

Distance Calculations Geodesic and Cartesian

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Outline

- **Description of the problem**
- **Enhancements to ArcGIS**
- **Considerations & tips**

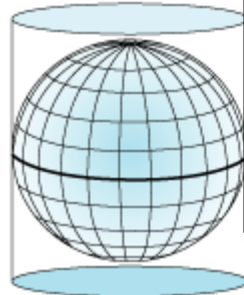
The problem



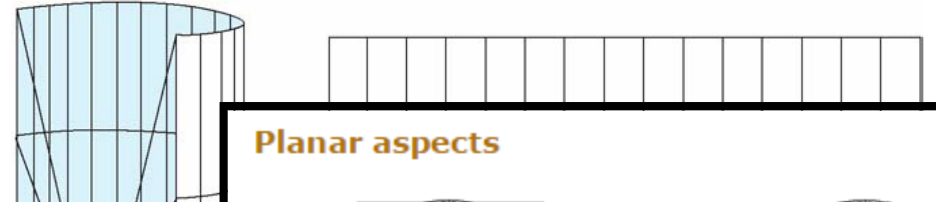
Fundamental question answered by GIS

- What is near me
- How far is something

Cylindrical aspects



A diagram showing a globe with a grid of latitude and longitude lines enclosed within a cylindrical shape. This represents the concept of cylindrical aspects in cartography.



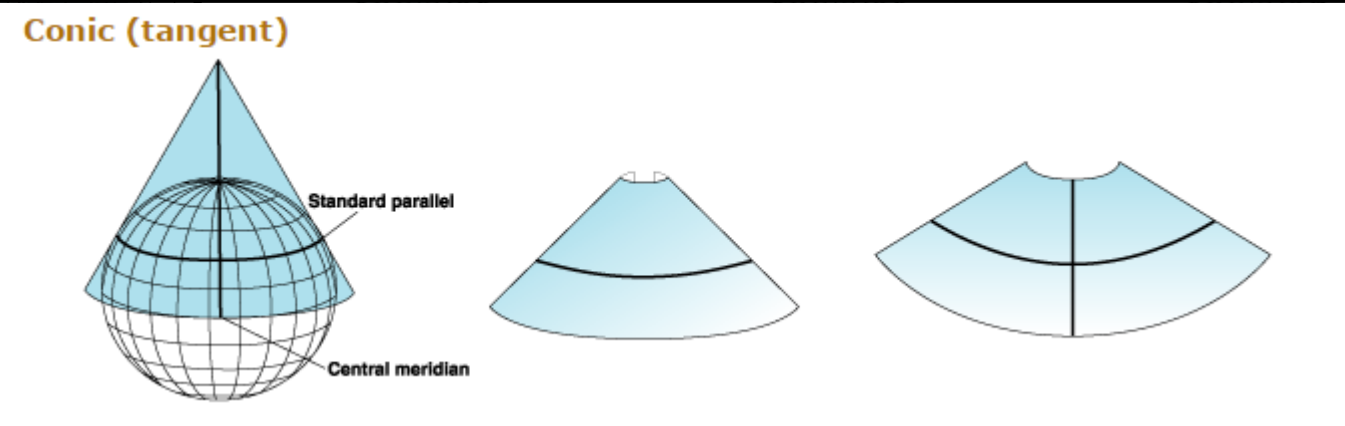
A diagram illustrating the planar aspect of a cylinder. On the left, a cylinder is shown with vertical lines representing its surface. On the right, a horizontal rectangle is shown, representing the cylinder's surface flattened into a flat map projection.

Planar aspects



A diagram illustrating the planar aspect of a cone. On the left, a cone is shown with a grid of latitude and longitude lines. On the right, a fan-shaped sector is shown, representing the cone's surface flattened into a flat map projection.

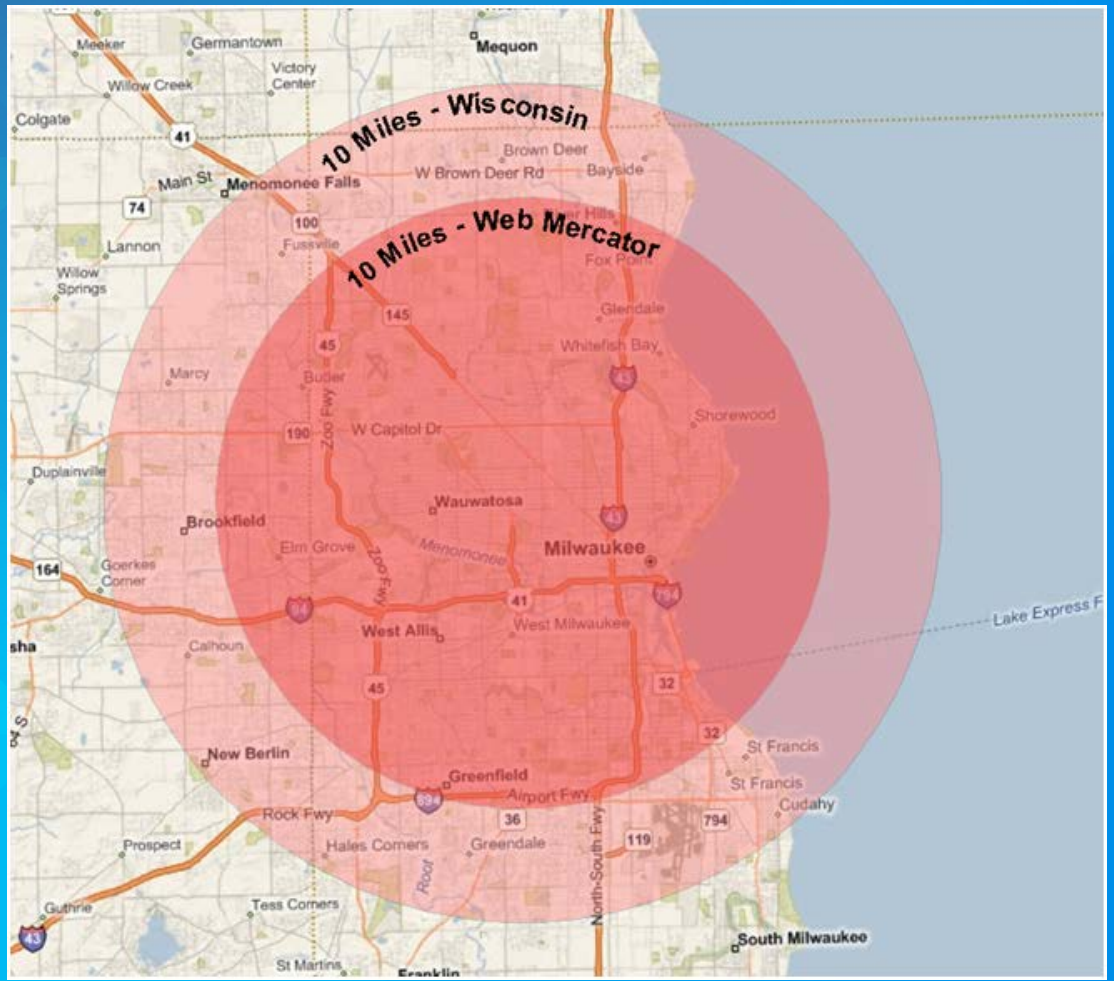
Conic (tangent)



A diagram illustrating the conic (tangent) aspect. On the left, a globe is shown with a cone tangent to its surface at a single point. Labels include "Standard parallel" pointing to a horizontal line on the globe and "Central meridian" pointing to a vertical line. On the right, a fan-shaped sector is shown, representing the cone's surface flattened into a flat map projection.



A diagram illustrating the planar aspect of a globe. On the left, a globe is shown with a grid of latitude and longitude lines. On the right, a horizontal rectangle is shown, representing the globe's surface flattened into a flat map projection.



GIS 101

- **distance measurements should be made in an appropriate coordinate system**
 - **Local coordinate system which minimized distance distortions**
- **But what about studies over large geographic areas?**

The solution



8.x

- **Buffer wizard**



Demo



ge·o·des·ic

/ˌjēəˈdesɪk,-ˈdē-/ 

adjective

adjective: **geodesic**

1. of, relating to, or denoting the shortest possible line between two points on a sphere or other curved surface.
2. another term for **geodetic**.

noun

noun: **geodesic**; plural noun: **geodesics**

1. a geodesic line or structure.

Geodesic distances in ArcGIS

- **9.3**

- **Buffer tool (points only, when GCS & linear distance specified)**

- **10.0**

- **ArcMap's measure tool now has GEODESIC option**
- **XY To Line tool : converts a table of from and to points (xy pairs) to create a feature class from geodesic lines**
- **Bearing Distance To Line : converts a table containing information for creating a feature class from geodesic lines**

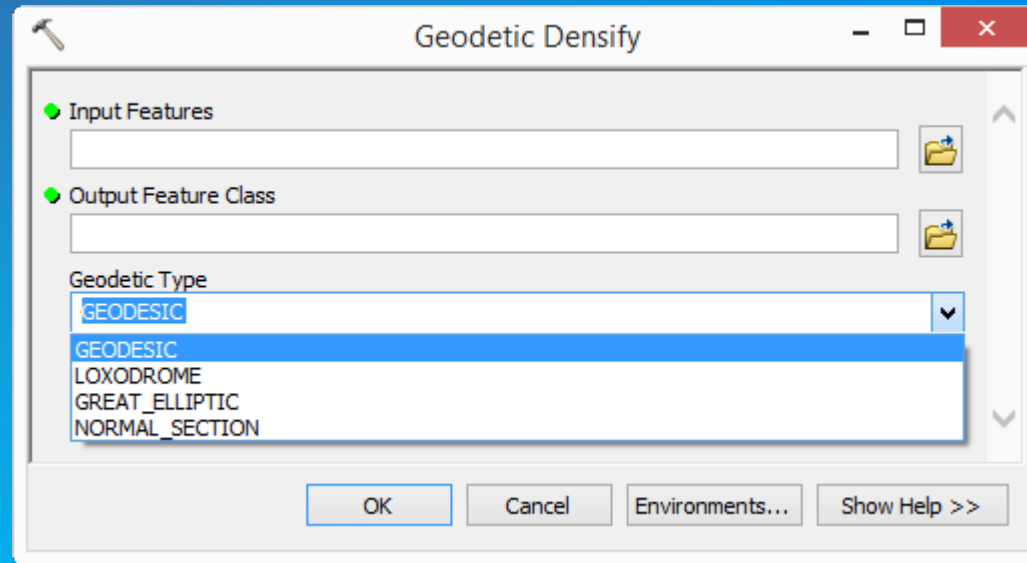
Geodesic distances in ArcGIS -cont

- 10.1

- Buffer (polygon & lines – when GCS & linear distance specified)
- Calculate Field tool
 - !shape.geodesicArea@hectares!
 - !shape.geodesicLength@miles!
- arcpy geometry methods
 - getLength
 - getArea

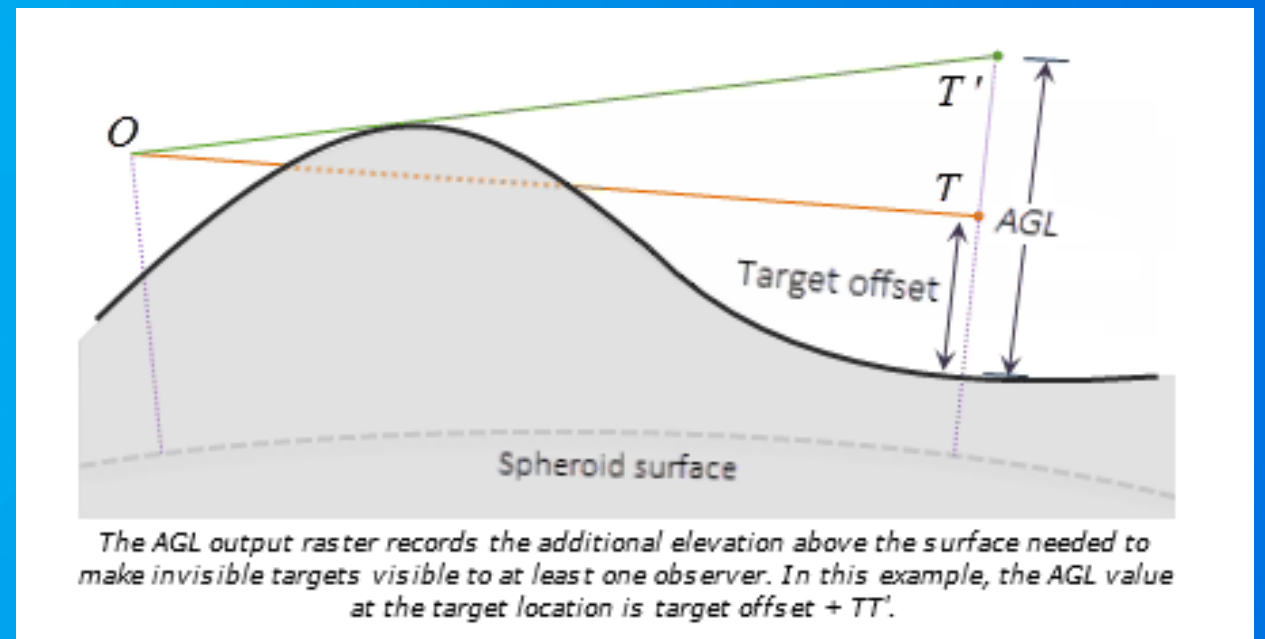
Geodesic distances in ArcGIS -cont

- **10.2.1**
 - Near (new method parameter)
 - Generate Near Table (new method parameter)
- **10.3**
 - Buffer (new method parameter)
 - Spatial Join new option
 - WITHIN_A_DISTANCE_GEODESIC
 - CLOSEST_GEODESIC
 - Geodesic Densify



Geodesic distances in ArcGIS -cont

- Viewshed2
- Empirical Bayesian Kriging



Consideration



- **Units**

- If run in a projected coordinate system, distance are in that CS' units
- If run in a geographic coordinate system, distance are in Meter

- **Backward compatibility**

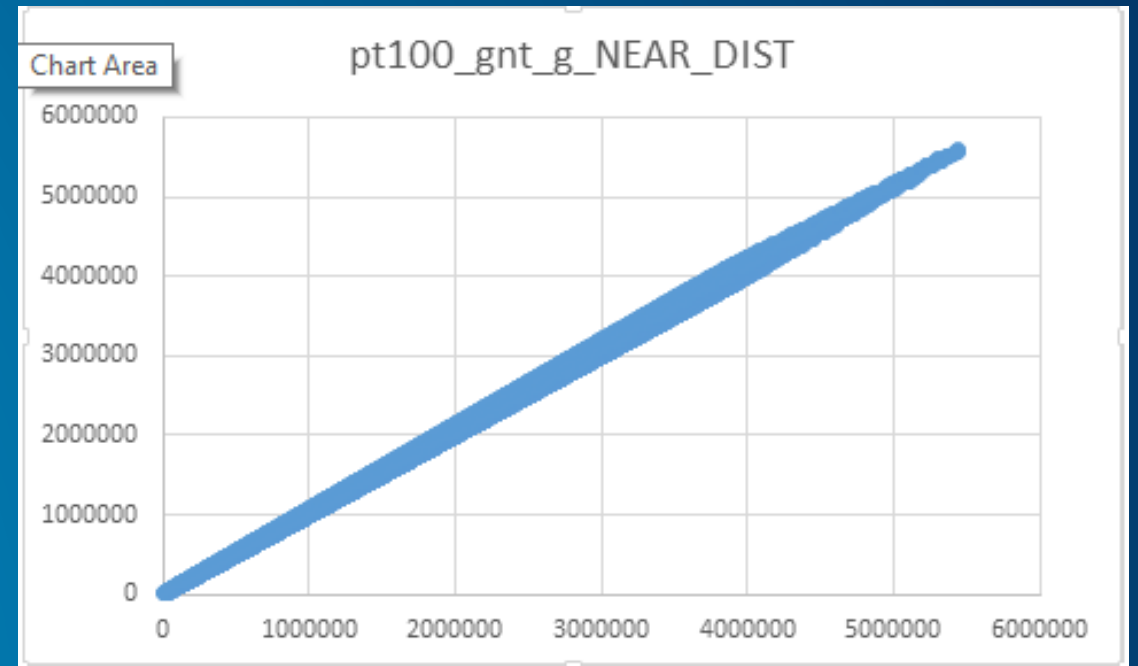
- **SHAPE_PRESERVING vs GEODESIC**

- **Performance**



- **PLANAR and GEODESIC both took about 15 seconds (for 100,000 distsances)**

AVERAGE	59,336.3
STDDEV	53,457.0



Additional resources

- blogs.esri.com/esri/arcgis/2010/05/24/geodesic-features-and-measurements-in-argis
- blogs.esri.com/esri/arcgis/2011/07/21/calculating_geodesic



Understanding our world.