Developable Surfaces in Map Projections - A Pandemic

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Map projections are mathematical procedures that enable the mapping of the earth's or other celestial bodies' curved surface to a plane.

The theory of map projections is often referred to as the mathematic cartography.

The goal of studying map projections is the creation of mathematical basis for making maps and solving theoretic and practical problems in cartography, geodesy, geography, astronomy, navigation and other related sciences.

http://ica-proj.kartografija.hr/home.en.html

Pandemic in Map Projections

Questions:

1. Do we really need a way to visualize a projection system, *although it may not correspond to the actual mathematical projection method*?

2. Why the definition on cylindrical (or conical or azimuthal) projection should be done by using the term of conceptual projection, i.e. projecting the Earth onto a tangent or secant cylinder, which is then cut lengthwise and laid flat, although we are aware that *this is generally not correct*?

3. What is a secant cone, cylinder, or plane used for in map projections?

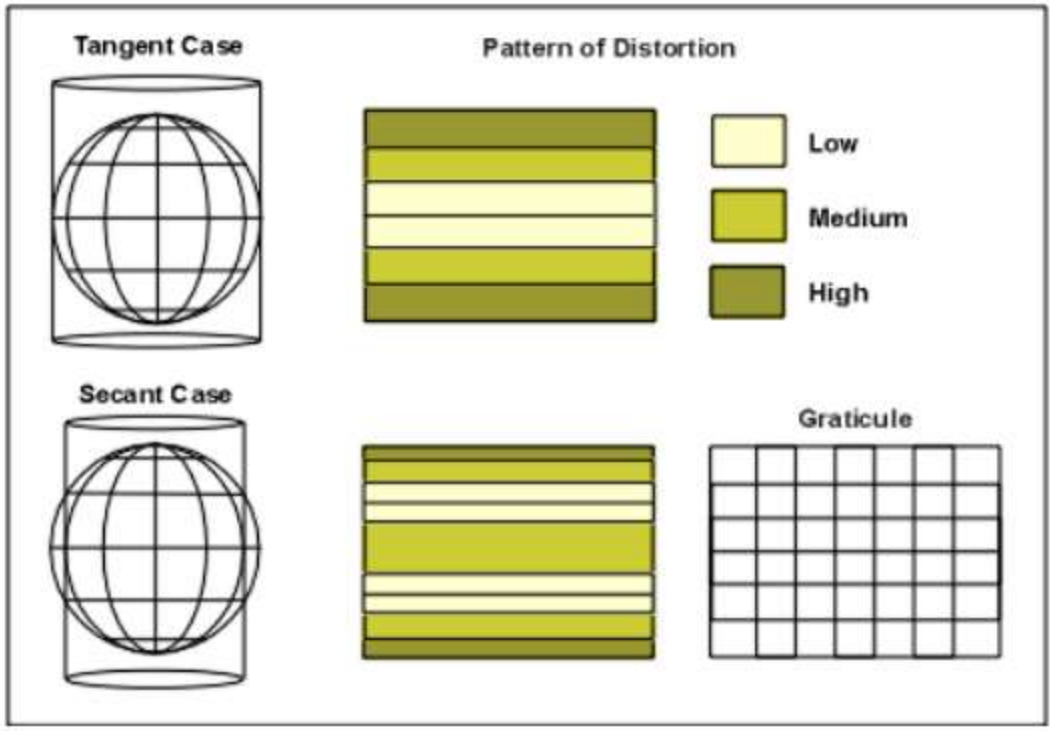
In my opinion:

1. In the field of map projections, *we do not need* anything that not corresponds to the actual mathematical projection methods.

2. *We do not need* definitions that are conceptual and that not correspond to the reality, or that are not correct.

3. Generally speaking, secant cone, cylinder, and plane *should not be used* in map projections, because they usually give a wrong impression of what is really happening.

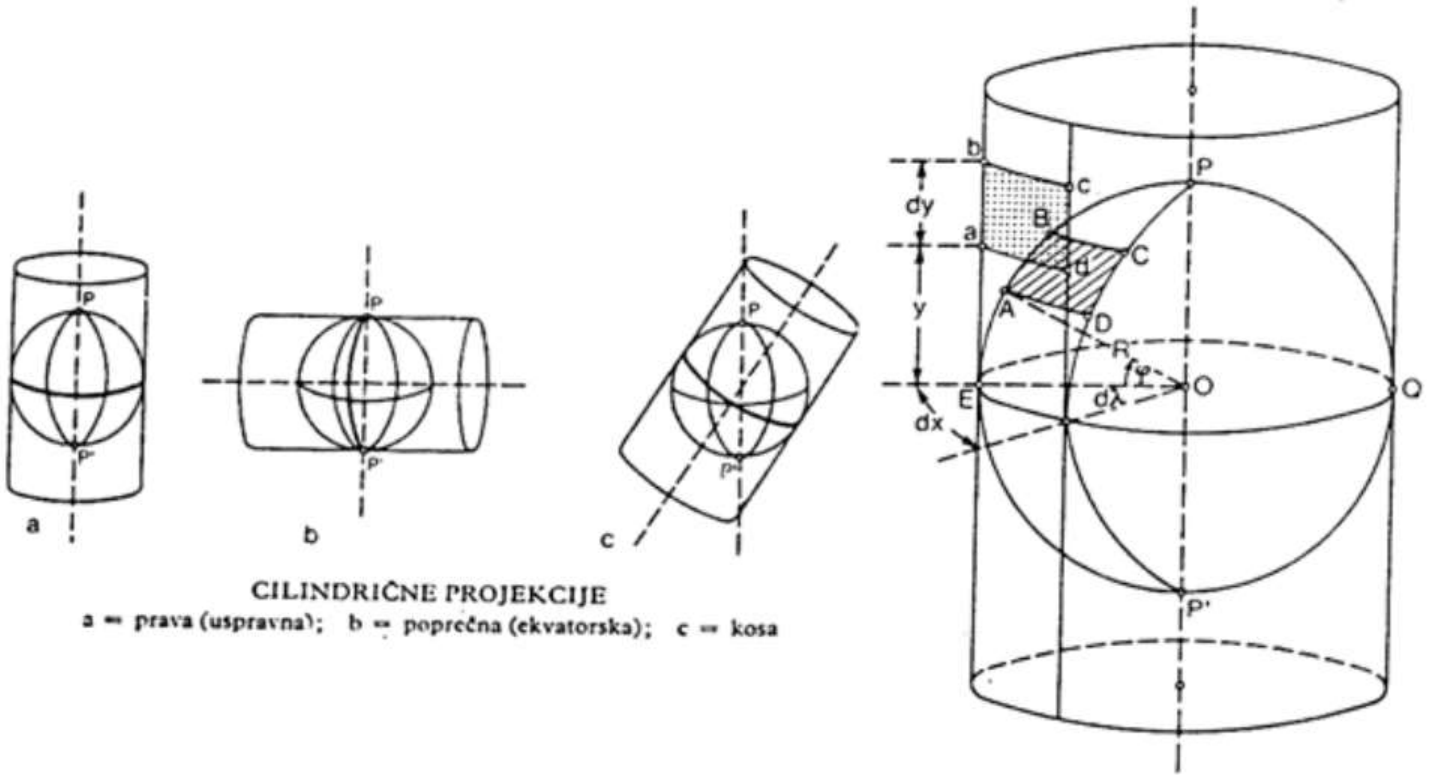
Cylindric projection



Izvornik: www.fes.uwaterloo.ca/crs/geog165/cylproj.htm

http://www2.geof.unizg.hr/~nvucetic/OGI_kart_proj.pdf

Cylindric projection

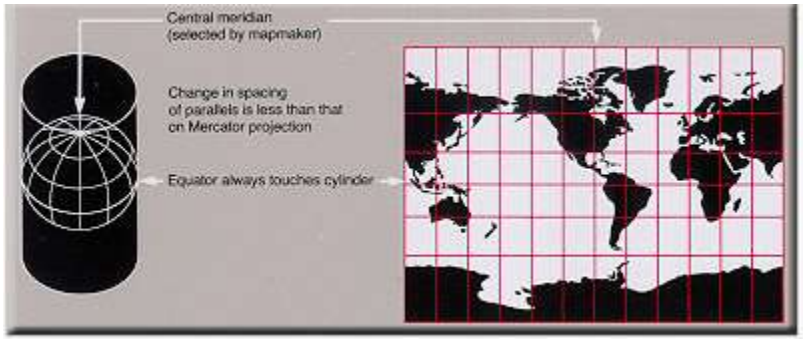


CILINDRIČNE PROJEKCIJE

a = prava (uspravna); b = poprečna (ekvatorska); c = kosa

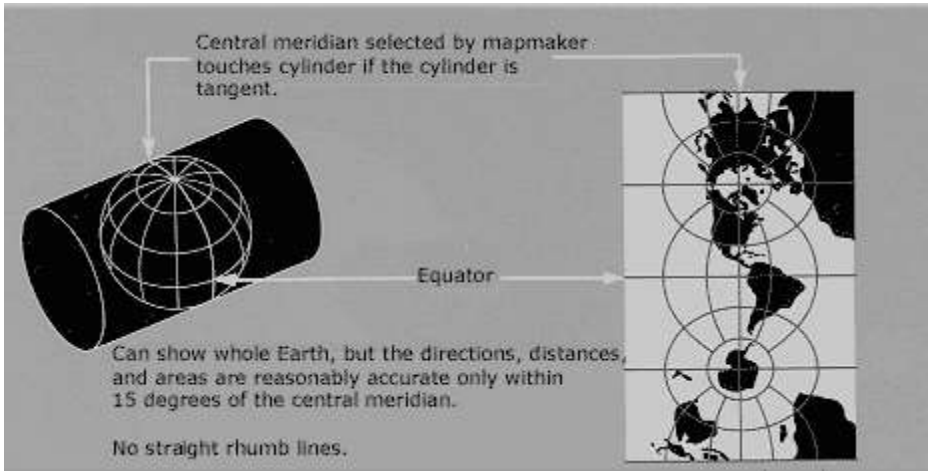
http://www.pfri.uniri.hr/~brcic/downloads/3.%20TERESTRICKA%20NAVIGACIJA_%20Kartografske%20projekcije.pdf

Cylindric projection



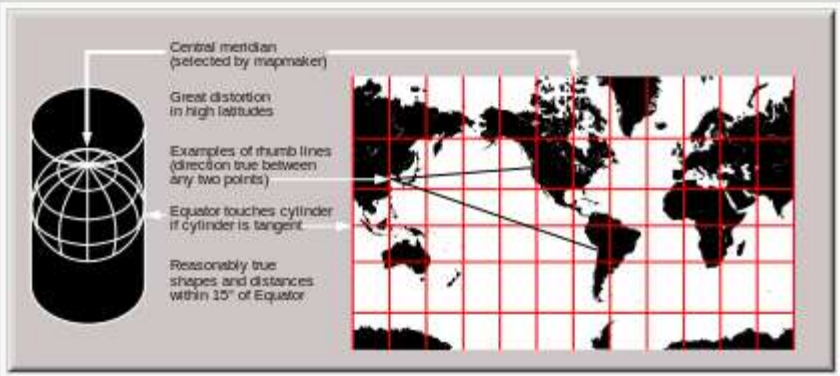
https://hr.wikipedia.org/wiki/Mercatorova_projekcija

Cylindric projection



https://en.wikipedia.org/wiki/Map_projection

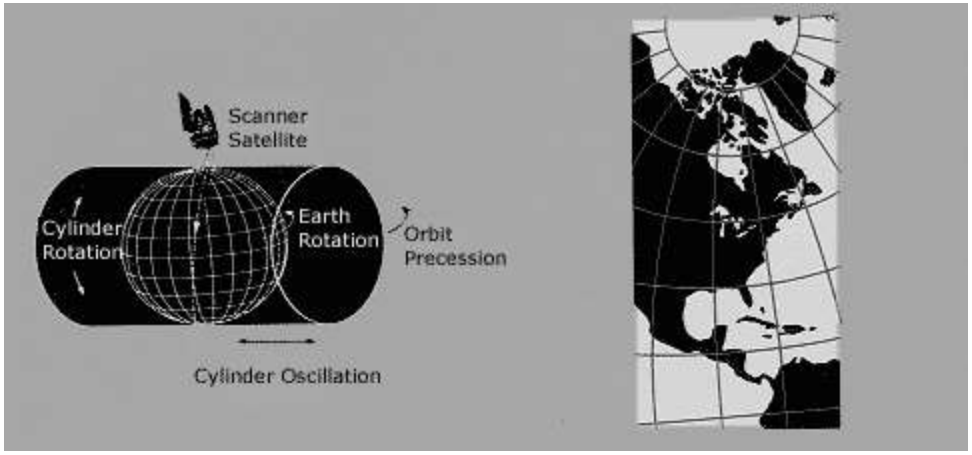
Cylindric projection



The Mercator projection shows courses of constant bearing as straight lines.

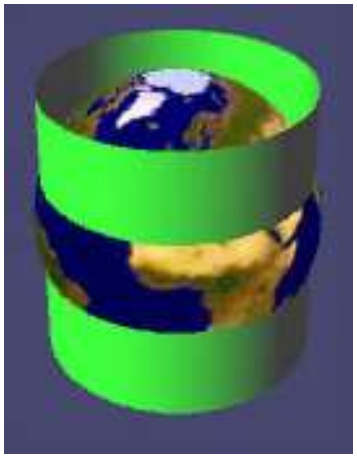
http://egsc.usgs.gov/isb//pubs/MapProjections/projections.html

Cylindric projection



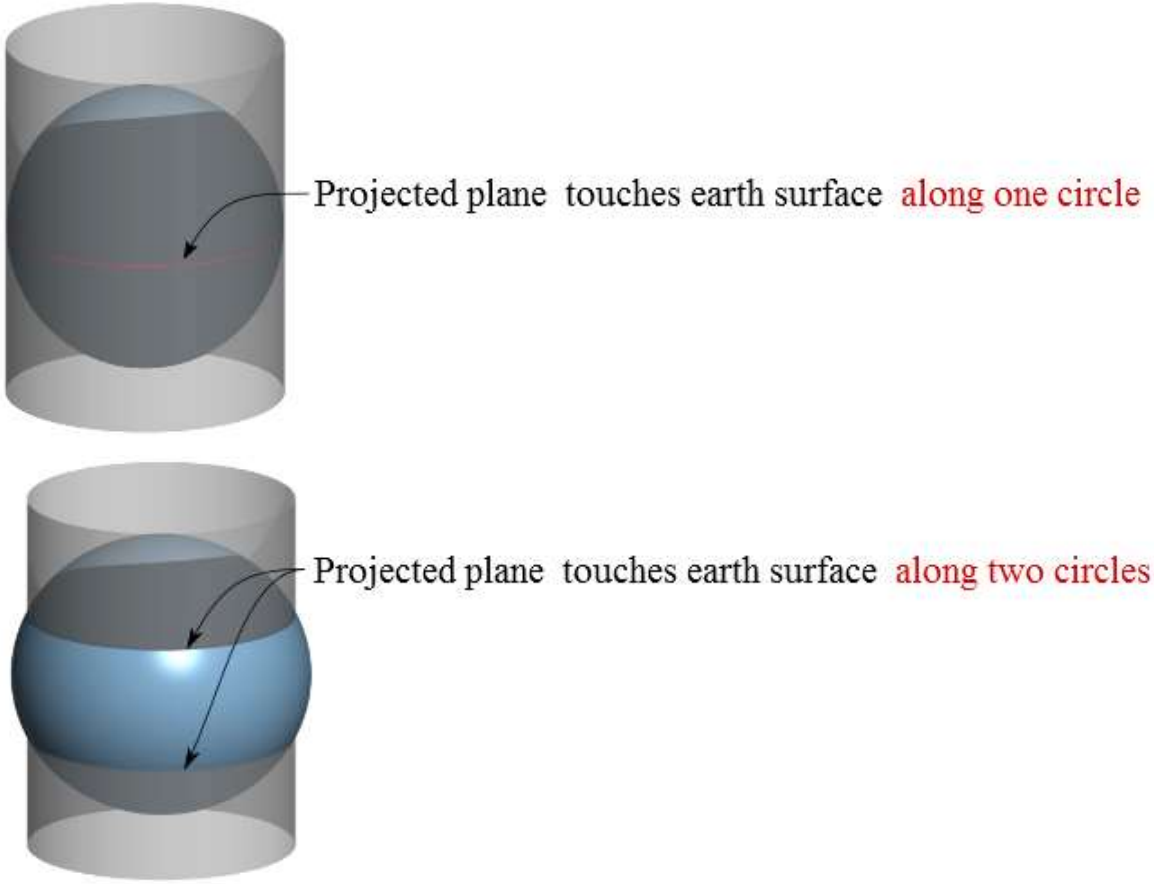
http://www.slideshare.net/yourmohsin/projections-and-coordinate-system

Cylindric projection



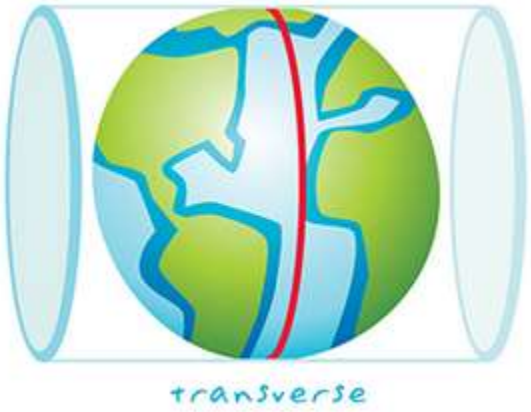
http://lazarus.elte.hu/~guszlev/vet/cylin.htm

Cylindric projection



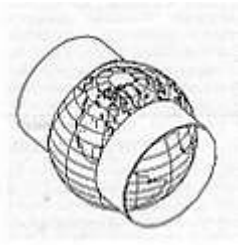
https://mgimond.github.io/Spatial/coordinate-systems.html

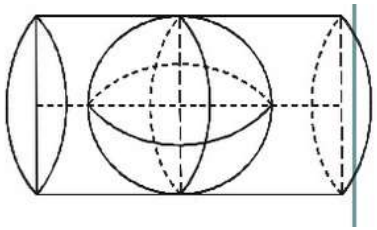
Cylindric projection



http://support.esri.com/other-resources/gis-dictionary/term/cylindrical%20projection

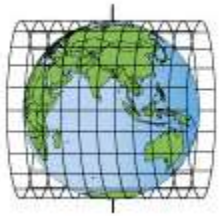
Cylindric projection





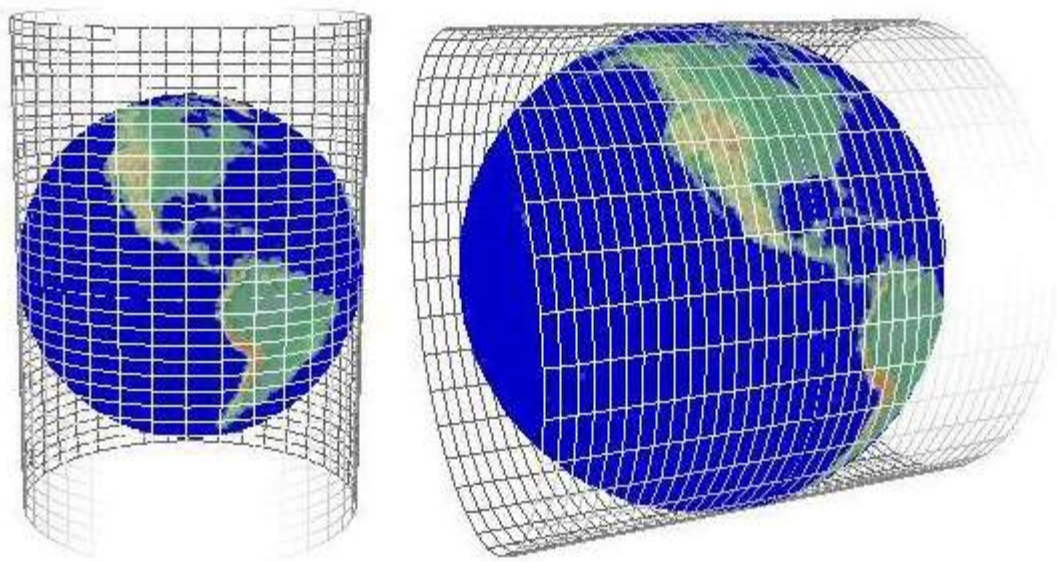
http://www.slideshare.net/geohabahaba/prostorni-referentni-sistemi

Cylindric projection



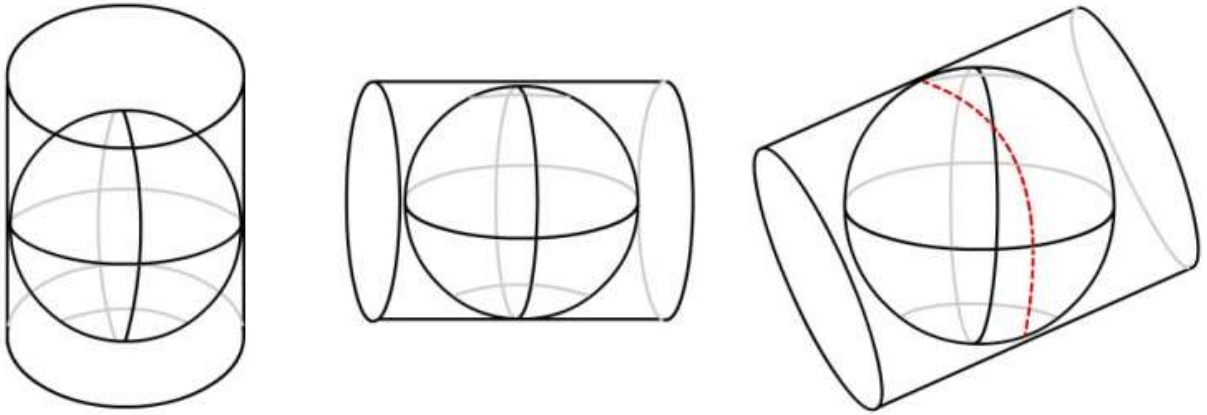
http://geographx.co.nz/map-projections/

Cylindric projection



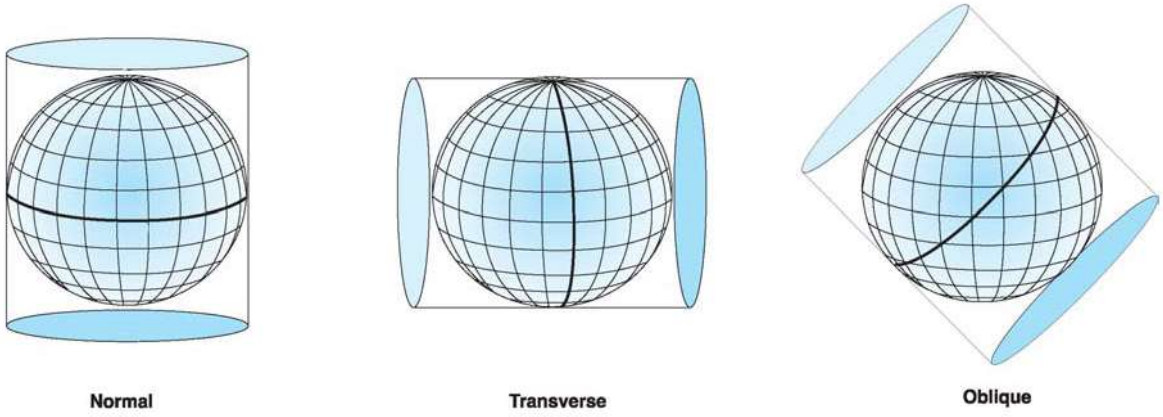
http://www.codeguru.com/cpp/g-m/bitmap/viewers/article.php/c9187/2D--3D-Visualization-Techniques-for-GeoReferenced-Images.htm

Cylindric projection



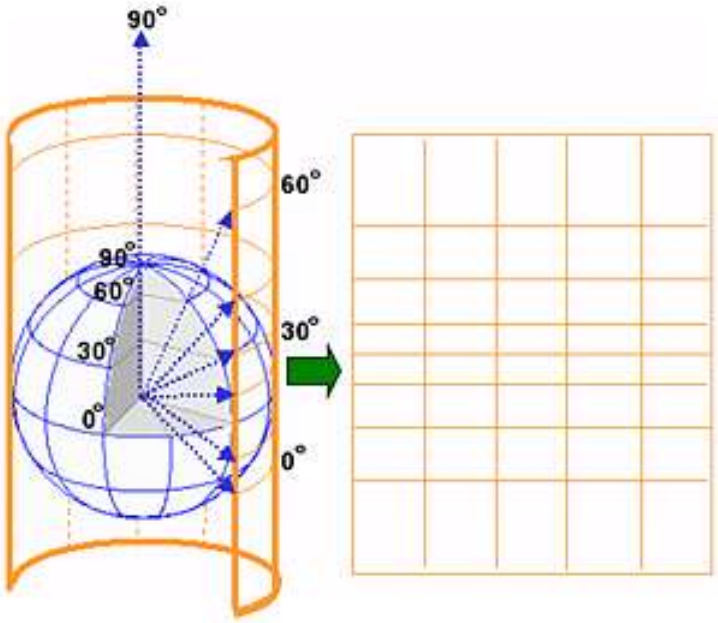
http://nptel.ac.in/courses/105102015/42

Cylindric projection



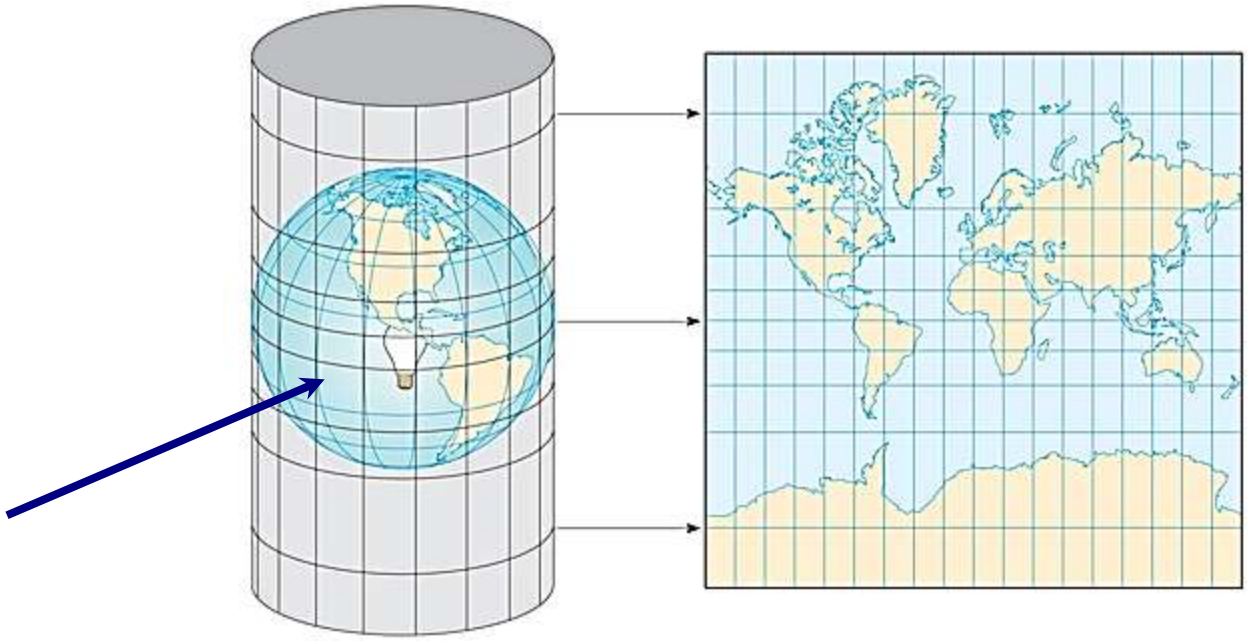
http://maps.unomaha.edu/Peterson/gis/notes/MapProjCoord.html

Cylindric projection

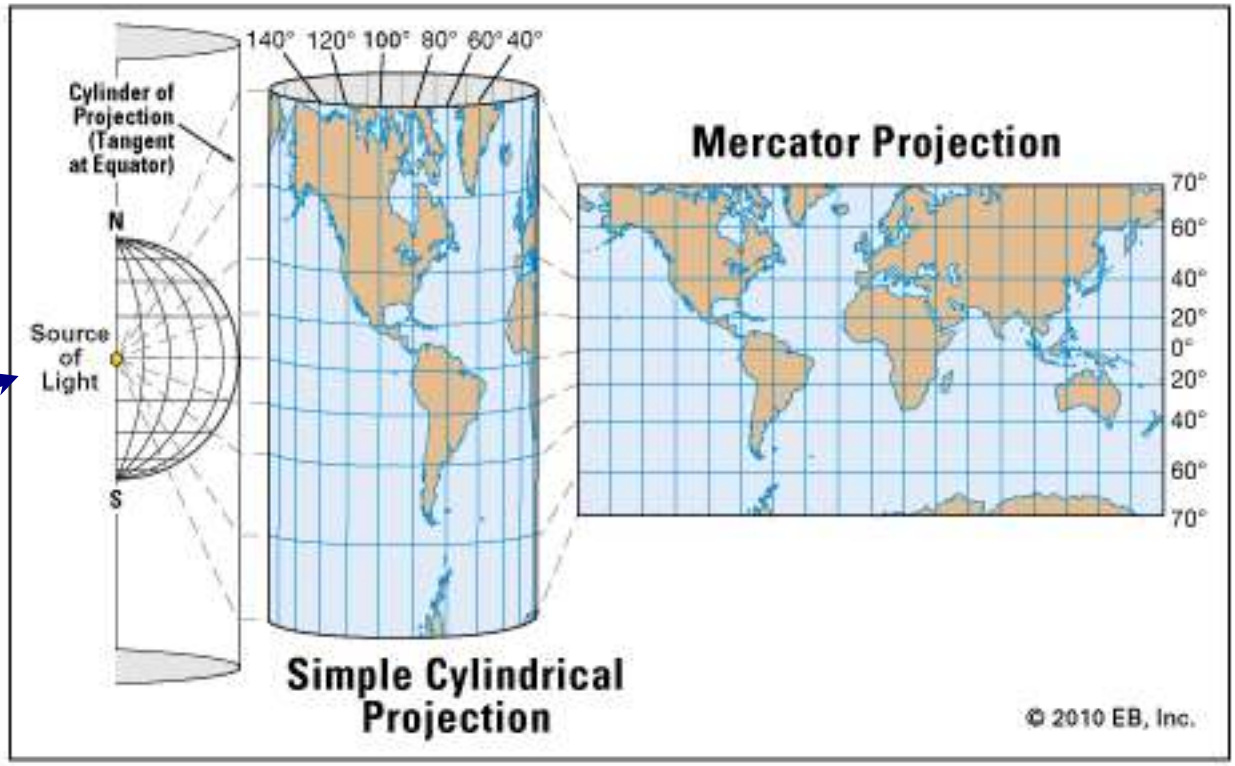


http://www.geography.hunter.cuny.edu/~jochen/GTECH361/lectures/lecture04/concepts/Map%20coordinate%20systems/Cylindrical%20projections.htm

Cylindric projection



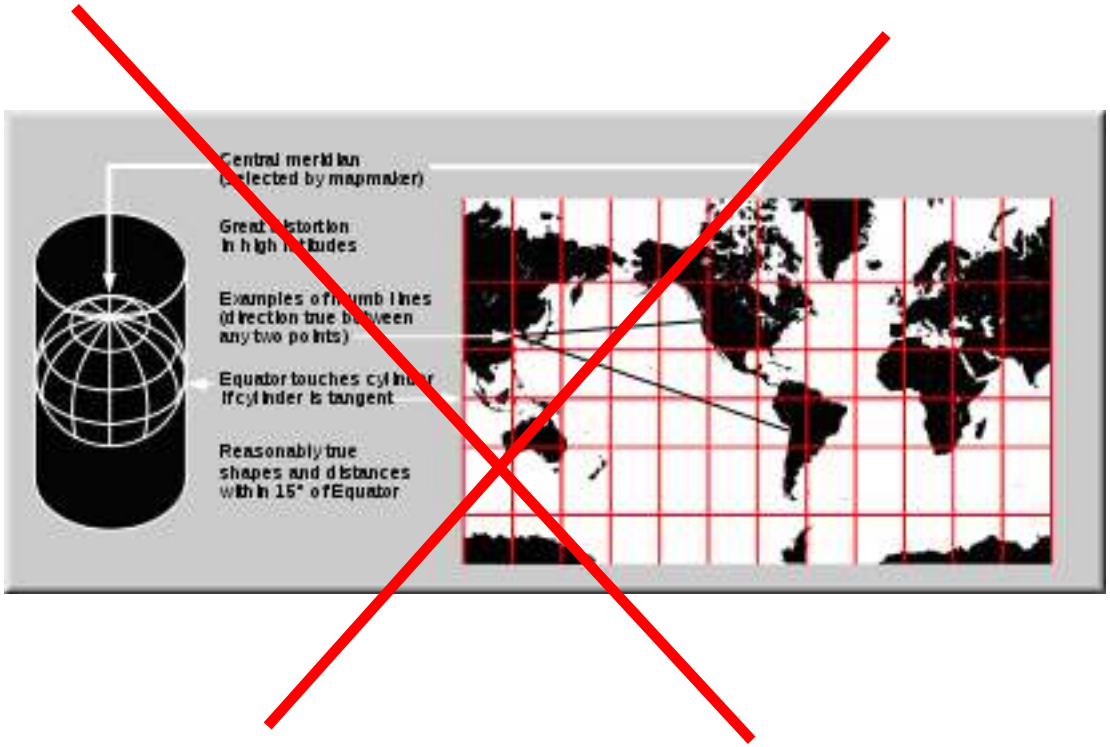
http://web.gccaz.edu/~lnewman/gph111/topic_units/systems_grid_proj/systems_time/systems_time2.html



The Mercator projection—a transformation from the simple cylindrical projection—is used for navigation, since lines of constant direction on the Earth appear as straight lines on the map.

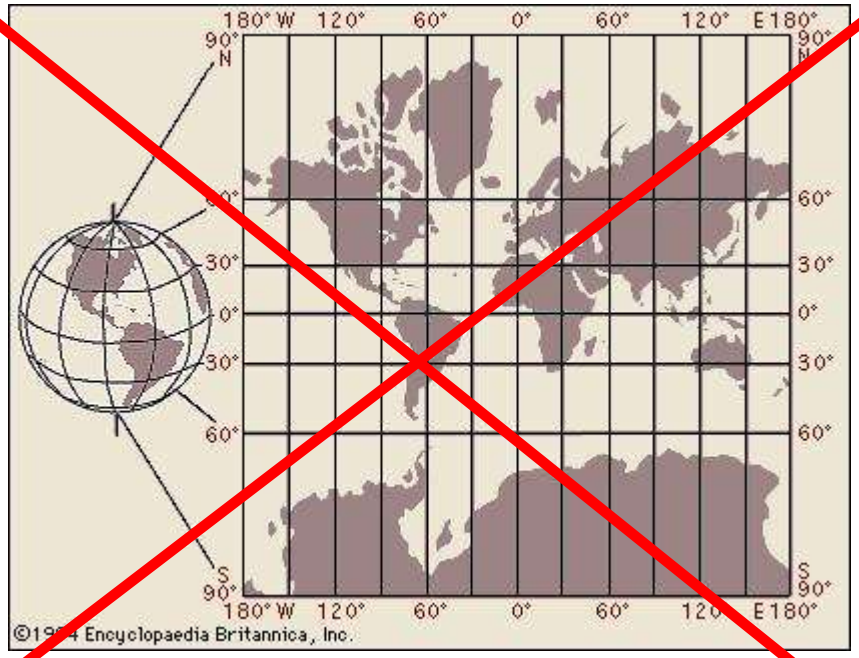
Please remember

Ther is no cylinder in derivation of cylindrical projections, with the exception to perspective cylindrical projections.



Please remember

Cylindric projection



https://www.britannica.com/science/Mercator-projection

Please remember

Cylindric projection

Pseudocylindric projections are projections on a pseudocylinder!

Map Projections

Map Projection Classes: Introduction

Introduction | Earth's Graticule | Map Projection Properties | Map Projection Classes | Using Map Projections

Introduction | Cylindrical Projections | Planar Projections | Conic Projections | Pseudocylindrical (Oval) Projections

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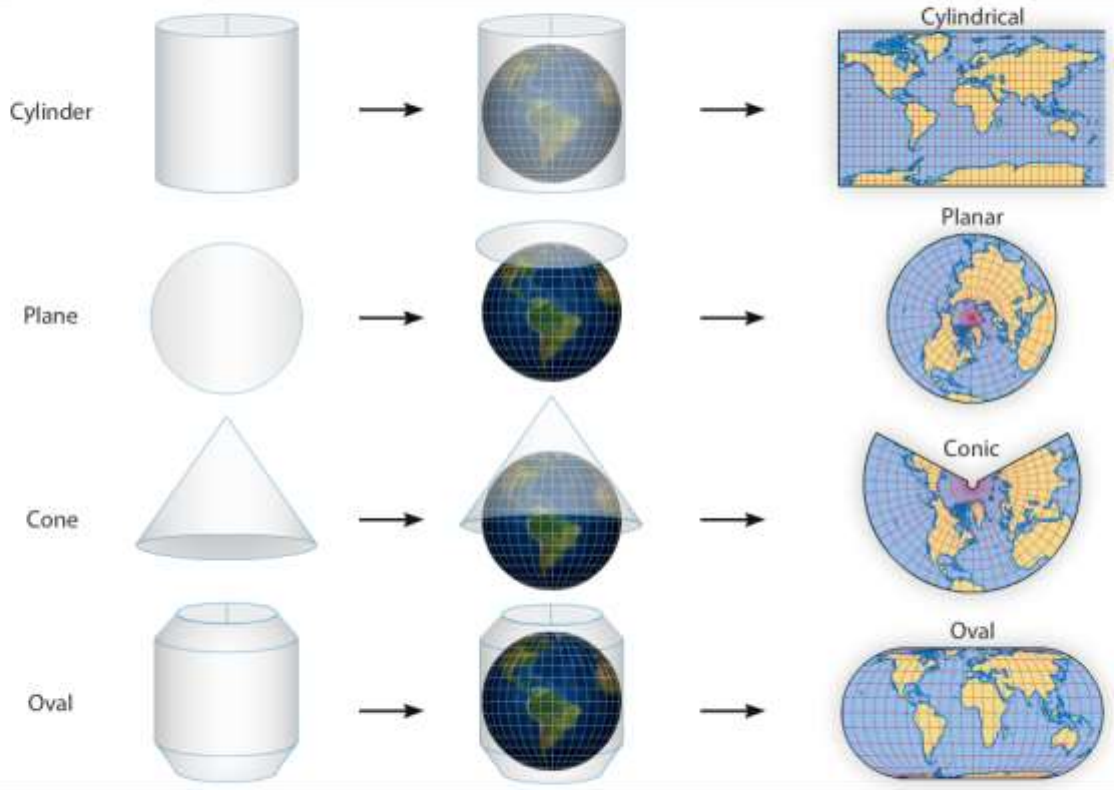

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ALWAYS LEARNING

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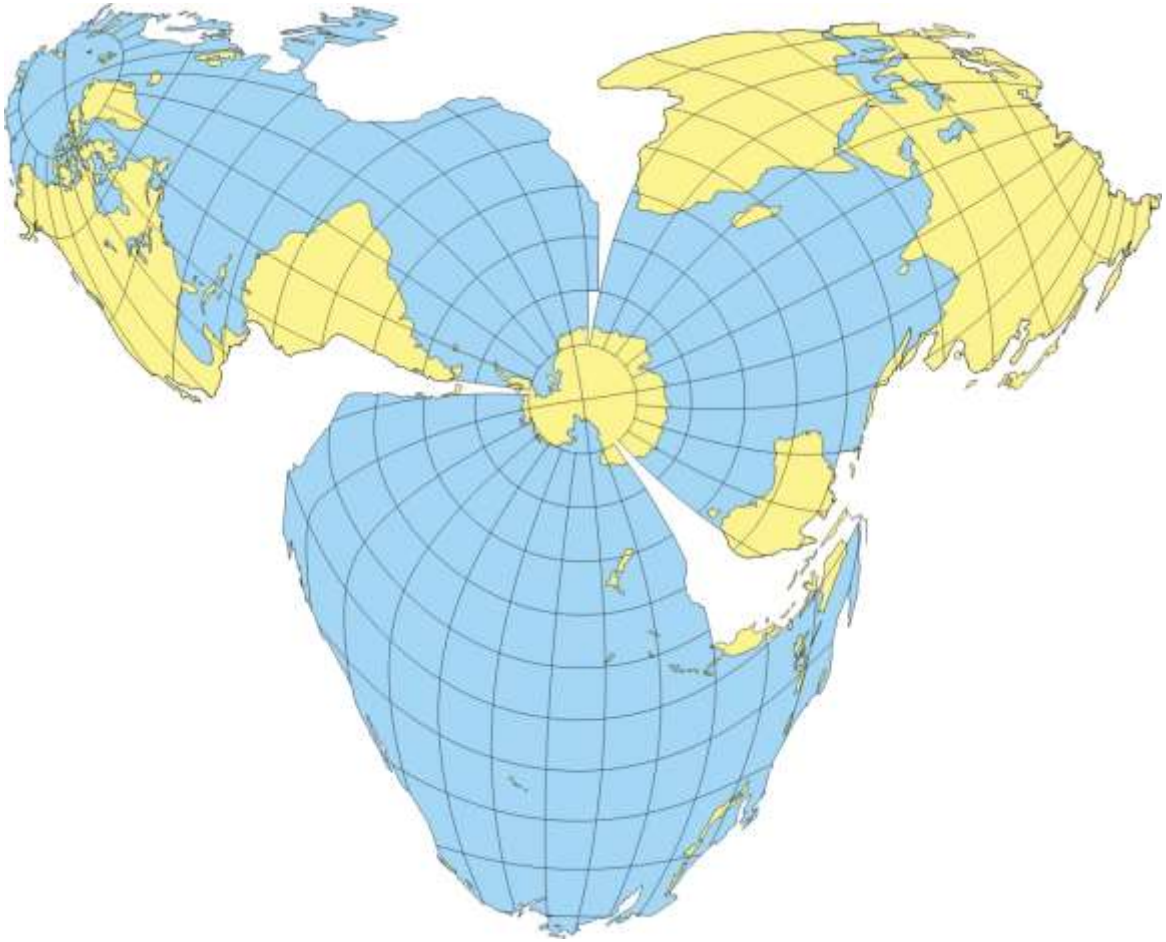


Pseudosomething ...

Contributions to the Use of Mathematics and its Applications

VERÖFFENTLICHUNG
DES KÖNIGLICH PREUSZISCHEN GEODÄTISCHEN INSTITUTES
NEUE FOLGE № 52

KONFORME ABBILDUNG DES ERDELLIPSOIDS IN DER EBENE

VON

PROF. DR. L. KRÜGER

POTSDAM

DRUCK UND VERLAG VON B. G. TEUBNER IN LEIPZIG

1912

Close, C. F. and Clarke, A. R., (1911): Map projections:
Encyclopaedia Britannica, 11th ed., v. 17, p. 653-663, reprintings to 1960

Conical projections are those in which the parallels are represented by concentric circles and the meridians by equally spaced radii. There is no necessary connexion between a conical projection and any touching or secant cone.

The name conical is given to the group embraced by the above definition, because, as is obvious, a projection so drawn can be round to form a cone.

Lee, L. P. (1944): The Nomenclature and Classification of Map Projections, Empire Survey Review, No. 51, Vol. VII, 190–200.

Cylindric: projections in which the meridians are represented as a system of equidistant parallel straight lines, and the parallels by a system of parallel straight lines at right angles to the meridians.

Conic: projections in which the meridians are represented as ...

Azimuthal: projections in which the meridians are represented as ...

No cylinders, no cones, ... ?!

"No reference has been made in the above definitions to cylinders, cones or planes. The projections are termed cylindric or conic because they can be regarded as developed on a cylinder or cone, as the case may be, but it is as well to dispense with picturing cylinders and cones, since they have given rise to much misunderstanding.

Particularly is this so with regards to the conic projections with two standard parallels: they may be regarded as developed on cones, but they are cones which bear no simple relationship to the sphere."

Some projections of the azimuthal, cylindrical and conic families have a direct geometric interpretation as light rays projected from a source intercept the Earth and, according to laws of perspective, "draw" its features on a surface. The latter may be a plane, yielding the map itself, or an intermediate shape like a cylindrical or conical shell.

http://www.progonos.com/furuti/MapProj/

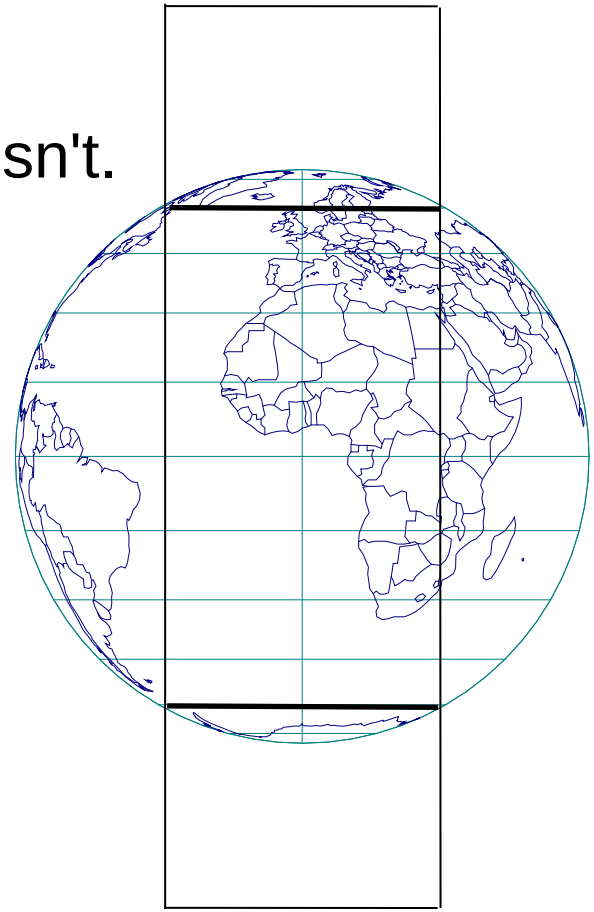
On the other hand, many projections are only distantly inspired by geometric principles. For instance, Mercator's cylindrical projection can't be visualized as a perspective process unless:

- light rays don't follow straight trajectories, or
- the light source is not a point or straight line, or
- the projection surface is not a simple tube

In all three cases the complexity negates the usefulness of a perspective model. Indeed, many projections have simply no geometric or physical interpretation, and are described purely by mathematical formulae. I.e., the cartographer devises a spherical-to-flat mapping according to some desirable but arbitrary property or constraint.

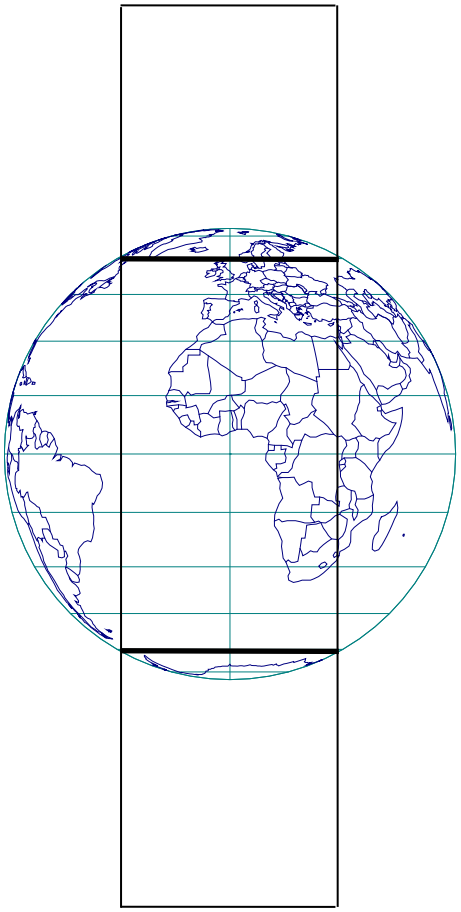
Is the normal aspect of equidistant cylindrical projection with two standard parallels a secant projection?

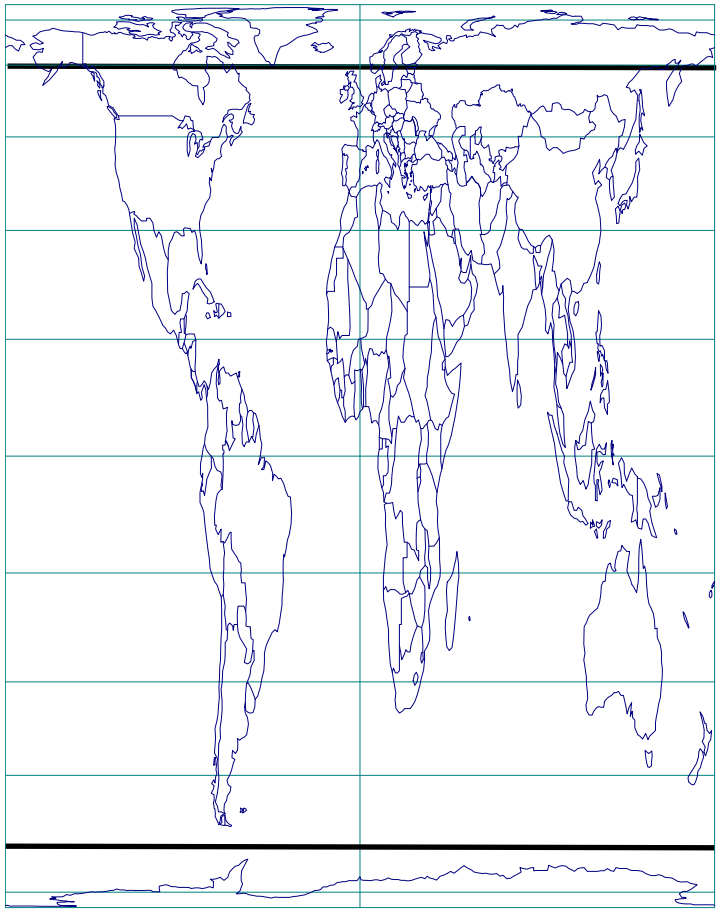
No, it isn't.



Is the normal aspect of equal-area cylindrical projection with two standard parallels a secant projection?

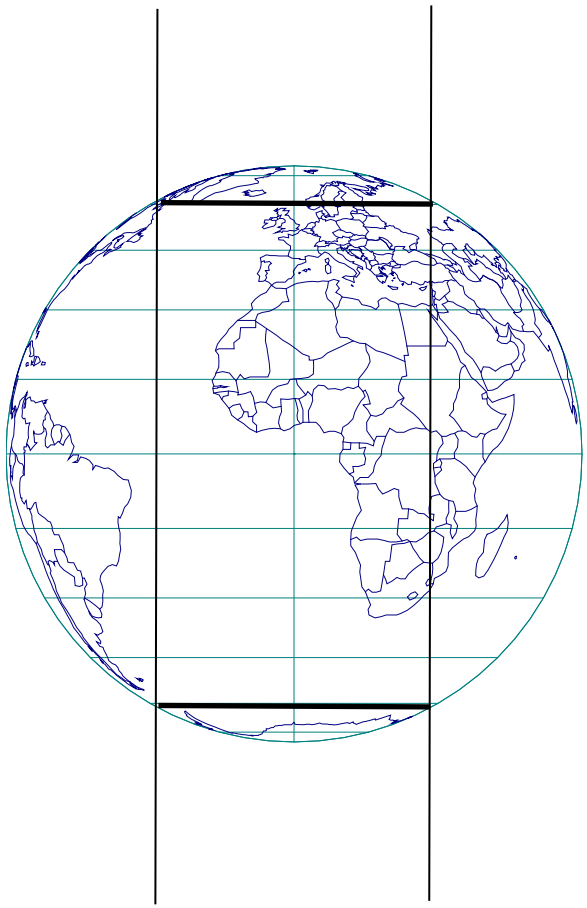
No, it isn't.

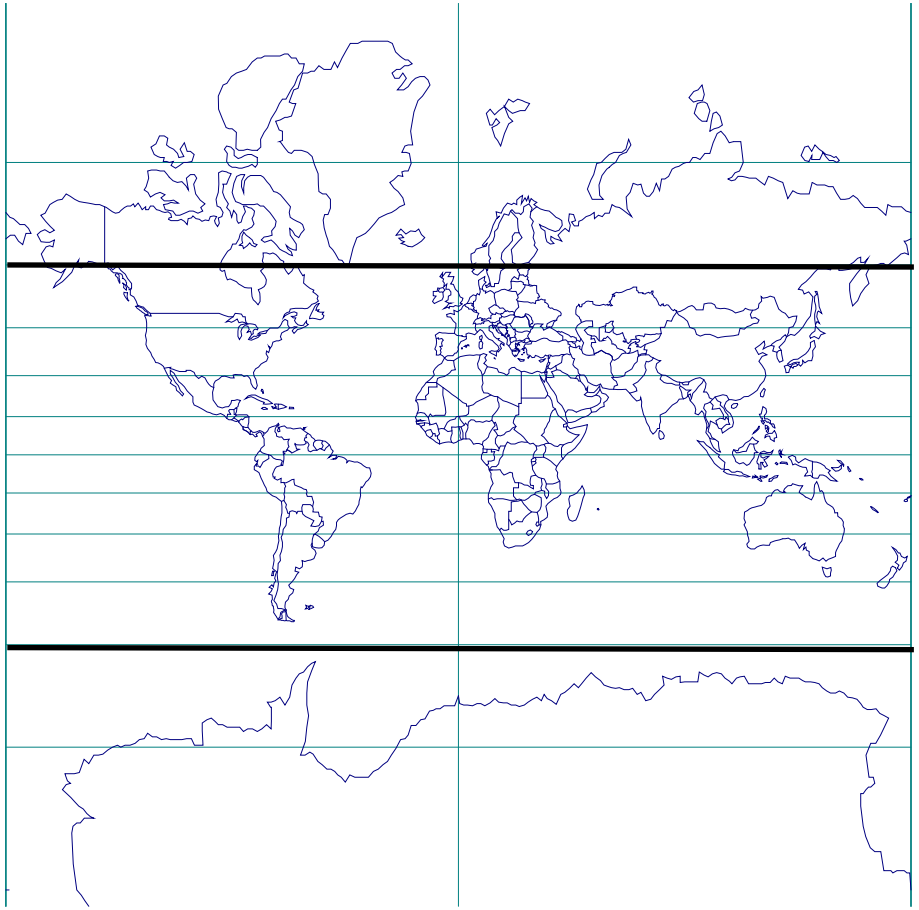




Is the normal aspect of Mercator projection with two standard parallels a secant projection?

No, it isn't.



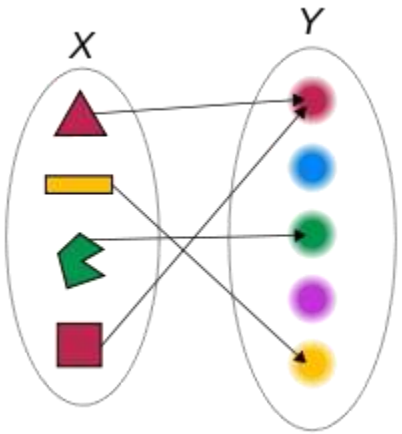


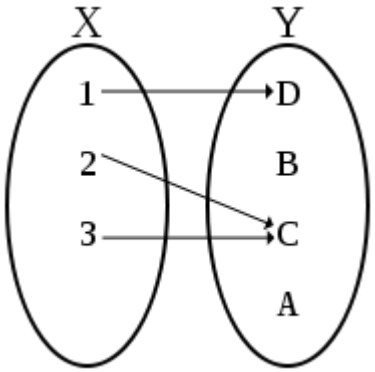
Let us remember

It is not wise to use intermediate surfaces in the interpretation of map projections in general because:

- Most map projections in its definition do not have an auxiliary surface
- The application of the auxiliary/intermediate surface can lead to the wrong conclusion about the distortion distribution (standard parallels)
- The application of a non-developing surface is out of question, because a spere is a non-developing surface!

How to proceed?





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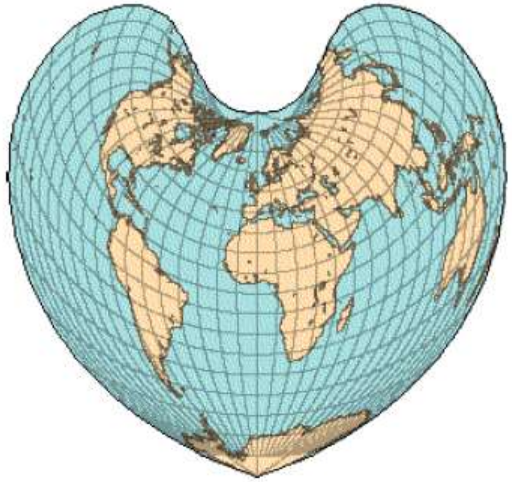
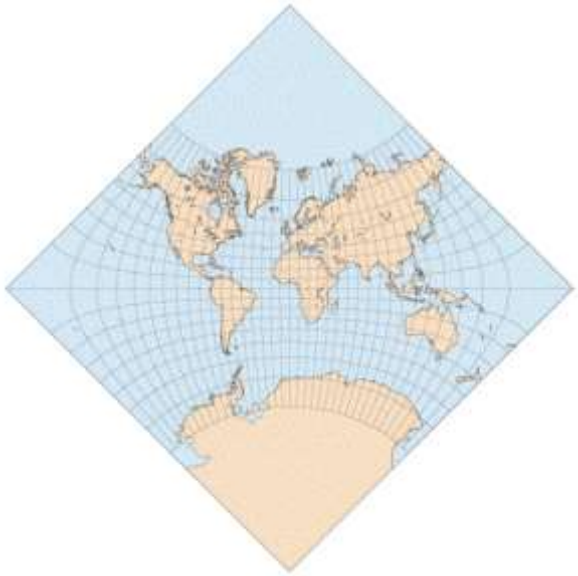
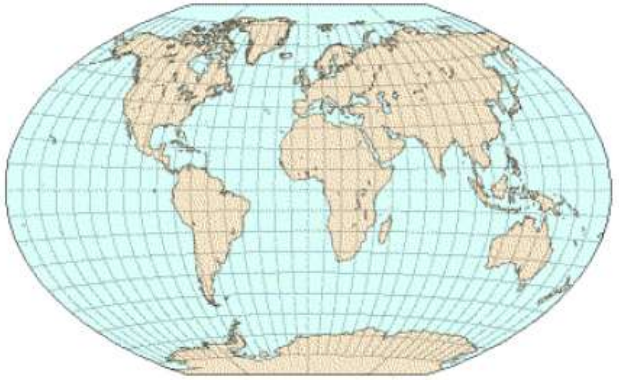
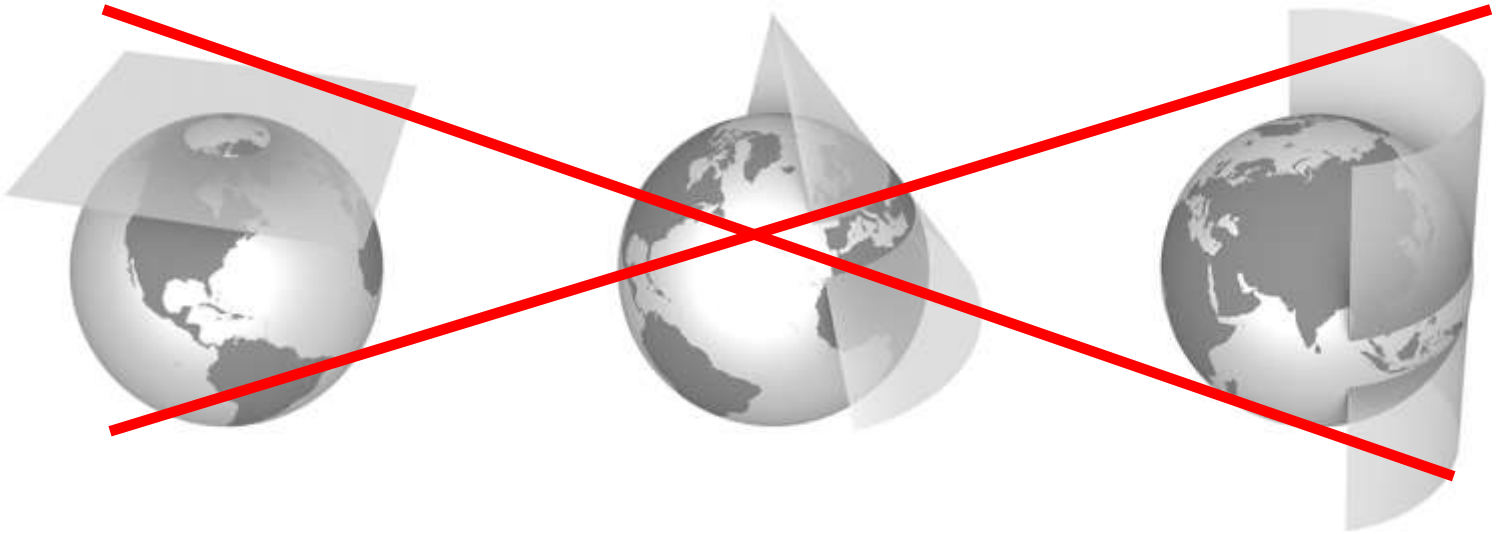
How to proceed?

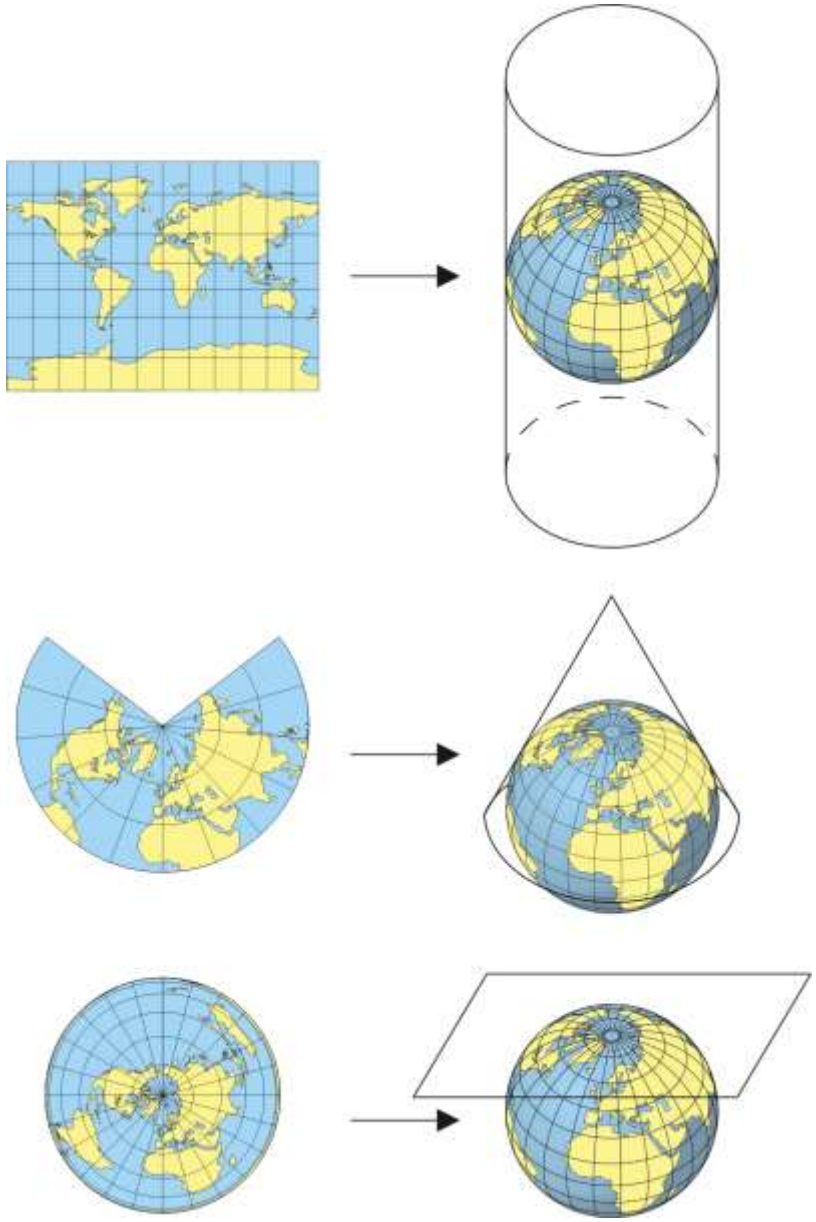






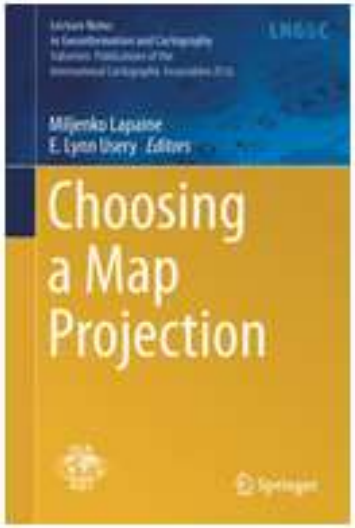
To conclude





» Earth Sciences & Geography » Geography

Publications of the International Cartographic Association (ICA)



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Choosing a Map Projection

Editors: **Lapaine**, Miljenko, **Usery**, E. Lynn (Eds.)

Offers a guide to selecting map projections for non-technical users

Thank you for your attention and understanding!