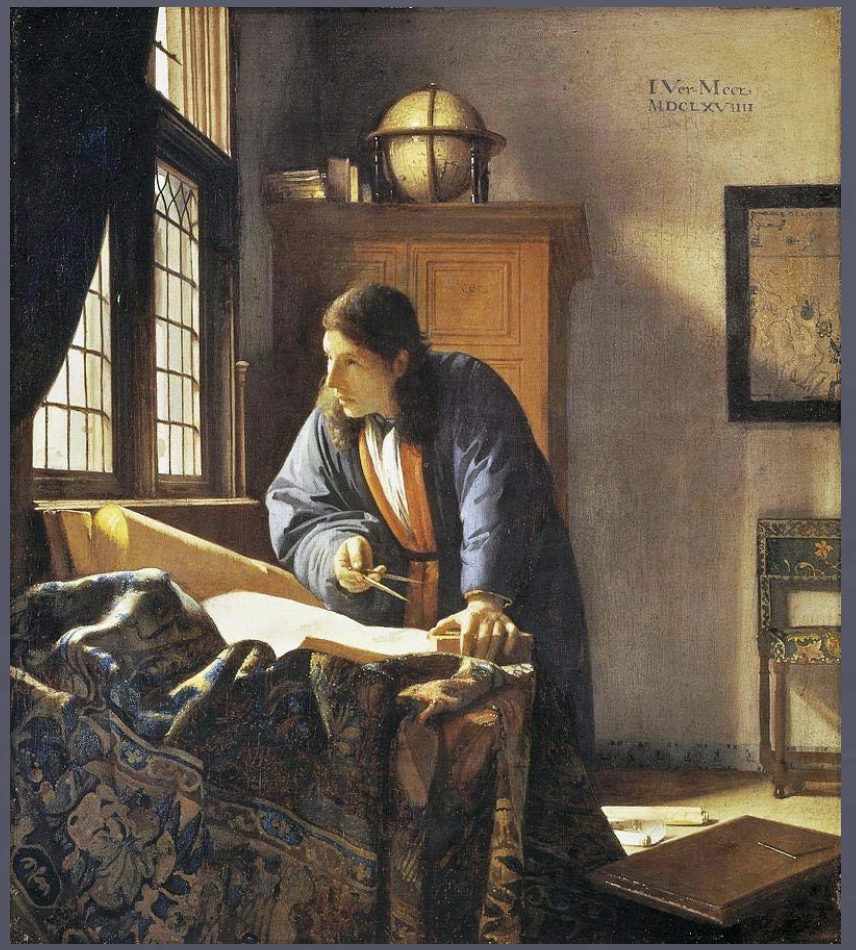
Cartographic Principles and Geospatial Technologies

Cartography and Map Principles

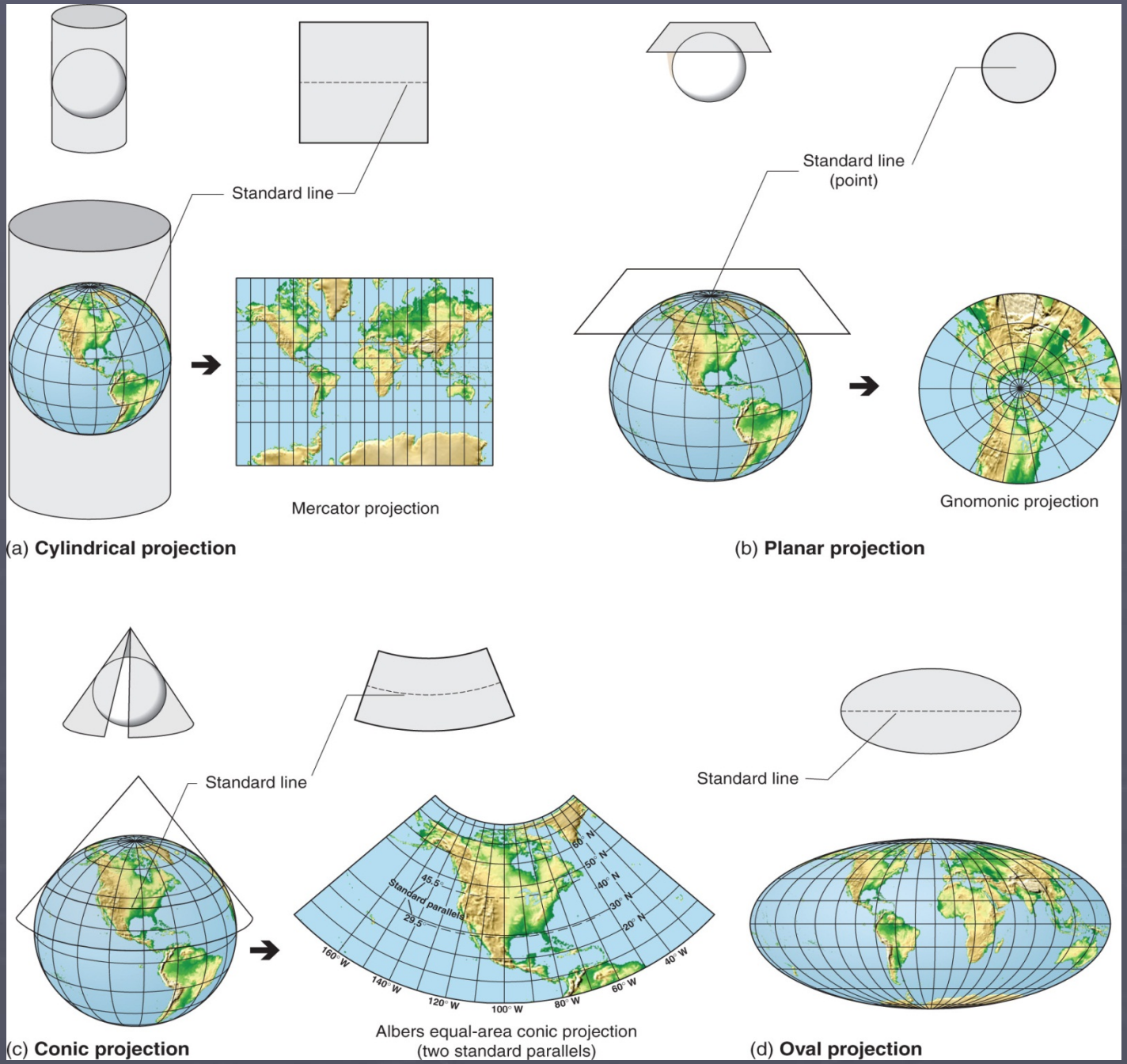
- Cartography – The Science and Study of Map Making
- Elements of a ”Good Map” (As many as possible)
  - T - Title
  - O – Orientation
  - D – Date
  - A – Author
  - L – Legend
  - S – Scale
  - I – Index
  - G – Grid
  - S – Source



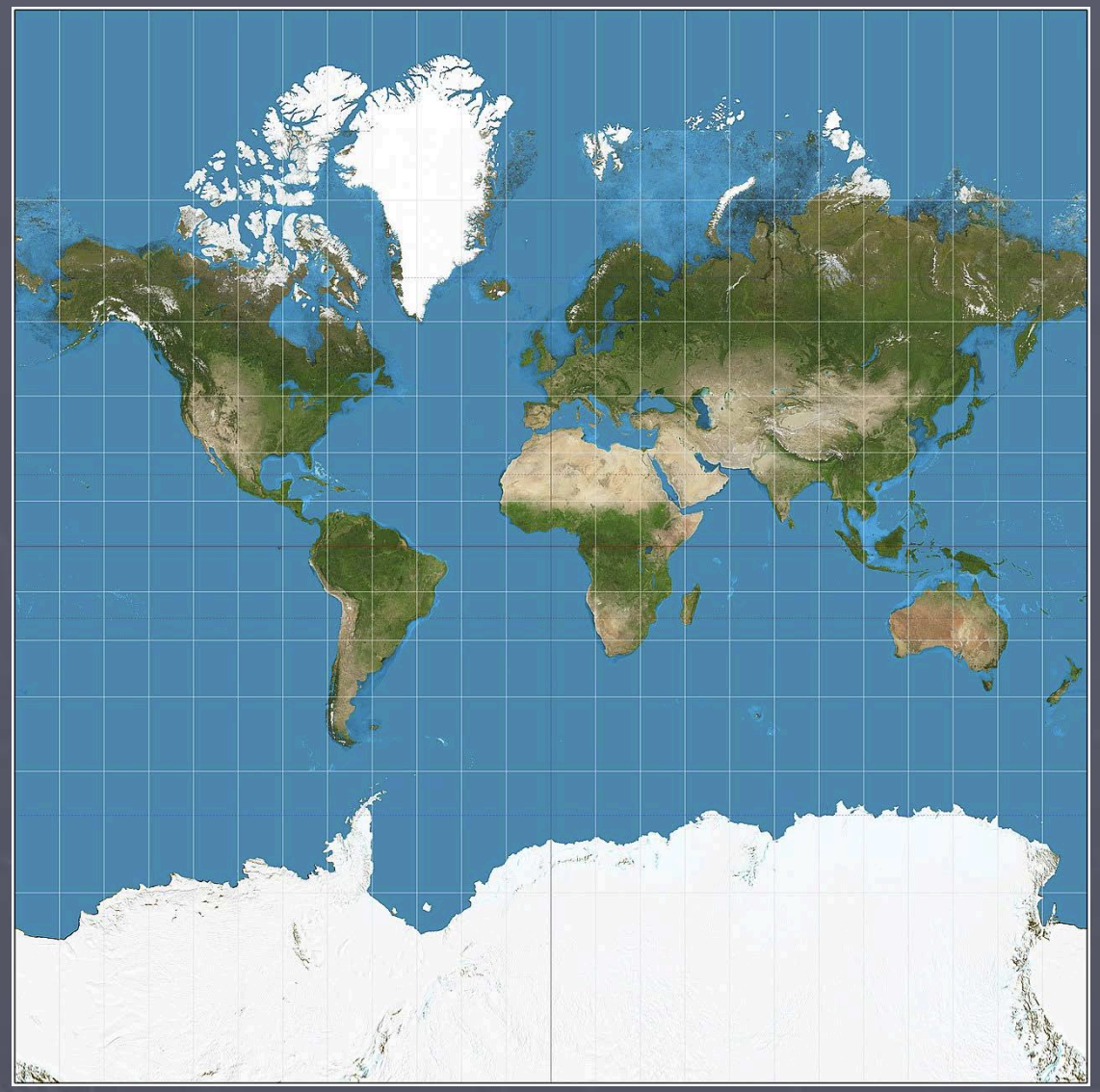
“The Geographer,” Johannes Vermeer, 1668-1669

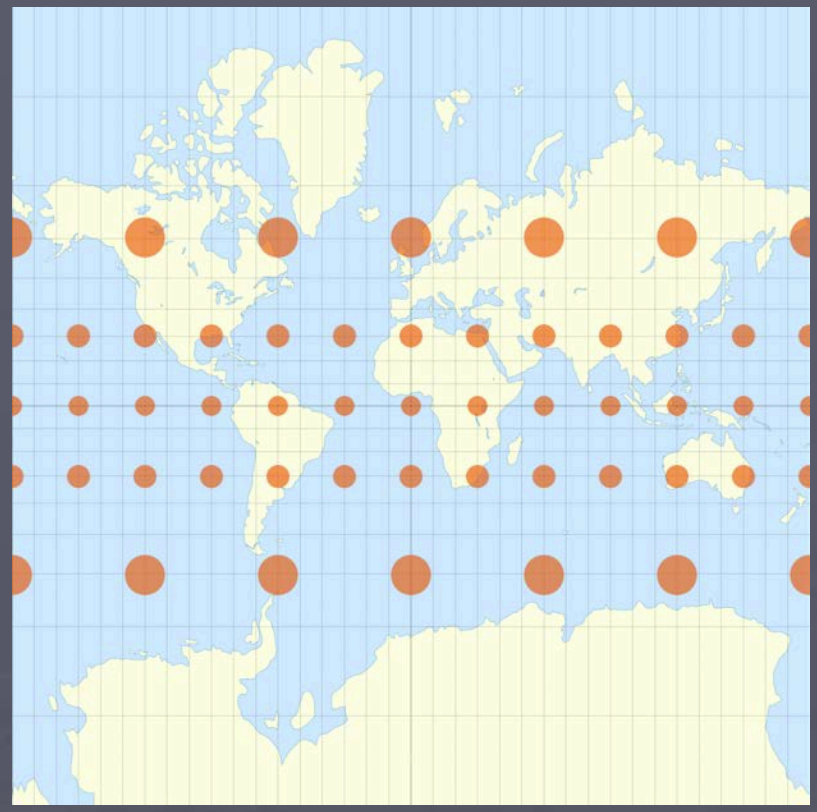
Map Projections

- Distortion results from taking a spherical object and trying to flatten out onto a flat surface
  - Shape can be distorted
  - Distance between two points can increase or decrease
  - Relative size may be altered, areas can appear much larger than they really are
  - Direction can be distorted

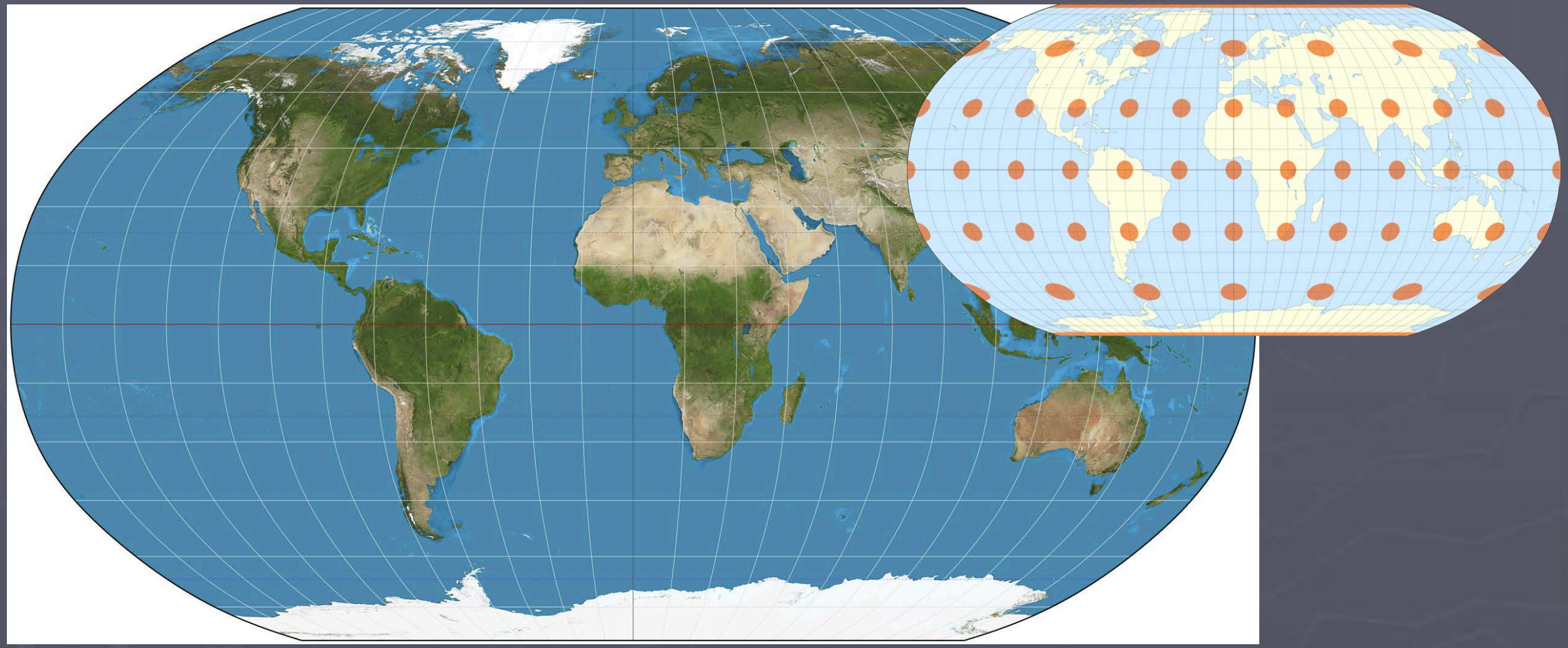

Standard line
Mercator projection
(a) Cylindrical projection
Standard line
(point)
Gnomonic projection
(b) Planar projection
Standard line
Standard parallels
45.5
29.5
60° N
50° N
40° N
30° N
20° N
160° W
140° W
120° W
100° W
80° W
60° W
40° W
Albers equal-area conic projection
(two standard parallels)
(c) Conic projection
Standard line
(d) Oval projection

Mercator (Conformal Cylindrical)

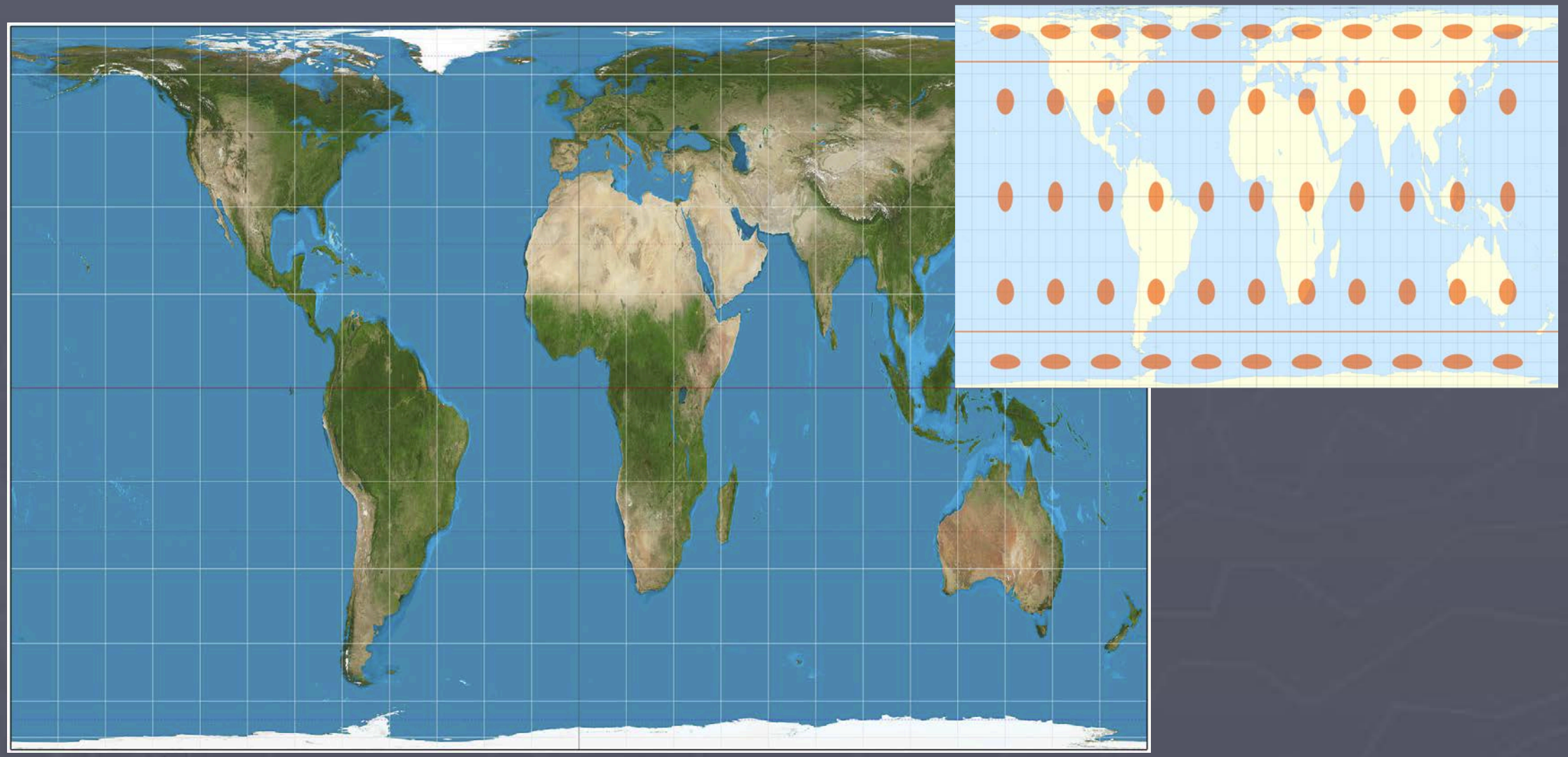




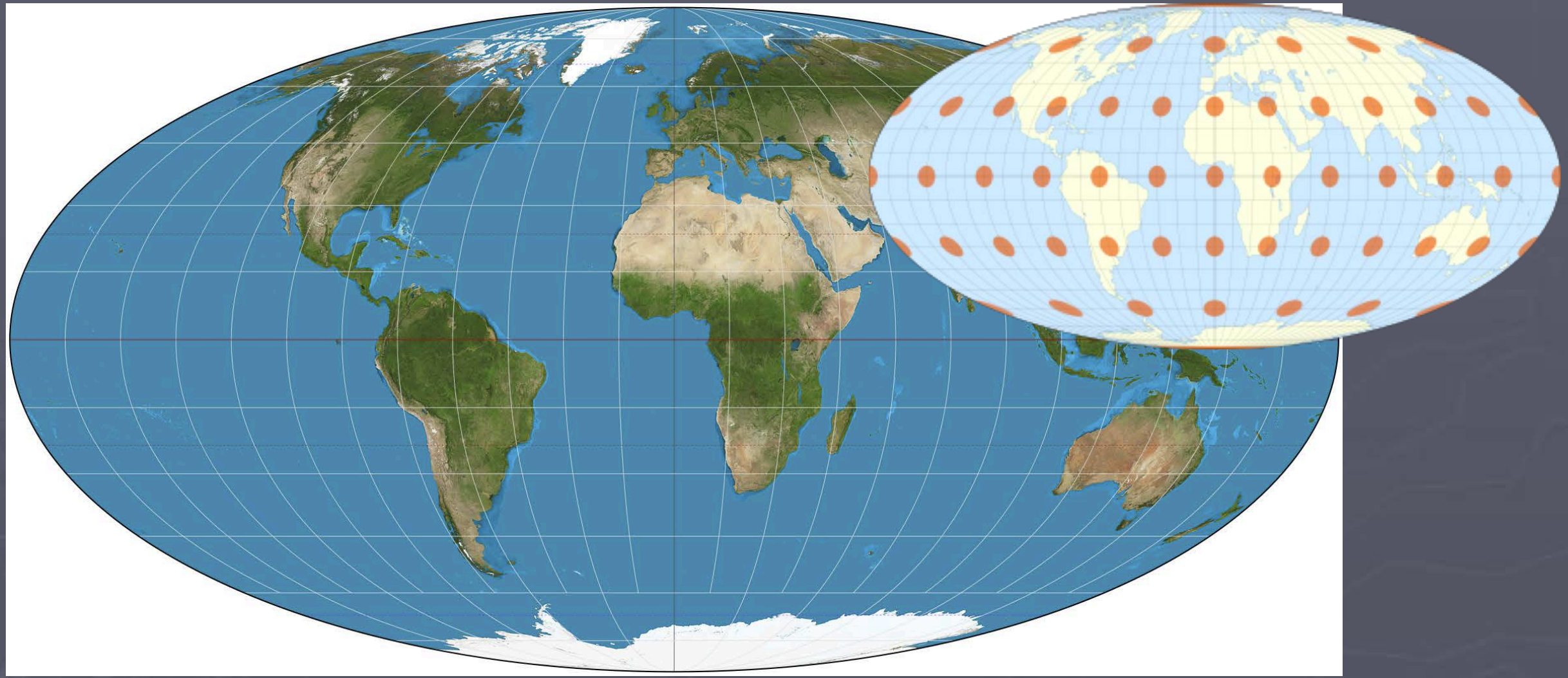
Robinson (Compromise Projection)



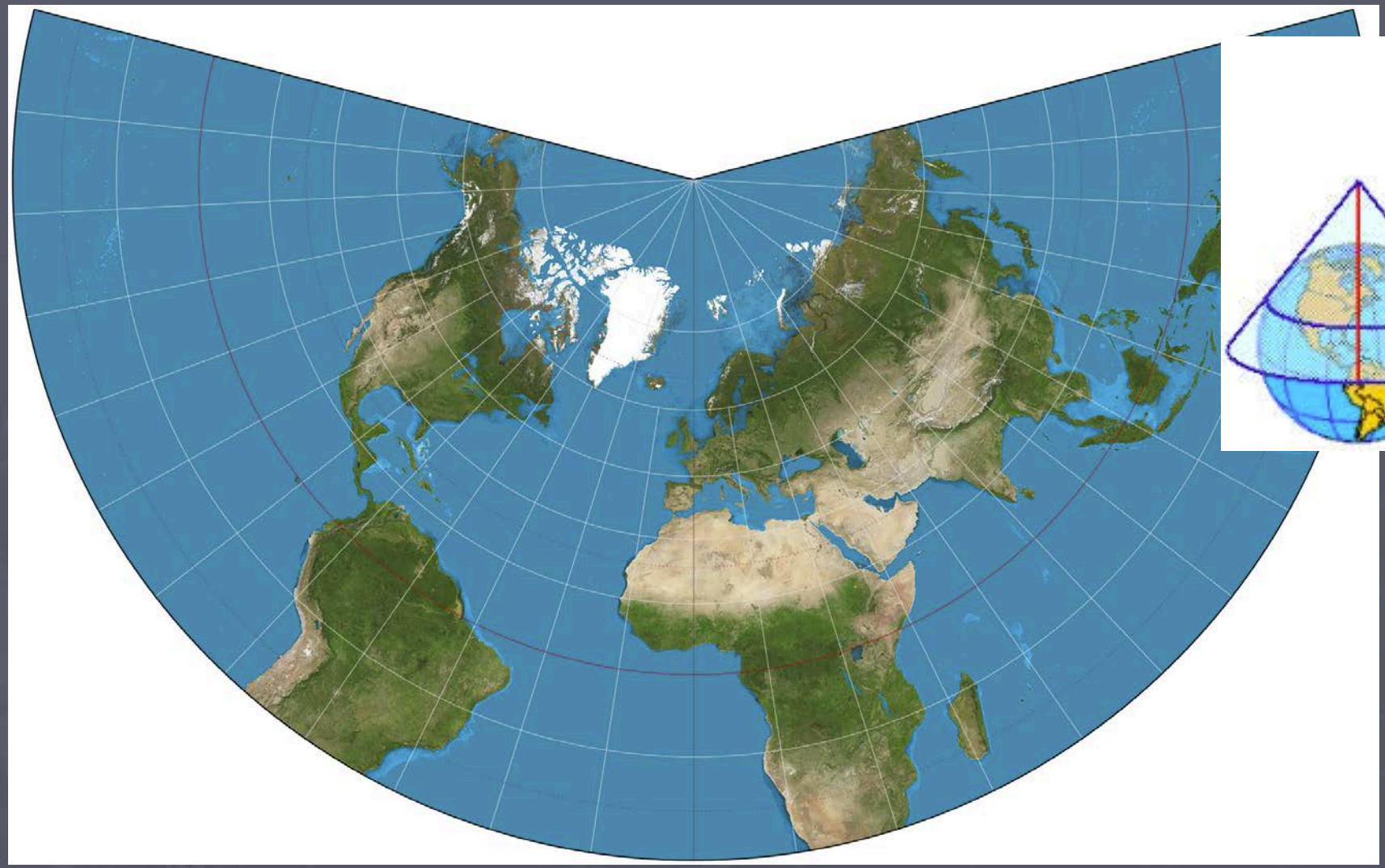
Gall-Peters (Cylindrical Equal Area Projection)

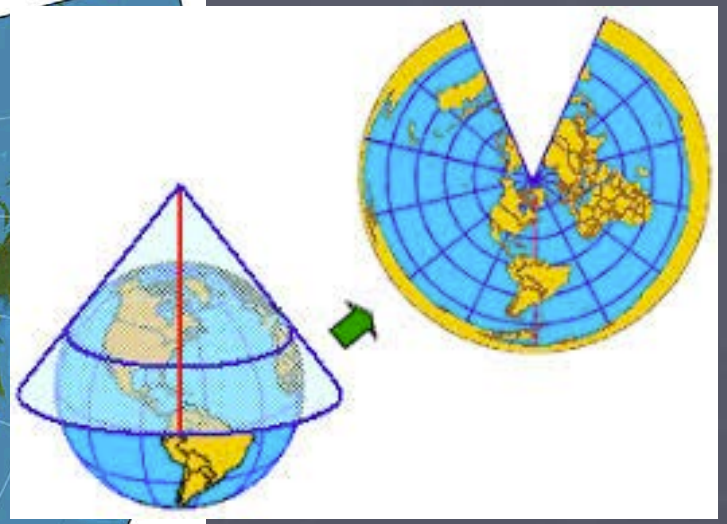


Mollweide (Pseudocylindrical Equal-Area Projection)

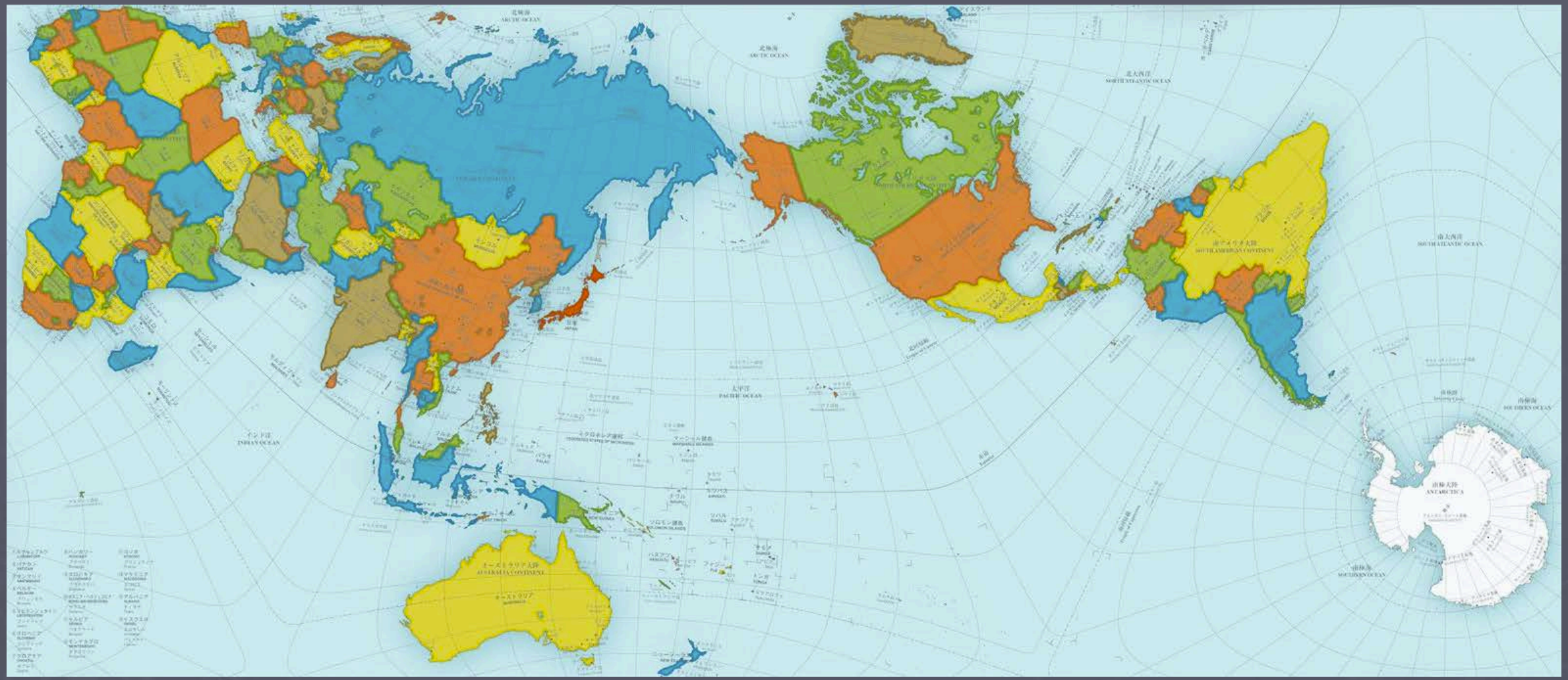


Lambert (Conformal Conic Projection)





Authagraph

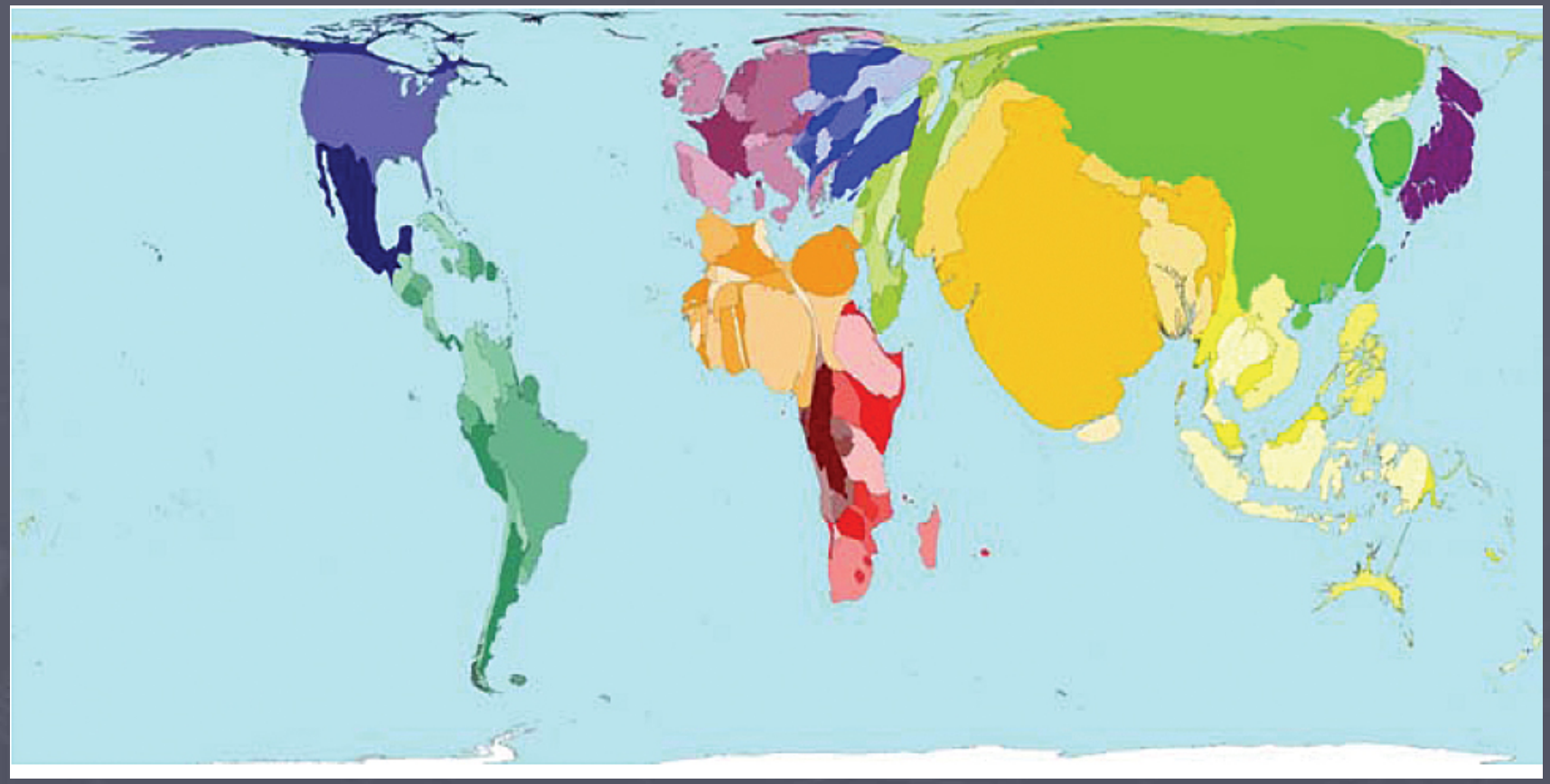

北極海
ARCTIC OCEAN
北大西洋
NORTH ATLANTIC OCEAN
南大西洋
SOUTH ATLANTIC OCEAN
太平洋
PACIFIC OCEAN
インド洋
INDIAN OCEAN
南極海
SOUTHERN OCEAN
南極大陸
ANTARCTICA

Reference Maps & Thematic Maps

- Reference Maps
  - Used to show locations (Political and Physical Maps)
- Thematic Maps
  - Used to shows relationships and patterns over space

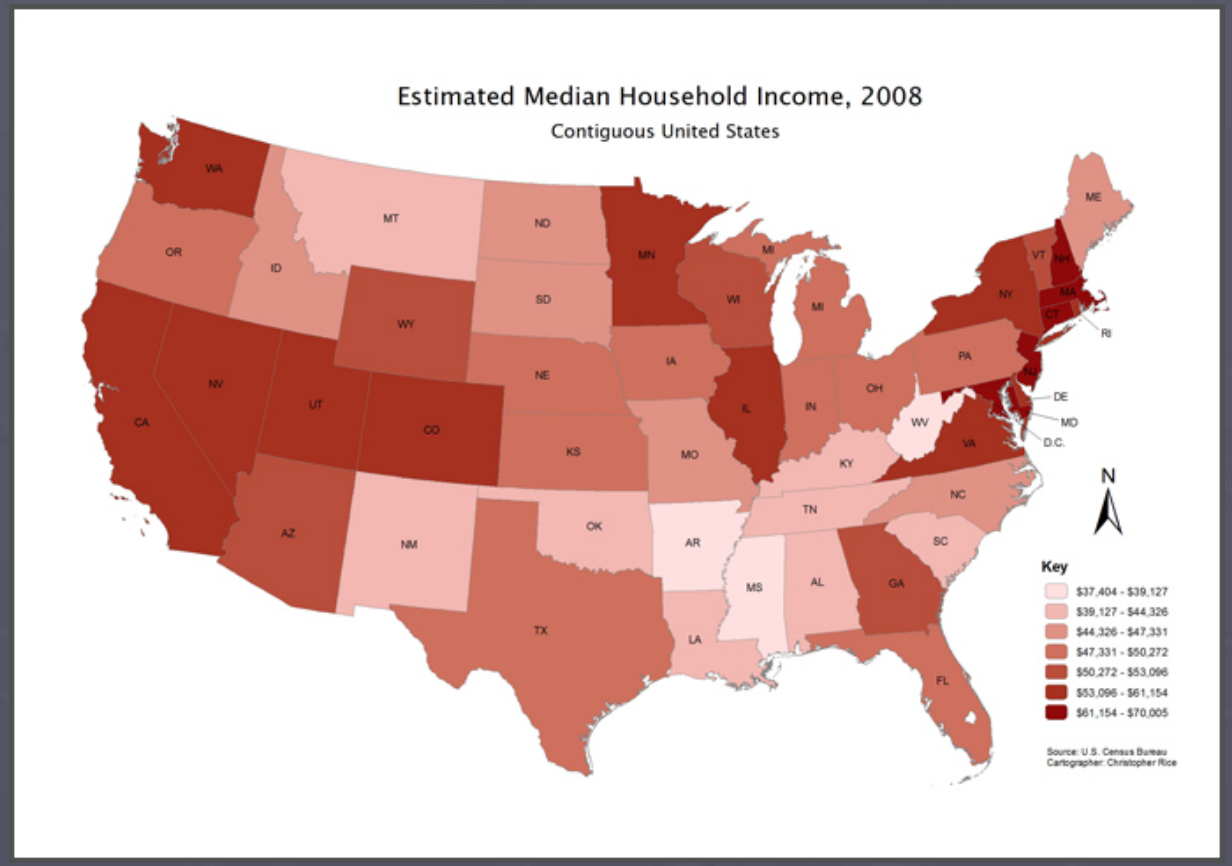
Thematic Map - Cartogram

- Changes the physical size of an area to display a characteristic



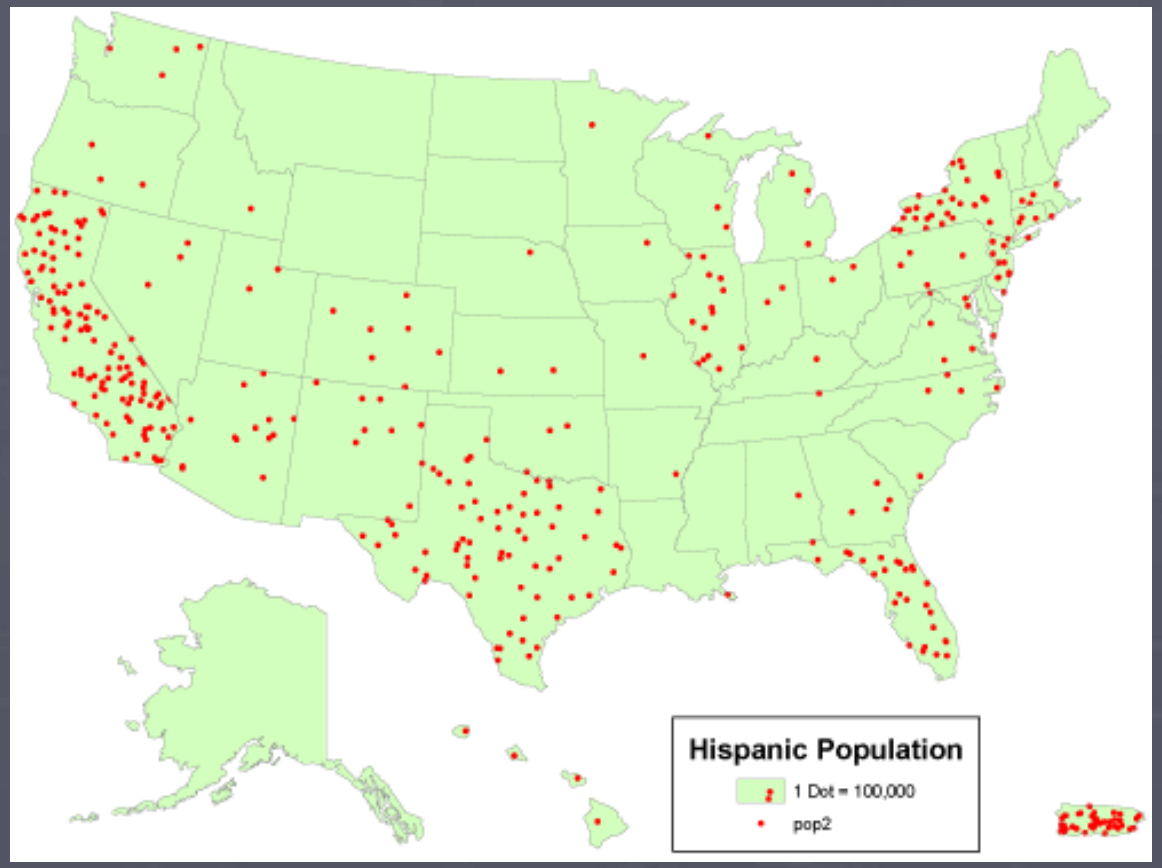
Thematic Map - **Choropleth**

- Shows value or characteristic by using different colors



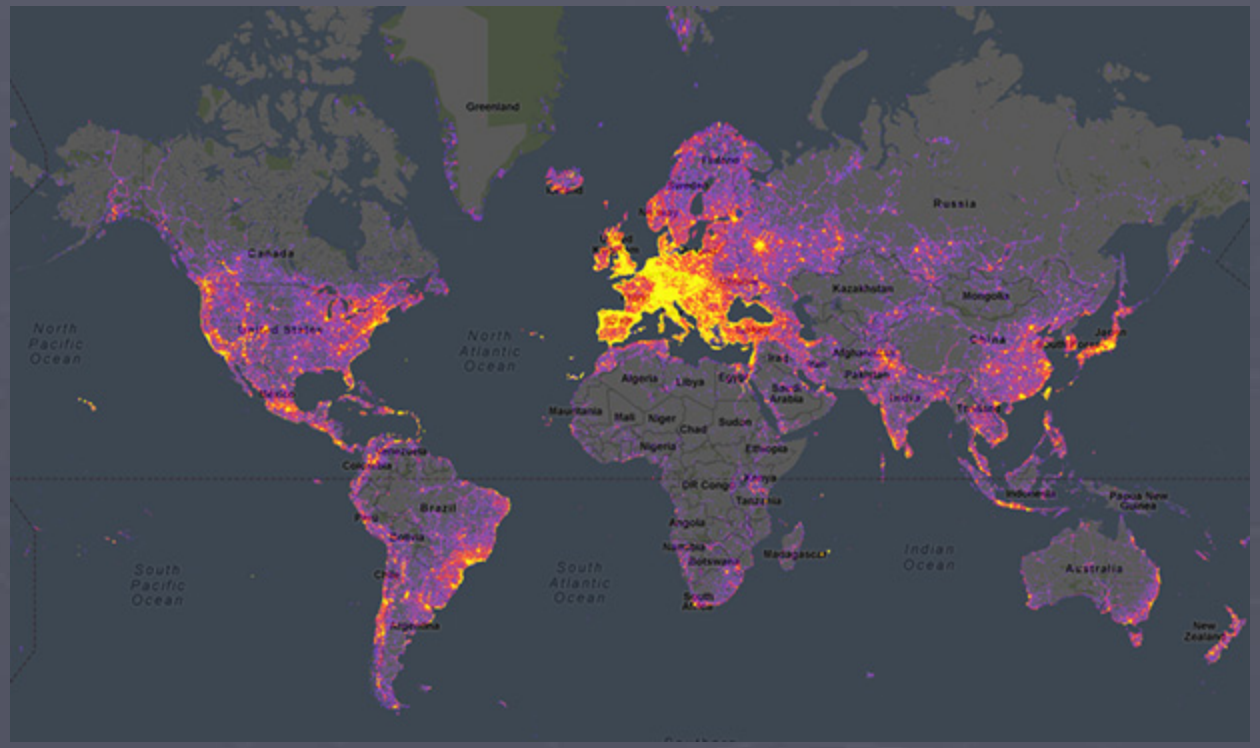
Thematic Map - **Dot Density**

- Each dot has an assigned value, the more dots the more a characteristic is prevalent



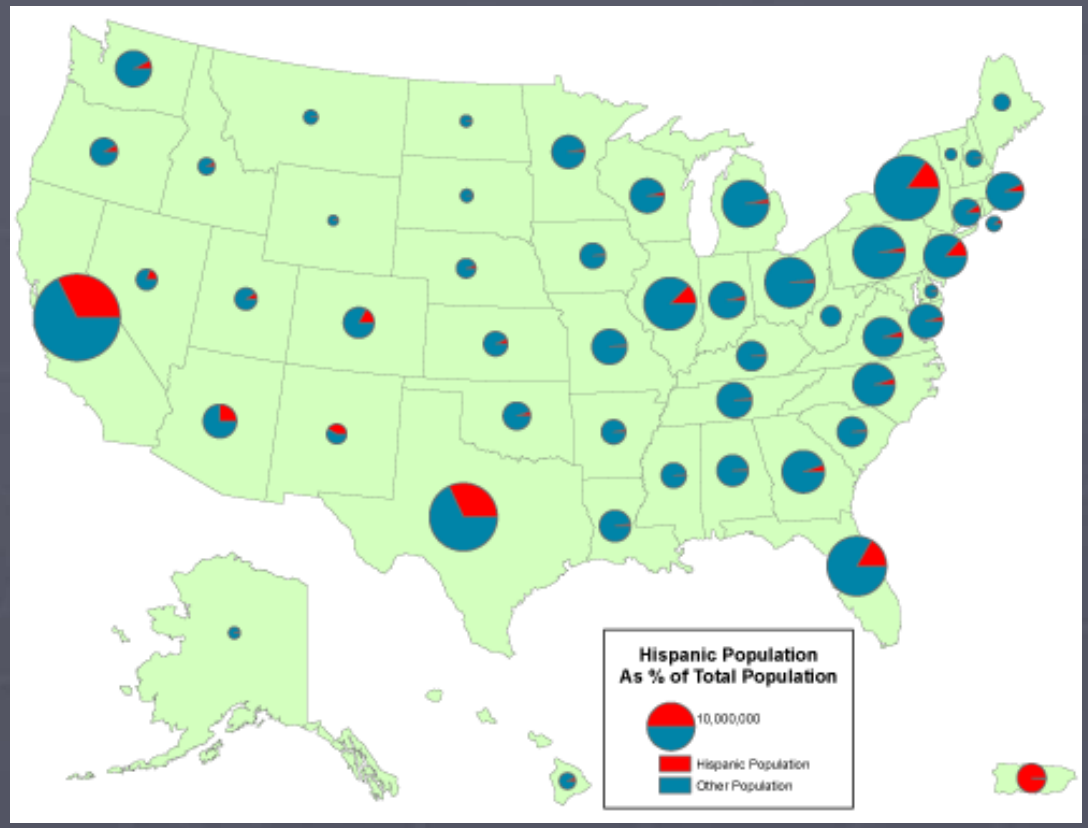
Thematic Map - **Heat Map**

- A map that shows distribution through the use of color
  - “Hotter” means more exists



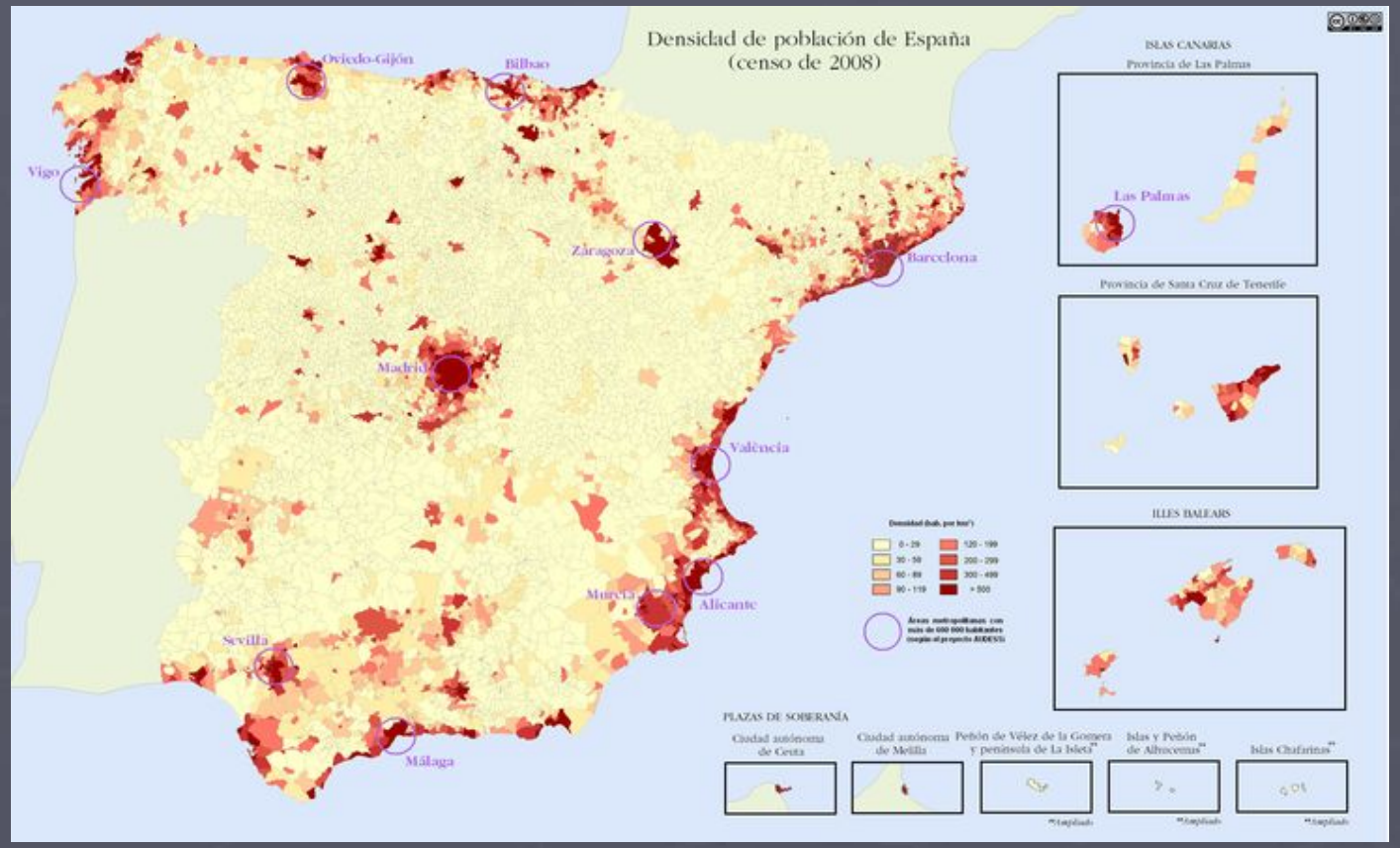
Thematic Map - **Graduated Symbol**

- The bigger the symbol, the more of something exists in that area



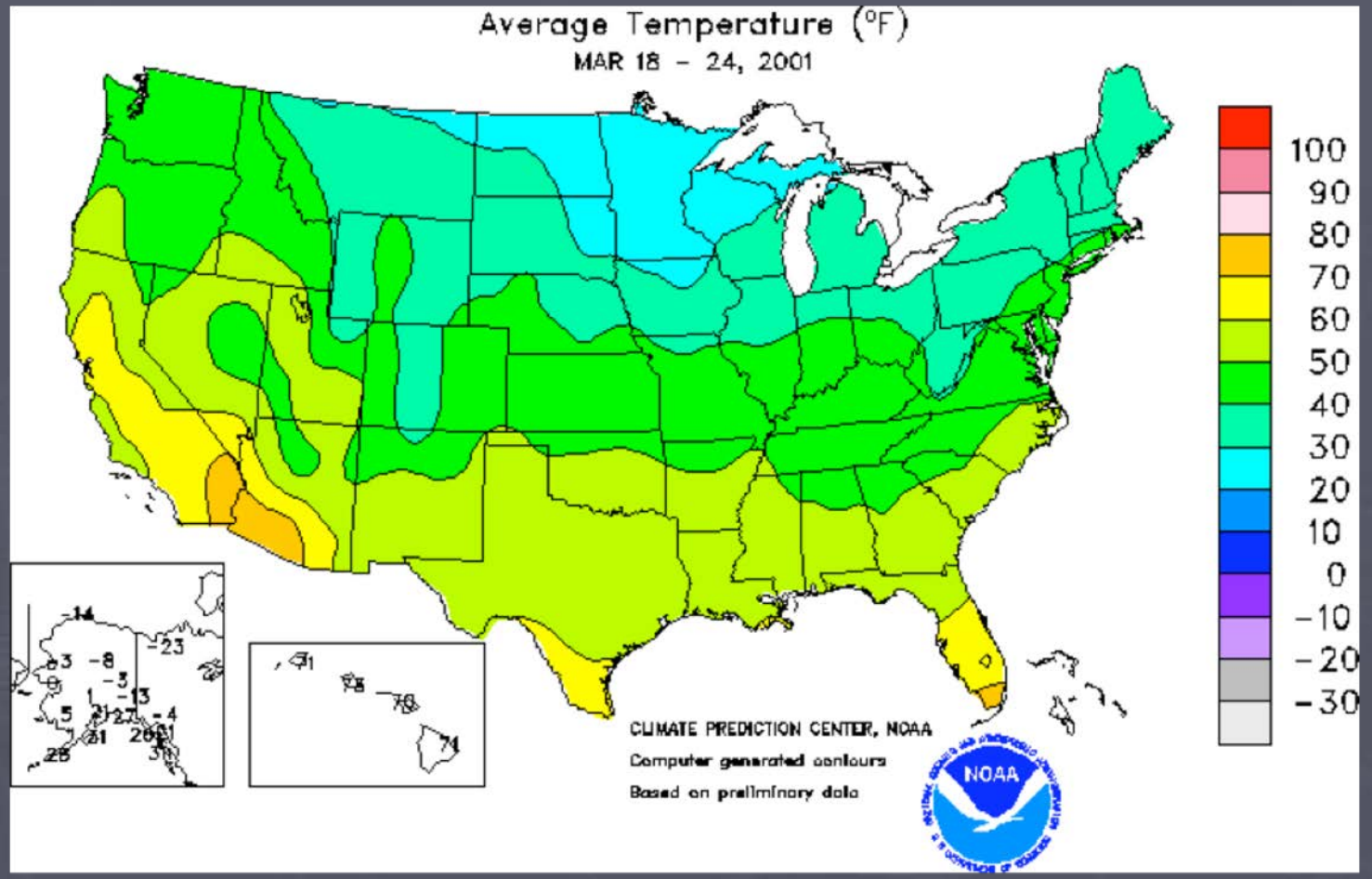
Thematic Map - Quantitative Symbology/Color Ramp

- Uses shades to imply density or higher quantity



Thematic Map – Isoline/Contour

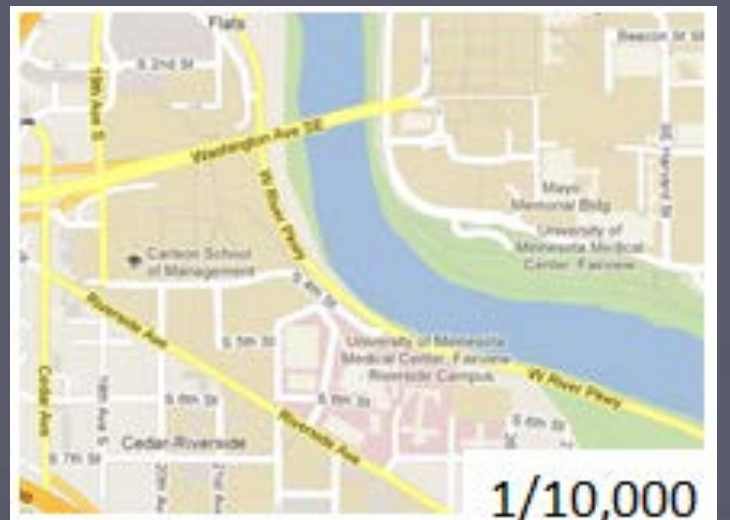
- Lines signify breaks or progressions

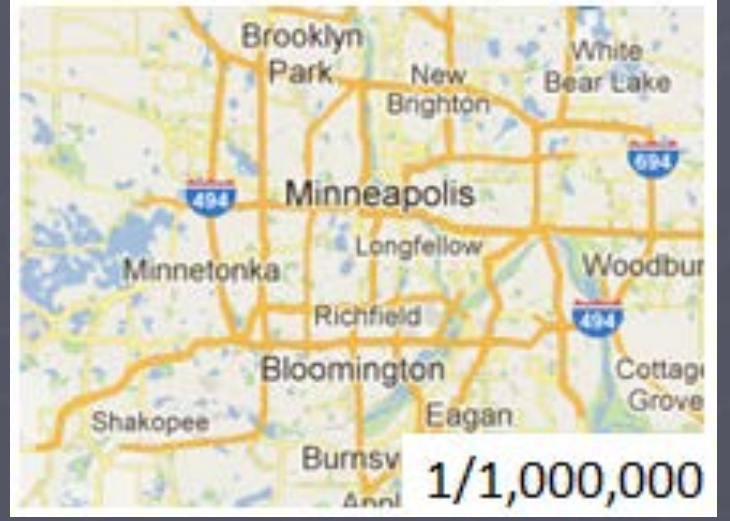


1in on map = 10,000 inches in real life (roughly .157 miles)

Scale

- Scale is representation between map and real world proportions
- Scale is the size of the area being examined
  - Large Scale: Small area, large amounts of detail
  - Small Scale: Large area, small amounts of detail

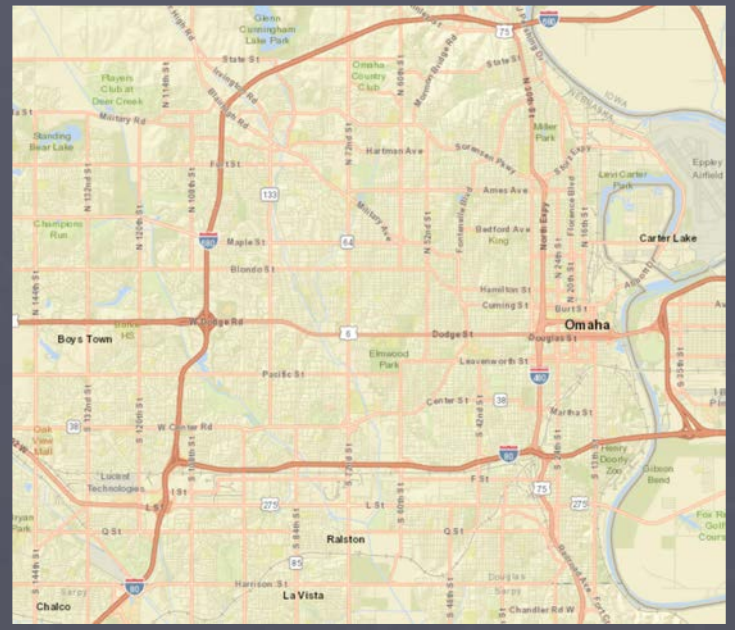




1in on map = 1,000,000 inches in real life (roughly 15.7 miles)

Scale

- Scale can also refer to the scope of examination (ex. Neighborhood, city, state, country, etc…)



Remote Sensing

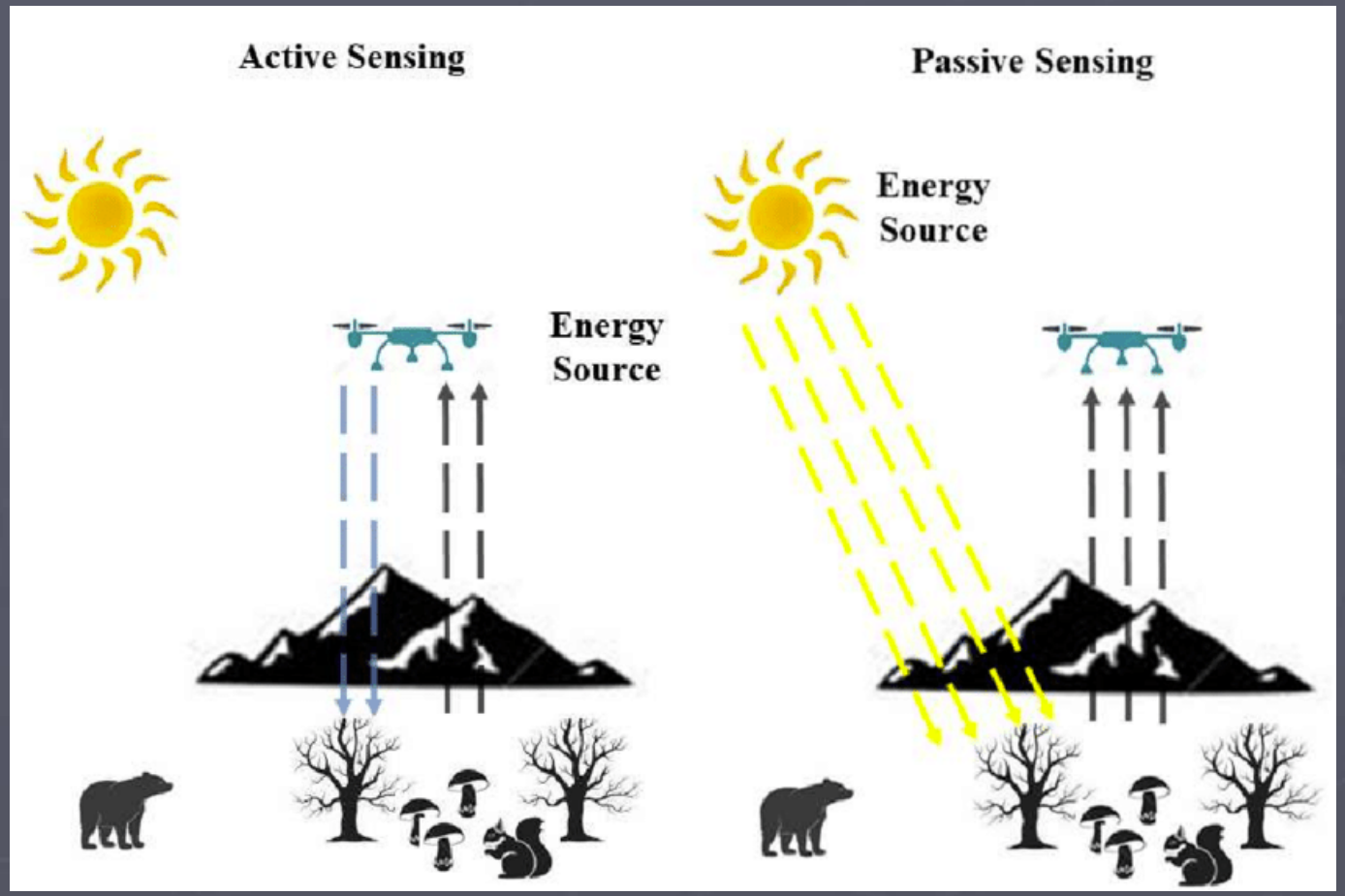
- The collection of wavelength specific data about the Earth's surface without being in direct contact

Aerial Imagery

Satellite Infrared Imagery

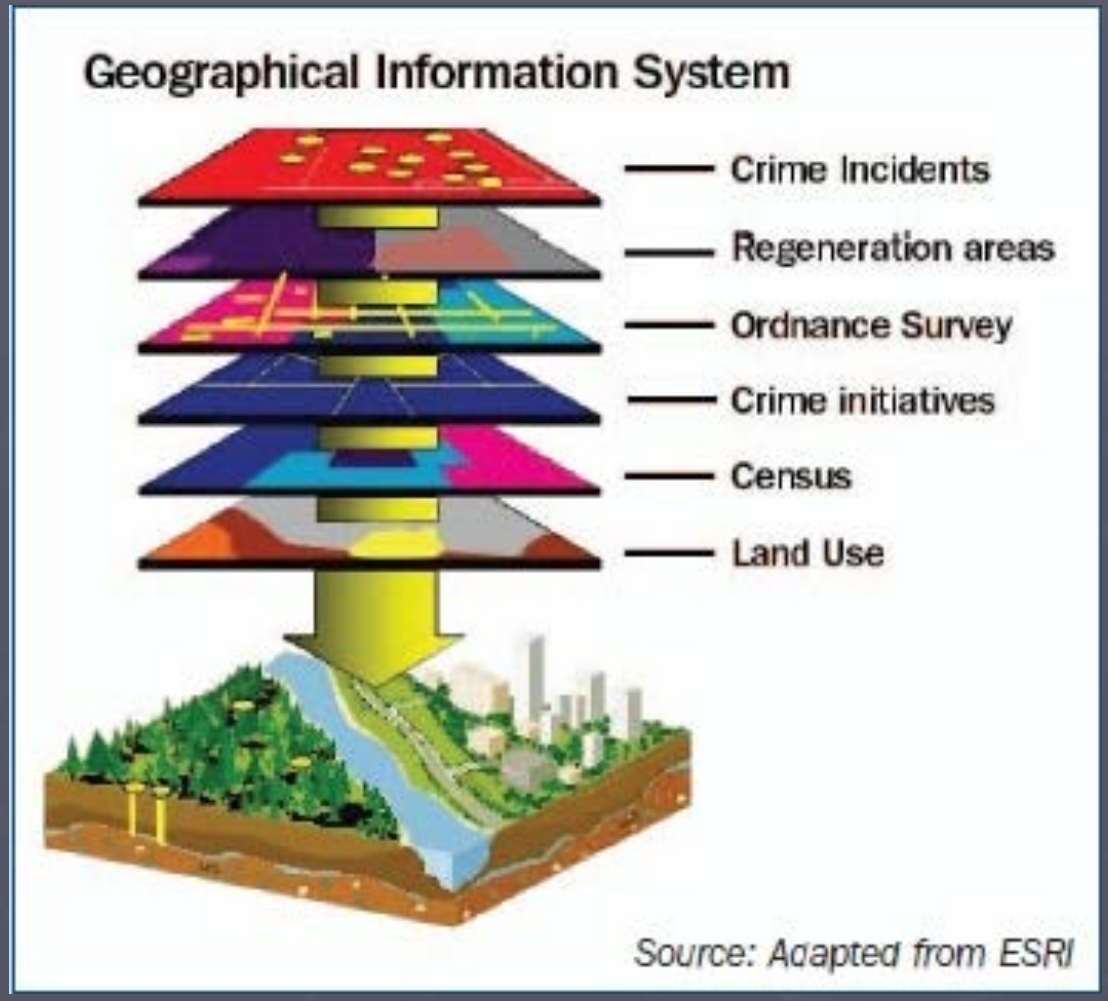
Active vs. Passive Remote Sensing

- Active remote-sensing systems send a beam of energy at a surface and analyze the energy reflected back.
  - Ex. Photograph
- Passive remote-sensing systems record wavelengths of energy radiated from a surface.
  - Ex. LIDAR



Geographic Information Systems (GIS)

- GIS uses computer programs to collect, store, analyze, and share geographic data
- GIS allows users to view relationships and identify patterns more easily with different layers
- Layers are different bits of data that are placed on top of each other
  - GIS uses two or more layers to identify patterns and relationships



Geographic Analysis and GIS

- Spatial Patterns: Identifiable connections that are repeated
  - Ex. Urban vs. Rural voting patterns in the United States over time
- Spatial Relationships: Connections between different data sets as connected to their physical geographic locations
  - Ex. Connection between world population centers and access to water

Advantages of GIS over “Static” Maps

- GIS software designed to easily collect and store massive amounts of data
  - Many are cloud based allowing access from anywhere
- Allows the easy display of findings and geographic information
  - Web-based interactive maps or static maps
  - Can be used to present data in real time
- Data Can be paired with multiple layers to examine for correlation and patterns