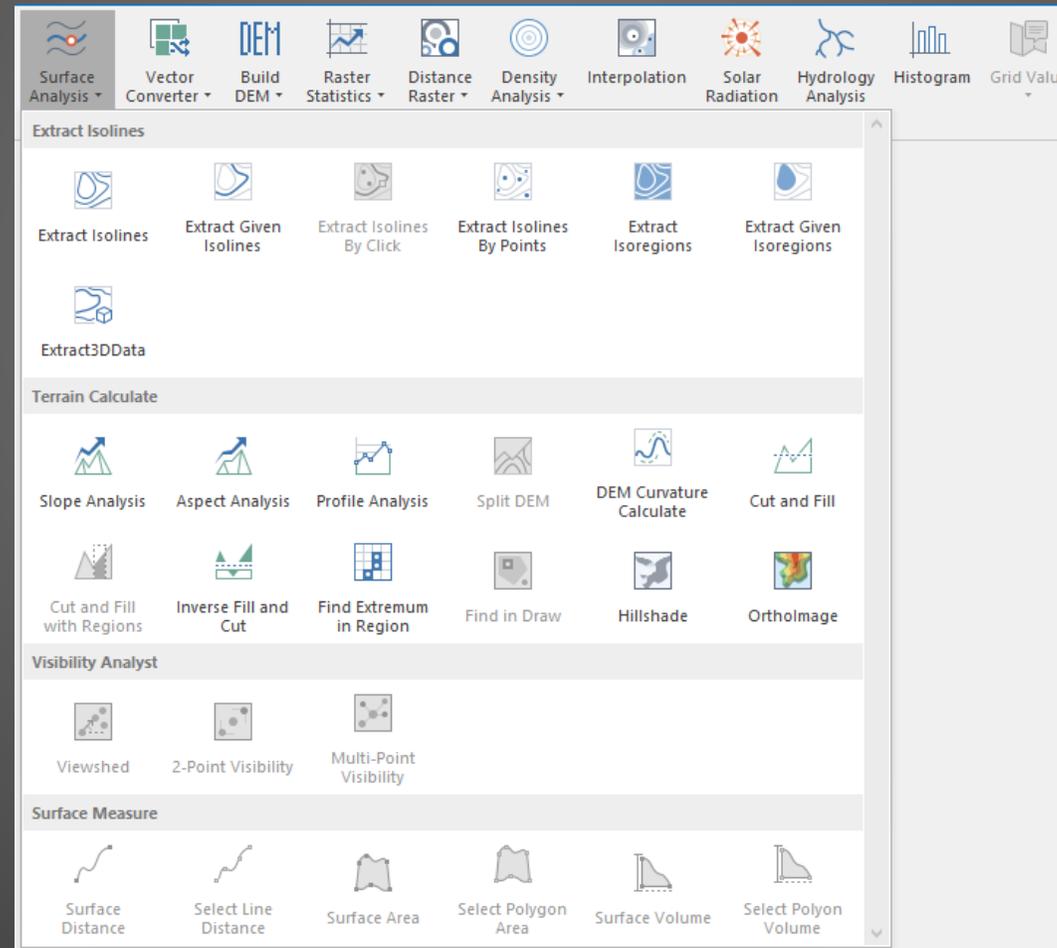
Raster Analysis

Overview

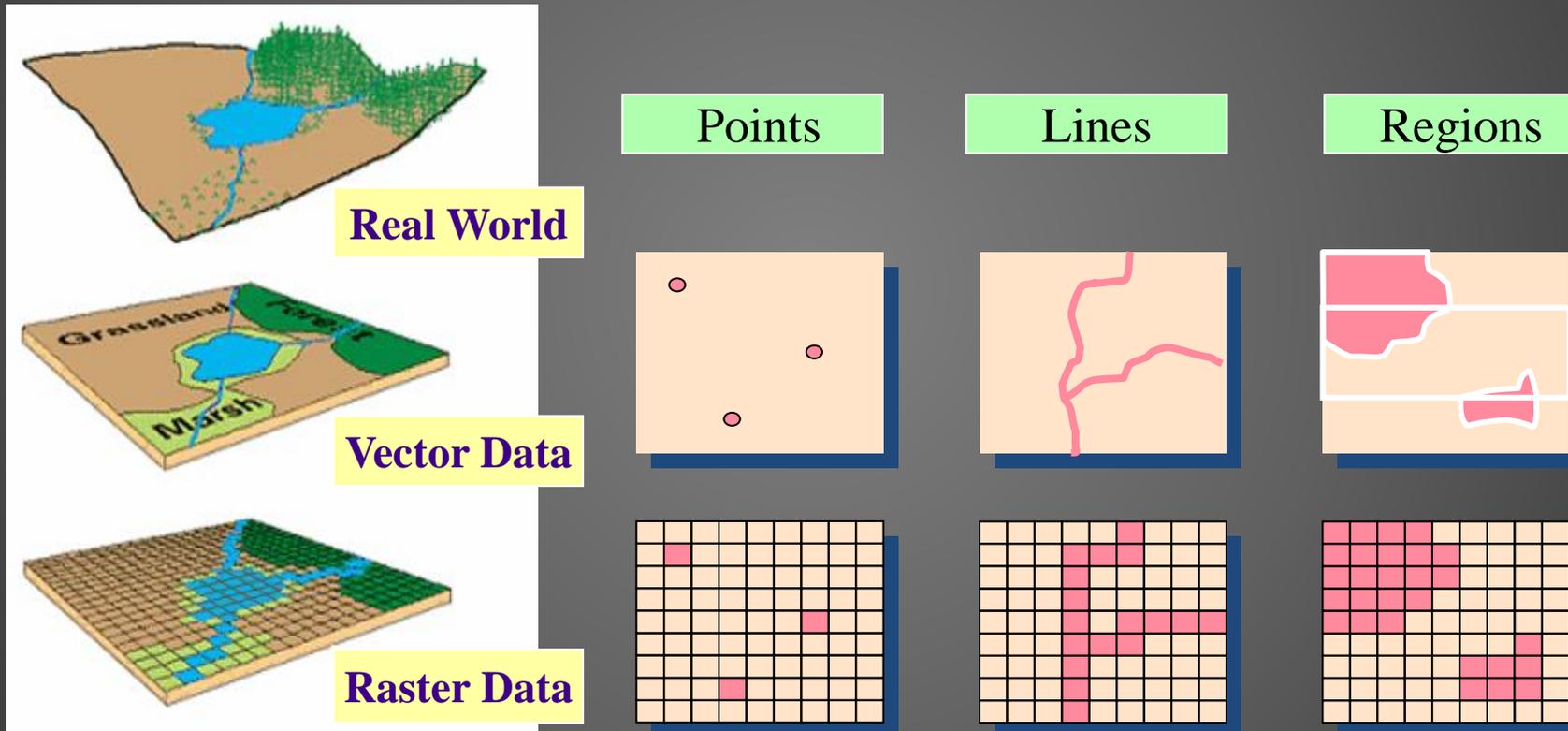
- Raster Dataset Types
- Interpolate to Raster (IDW, Kriging & Spline)
- Surface Analysis
 - Isolines /Isoregions
 - Slope / Aspect
 - Orthographic Image & HillShade
 - Surface Area & Distance
 - Identify Value

Raster Analysis

- Analysis based on raster dataset.

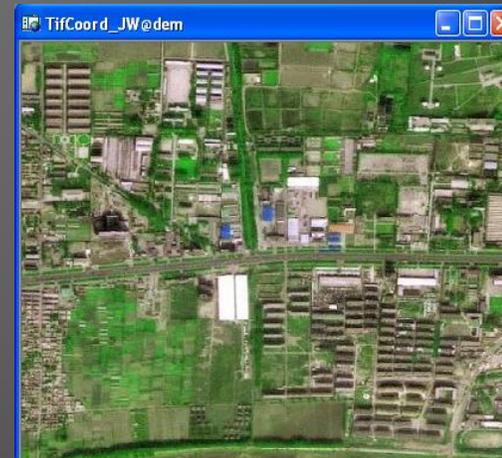
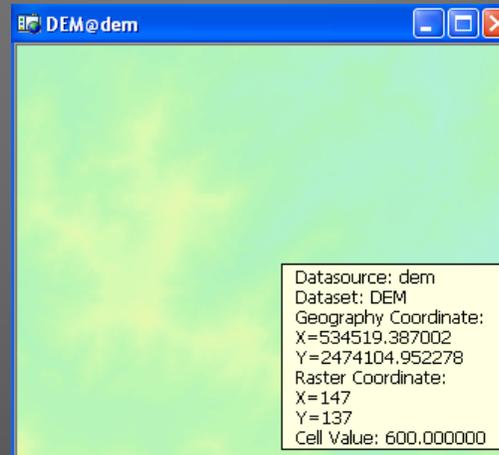


Raster Data Structure



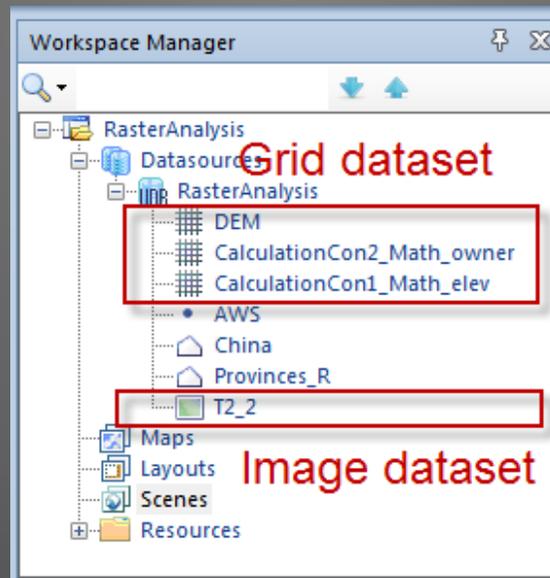
Raster Dataset Types

- 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.

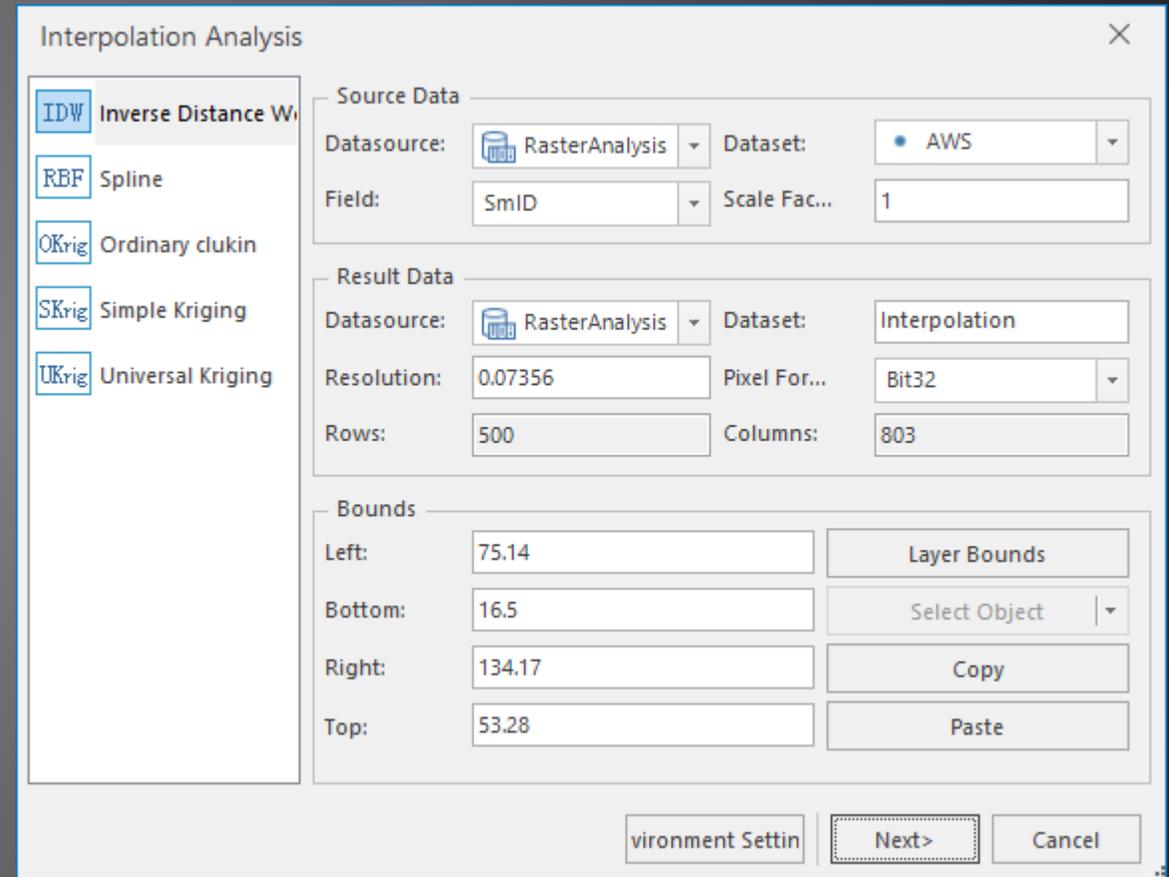


Interpolate to Raster

- 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.

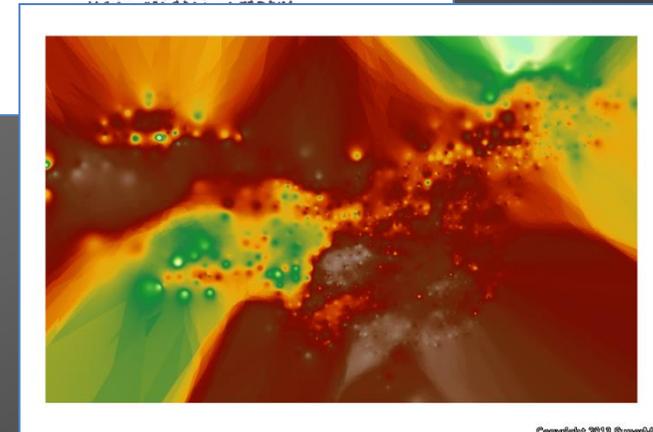
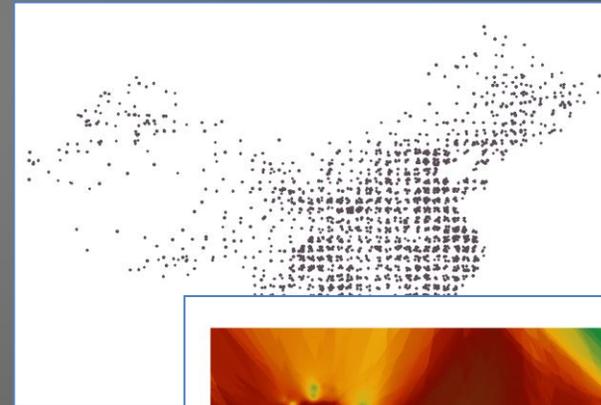
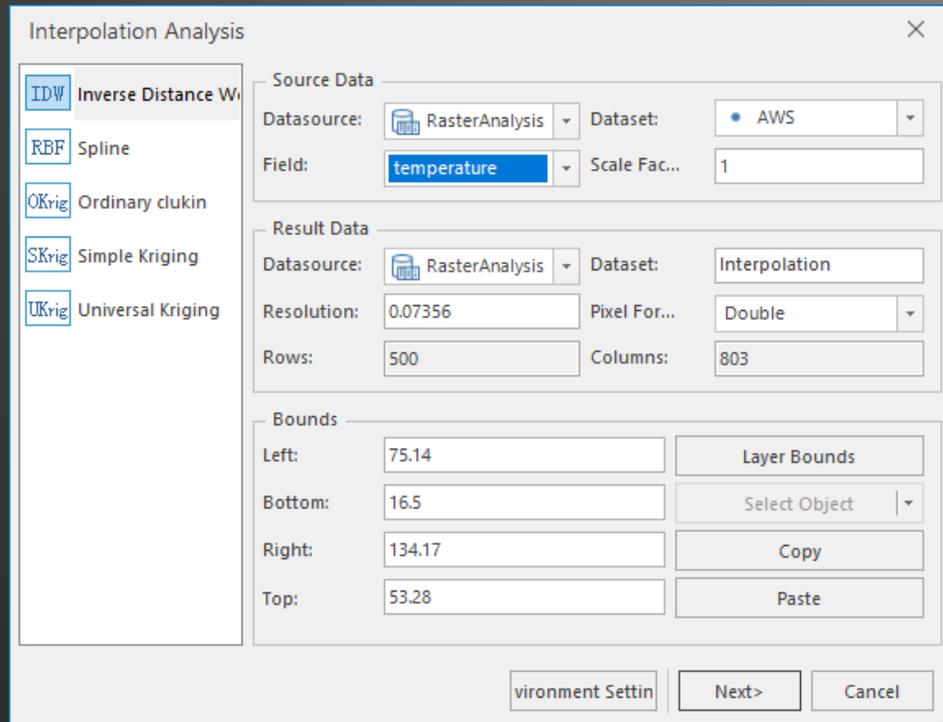
Interpolation to Raster

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



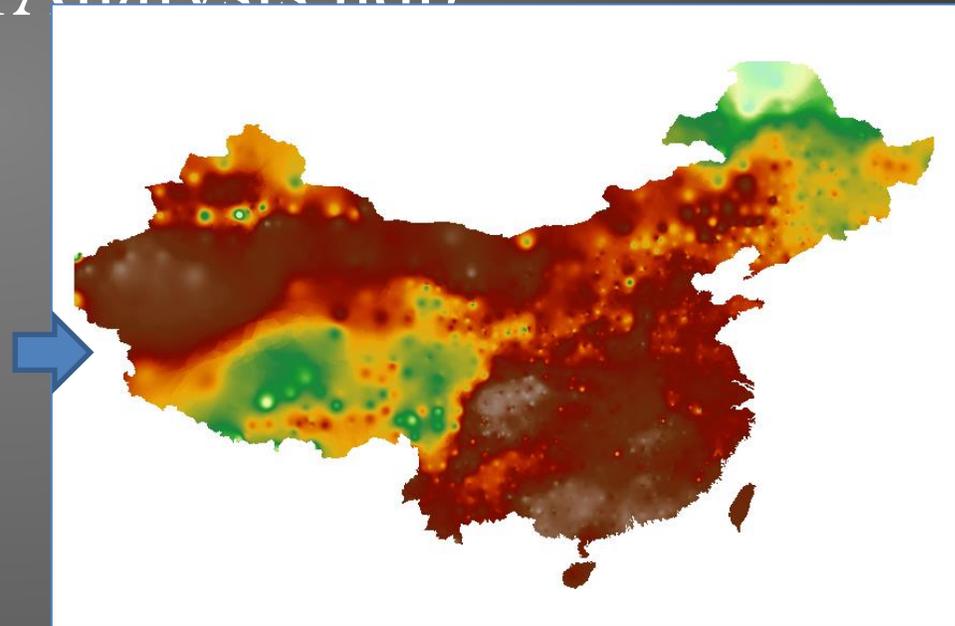
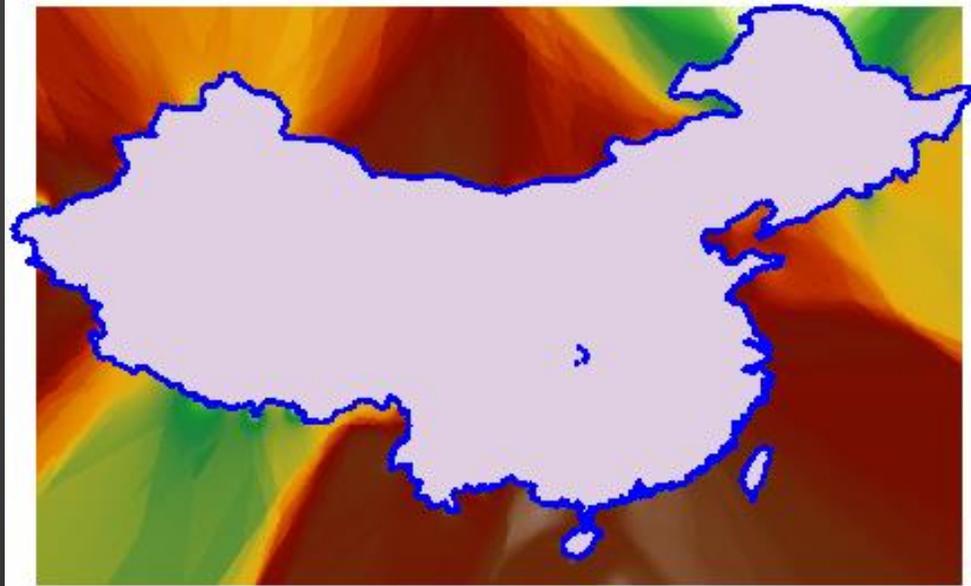
Exercise:

- 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.

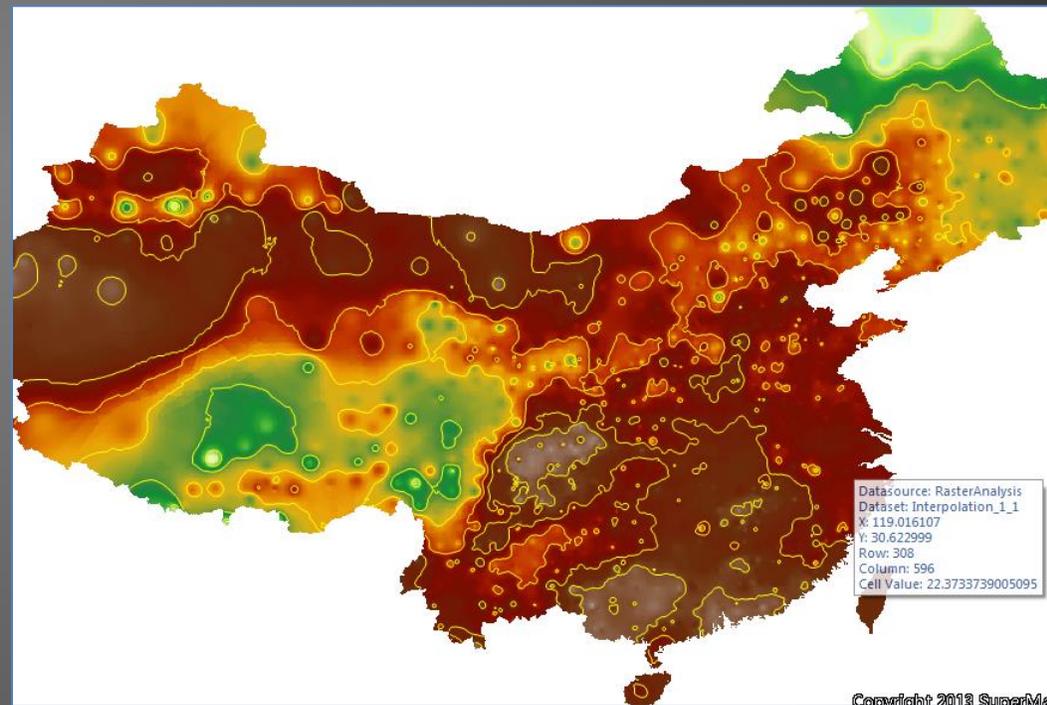
Extract Isolines

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

Extract All Isolines

Source Data	Target Data
Datasource: RasterAnalysis	Datasource: RasterAnalysis
Dataset: Interpolation	Dataset: IsoLine
Result Settings	Parameter Settings
Max Cell Value: 31.548735	Datum Value: 0
Min Cell Value: 0.274053	Interval: 4
Max Isoline: 28	Resampling: 0
Min Isoline: 4	Smooth Met...: None
Count: 7	Smoothness: 2

OK Cancel

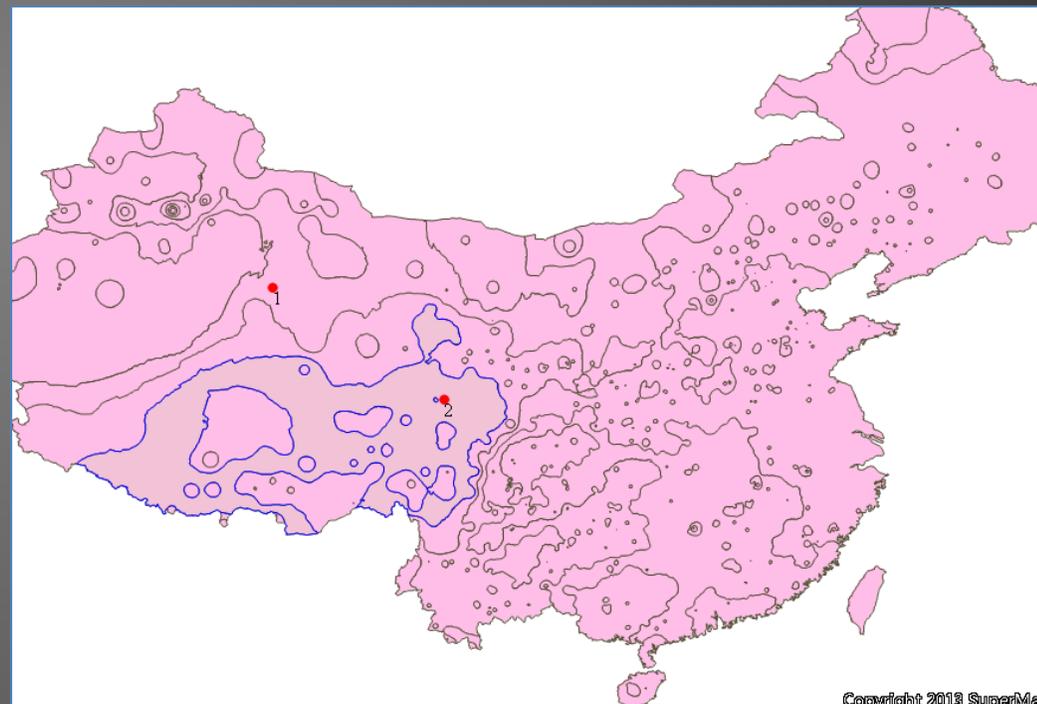


Extract Isoregions

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

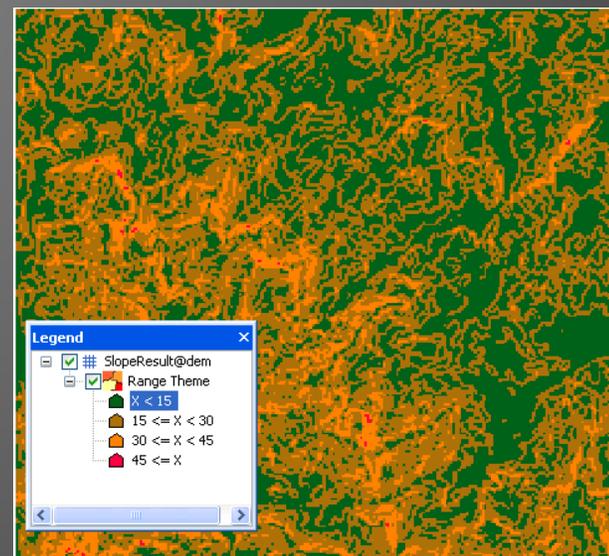
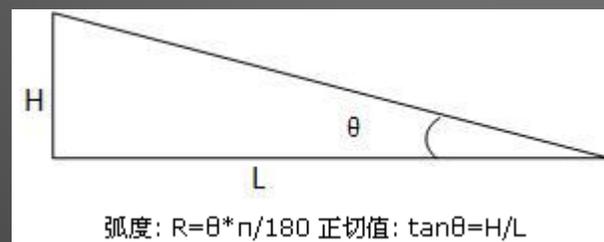
Extract All Isoregions

Source Data	Target Data
Datasource: RasterAnalysis	Datasource: RasterAnalysis
Dataset: Interpolation	Dataset: IsoRegion
Result Settings	Parameter Settings
Max Cell Value: 31.548735	Datum Value: 0
Min Cell Value: 0.274053	Interval: 4
Max Isoregion: 28	Resampling: 0
Min Isoregion: 4	Smooth Met...: None
Count: 7	Smoothness: 2
	OK Cancel



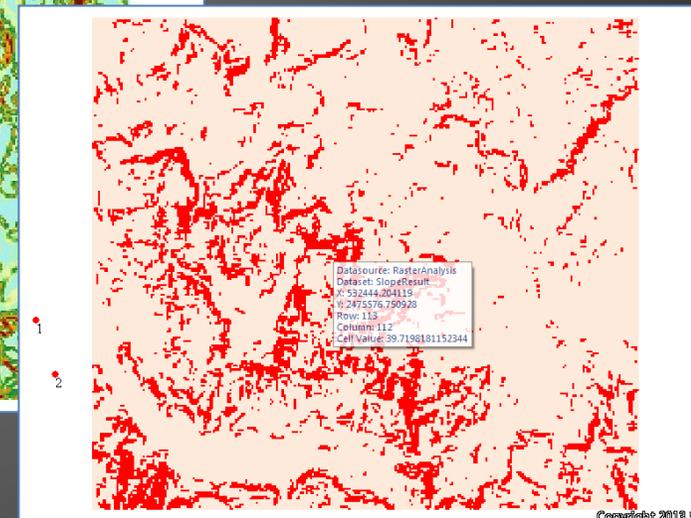
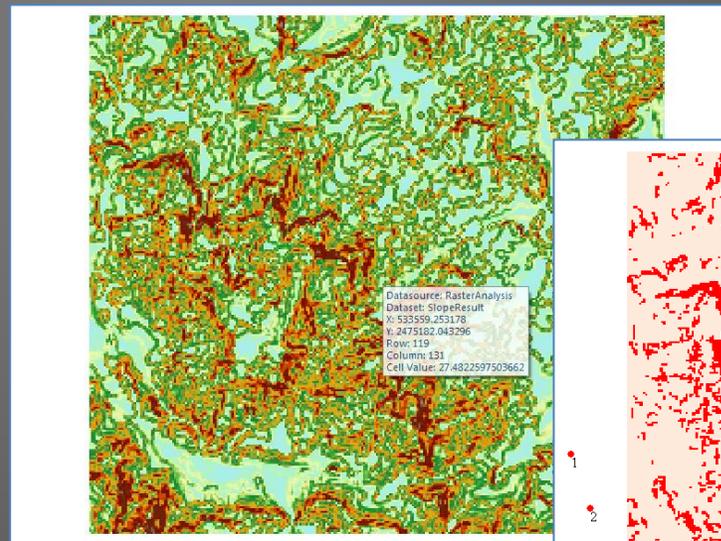
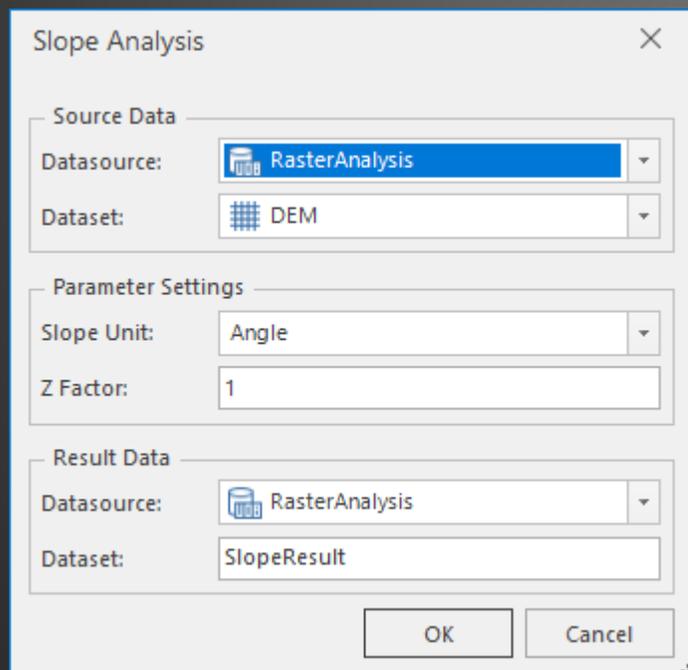
Slope

- 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



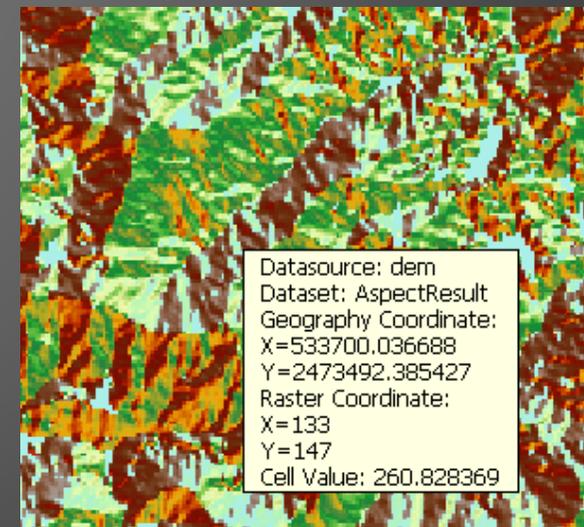
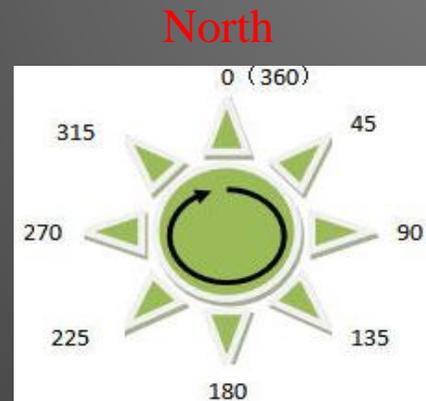
Exercise:

- 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.



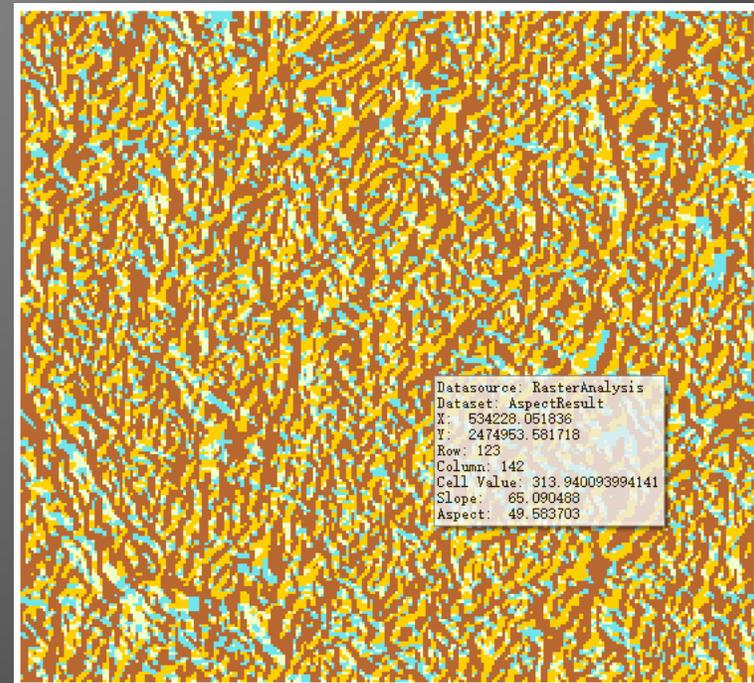
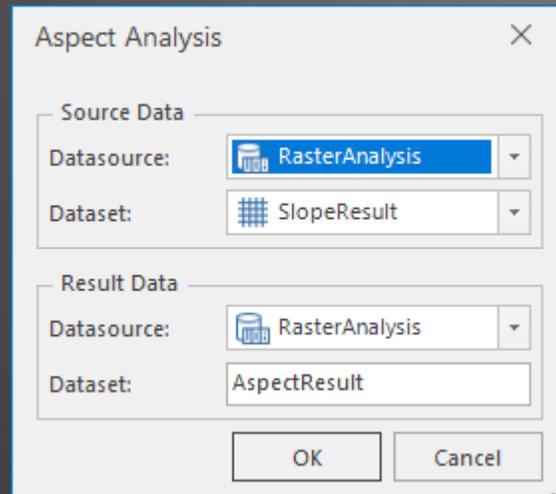
Aspect (Slope Direction)

- 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.



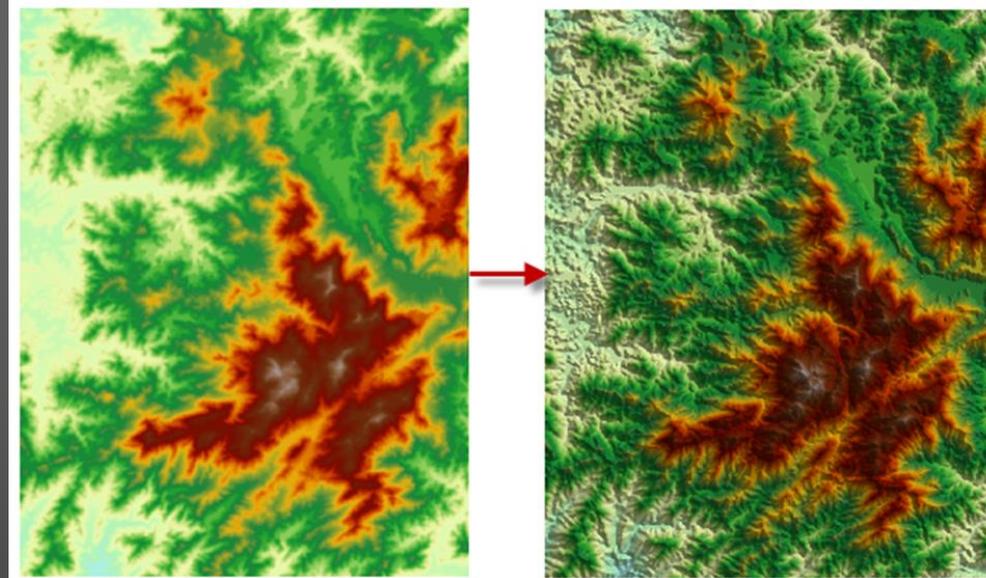
Exercise:

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



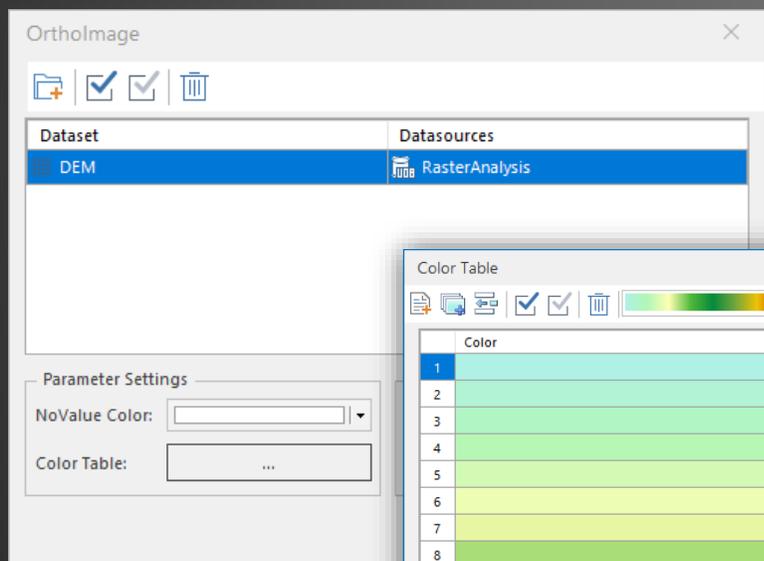
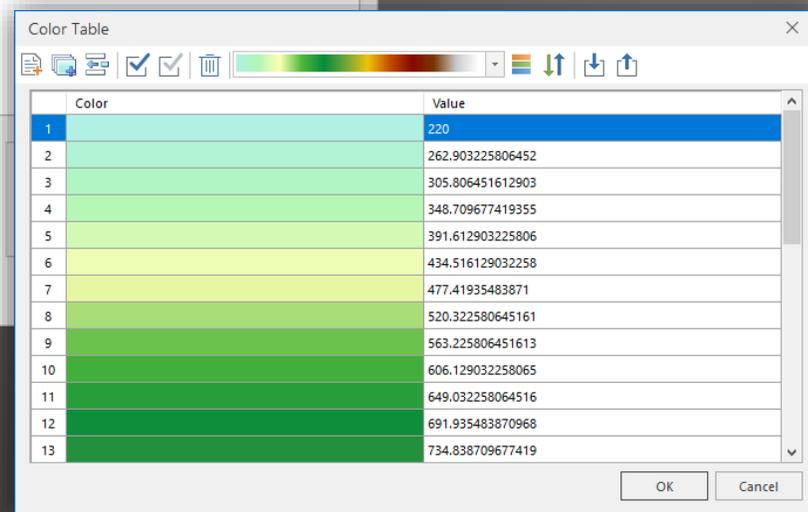
Ortho Image

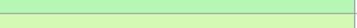
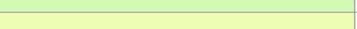
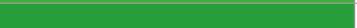
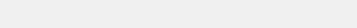
- Orthographic Image
 - Show the variation of grid values by variation of colors, such as elevation.
- The result looks like 3D data.

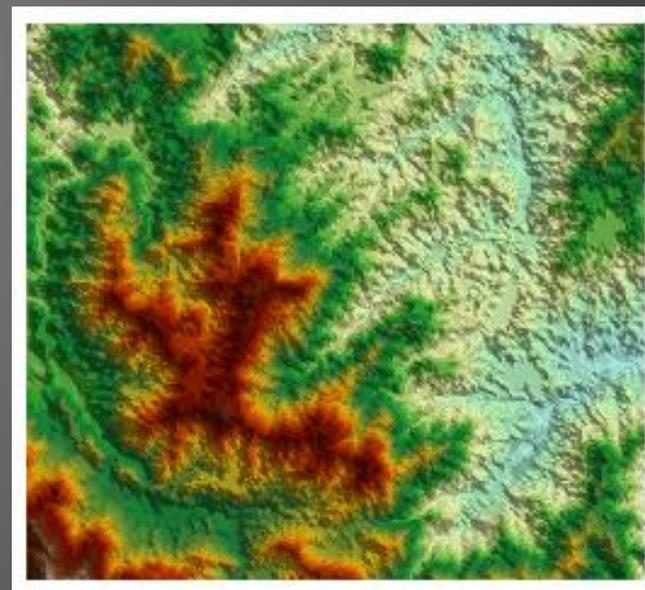


Exercise:

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

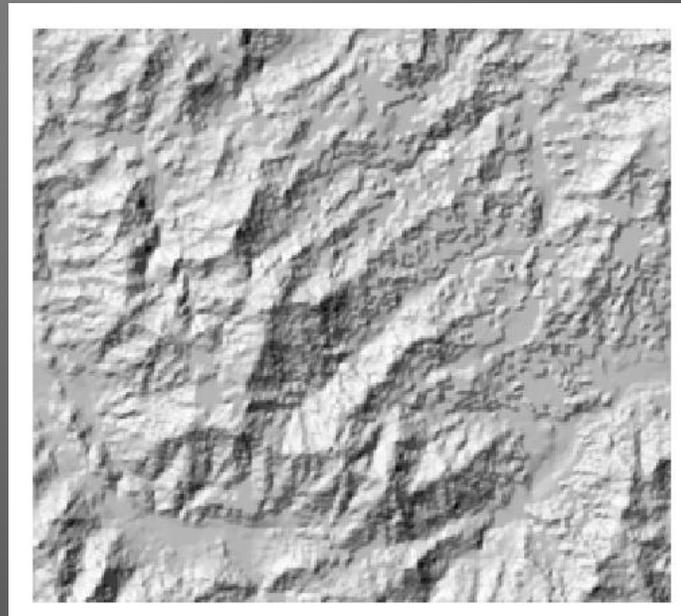
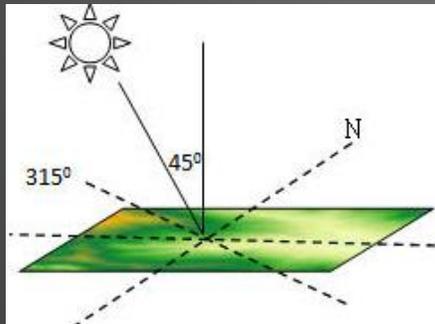



	Color	Value
1		220
2		262.903225806452
3		305.806451612903
4		348.709677419355
5		391.612903225806
6		434.516129032258
7		477.41935483871
8		520.322580645161
9		563.225806451613
10		606.129032258065
11		649.032258064516
12		691.935483870968
13		734.838709677419



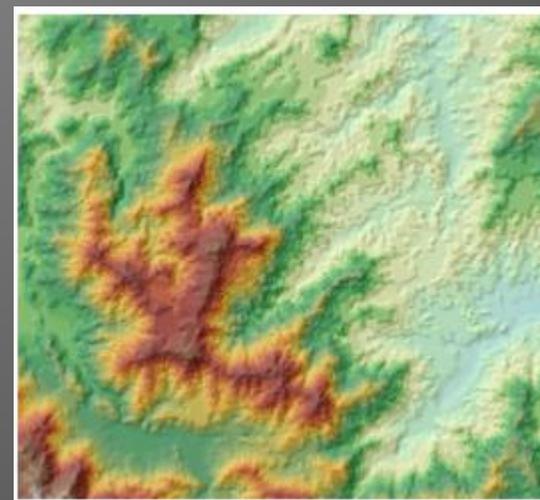
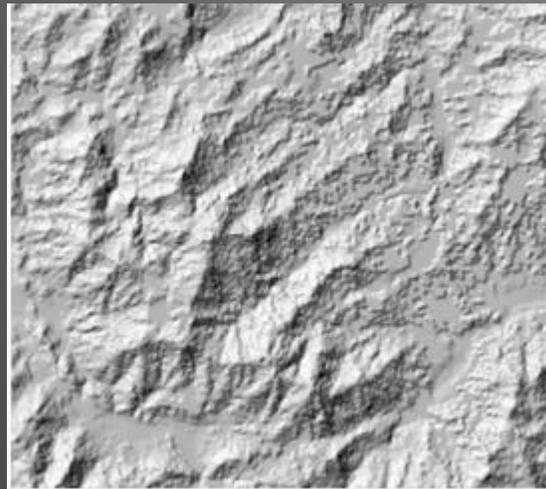
Hillshade

- 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.



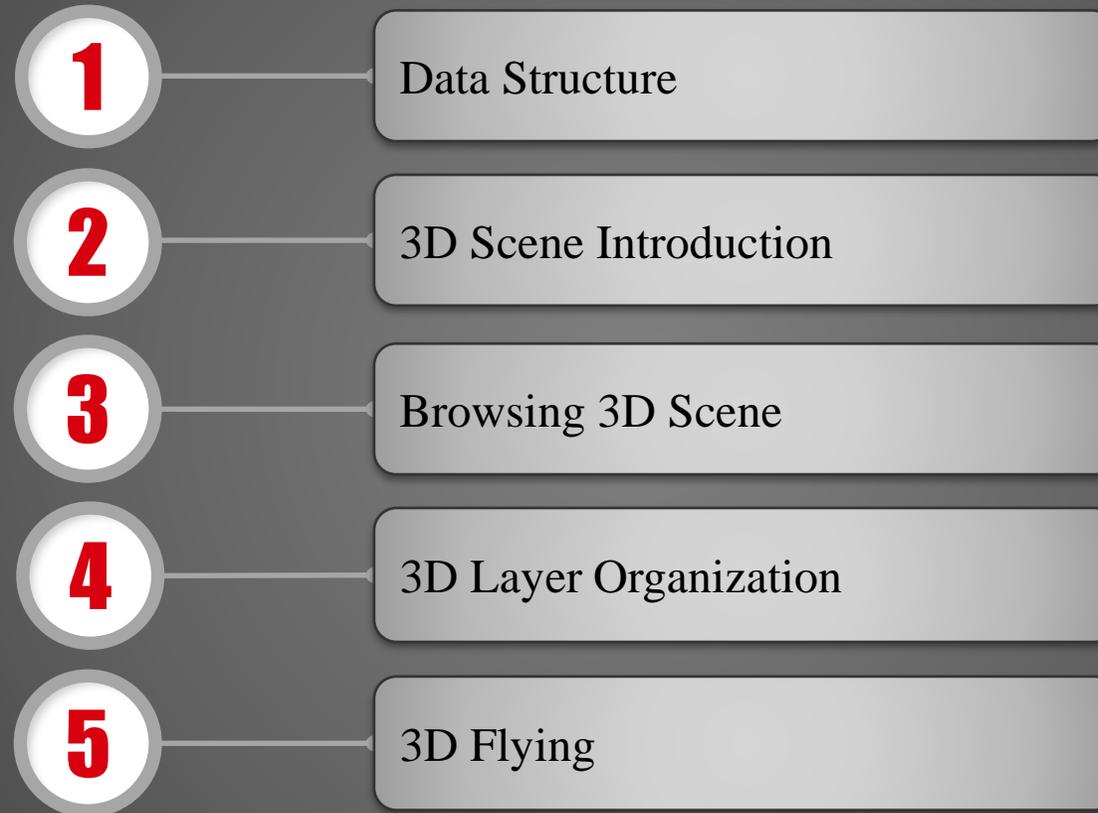


PART 03

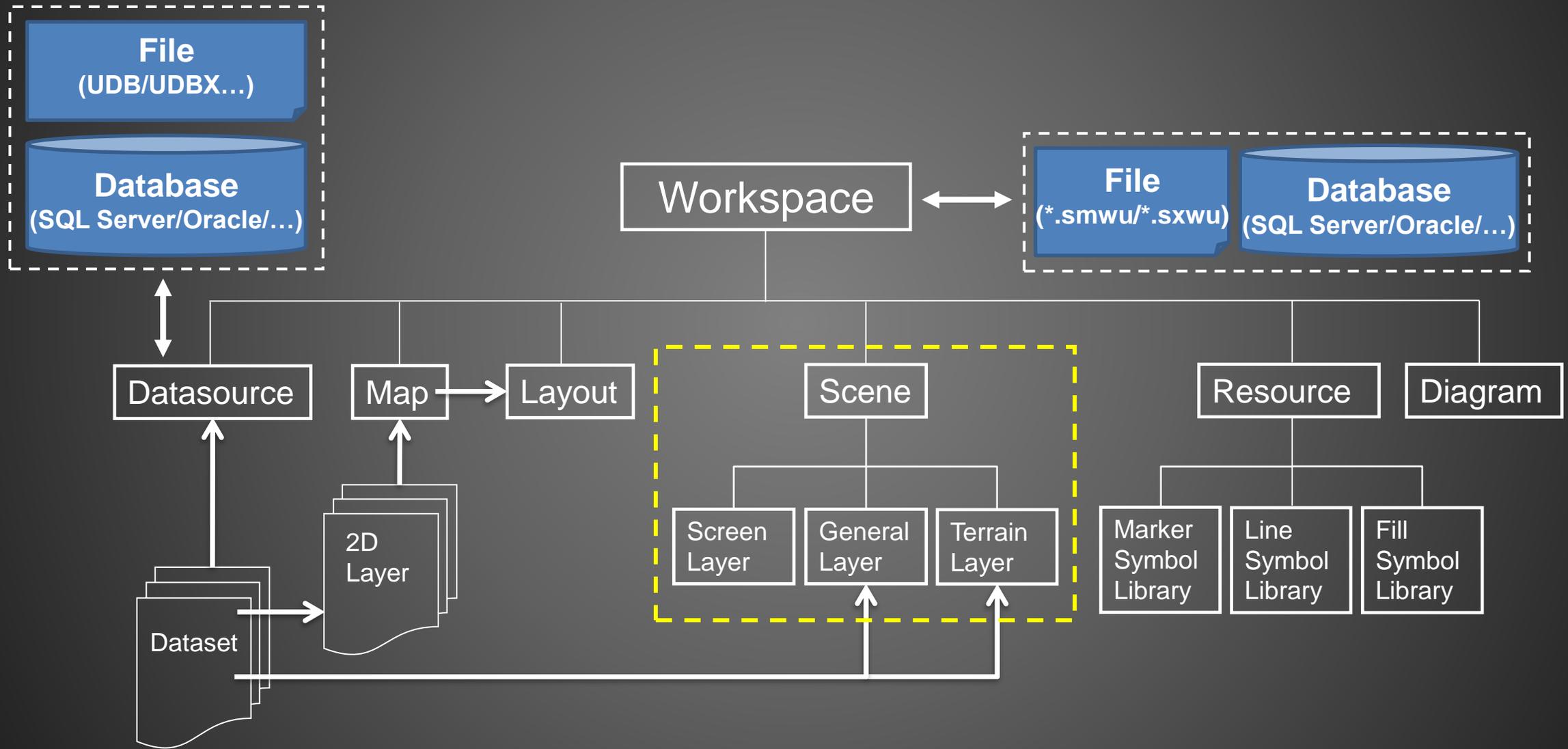


Organization of 3D Data

Overview

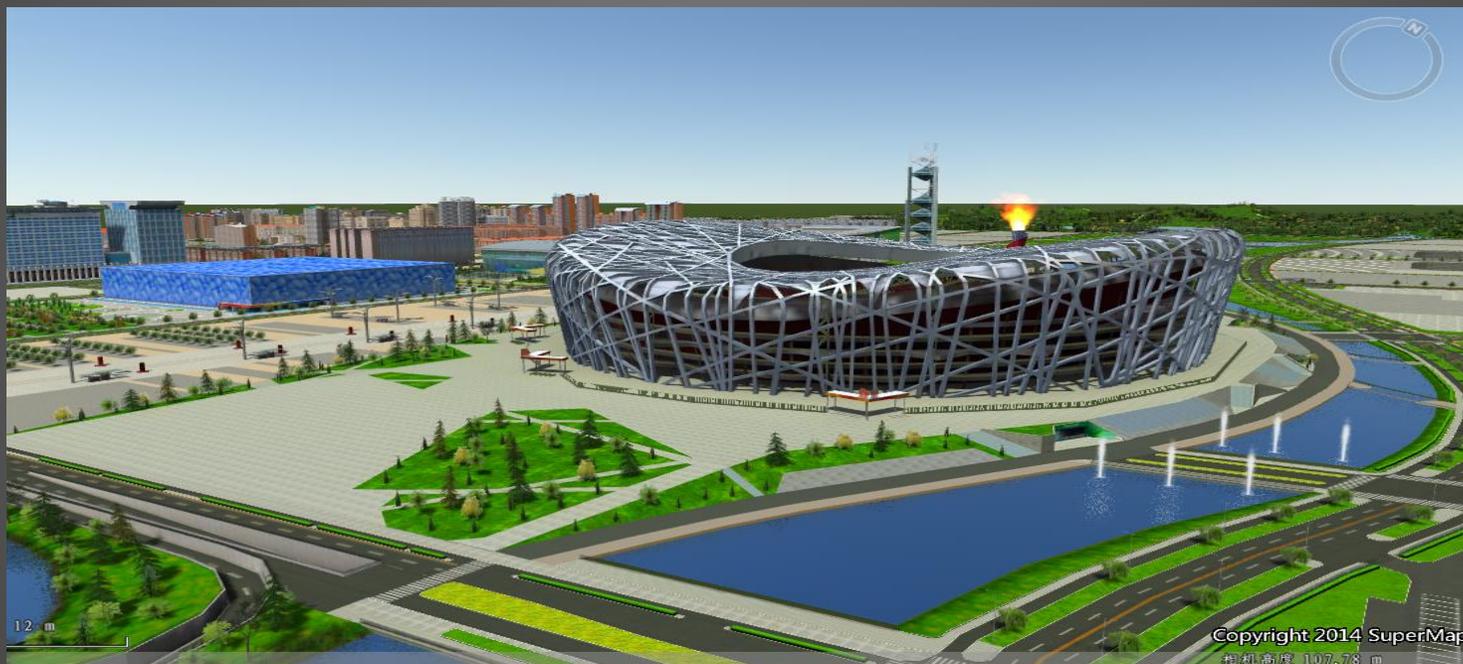


Data Structure



3D Scene Introduction

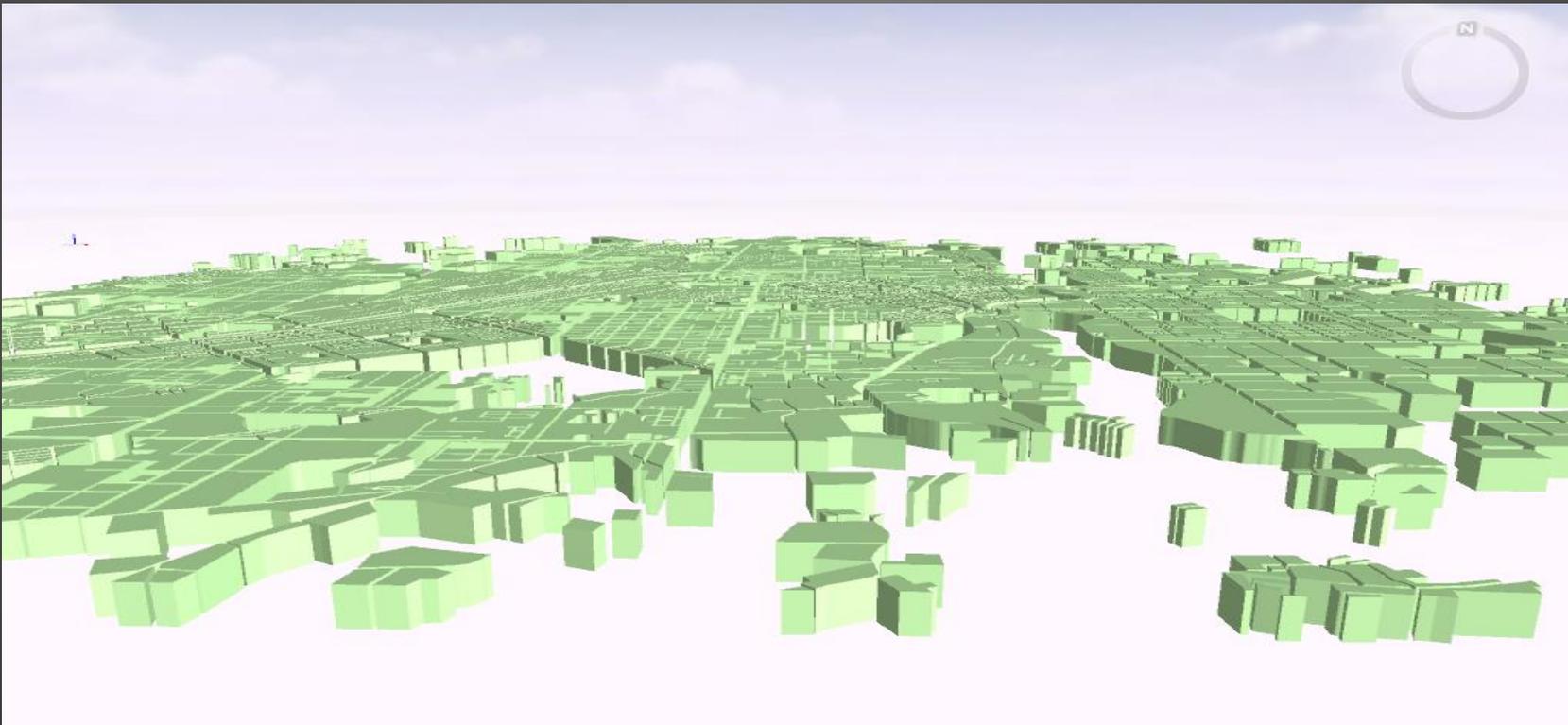
- The 3D scene uses virtualized technology to simulate various geographic features and their spatial relationships in the real world.



- 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**



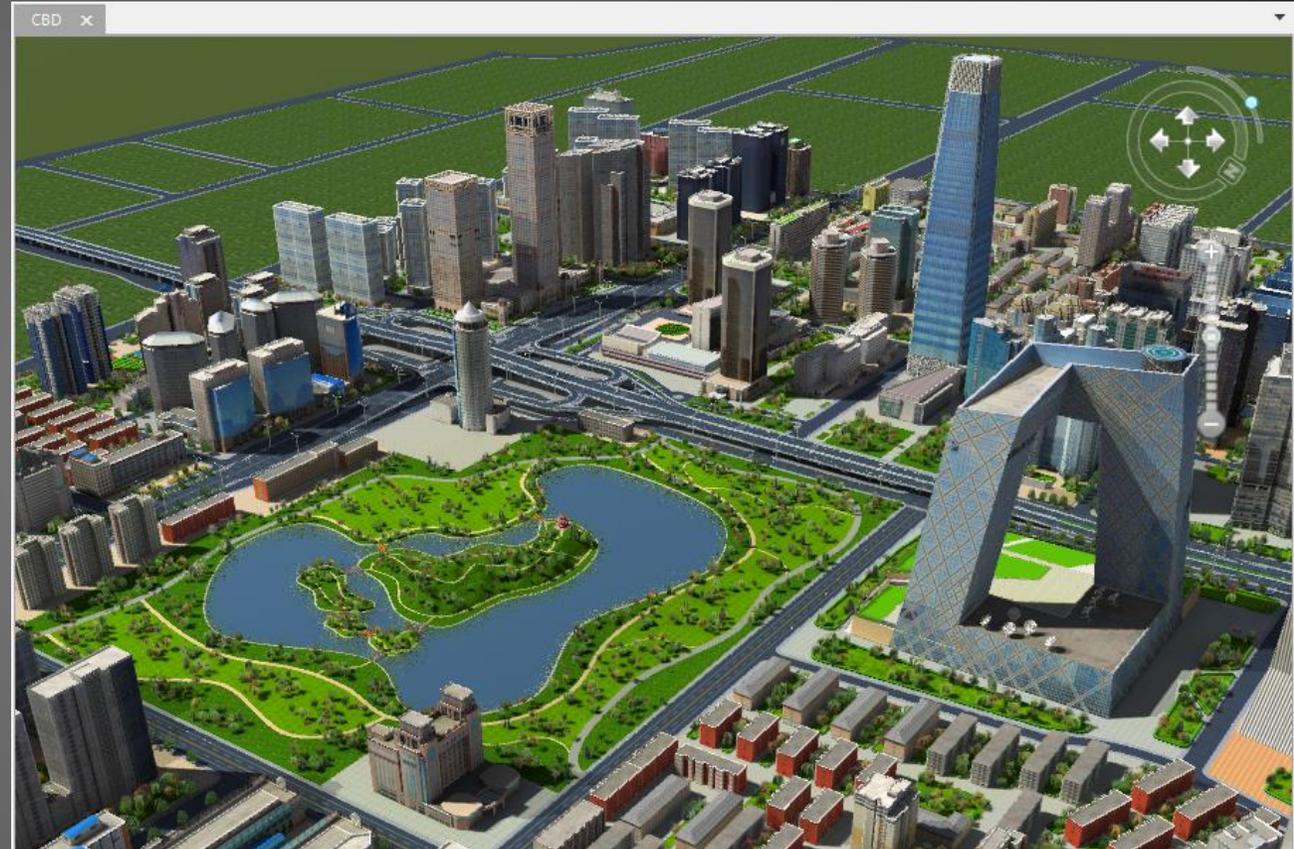
Spherical Scene

- 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

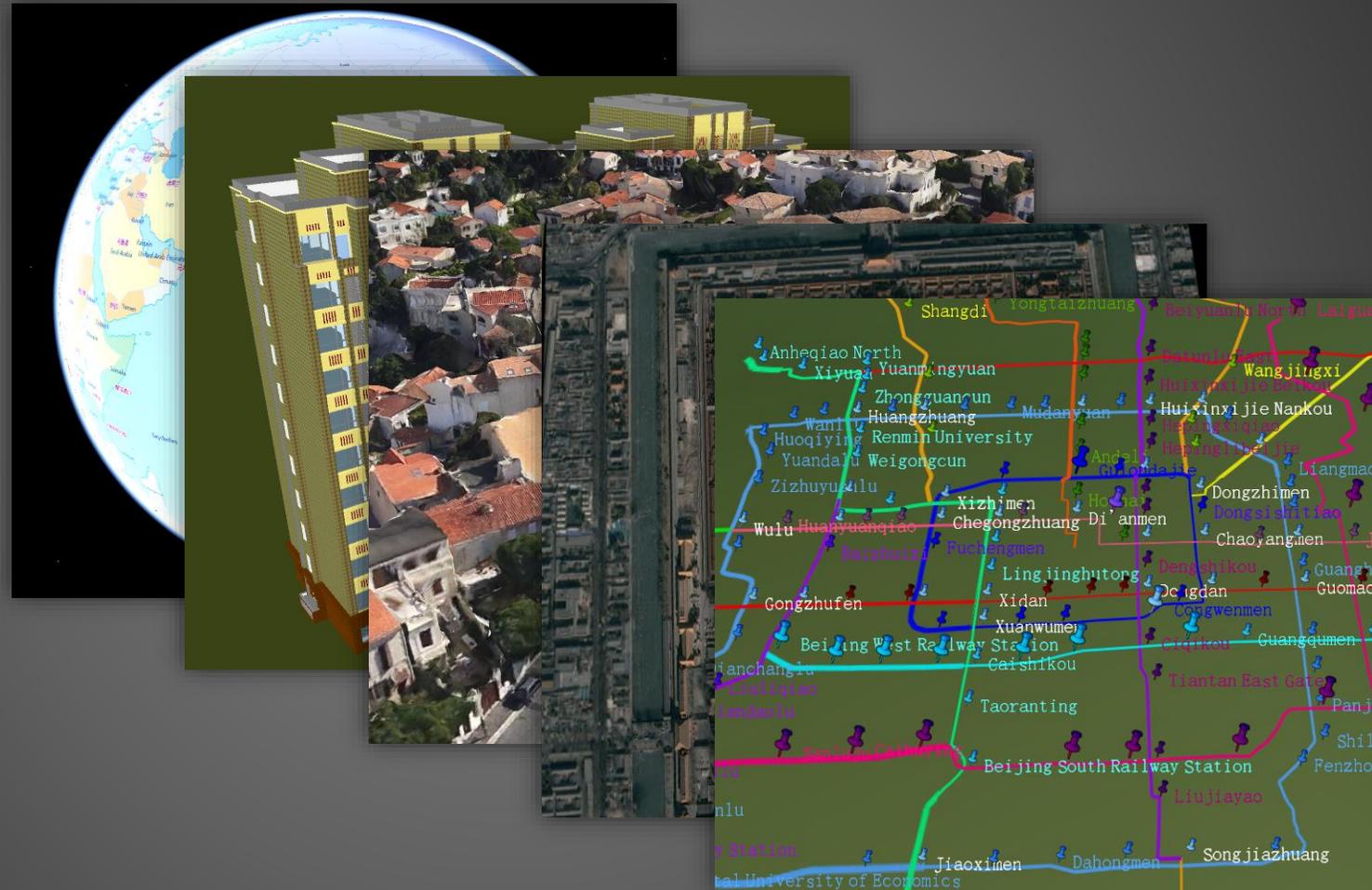
Adding Screen Layer

- 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



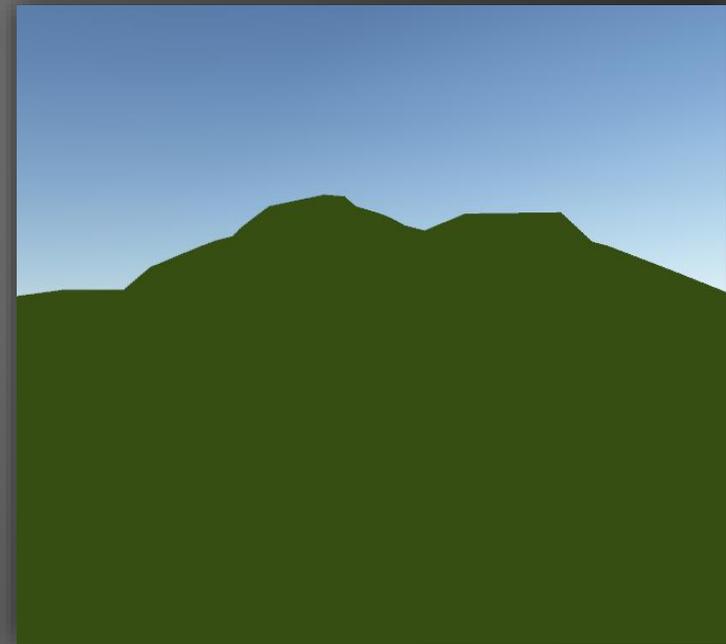
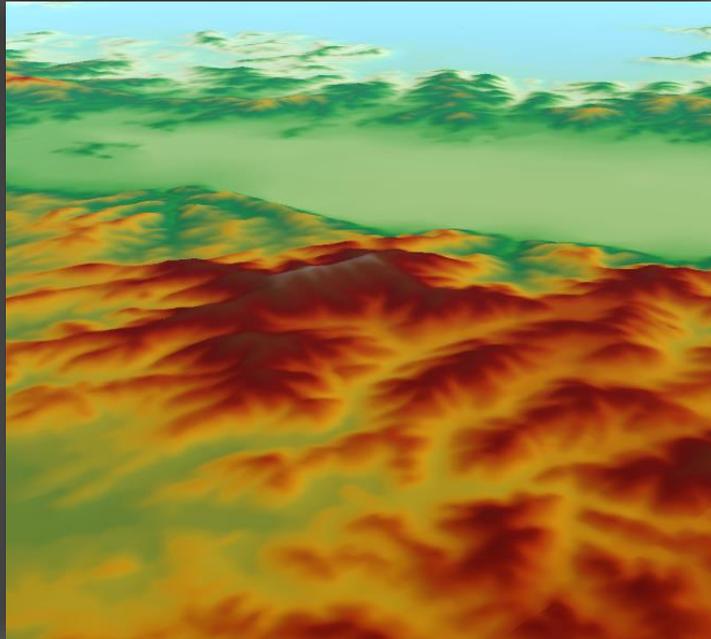
Adding General Layer

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



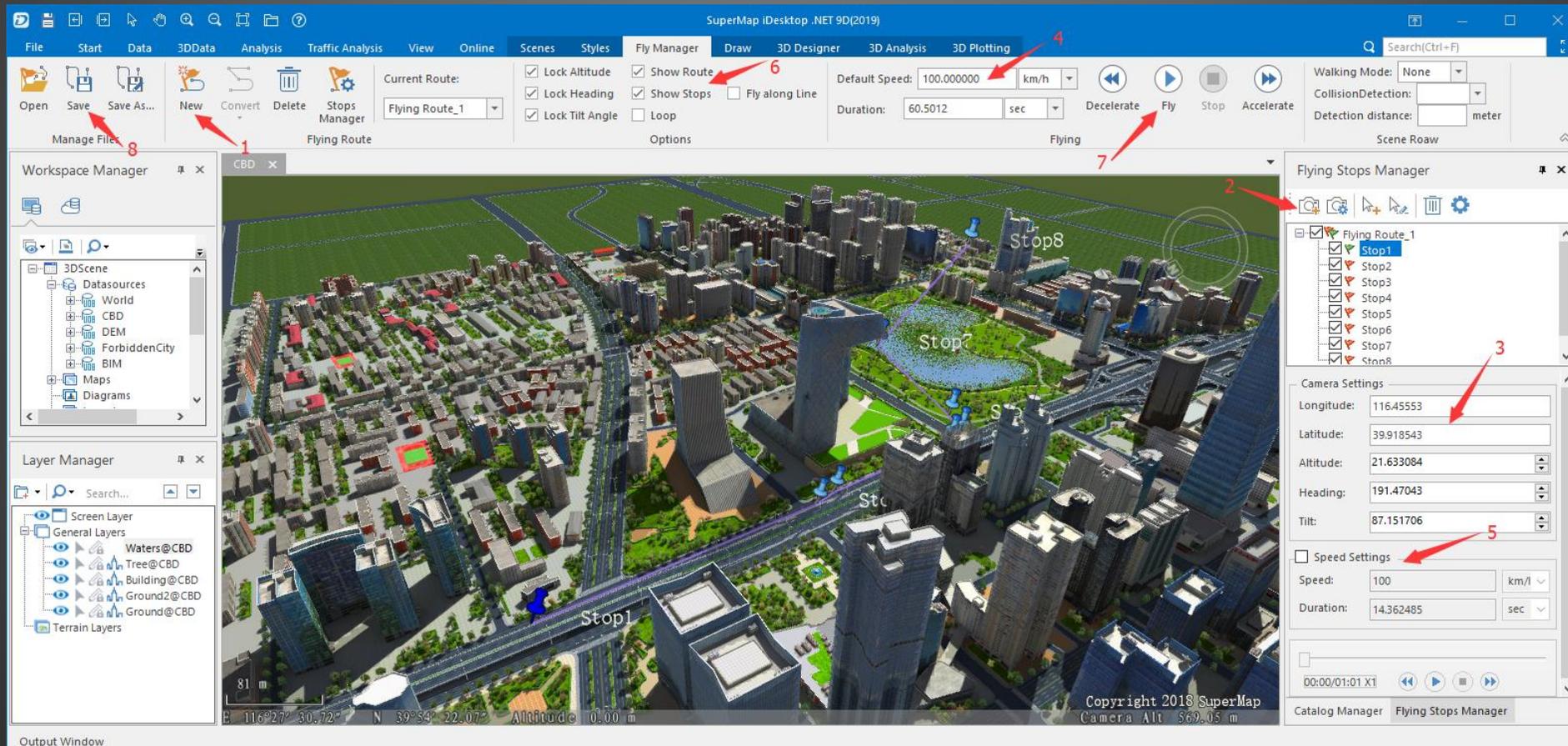
Adding Terrain Layer

- Exercise
 - Grid
 - Terrain cache



3D Flying

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





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

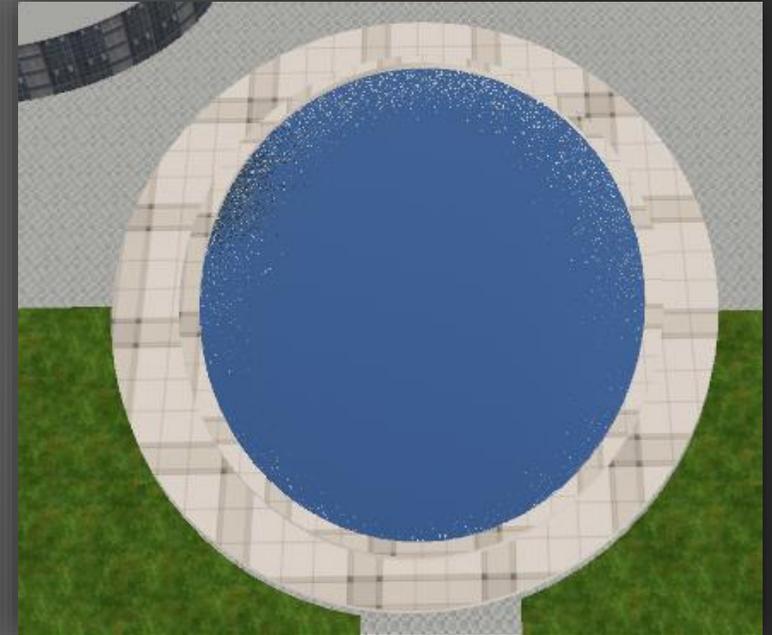
- Vector rendering
 - 3D Symbolization of point, line and polygon



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

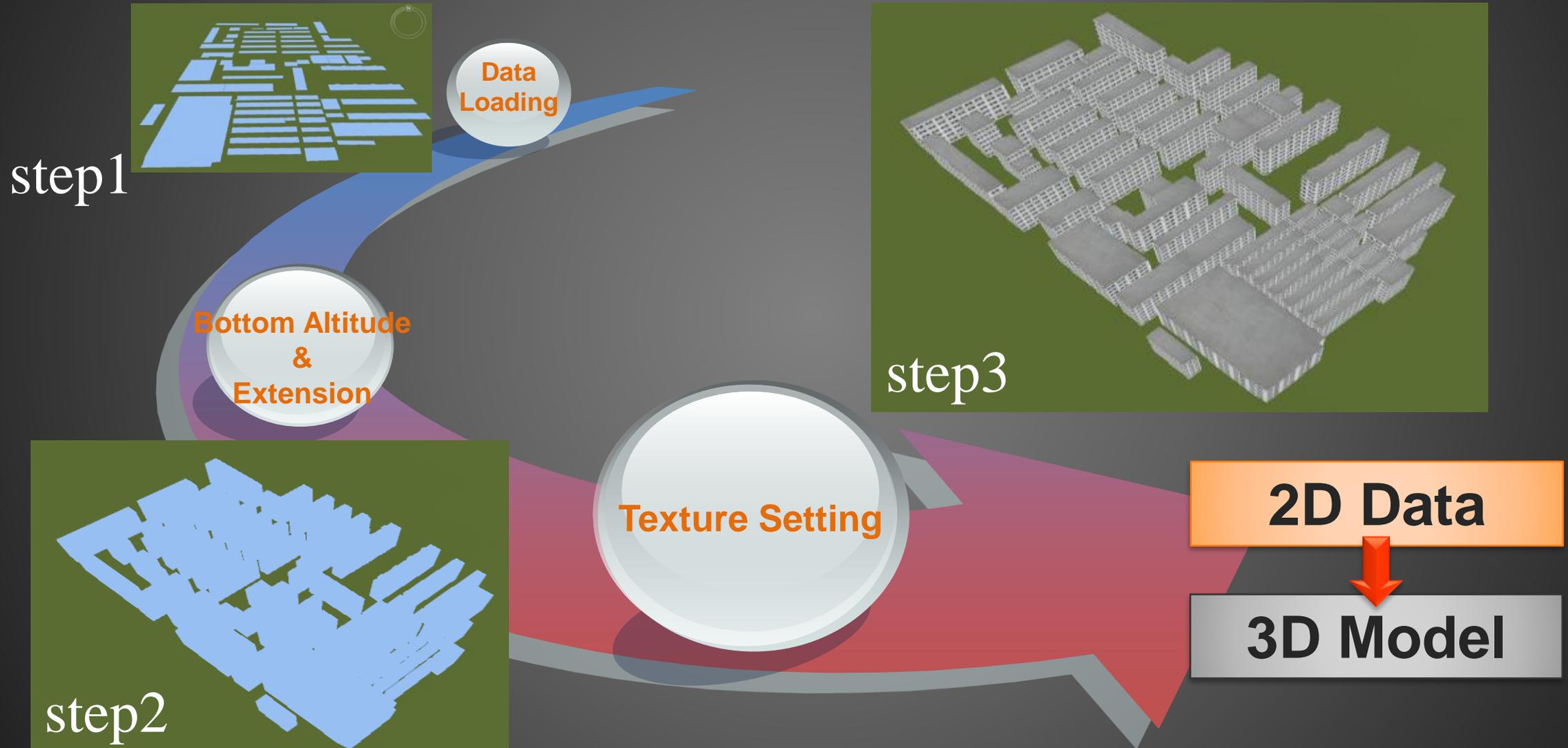
Exercise:

- 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

Thematic Map Item Texture Settings ✕

Extensive Property:

Altitude Mode:

Data From:

Fill Mode:

Base Altitude:

Extended Height:

Side Texture Settings

Texture File: 

Repeat Mode:

Tiling U:

Tiling V:

Top Texture Settings

Texture File: 

Repeat Mode:

Tiling U:

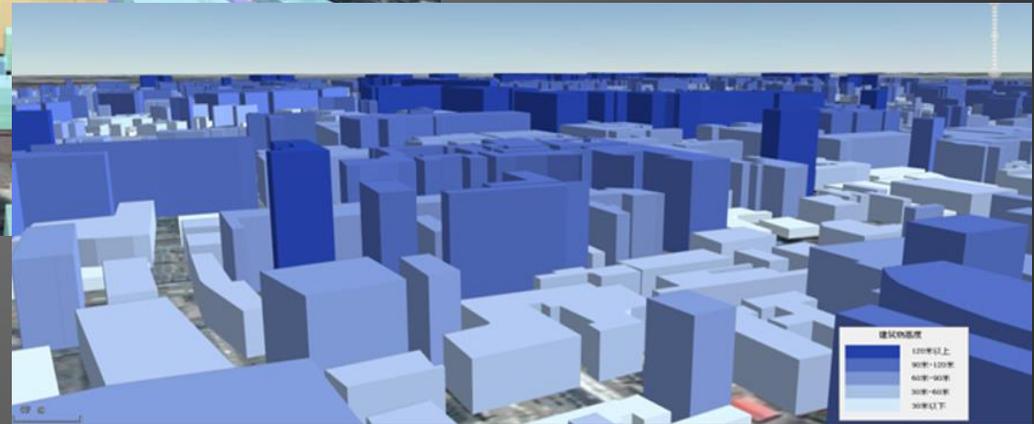
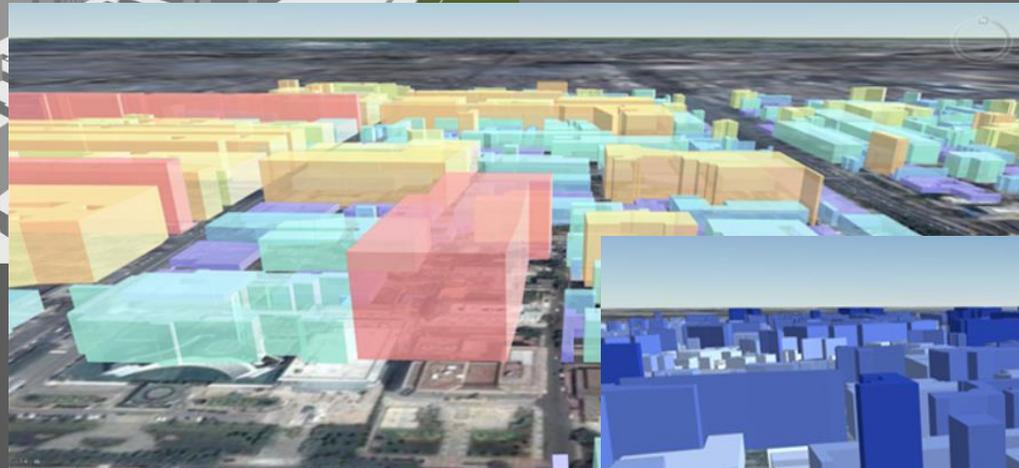
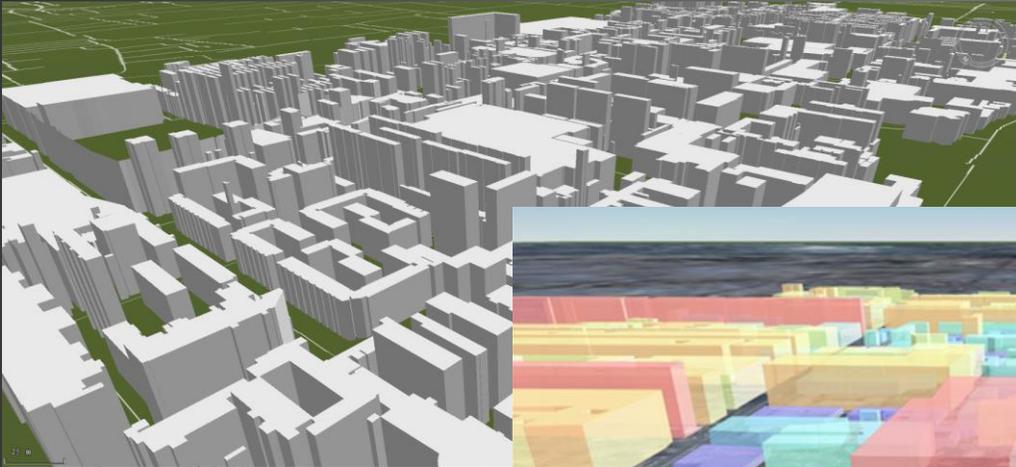
Tiling V:

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.

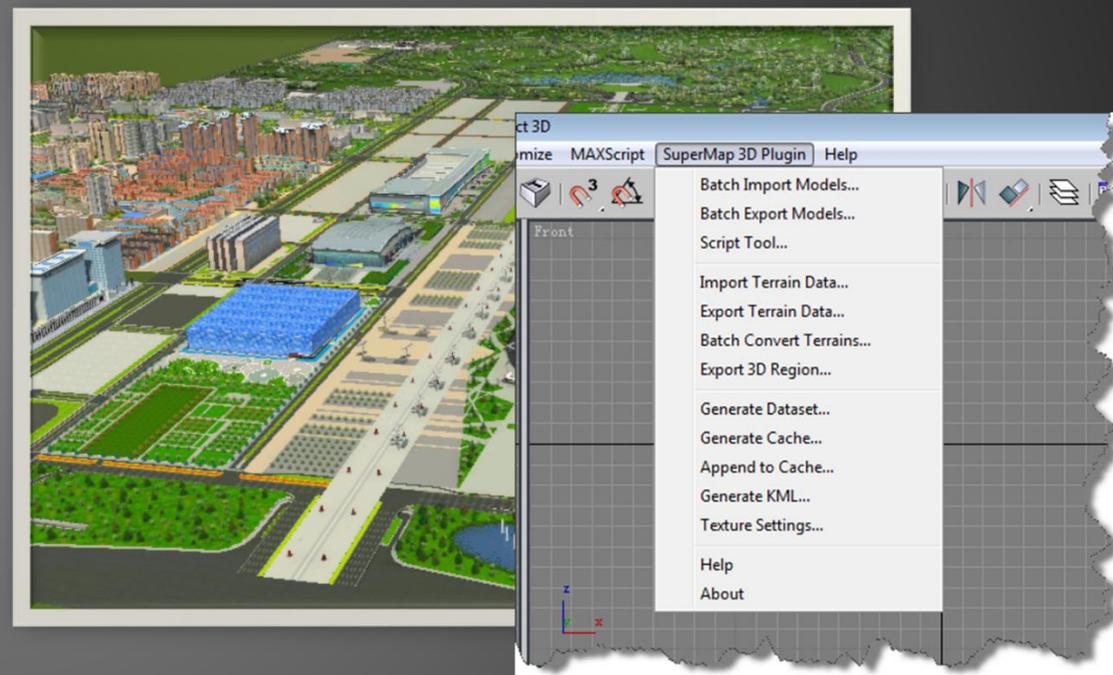
Rapid Modeling By Vector Stretching

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

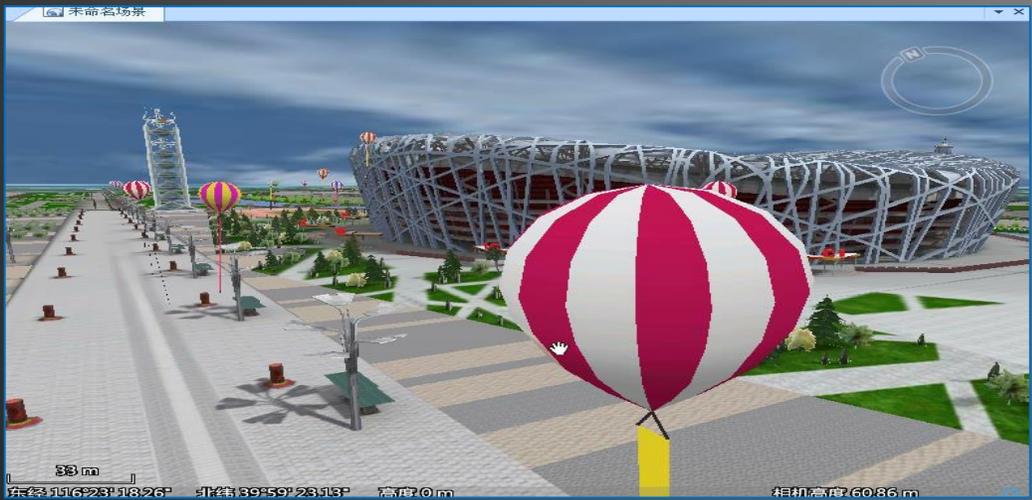
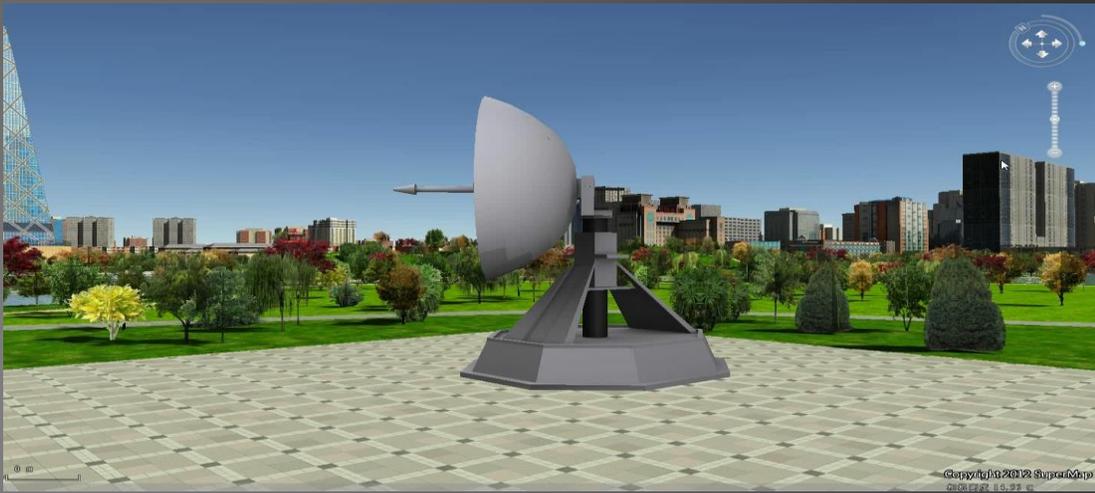


3Ds Max Model

- 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>

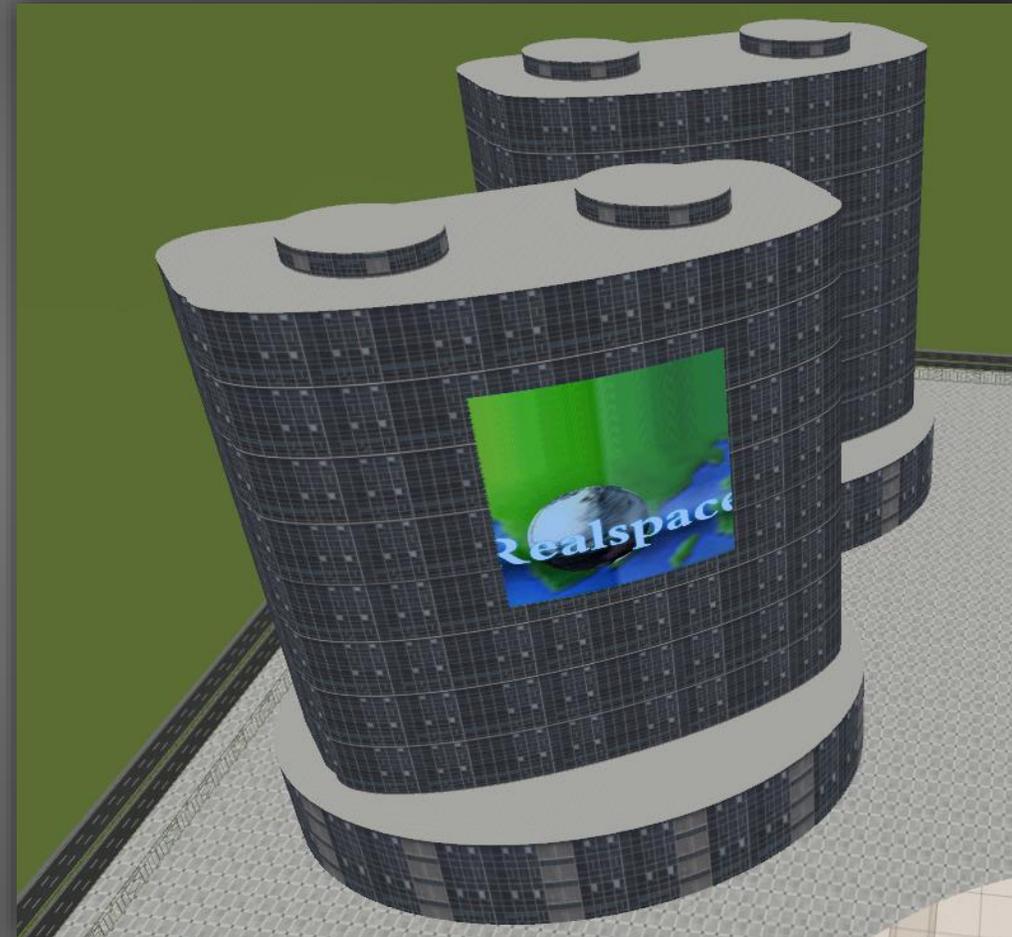


Animation Model



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

名称	类型	大小
Tile_008_006_2_037.osgb	OSGB 文件	289 KB
Tile_008_006_2_038.osgb	OSGB 文件	226 KB
Tile_008_006_2_039.osgb	OSGB 文件	222 KB
Tile_008_006_2_040.osgb	OSGB 文件	253 KB
Tile_008_006_2_041.osgb	OSGB 文件	259 KB
Tile_008_006_2_042.osgb	OSGB 文件	263 KB
Tile_008_006_2_043.osgb	OSGB 文件	263 KB
Tile_008_006_2_044.osgb	OSGB 文件	234 KB
Tile_008_006_2_045.osgb	OSGB 文件	279 KB
Tile_008_006_2_046.osgb	OSGB 文件	263 KB
Tile_008_006_2_047.osgb	OSGB 文件	263 KB
Tile_008_006_2_048.osgb	OSGB 文件	289 KB
Tile_008_006_2_049.osgb	OSGB 文件	266 KB
Tile_008_006_2_050.osgb	OSGB 文件	237 KB
Tile_008_006_2_051.osgb	OSGB 文件	271 KB
Tile_008_006_2_052.osgb	OSGB 文件	260 KB
Tile_008_006_2_053.osgb	OSGB 文件	305 KB
Tile_008_006_2_054.osgb	OSGB 文件	305 KB

```

F:\SampleData\OSGB\compressed.scp - Notepad++
File Edit Search View Encoding Language Settings Macro Run Window ?
compressed.scp
1 <?xml version="1.0" encoding="UTF-8" ?>
2 <SuperMapCache_Unicode xmlns:sml="
  http://www.supermap.com/SuperMapCache/vectorltile">
3 <sml:Version>1.000000</sml:Version>
4 <sml:Position>
5 <sml:X>43.2963888888889</sml:X>
6 <sml:Y>5.37</sml:Y>
  <sml:Z>-30</sml:Z>
  </sml:Position>
  <sml:OSGFiles>
    <sml:FileName>.\Tile_008_005\Tile_008_005.osgb
    </sml:FileName>
    <sml:FileName>.\Tile_008_006\Tile_008_006.osgb
    </sml:FileName>
    <sml:FileName>.\Tile_009_005\Tile_009_005.osgb
    </sml:FileName>
    <sml:FileName>.\Tile_009_006\Tile_009_006.osgb
    </sml:FileName>
  </sml:OSGFiles>
</SuperMapCache_Unicode>
16
  
```





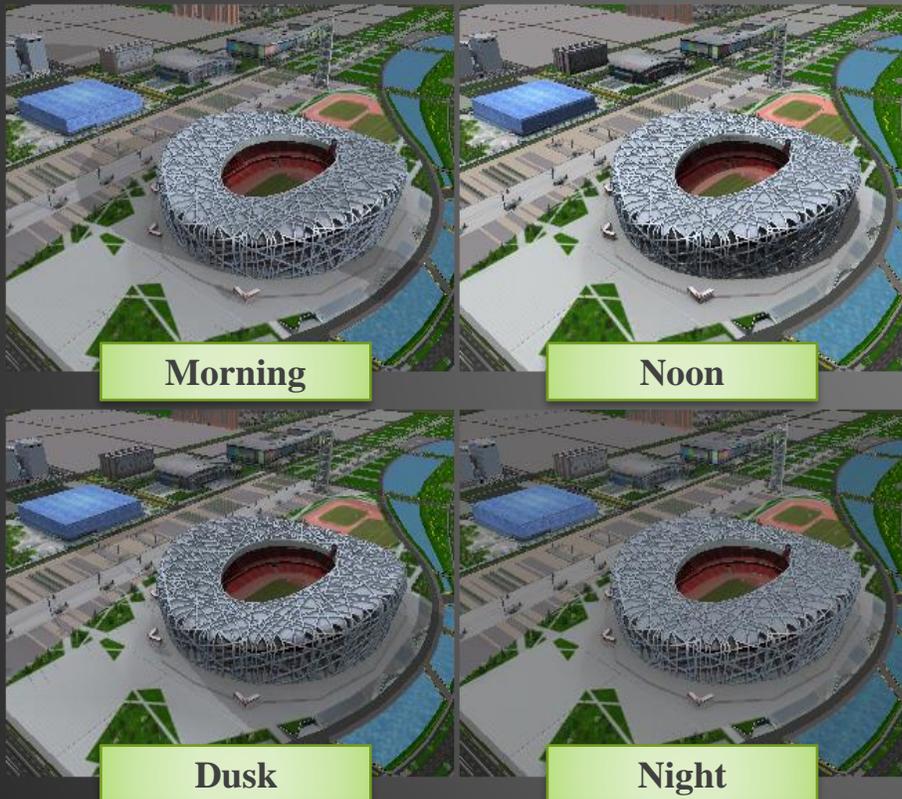
PART 05



Effects in 3D Scene

Overview

- Sunshine effects



- Particle effects



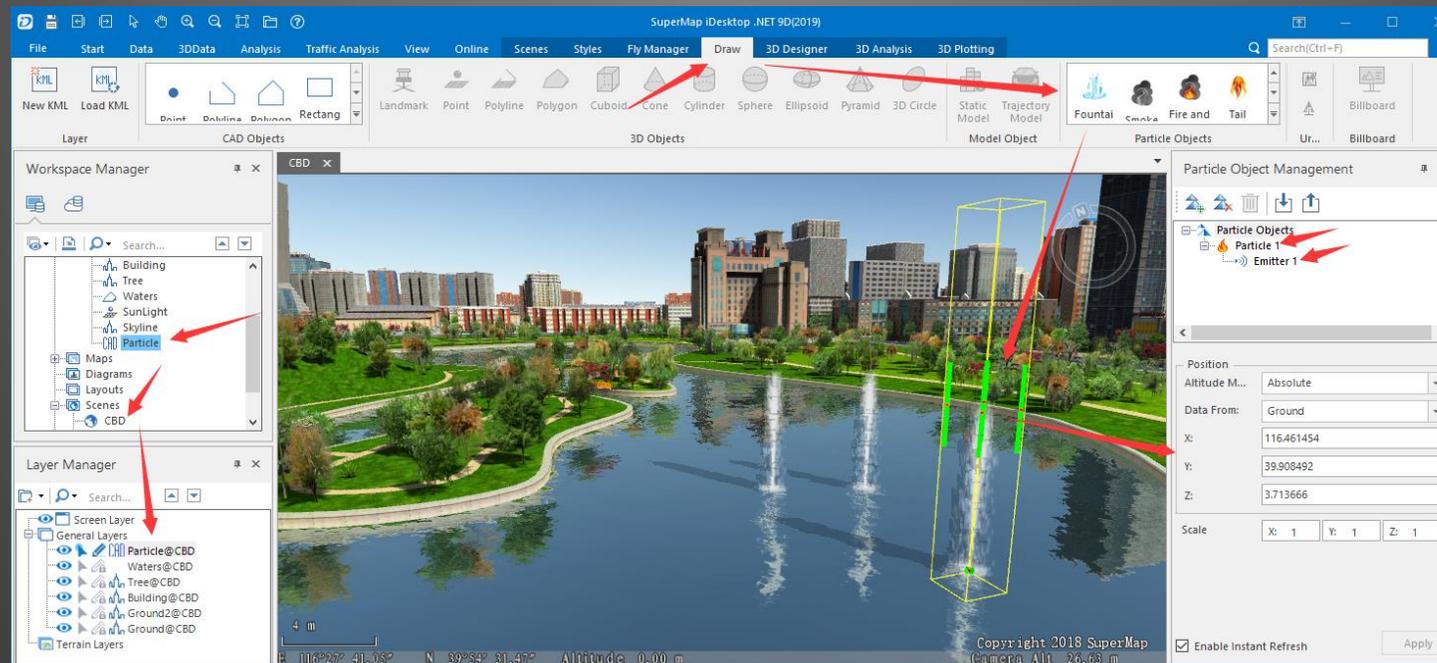
Sunshine effects

1. Open the CBD workspace under the installation directory\SampleData\3D\CBD\Dataset
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

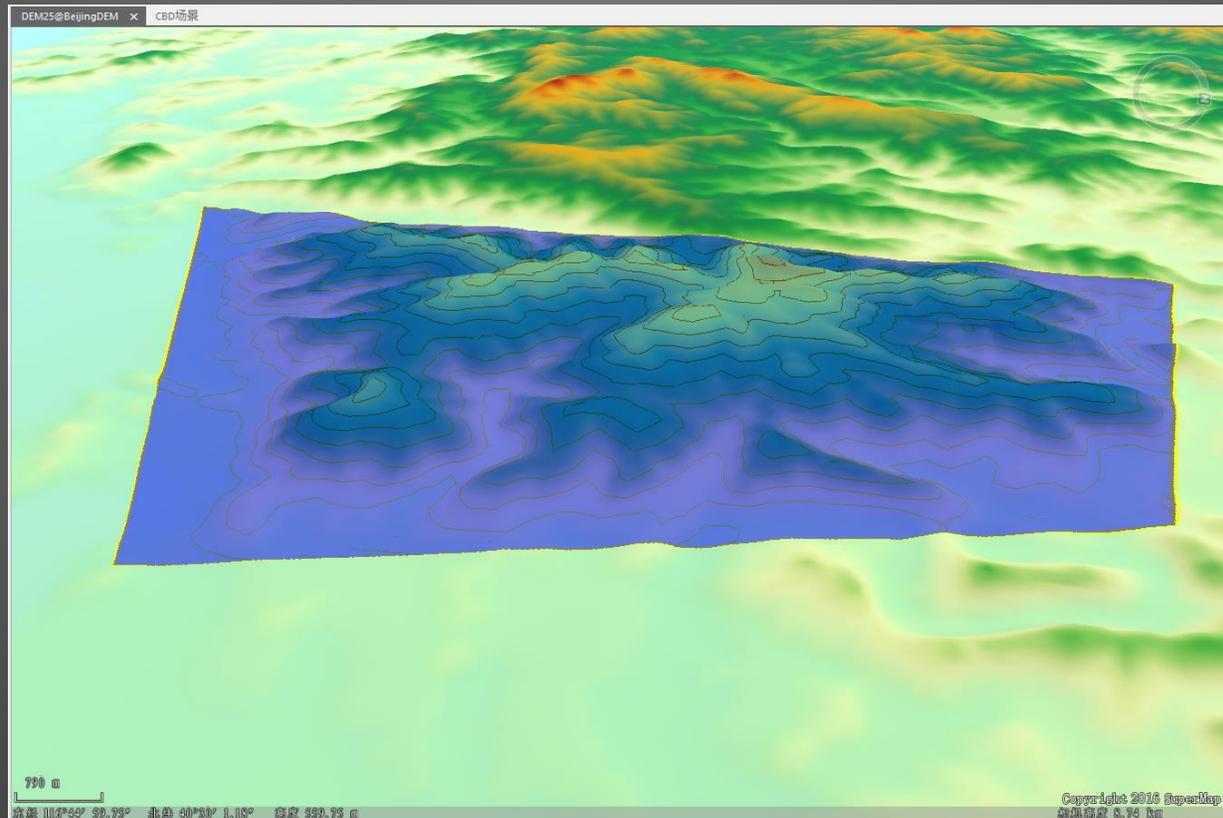
Sunlight Analysis

Profile Analysis

Skyline Analysis

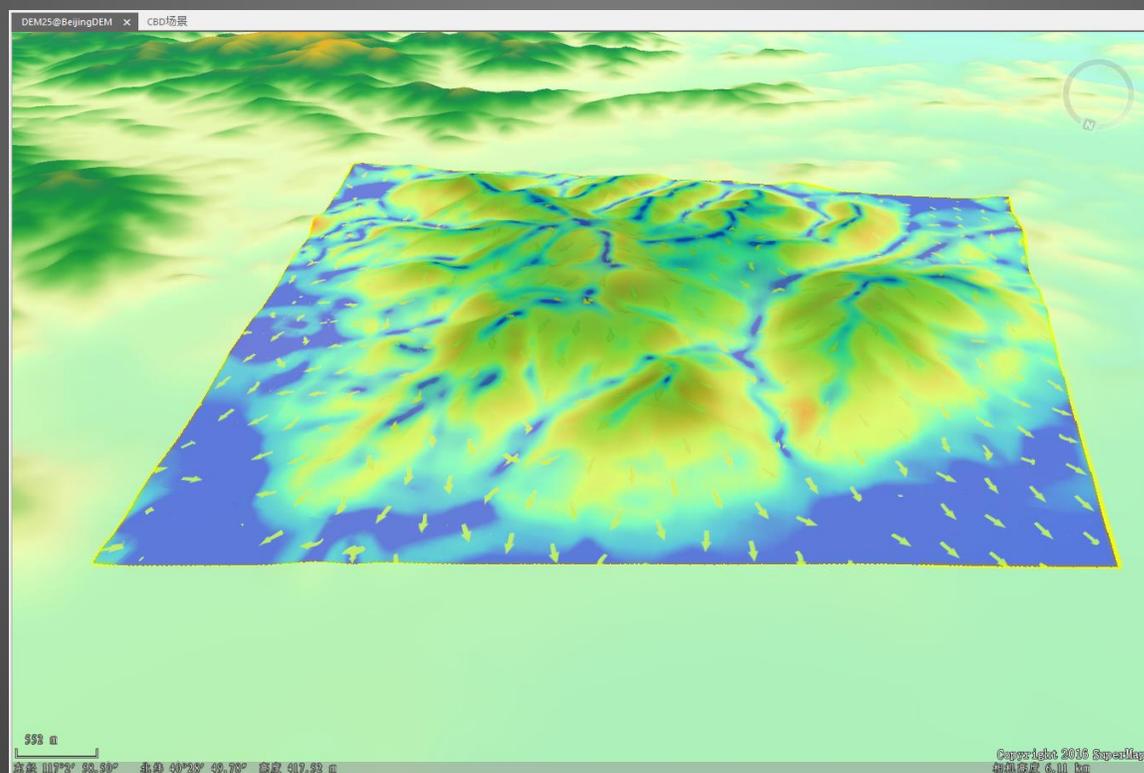
Isoline Analysis

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



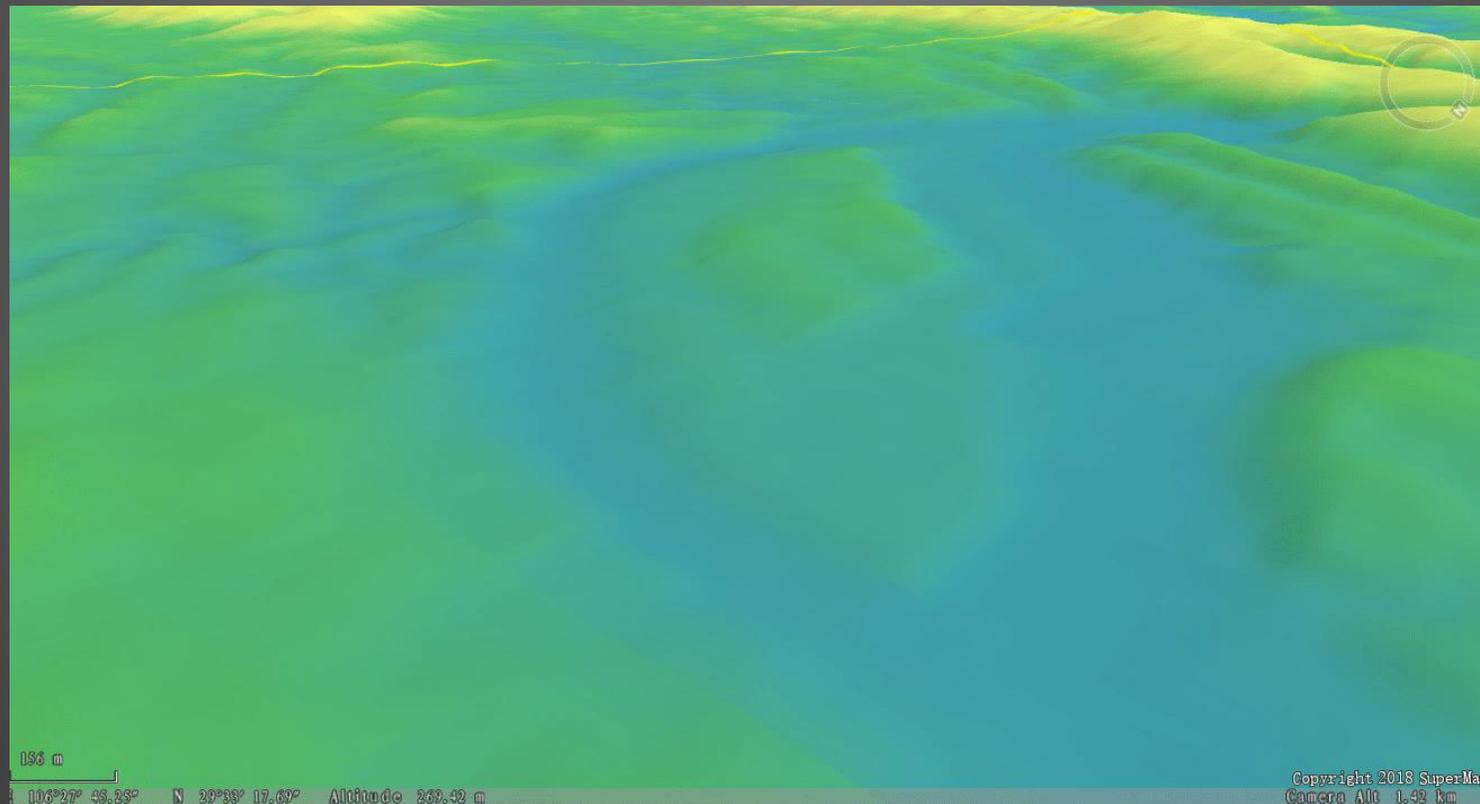
Slope and Aspect Analysis

- 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.



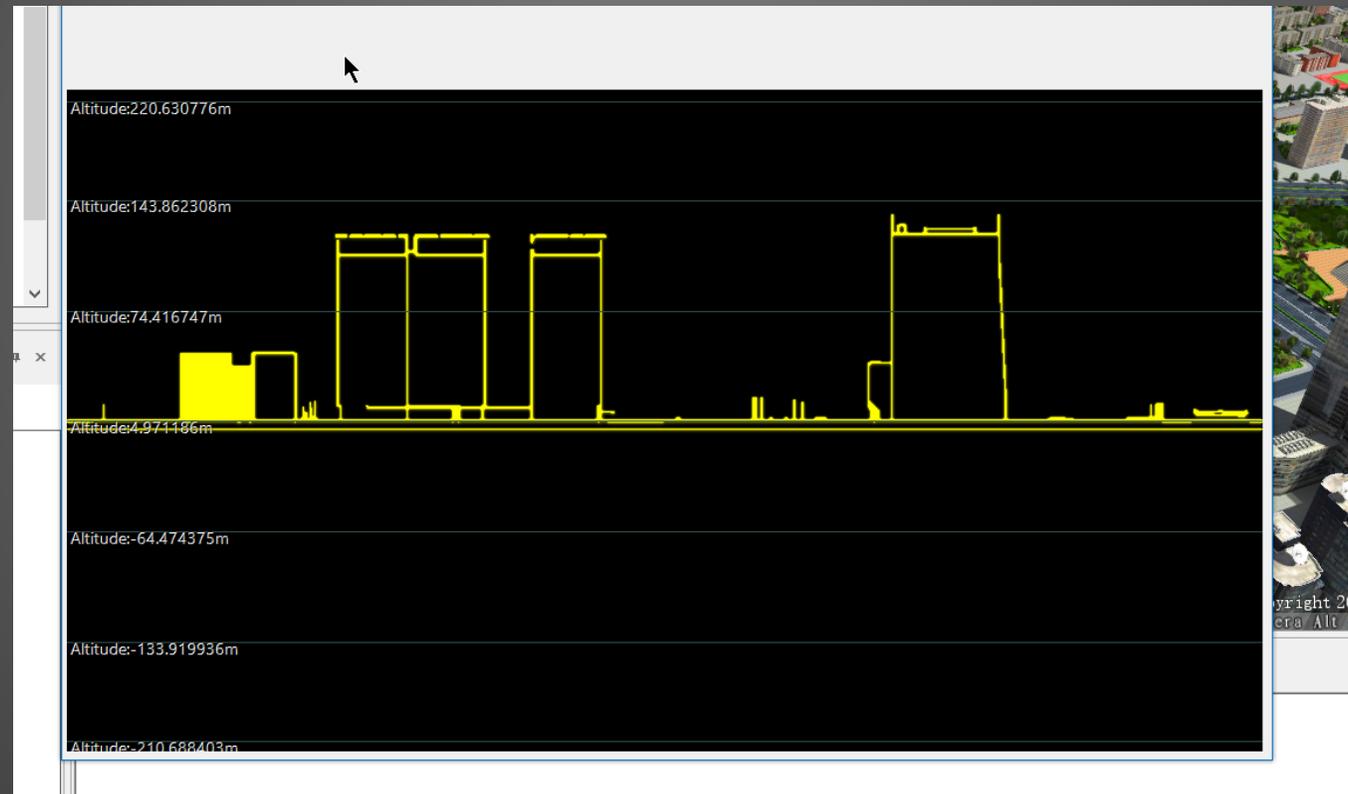
Sunlight Analysis

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



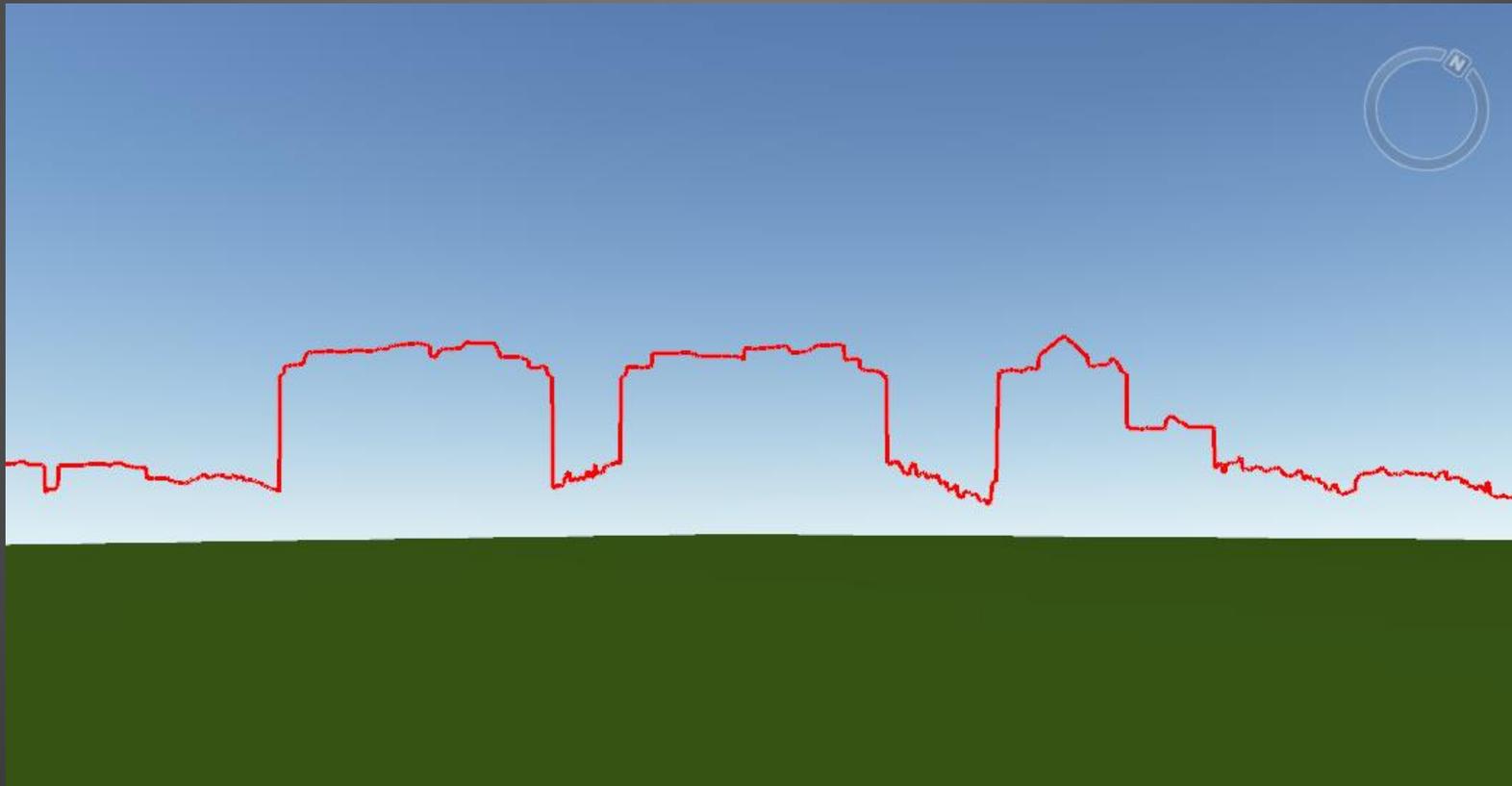
Profile Analysis

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



Skyline Analysis

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



Thank you