Course Goals to Understand

1. Processes operating on the earth's surface

   Atmosphere
   Lithosphere
   Hydrosphere
   Biosphere

2. Environmental issues in the relationship of humankind to the environment

3. Science – Goals and methods of scientific inquiry

   Predictive
   Self - correcting

What is Geography, Especially Physical Geography?

Geography tries to obtain a holistic understanding of the earth by merging environmental processes with human interaction. Physical geography is part of the larger collection of disciplines known as Earth Systems Sciences. Geography is a way of analyzing phenomena that change across distance or space. Consequently it is a spatial science with 5 major themes:

1. Location = where things are.

2. Human-environment relationships = how people interact with their environment. How do environmental processes work?

3. Region = How do processes aggregate to create areas with uniform character?

4. Movement = the transfer of people or materials across distance.

5. Place = every place is unique. How does a place its own unique character.

The Region. Iconic Images of the Great Plains

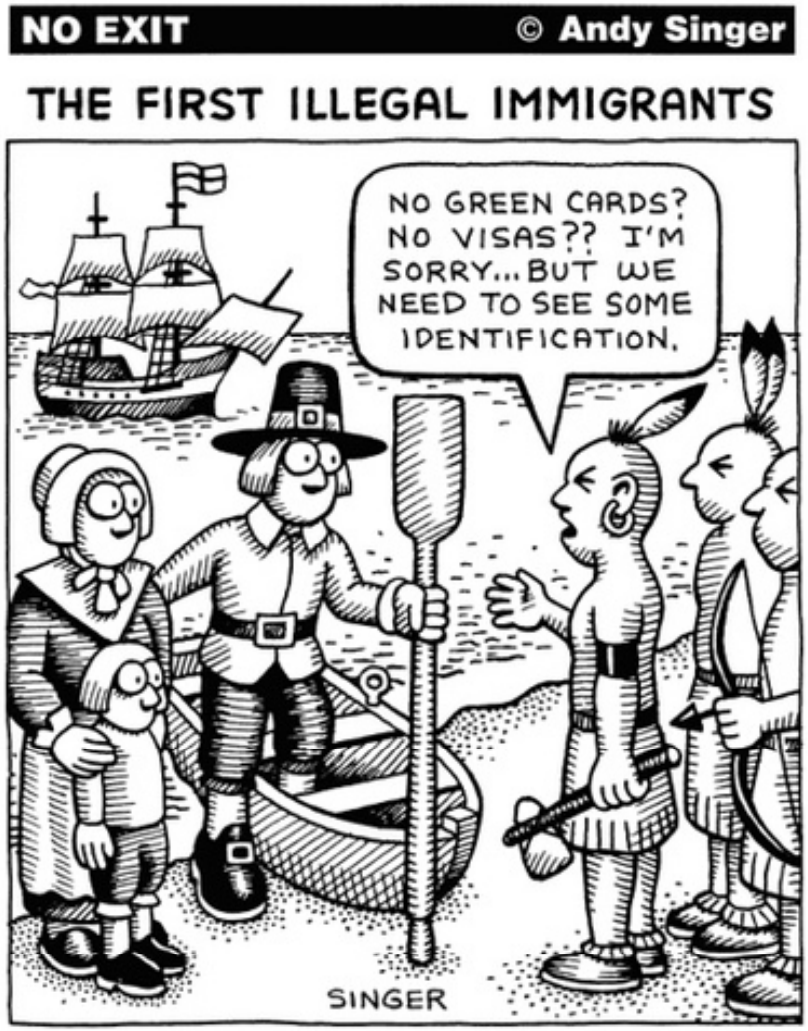
Interaction between People and Environment
How do Environmental Processes Work?

Flooding in Central Iowa, 2008

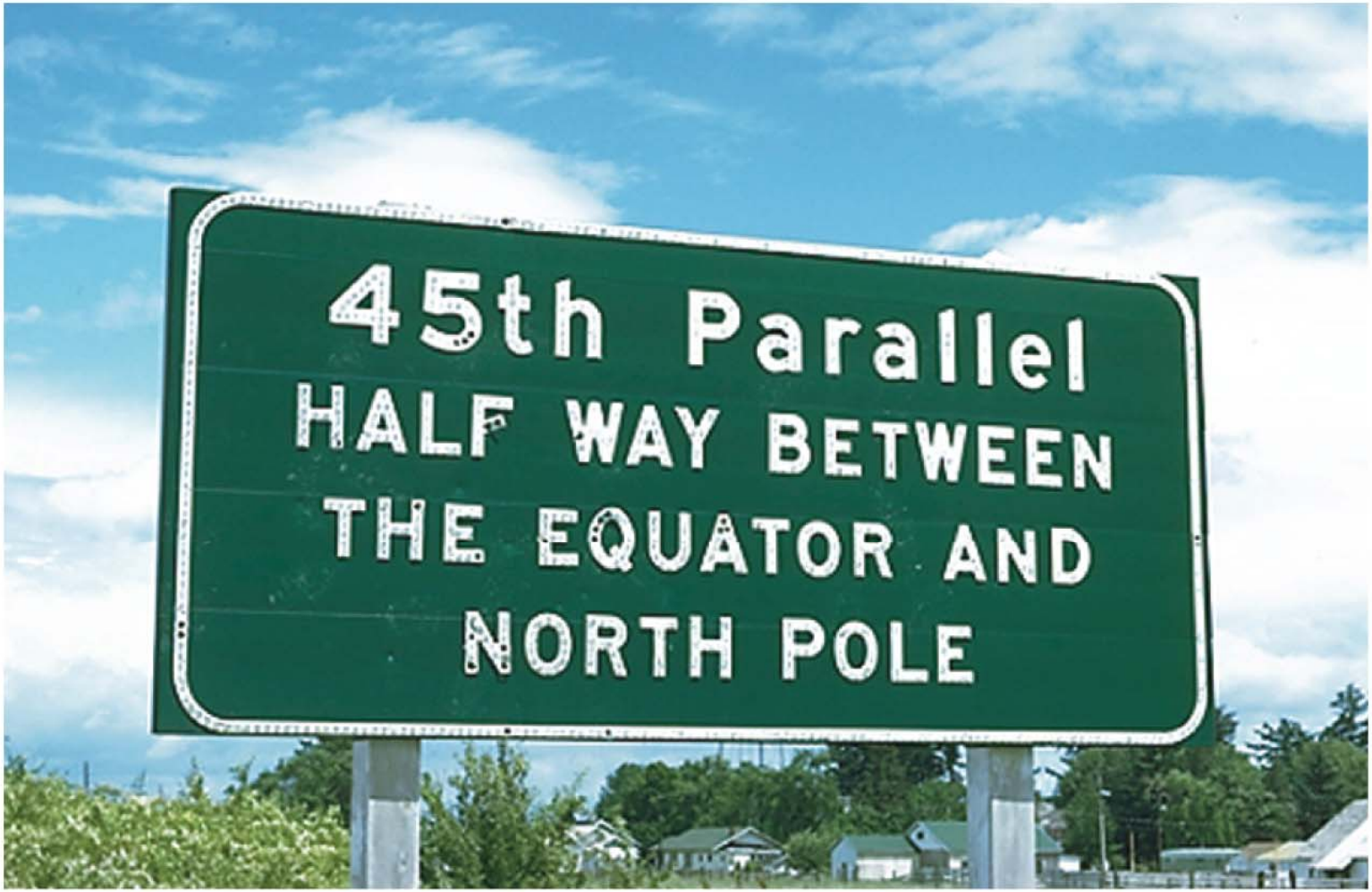
New Orleans, 2005

Cedar Rapids, Iowa, 2008

Movement of People and Materials



Every Place in Unique, Mill Lake RCNP



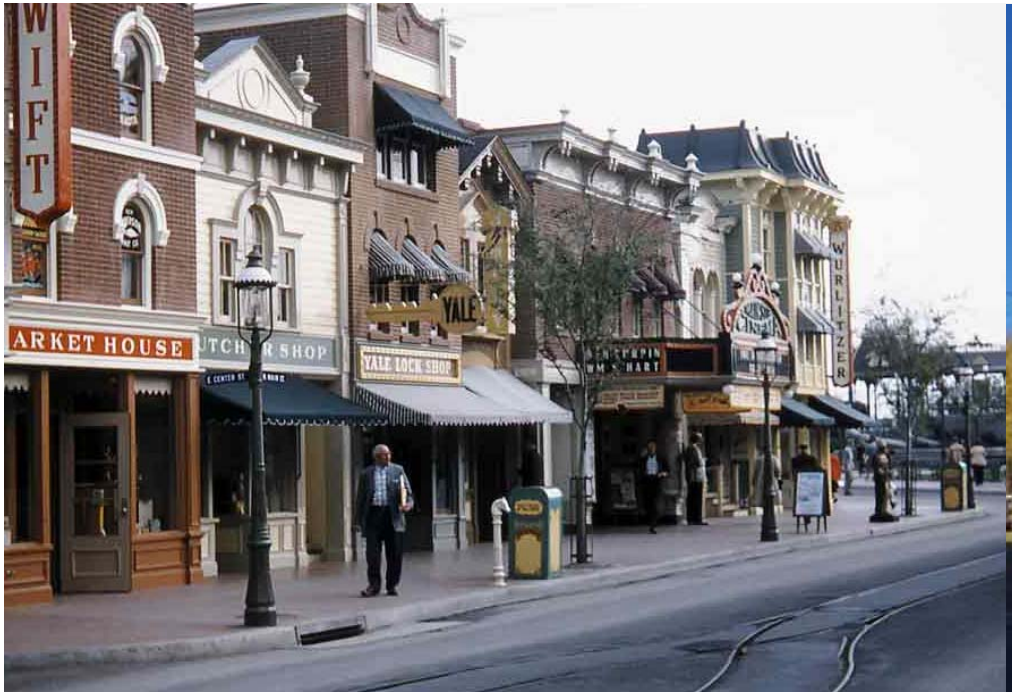
Location

Absolute and relative location on Earth. Location answers the question *Where?*—the specific planetary address of a location. This road sign is posted on the Interstate 5 freeway in Oregon telling drivers their position on Earth.

Main Street Is a Micro-region.

Disneyland

Typical



Cattle from Different Regions

The Earth's Four (4) Spheres:

1. The atmosphere = the collection of gases that surrounds the planet

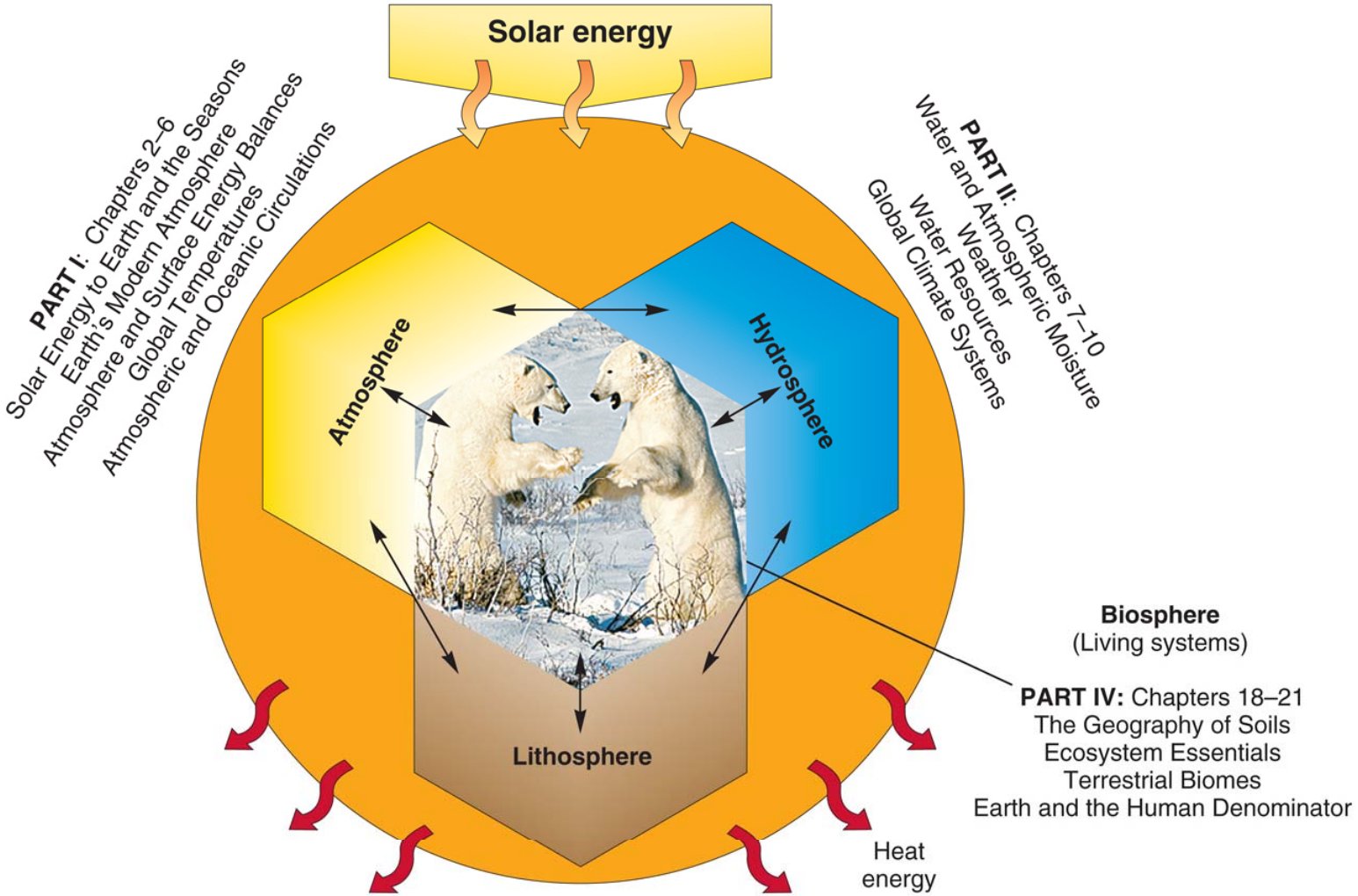
2. The hydrosphere = the water part including oceans, rivers and lakes

3. The lithosphere = the solid part including rocks, minerals, and sediments

4. The biosphere = the living organisms and ecosystems of the planet

These intersect at or near the surface of the earth.

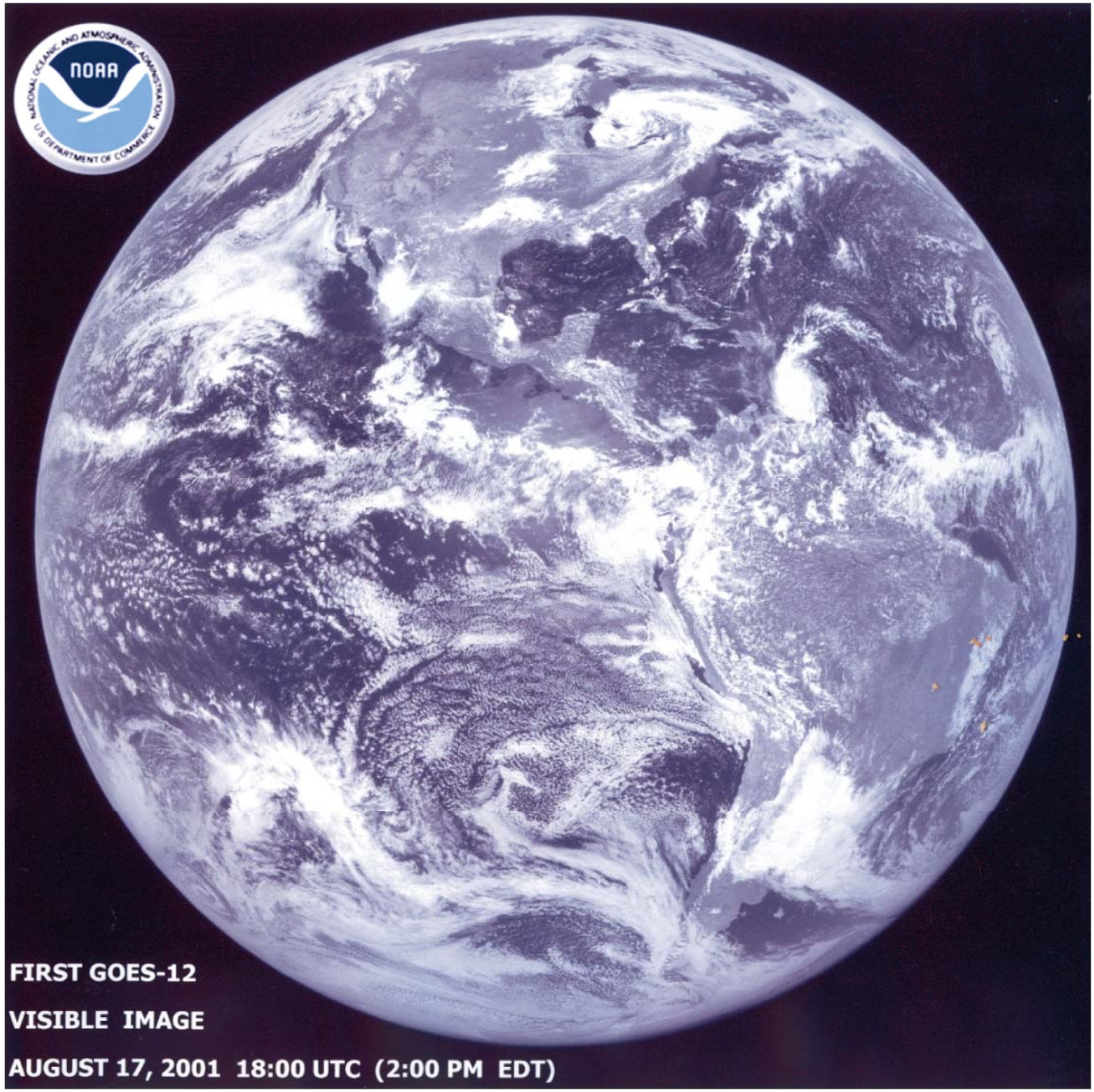
Geosystems: Our "Sphere of Contents"



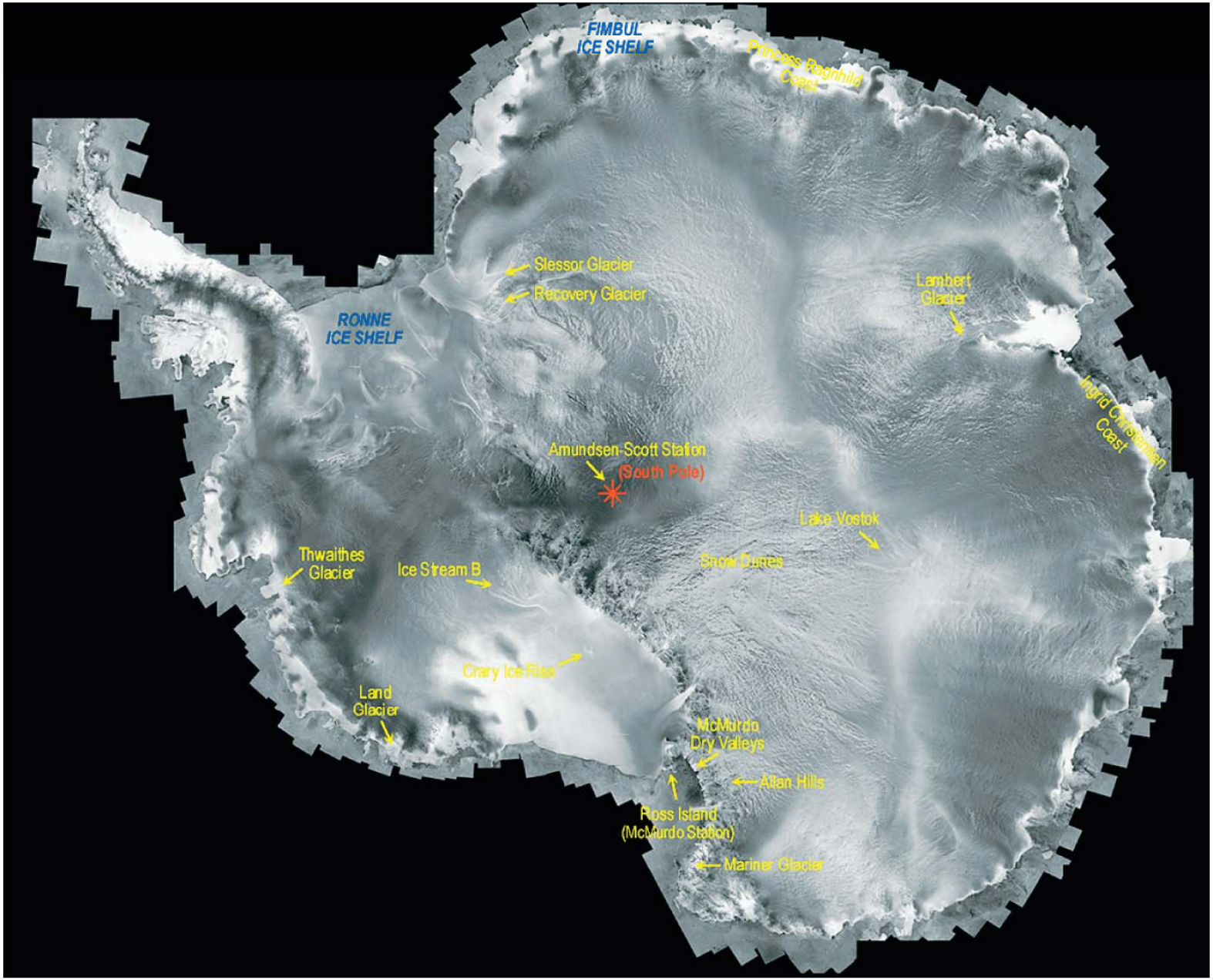
PART III: Chapters 11–17
The Dynamic Planet
Tectonics, Earthquakes, and Volcanism
Weathering, Karst Landscapes, and Mass Movement
River Systems and Landforms
Eolian Processes and Arid Landscapes
The Oceans, Coastal Processes, and Landforms
Glacial and Periglacial Processes and Landforms

Tools for cartography

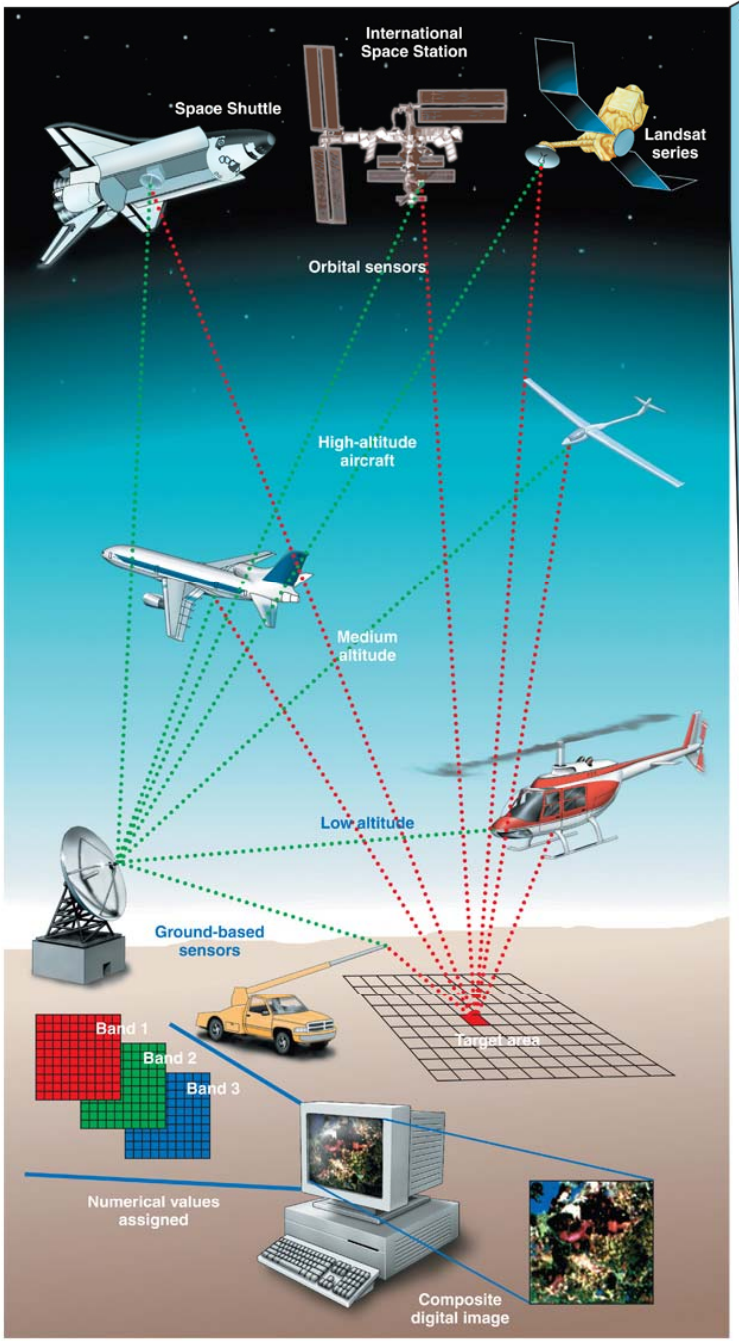
1. Fieldwork and observation
2. Statistical data
3. Remote sensors = satellites and related technology
4. GPS = Global Positioning System
5. GIS = Geographic Information Systems



Radar Image of Antarctica



Types of Remote Sensing Systems



A sample of orbital platforms

Envisat: ESA environment-monitoring satellite; 10 sensors, including a next-generation radar.

ERBS: Earth Radiation Budget Satellite.

GOES: Weather monitoring and forecasting.

JASON: Measures sea level heights.

Landsat: First in 1972 to *Landsat-7* in 1999, millions of images for Earth systems science and global change.

NOAA: First in 1978 through *NOAA-15, -16*, -17, and -18 now operating, global data, short- and long-term weather forecasts.

RADARSAT-1, -2: Synthetic Aperature Radar in near polar orbit operated by Canada Space Agency.

SciSat-1: Analyzes trace gases, thin clouds, atmospheric aerosols with Arctic focus.

SeaStar: Carries the SeaWiFS (Sea-viewing Wide Field-of-View instrument) to observe Earth's oceans and microscopic marine plants.

Terra* and *Aqua: Environmental change, error-free surface images, cloud properties, through five instrument packages.

TOMS-EP: Total Ozone Mapping Spectrometer, monitoring stratospheric ozone, similar instruments on *NIMBUS-7* and *Meteor-3*.

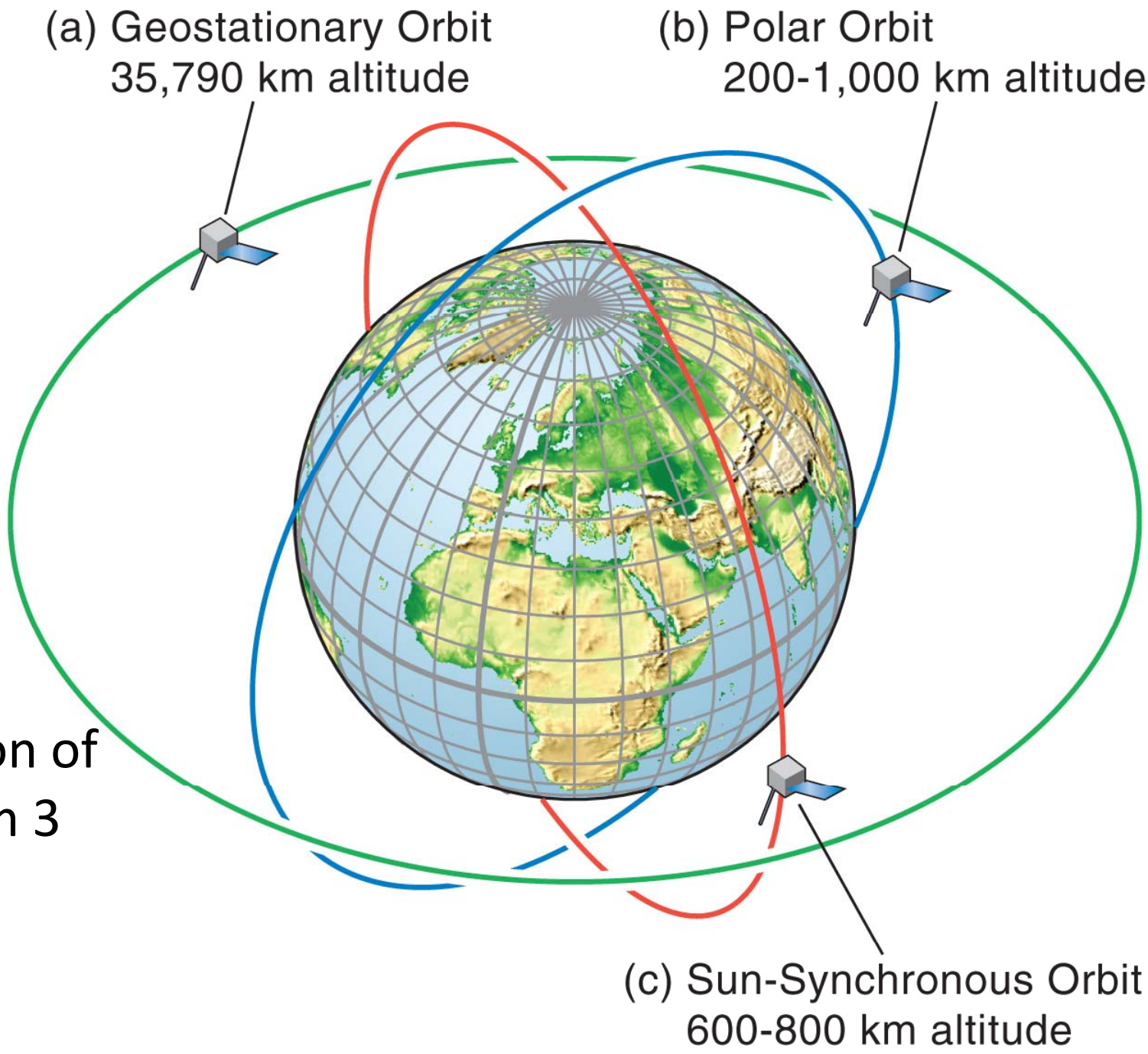
TOPEX/POSEIDON: Measures sea level heights.

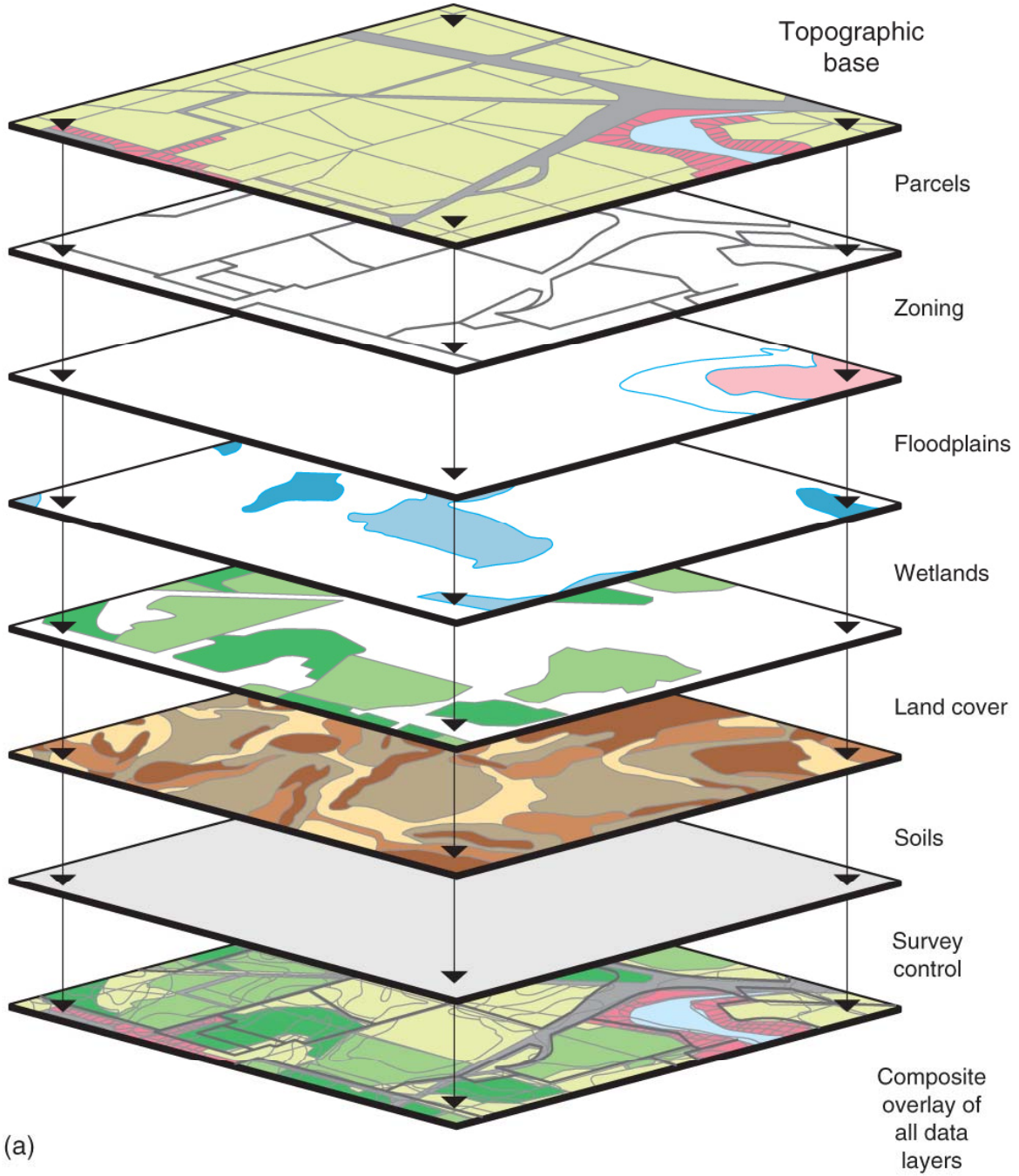
TRMM: Tropical Rainfall Measuring Mission, includes lightning detection, and global energy budget measurements.

UARS: Since 1991 measuring atmospheric chemistry and ozone layer changes.

For more info see:
http://www.nasa.gov/centers/goddard/mission/index.html

Global Positioning Works by triangulation of signals from 3 satellites





Types of Maps

A map is a representation of some aspect of some part of the earth's surface. There are two basic types of maps.

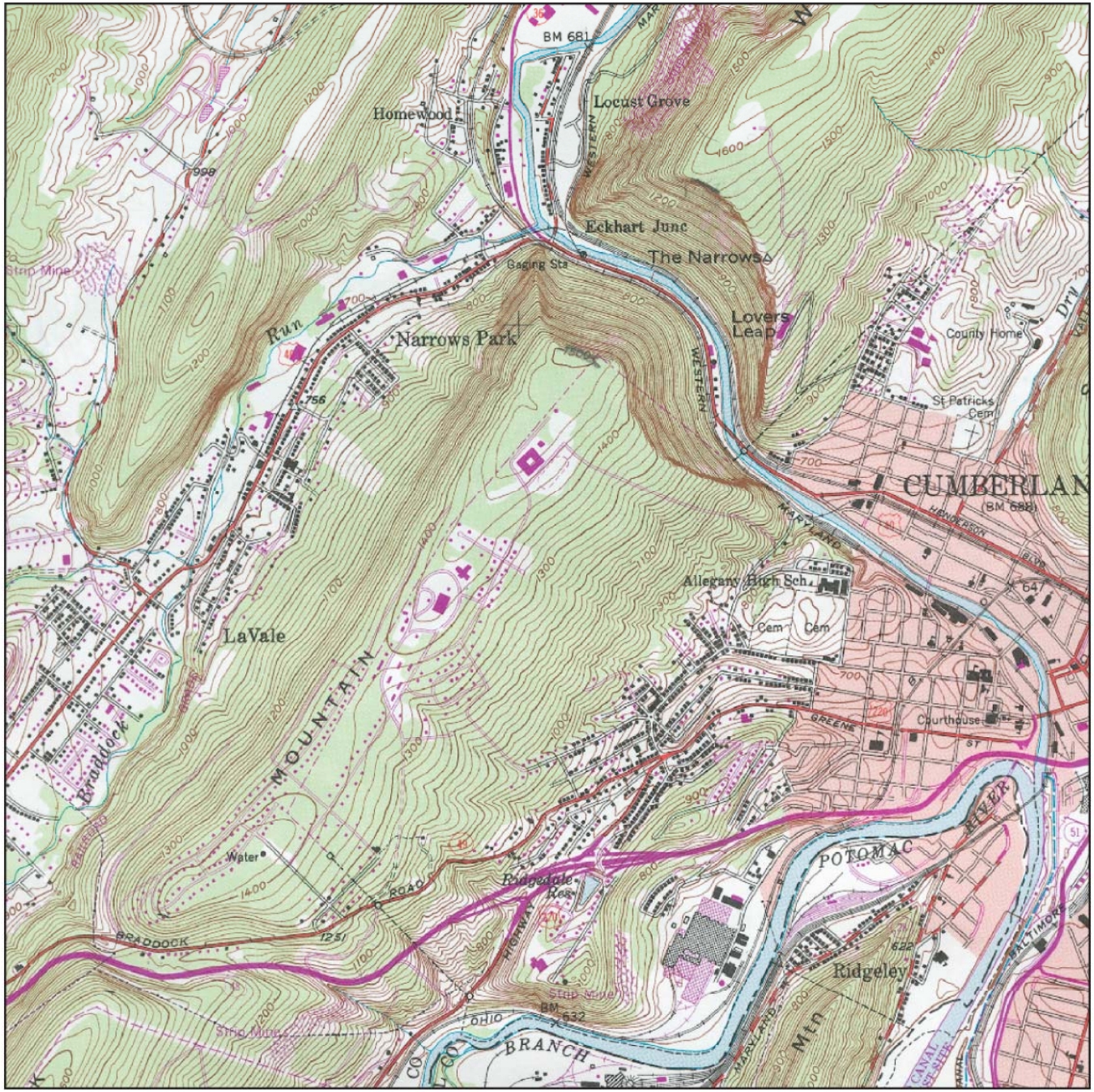
1. General – This type of map has many different types of information on it, and can be used for many different purposes.

For example U.S.G.S. topographic map.

2. Thematic – This is a specialized type of map showing one major theme or idea. For example:

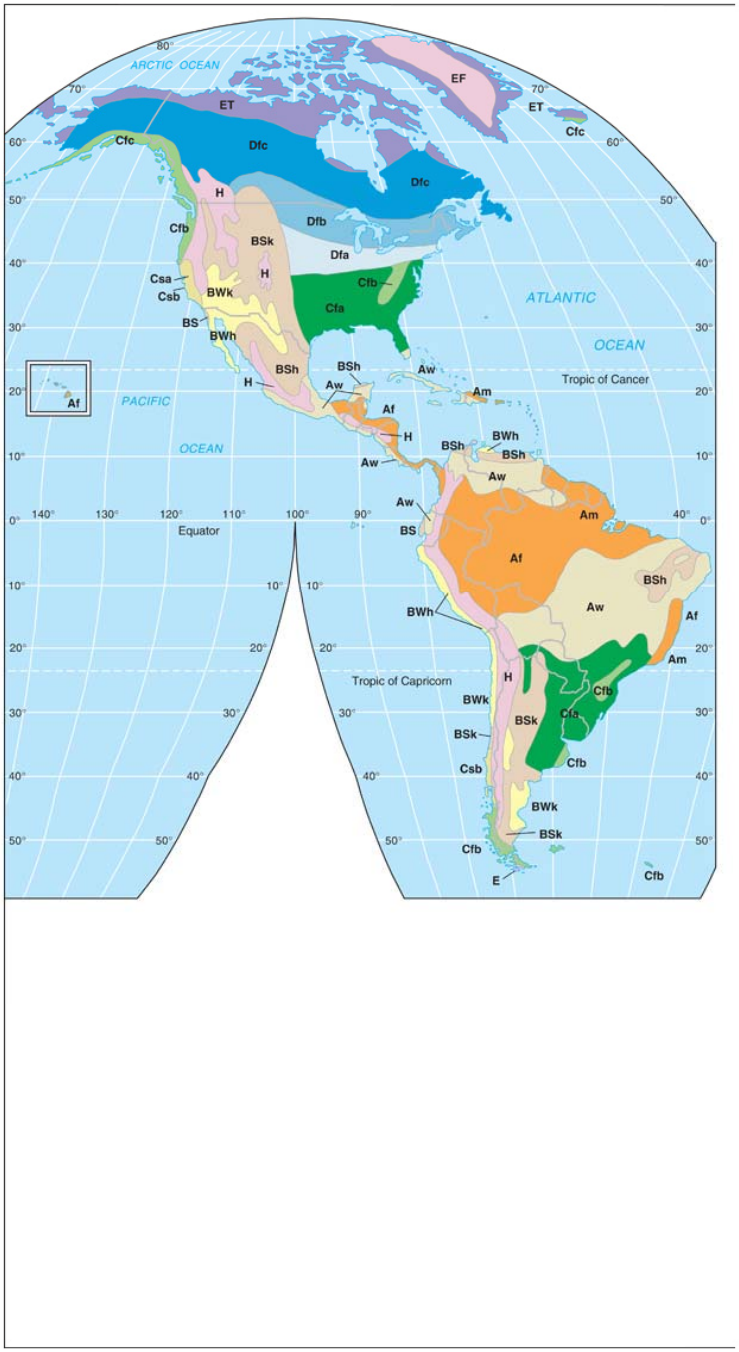
Population Density,
Average Household Income,
Annual Precipitation Total.

U.S.G.S. Topographic Map is a general use map because it contains many different types of information

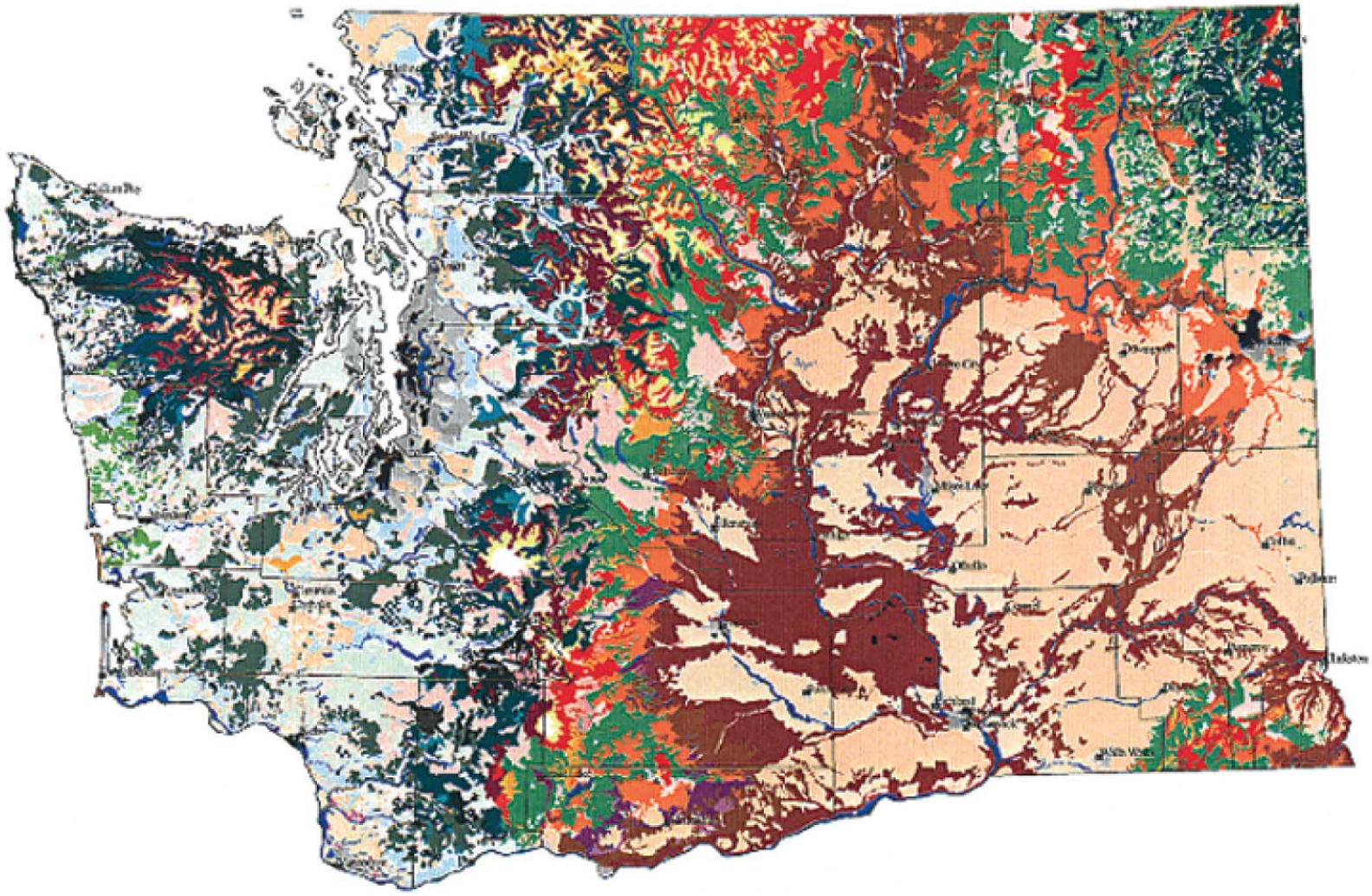


Earth's Climate Regions

This is an example of a thematic map because it displays information about only one topic or theme



Example of a Thematic Map



(b) Land-cover map, Washington state

Map Projections

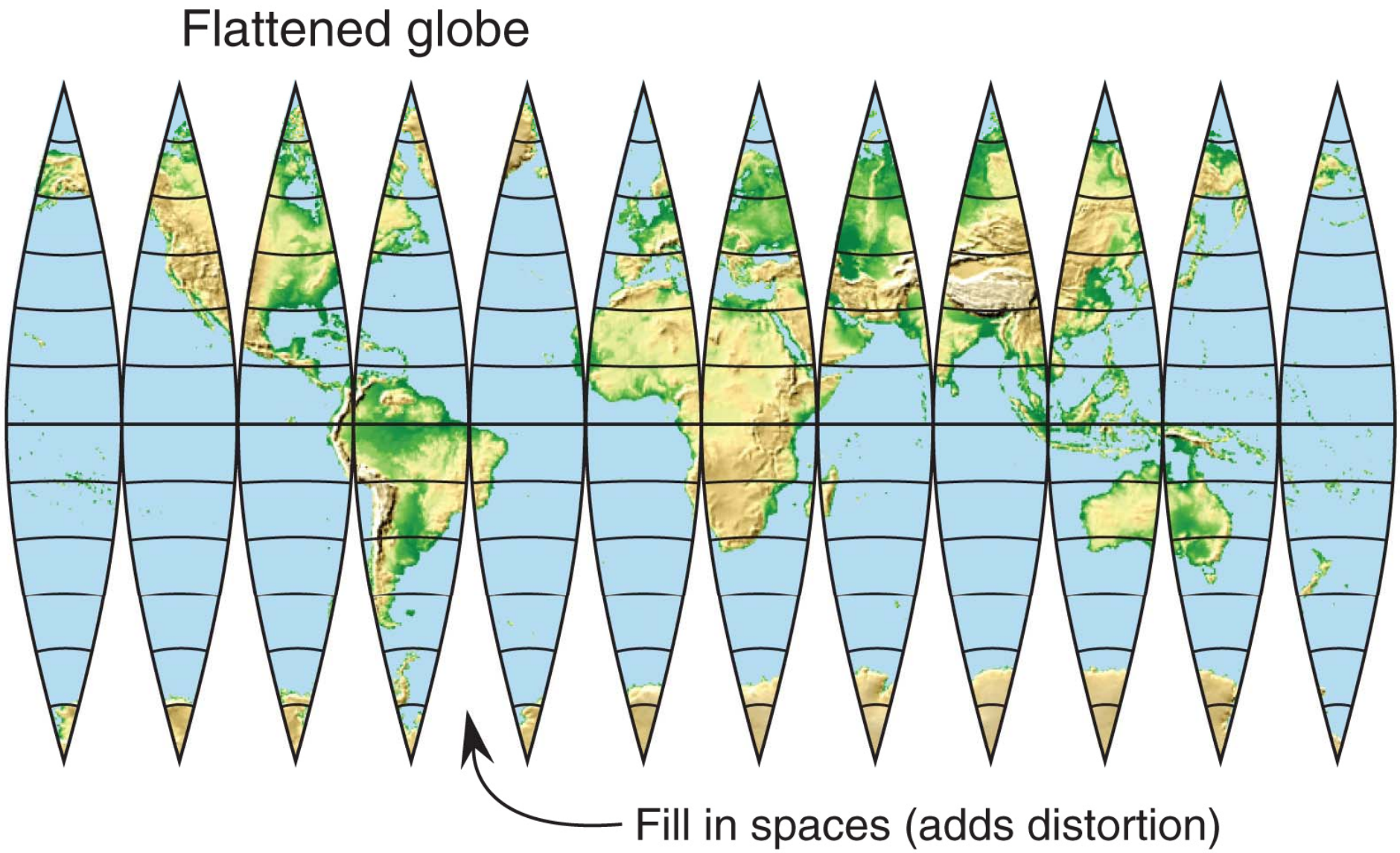
A map projection is the geometric transformation (of a grid such as longitude and latitude) from a globe or a sphere (3 d) to a flat (2 d) map. This means that something has to be distorted from one part of the map to another.

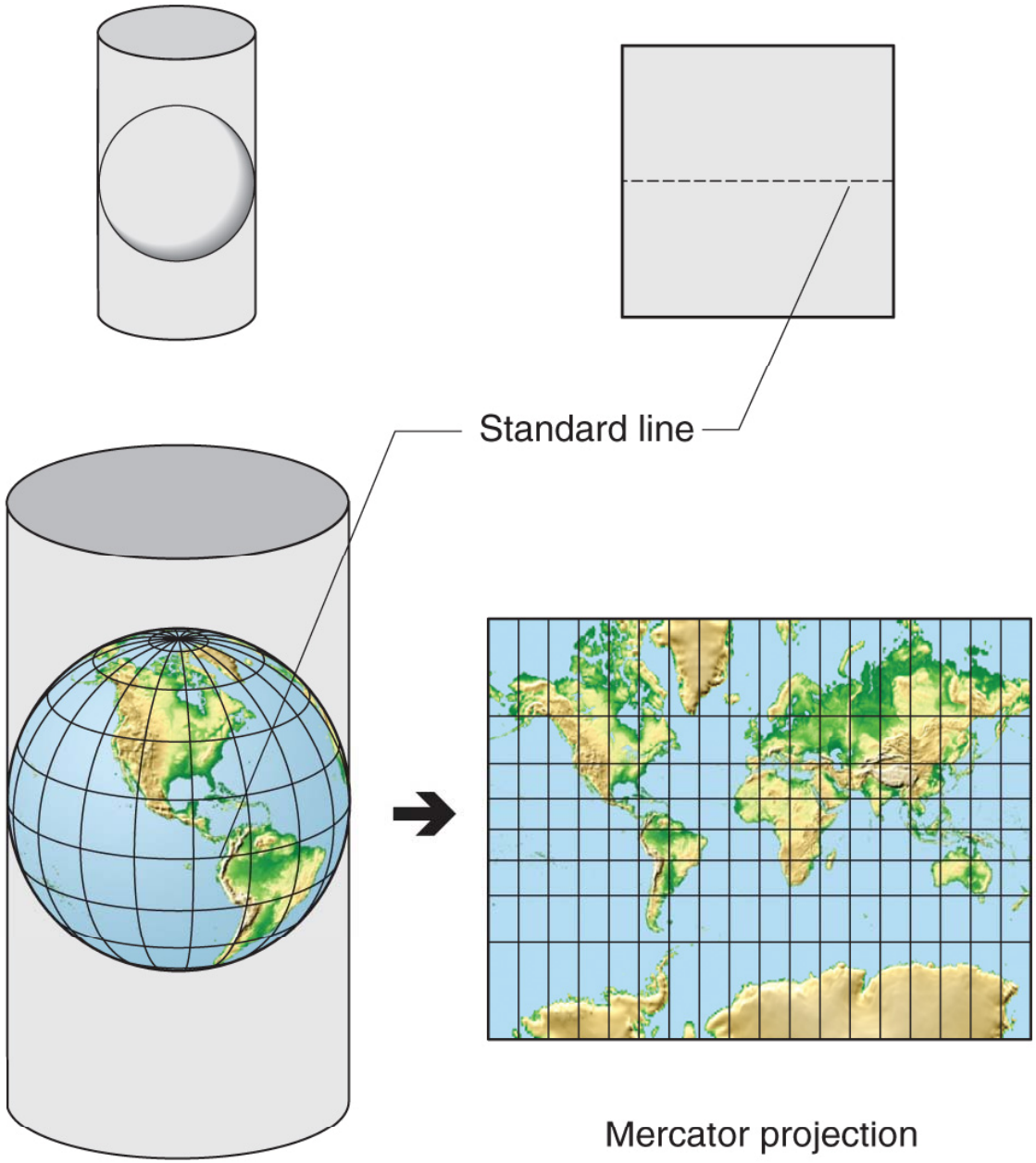
1. Distance
2. Size
3. Shape
4. Direction

There are projections on to 3 basic geometric forms:

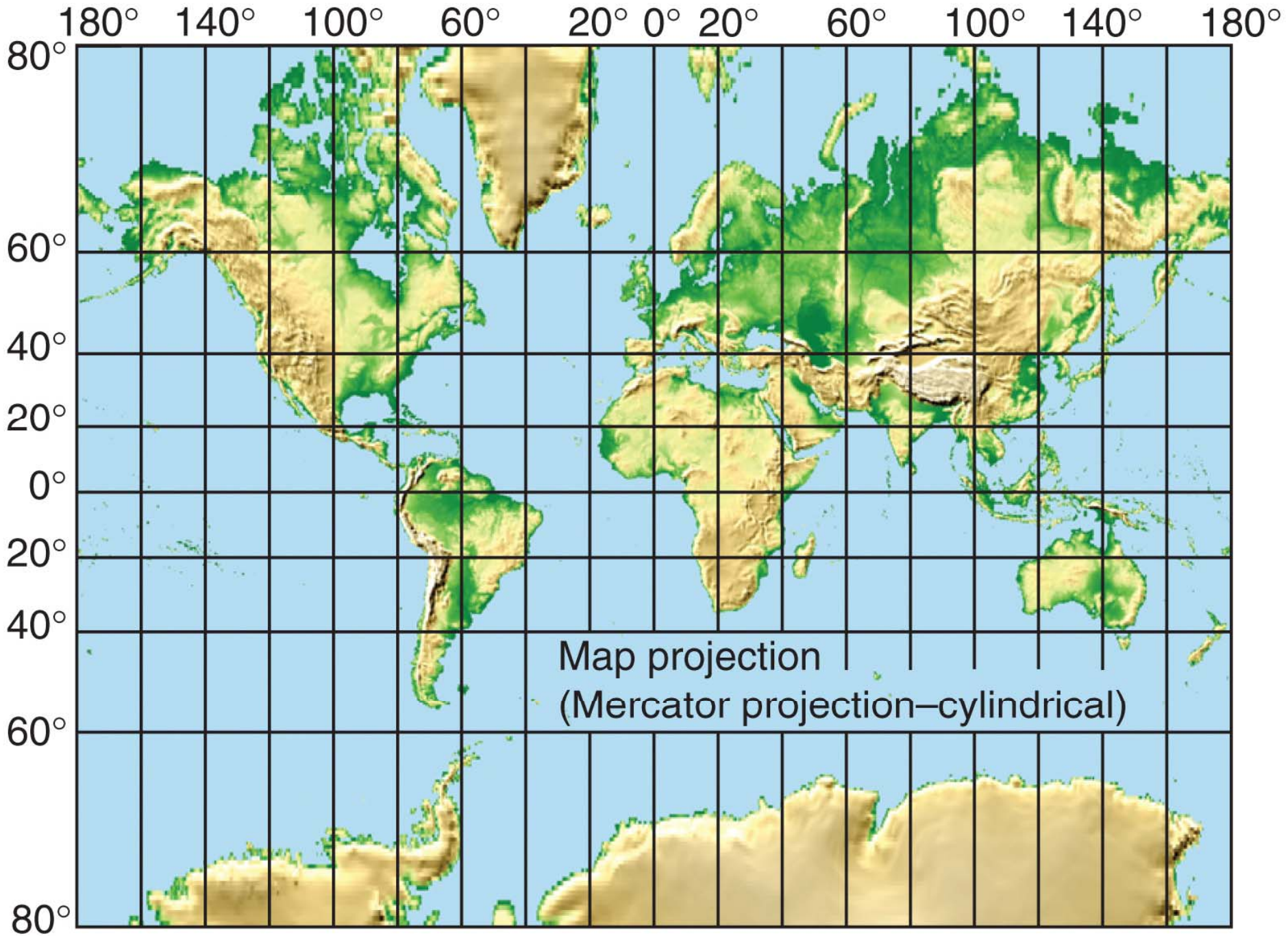
1. Cylinder – cylindrical projection
2. Cone – conic projection
3. Disk – gnomic or azimuthal projection

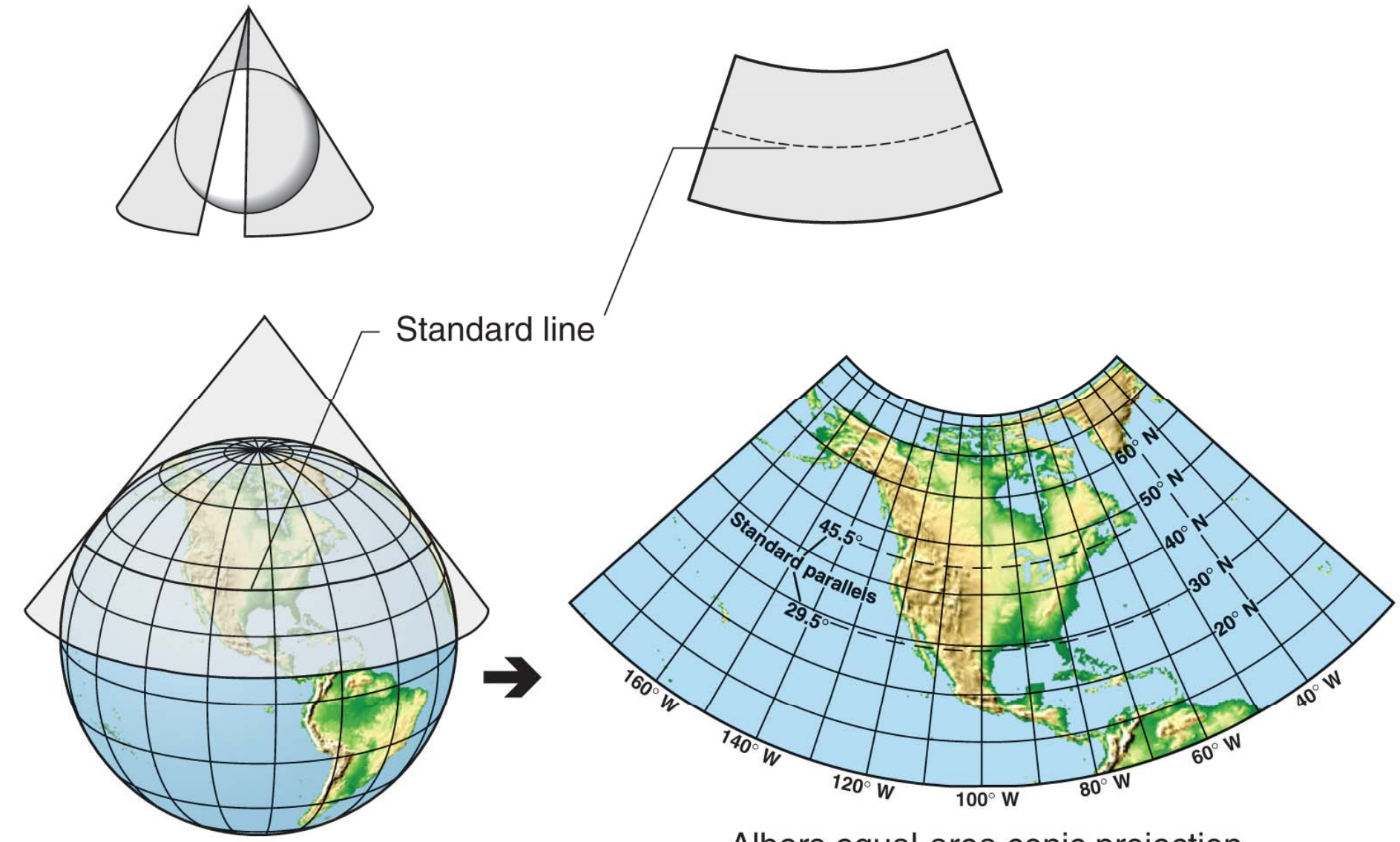
Accurate But Not Usable





(a) **Cylindrical projection**



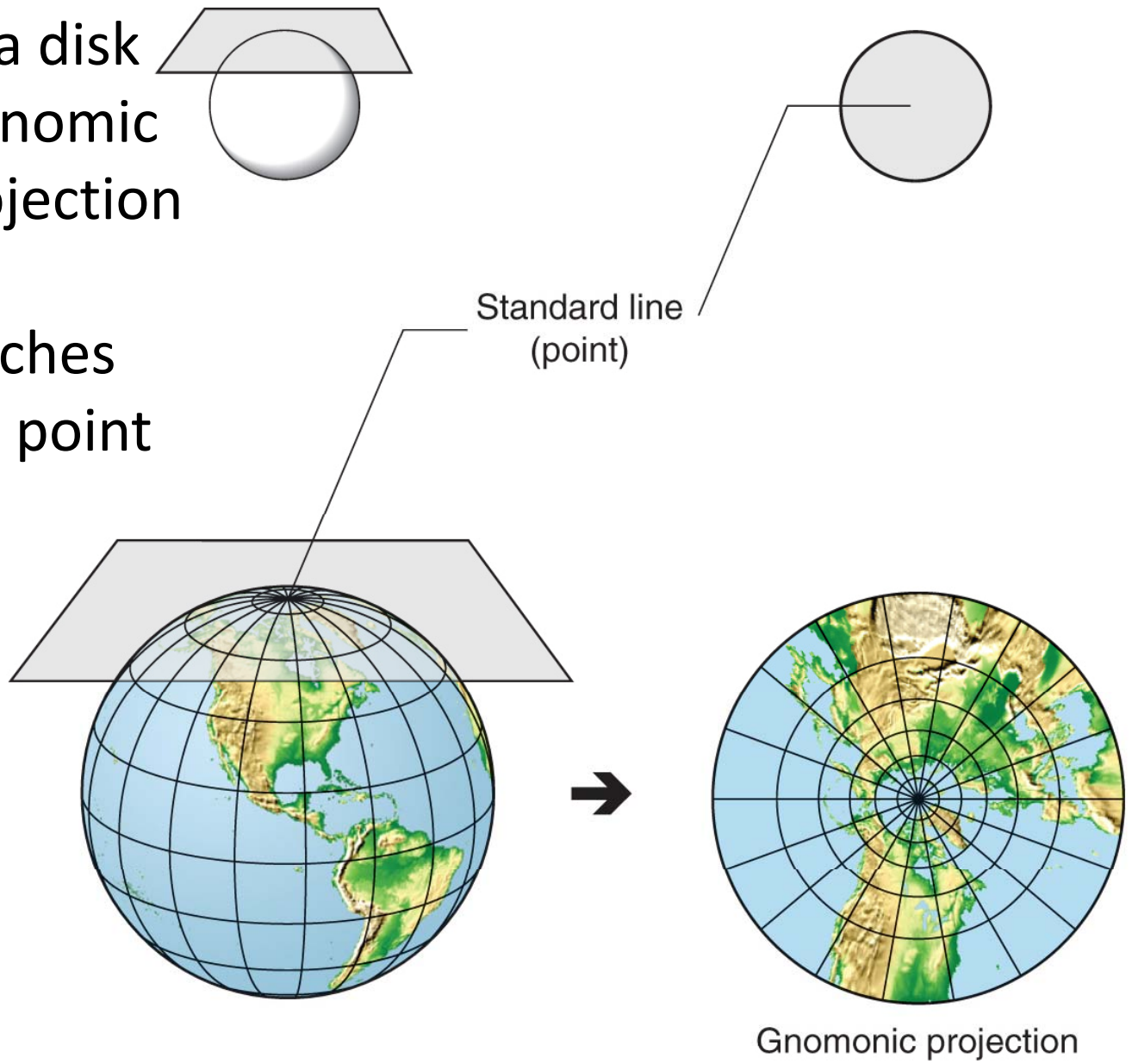


(c) **Conic projection**

Albers equal-area conic projection
(two standard parallels)

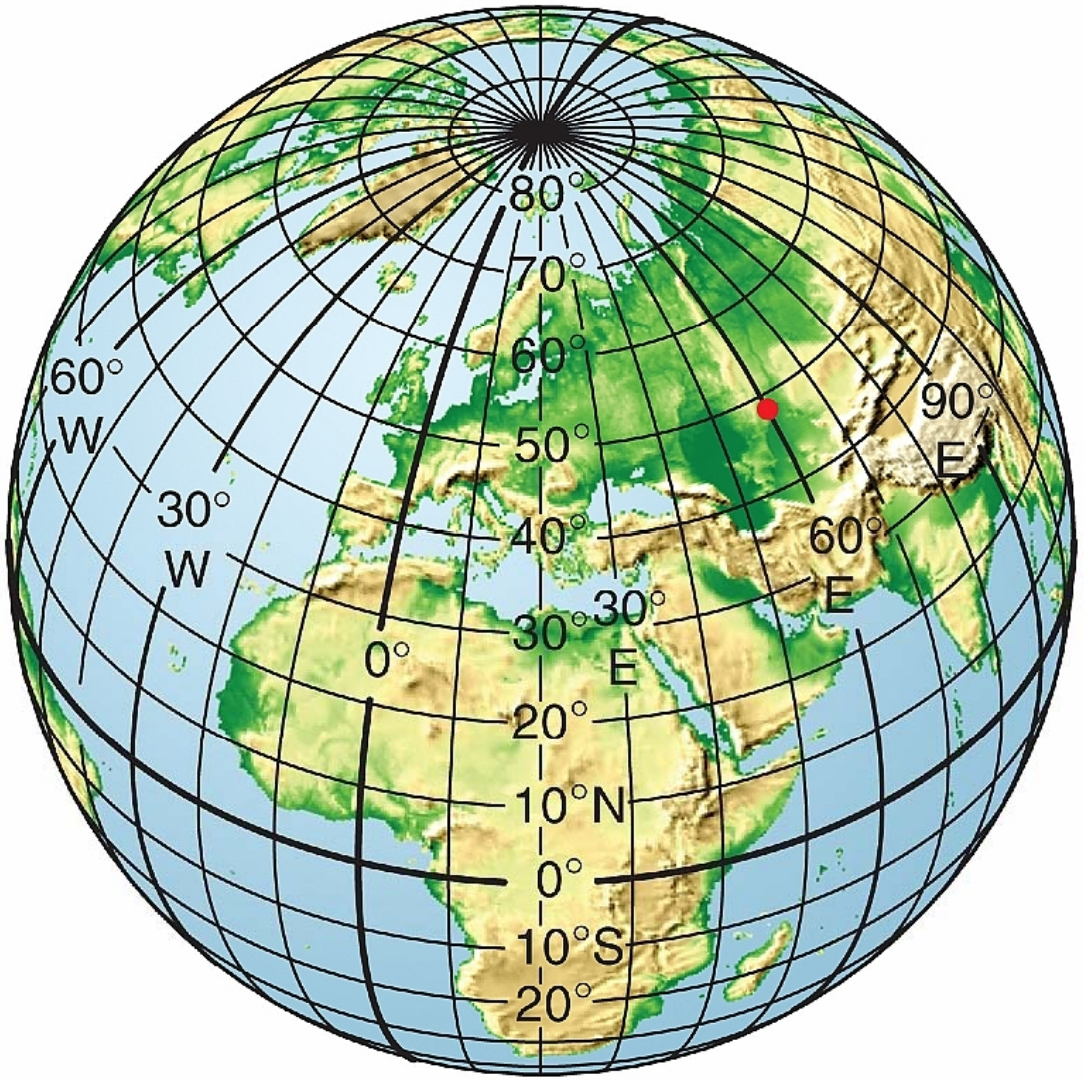
Projection onto a disk or a plane, the gnomic or azimuthal projection

Note, it only touches the globe at one point

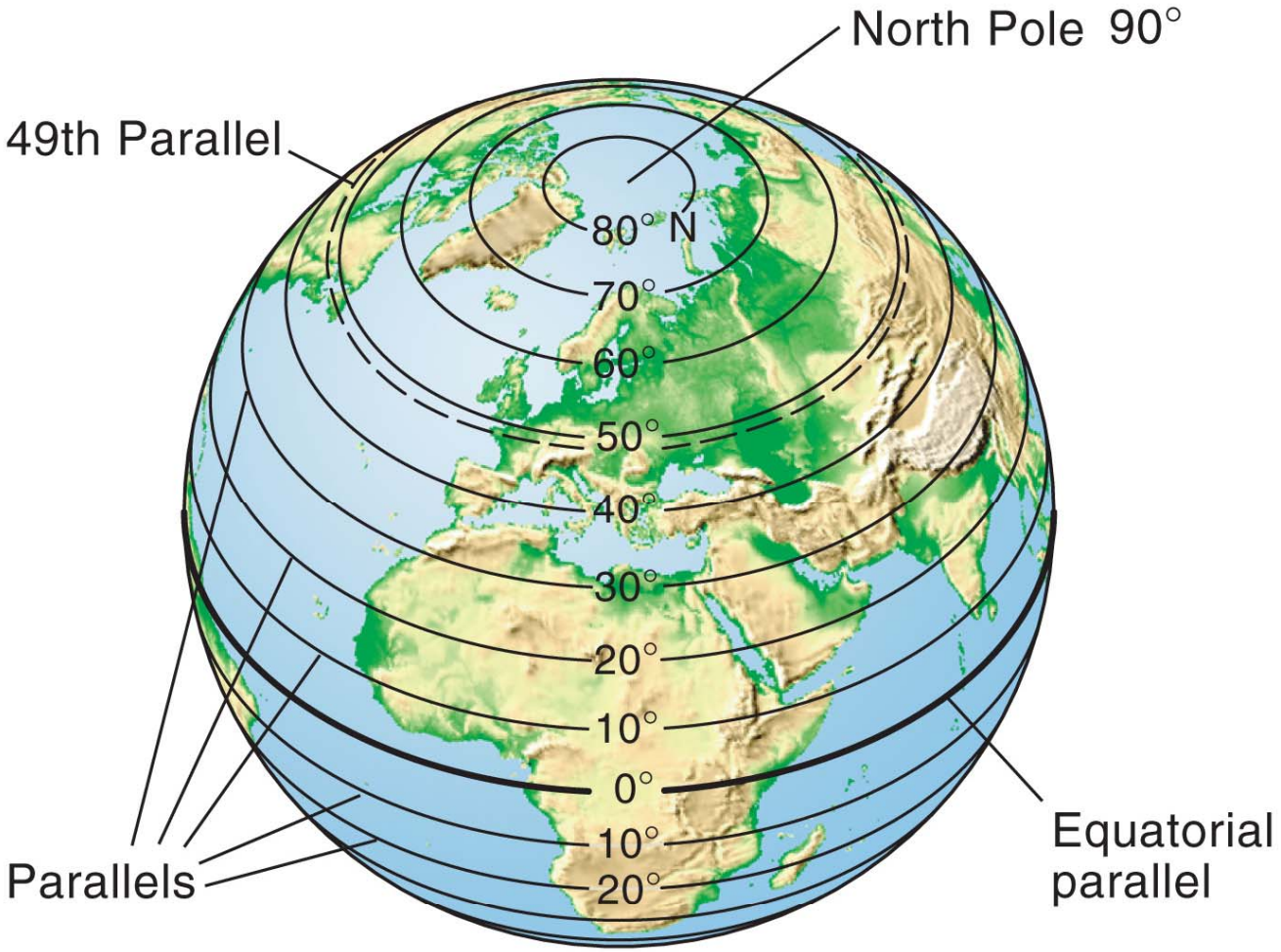


(b) **Planar projection**

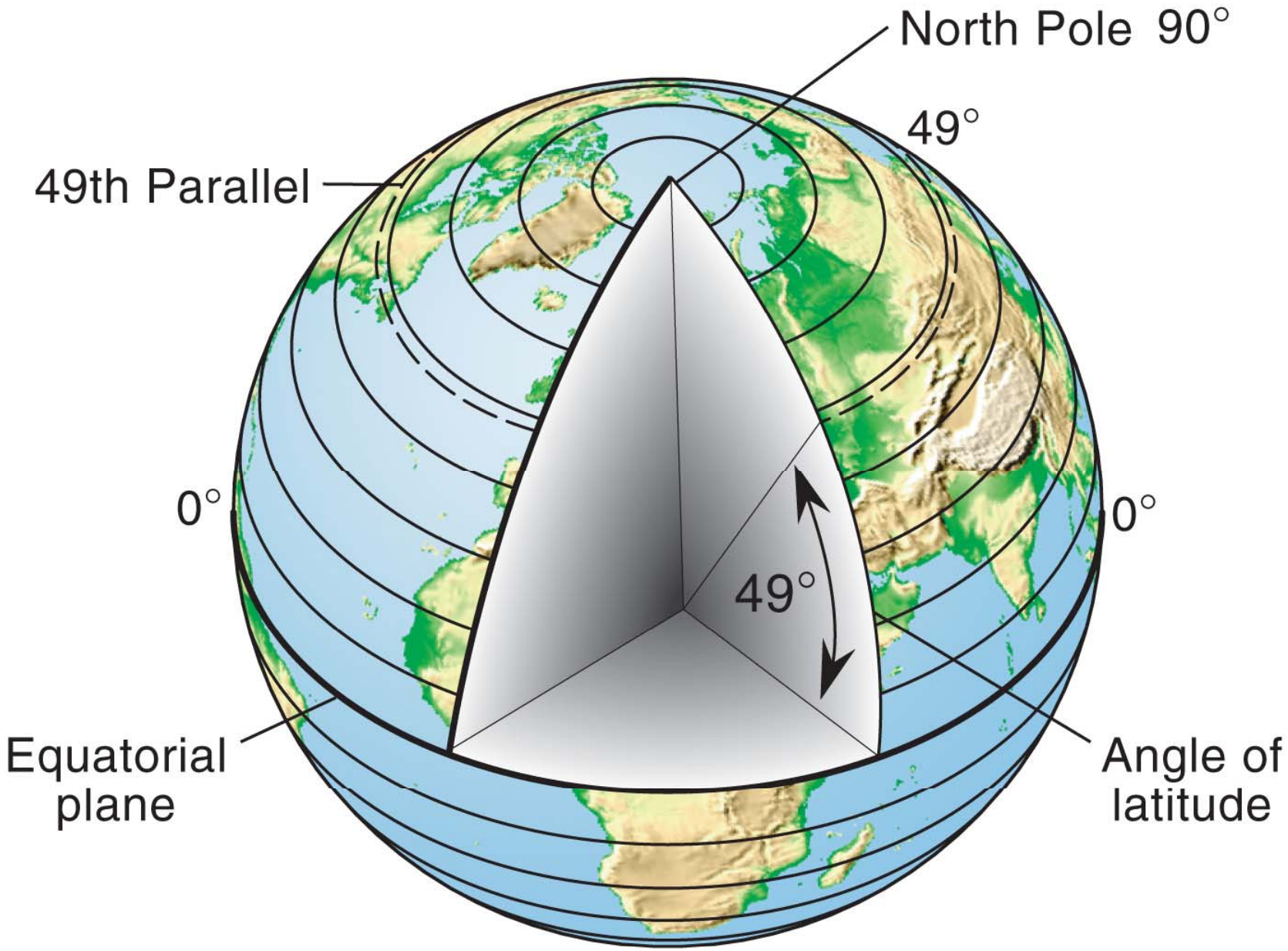
The Grid of Latitude and Longitude Lines Locates Any Point on the Earth



Lines of Latitude Run East-West, But Locate Position Norht-South
Latitude is Measured from the Equator



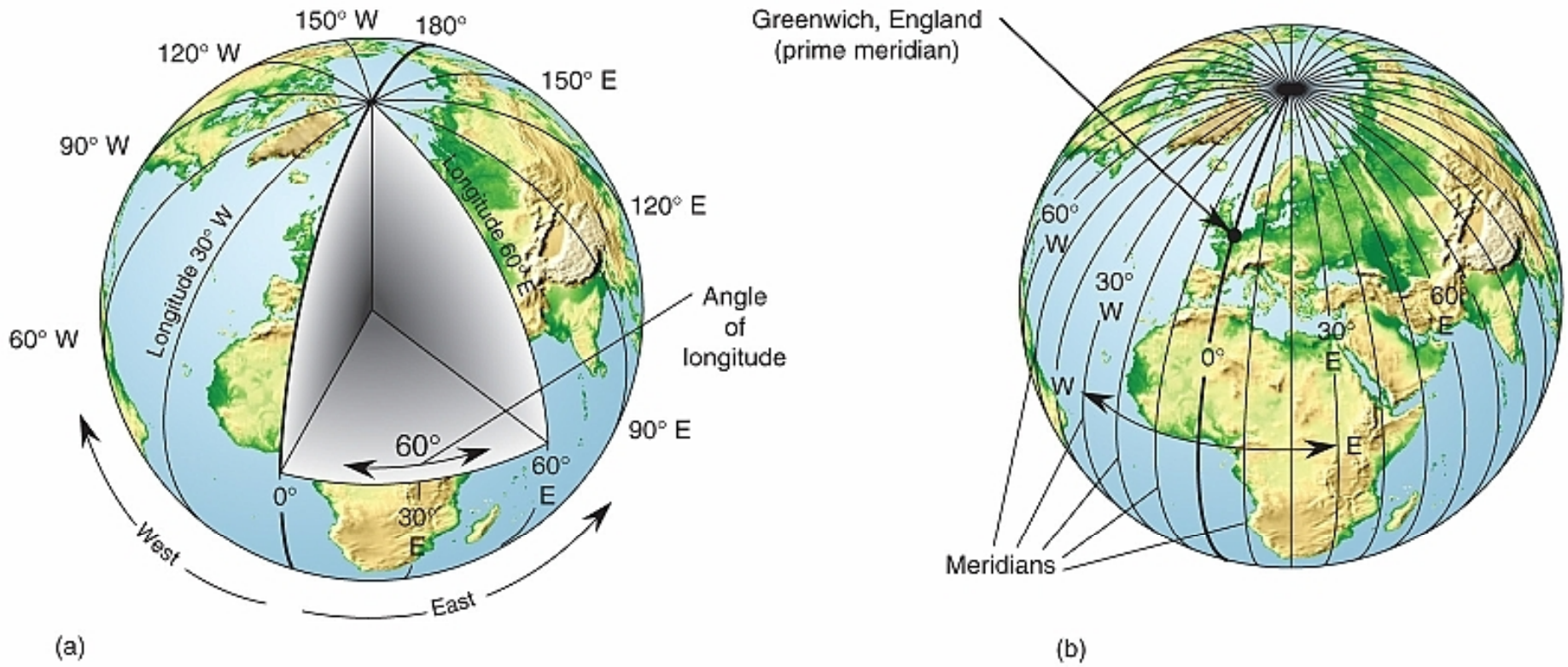
(b)



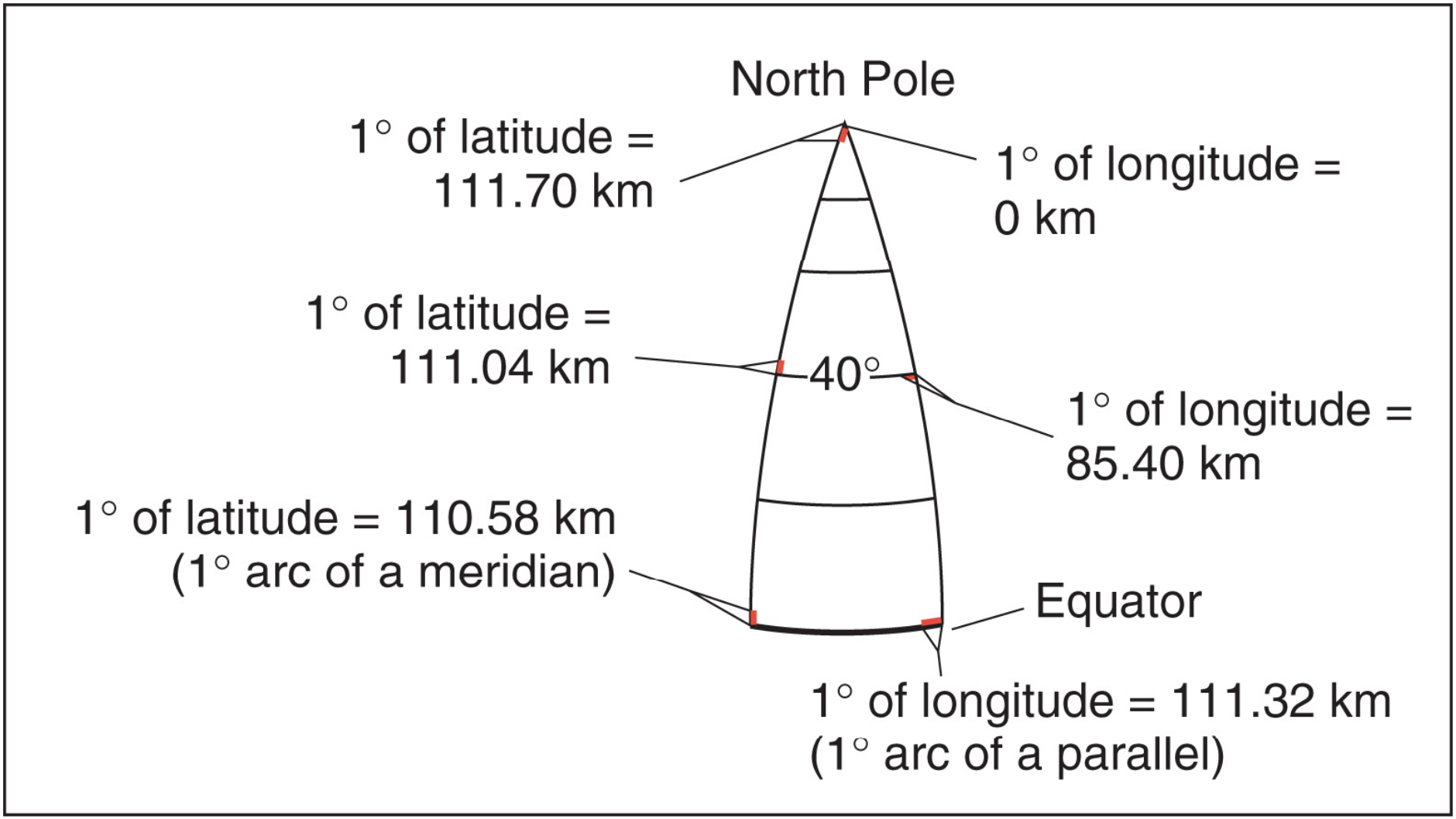
(a)

Lines of Longitude Run North-South, But Locate Position East-West

Longitude is Measured from The Prime Meridian



Meridians Converge So 1° of Longitude Gets Shorter across the Distance from Equator to Pole



Locating Position
Latitude and Longitude

Name	Locates Position	Base	End	Range	Lines
Latitude	N – S	Equator	Poles	0 – 90°	Parallel (Parallels)
Longitude	E- W	Prime M.	Int. Date Line	0 - 180°	Converge at Poles (Meridians

A degree of Latitude or Longitude (at the equator) is about 70 miles.

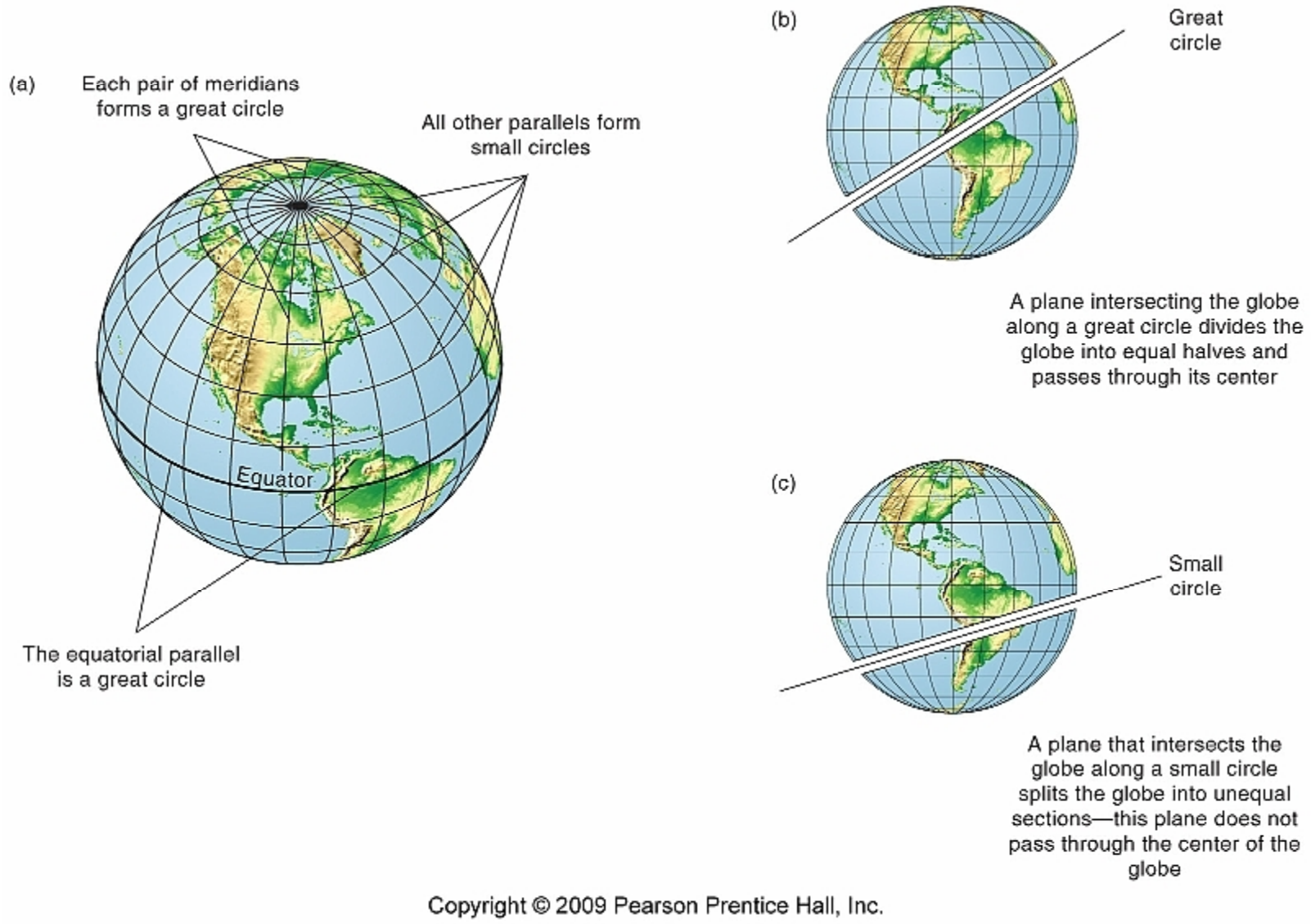
Each degree is subdivided into 60 minutes. So each minute represents 1.1 statute (land) miles or 1 nautical mile.

Each minute is subdivided into 60 seconds. So each second represents 101 feet.

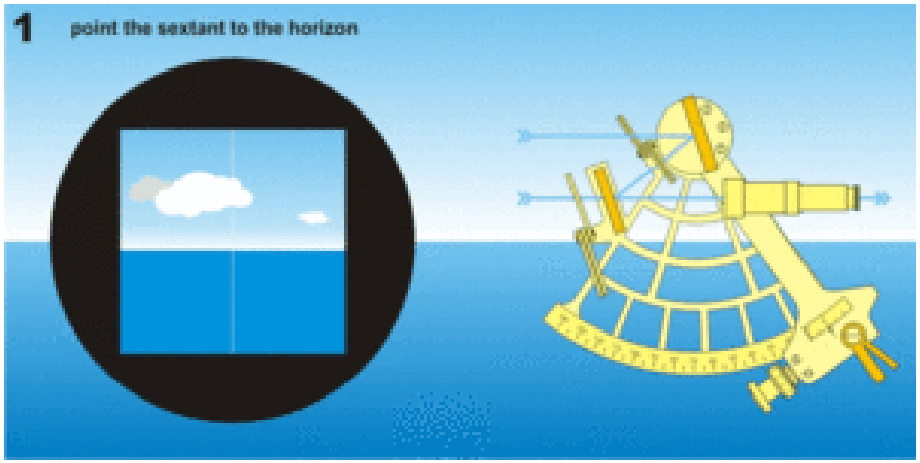
The Denton County Courthouse is 33° 12' 31" N. Lat. 97° 7' 32" W. Long.

These simple coordinates locate the courthouse to within 100 feet of its actual location. Note that this is about the size of the building itself.

Great Circles Divide the Earth into Two Equal Halves and Define the Shortest Route Between Any Two Points



The Sextant Measures Latitude



The Marine Chronometer Was the First Clock Accurate Enough to Determine Longitude