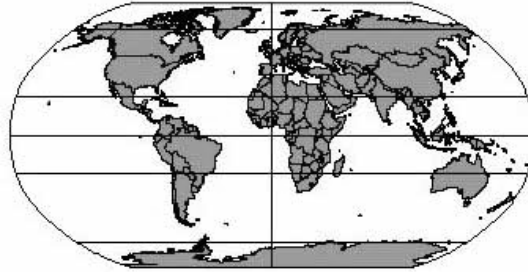
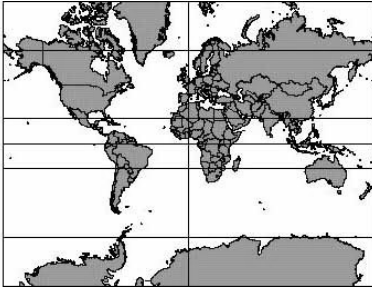


10. MAP PROJECTIONS

1. Name examples of well-known map projections. What is characteristic for these examples?

2. What do the following pictures represent? What are the main differences between them?



3. Read the text on the two map projections and answer the questions:

- What was the original purpose of the Mercator maps?
- What is the rhumb line?
- Where is the greatest distortion in the Mercator map?
- Why did the professional geographic organizations ban rectangular coordinate maps?

Gerardus Mercator invented his famous projection in 1569 as an aid to navigators. On his map, lines of latitude and longitude intersect at right angles and thus the direction of travel - the rhumb line - is consistent. The distortion of the Mercator Map increases as you move north and south from the equator. On Mercator's map Antarctica appears to be a huge continent that wraps around the earth and Greenland appears to be just as large as South America although Greenland is merely one-eighth the size of South America. Mercator never intended his map to be used for purposes other than navigation although it became one of the most popular world map projections.

During the 20th century, the National Geographic Society, various atlases, and classroom wall cartographers switched to the rounded Robinson Projection. The Robinson Projection is a projection that purposely makes various aspects of the map slightly distorted to produce an attractive world map. Indeed, in 1989, seven North American professional geographic organizations (including the American Cartographic Association, National Council for Geographic Education, Association of American Geographers, and the National Geographic Society) adopted a resolution that called for a ban on all rectangular coordinate maps due to their distortion of the planet.

<http://geography.about.com/library/weekly/aa031599.htm>

Metric properties of maps - match the properties and their definitions

Many properties can be measured on the Earth's surface independently of its geography. Some of these properties are:

area shape direction bearing distance scale

- the information contained in the relative position of one point with respect to another without distance information
- the angle between a line connecting two points and a north-south line
- a numerical description of how far apart objects are
- the ratio of a distance on the map to the corresponding distance on the ground
- the form of an object or its external boundary
- a quantity expressing the two-dimensional size of a defined part of a surface

Map Projections: A video Lecture

<https://www.youtube.com/watch?v=v5fSBQRbPR0> 0 - 5.15

1. Check the meaning and pronunciation of these words:

oblique cylinder cone plane tangent secant

2. Complete the definition and key points.

A map projection is a method of the Earth's surface as a flat surface.

1. Projections are transformations.
2. Scale is in only certain places.
3. Many different have been devised.
4. All map projections
5. Distortion characteristics from projection type to type.
6. Some types are better for some applications than
7. A few types are used.

3. Supply the terms for types based on projection surfaces.

-
-
-

4. What are standard lines? Where are they?

5. What spatial properties are distorted on maps?

-
-
-
-

6. Where is the smallest and greatest distortion in the following examples?

<i>Projection</i>	<i>preserves</i>	<i>distorts</i>
Conformal		
Equal area		
Equidistant		
Azimuthal		

Discuss in small groups

- Which process is concerned with measuring shapes and dimensions of the Earth's surface?
- Which mathematical geo-science focuses on this type of processes?
- What do you need to measure to produce a map of an area, e.g. a park near your school?
- What devices do you need for your measurements?

Should I be a geodesist? Complete the missing personal characteristics:

You should have a bachelor's degree or higher and share these traits:

- Player: You're able to listen, communicate, and work with tons of different people.
- Oriented: You pay close attention to all the little details.
- Thinker: You take a step-by-step approach to analyze information and solve problems.

Choosing a model for the shape of the Earth

- What models for representing the shape of the Earth are used?
 - There are some missing parts of sentences in the text, try to fill them in.
1. This model is not used for mapping due to its complexity but is instead used for control purposes in the construction of geodetic datums.
 2. at the expense of some accuracy in smaller regions.
 3. Historically, datums have been based on ellipsoids that best represent the geoid within the region the datum is intended to map.
 4. However, the Earth is not exactly spherical but is closer in shape to an oblate ellipsoid,

Projection construction is also affected by how the shape of the Earth is approximated. In the following discussion on projection categories, a sphere is assumed. A)..... a shape which bulges around the equator. Selecting a model for a shape of the Earth involves choosing between the advantages and disadvantages of a sphere versus an ellipsoid. Spherical models are useful for small-scale maps such as world atlases and globes, since the error at that scale is not usually noticeable or important enough to justify using the more complicated ellipsoid. The ellipsoidal model is commonly used to construct topographic maps and for other large and medium scale maps that need to accurately depict the land surface.

A third model of the shape of the Earth is called a geoid, which is a complex and more or less accurate representation of the global mean sea level surface that is obtained through a combination of terrestrial and satellite gravity measurements. B) (In geodesy, plural of "datum" is "datums" rather than "data".) A geoid is used to construct a datum by adding irregularities to the ellipsoid in order to better match the Earth's actual shape (it takes into account the large scale features in the Earth's gravity field associated with mantle convection patterns, as well as the gravity signatures of very large geomorphic features such as mountain ranges, plateaus and plains). C)..... Each ellipsoid has a distinct major and minor axis. Different controls (modifications) are added to the ellipsoid in order to construct the datum, which is specialized for a specific geographic regions (such as the North American Datum). A few modern datums, such as WGS84 (the one used in the Global Positioning System GPS), are optimized to represent the entire earth as well as possible with a single ellipsoid, D).....

- Explain the term geodetic datums.
- What is a geoid?
- What does the abbreviation WGS84 mean?
- What are mantle convection patterns?

WORD STUDY

Supply the missing forms. (if there exists)

noun	adjective	adverb
sphere		
	global	
		geographically
equator		
	cylindrical	
mathematics		
geomorphology		
		topographically
	gravitational	
complexity		

HOMEWORK Read about scale and fill in the missing expressions.

equivalent cylindrical equidistant globe radiating conformal constant longitude

A 1..... is the only way to represent the earth with constant scale throughout the entire map in all directions. A map cannot achieve that property for any area, no matter how small. It can, however, achieve 2..... scale along specific lines.

Some possible properties are:

- The scale depends on location, but not on direction. This is 3..... to preservation of angles, the defining characteristic of a 4..... map.
- Scale is constant along any parallel in the direction of the parallel. This applies for any 5..... or pseudocylindrical projection in normal aspect.
- Combination of the above: the scale depends on latitude only, not on 6..... or direction. This applies for the Mercator projection in normal aspect.
- Scale is constant along all straight lines 7..... from a particular geographic location. This is the defining characteristic of an 8..... projection such as the Azimuthal equidistant projection. There are also projections (Maurer, Close) where true distances from *two* points are preserved.

Sources

<http://geography.about.com/>

<http://en.wikipedia.org/>

Reading activities prepared by E. Čoupková