Cartography

Doç. Dr. Erkan Yılmaz

CYLINDER PROJECTIONS

Geographic Projection

Equirectangular Projection

Center Cylinder Projection

Gall Projection

Lambert Cylinder Projection

Mercator Cylinder Projection

Mollweide Projection

Sinusoidal Projection

Eckert Projection

Robinson Projection

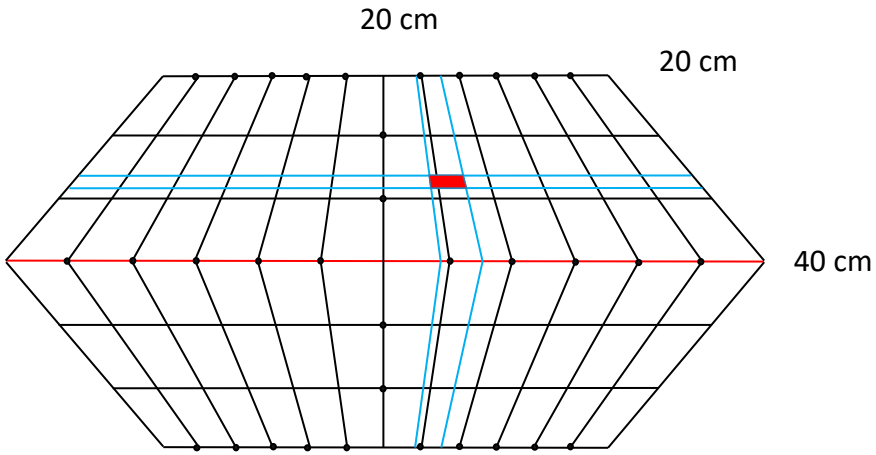
Winkel Tripel Projection

Segmented Projections

Central Meridian Change

ECKERT 1 PROJEKSİYON

Drawing of the graticule (grid network) of the Eckert I projection at a scale of 1/100,000,000 (Interval: 30 degree) and showing the location of Turkey.



0 2000 km

Pseudo

Equator

$$2\pi R = 2*3,14*6,37 = 40cm$$

Central meridian and poles

$$\pi R = 3,14*6,37 = 20cm$$

Parallels

Spaces are equal

$$\frac{20}{180}*30 = 3,33$$

Meridians

$$\frac{20}{360}*30 = 1,67$$

$$\frac{40}{360}*30 = 3,33$$

Logic

Maintain the equator length
Maintain the central meridian length
Poles are equal to a meridian

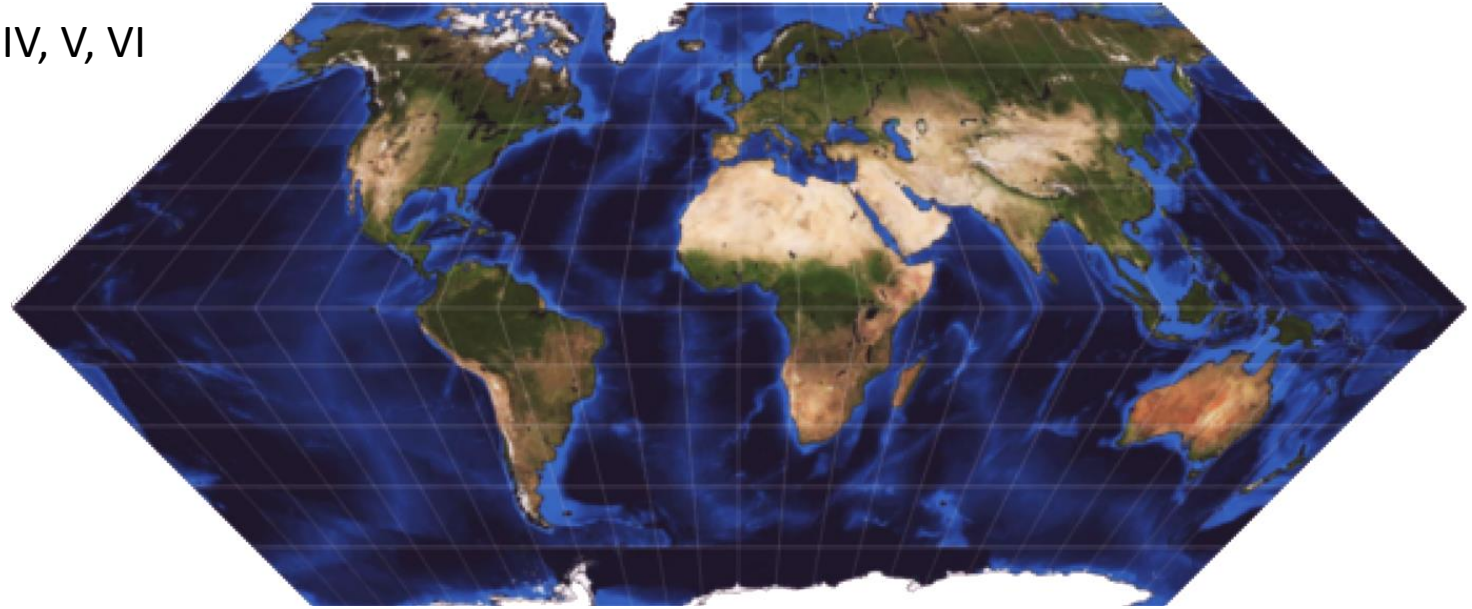
Eckert I, II, III, IV, V, VI

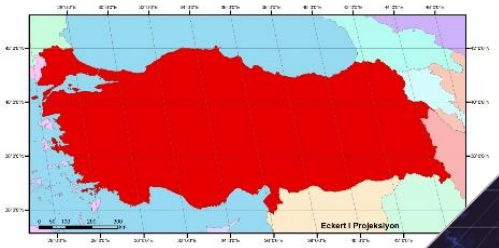
Features of Projection

- Entire world.
- Parallels are straight lines parallel to the equator.
- Parallel spaces are equal.
- Meridians are oblique.
- Meridian spaces are equal at any parallel.
- The equator and central meridian and their immediate surroundings have low error.
- Distortion rates increase going away from the equator and central meridian.

Usage

- Atlas.
- Modis image





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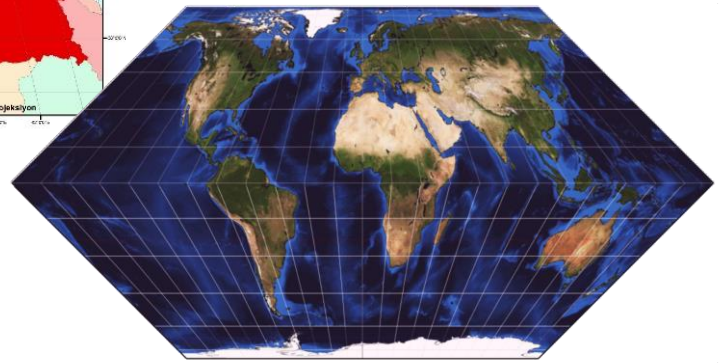

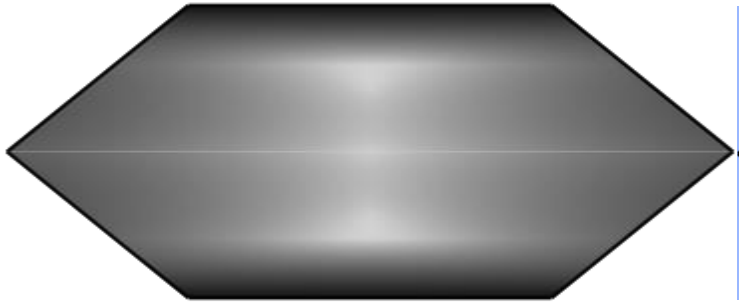

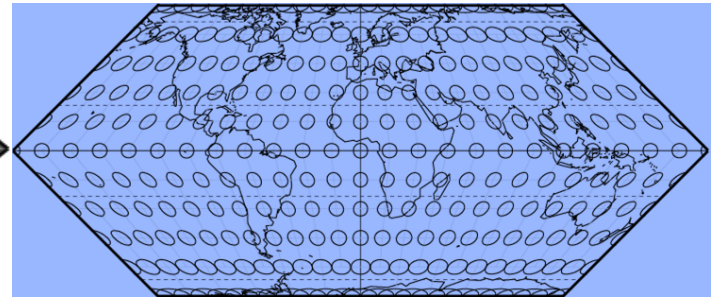

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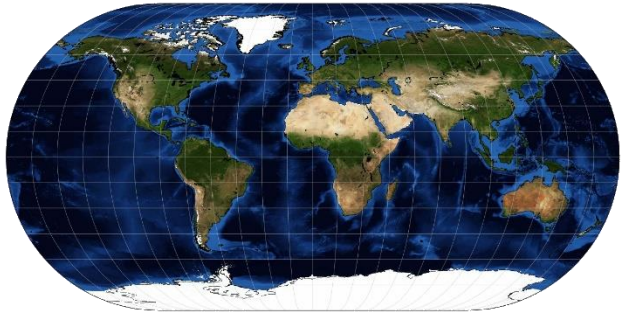

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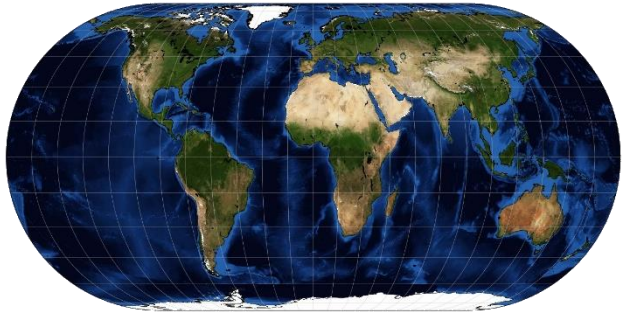
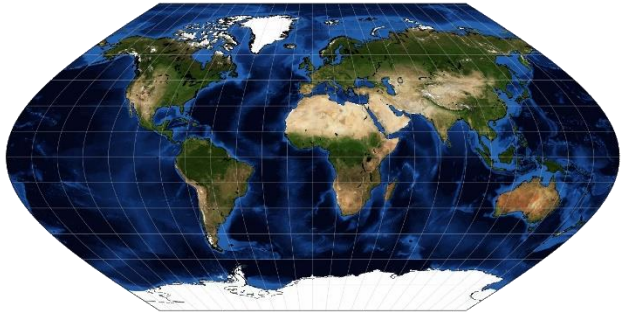
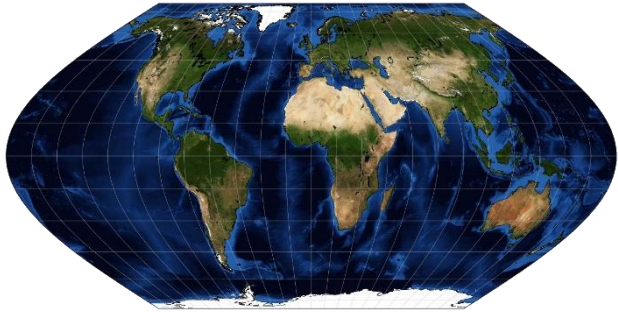


V

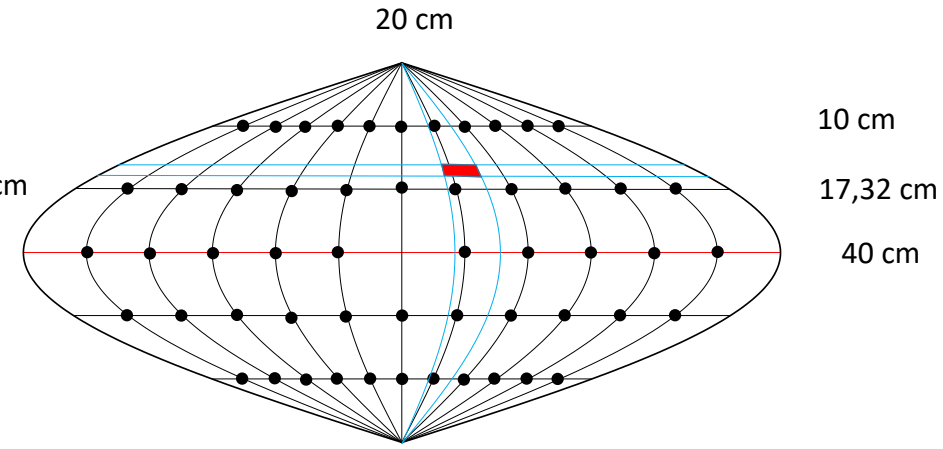


VI



Sinusoidal Projection

Drawing of the graticule (grid network) of the Sinusoidal projection at a scale of 1/100,000,000 (Interval: 30 degree) and showing the location of Turkey.



0 2000 km

Pseudo
Merkator-Sanson

Logic

Maintain the equator length
Maintain the central meridian length
Maintain the parallels lenth

Equator

$$2\pi R = 2*3,14*6,37 = 40cm$$

Central Meridian

$$\pi R = 3,14*6,37 = 20cm$$

Parallels
Spaces are equal
Maintain the length

$$\frac{20}{180}*30 = 3,33$$

Parallels Length

$$\varphi_{30} = 2\pi \cos 30 * R = 2*3,14*0,8660*6,37 = 34,64$$

$$\frac{34,64}{2} = 17,32cm \qquad \frac{17,32}{6} = 2,89$$

$$\varphi_{60} = 2\pi \cos 60 * R = 2*3,14*0,5*6,37 = 20$$

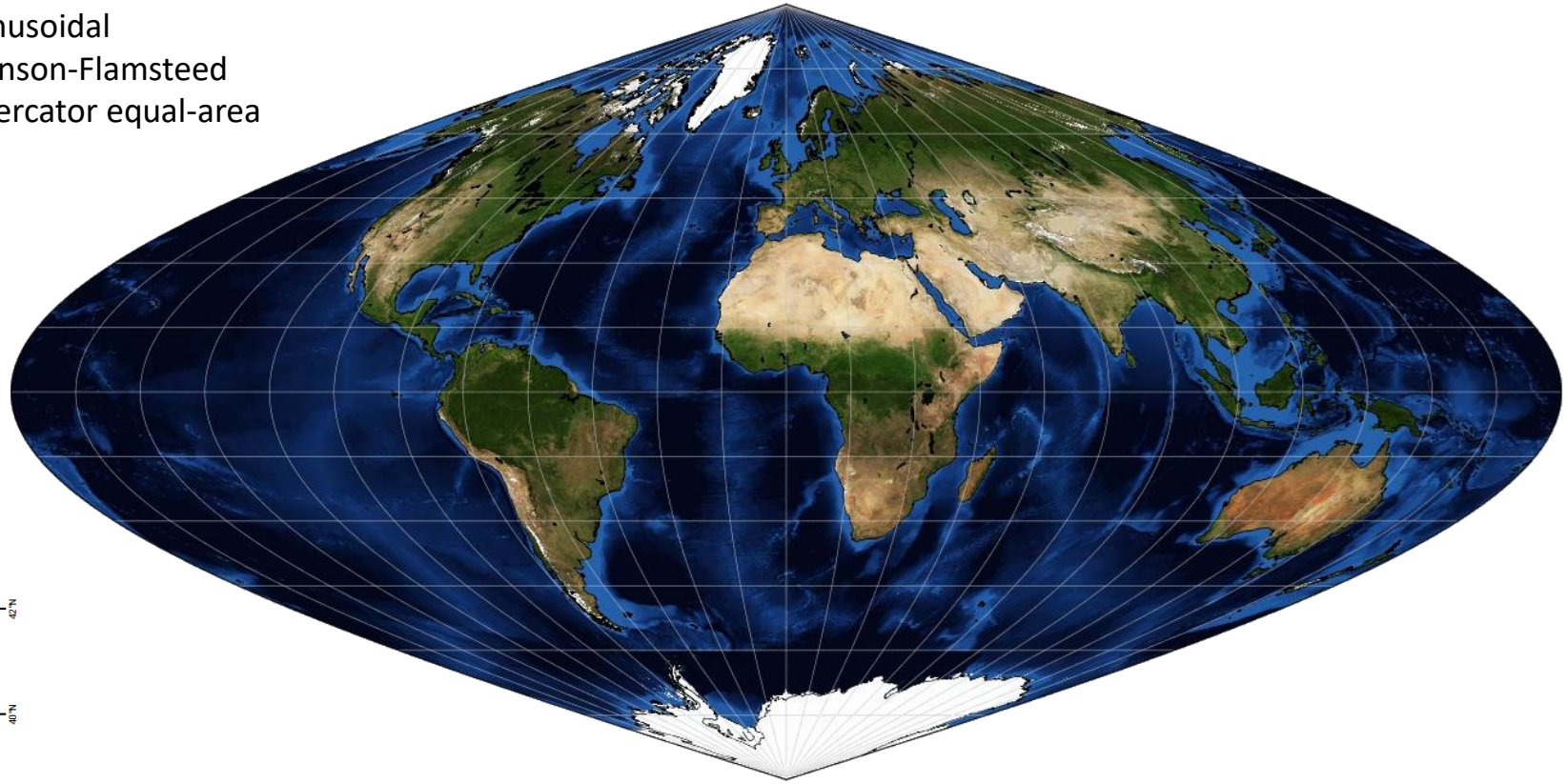
$$\frac{20}{2} = 10cm \qquad \frac{10}{6} = 1,67$$

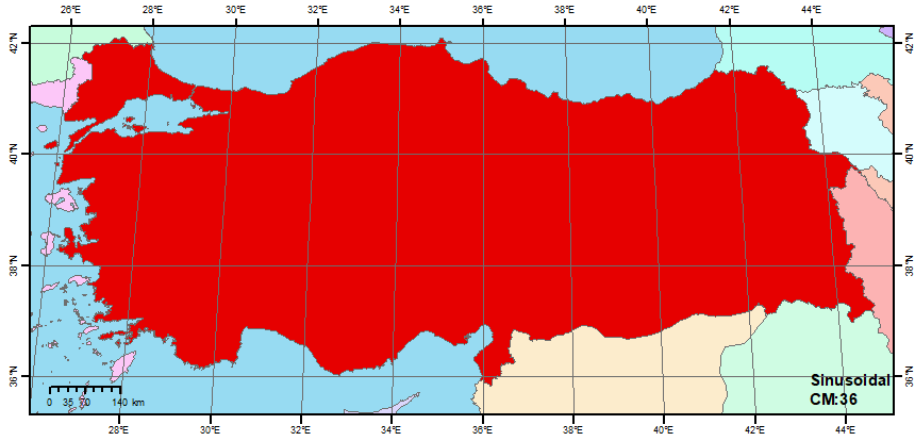
Meridians drawings

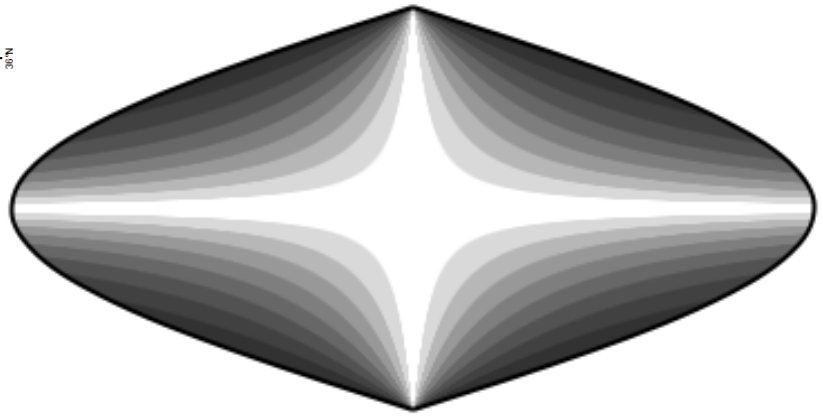
Features of Projection

- Entire world.
- Equal area
- Parallels are straight lines parallel to the equator.
- Parallel spaces are equal.
- Meridians are sinus arcs.
- Meridian spaces are equal at any parallel.
- The equator and central meridian and their immediate surroundings have low error.
- Distortion rates increase going away from the equator and central meridian.

Sinusoidal
Sanson-Flamsteed
Mercator equal-area





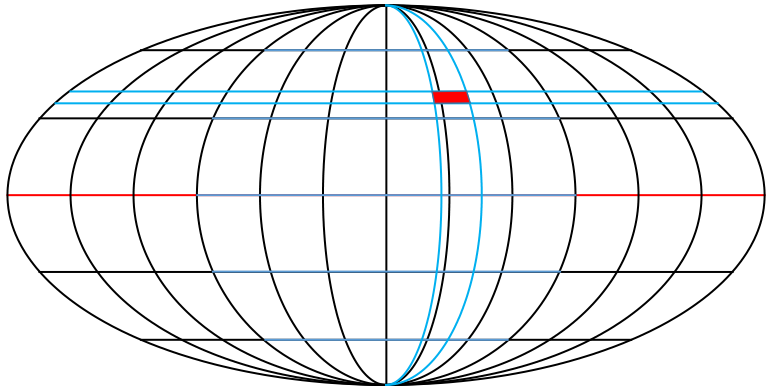


Usage

- Equal area maps
- Atlas.

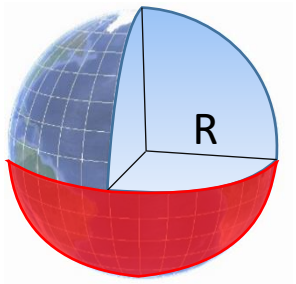
MOLLWEIDE PROJEKSİYON

Drawing of the graticule (grid network) of the Mollweide projection at a scale of 1/100,000,000 (Interval: 30 degree) and showing the location of Turkey.

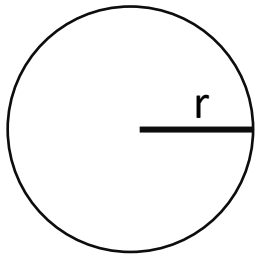


8,98 cm

$2\pi R^2$



πr^2



0 2000 km

Sphere Area

$4\pi R^2$

A Hemisphere Area

$$\frac{4\pi R^2}{2} = 2\pi R^2$$

Logic

Equal area

Circle Area

πr^2

$$\pi r^2 = 2\pi R^2$$

$$r = R\sqrt{2}$$

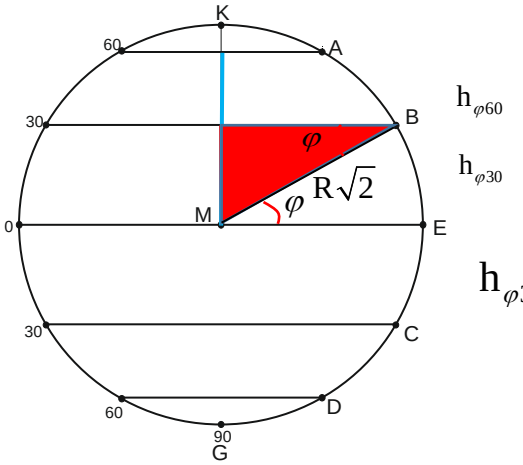
$$\sqrt{2} \cong 1,41$$

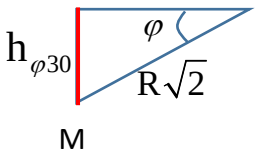
$$r = 6,37 * 1,41 = 8,98$$

Parallels

$$h_{\varphi 30} = \sin 30 * R = 0,5 * 6,37 * 1,14 = 4,49$$

$$h_{\varphi 60} = \sin 60 * R = 0,866 * 6,37 = 7,78$$





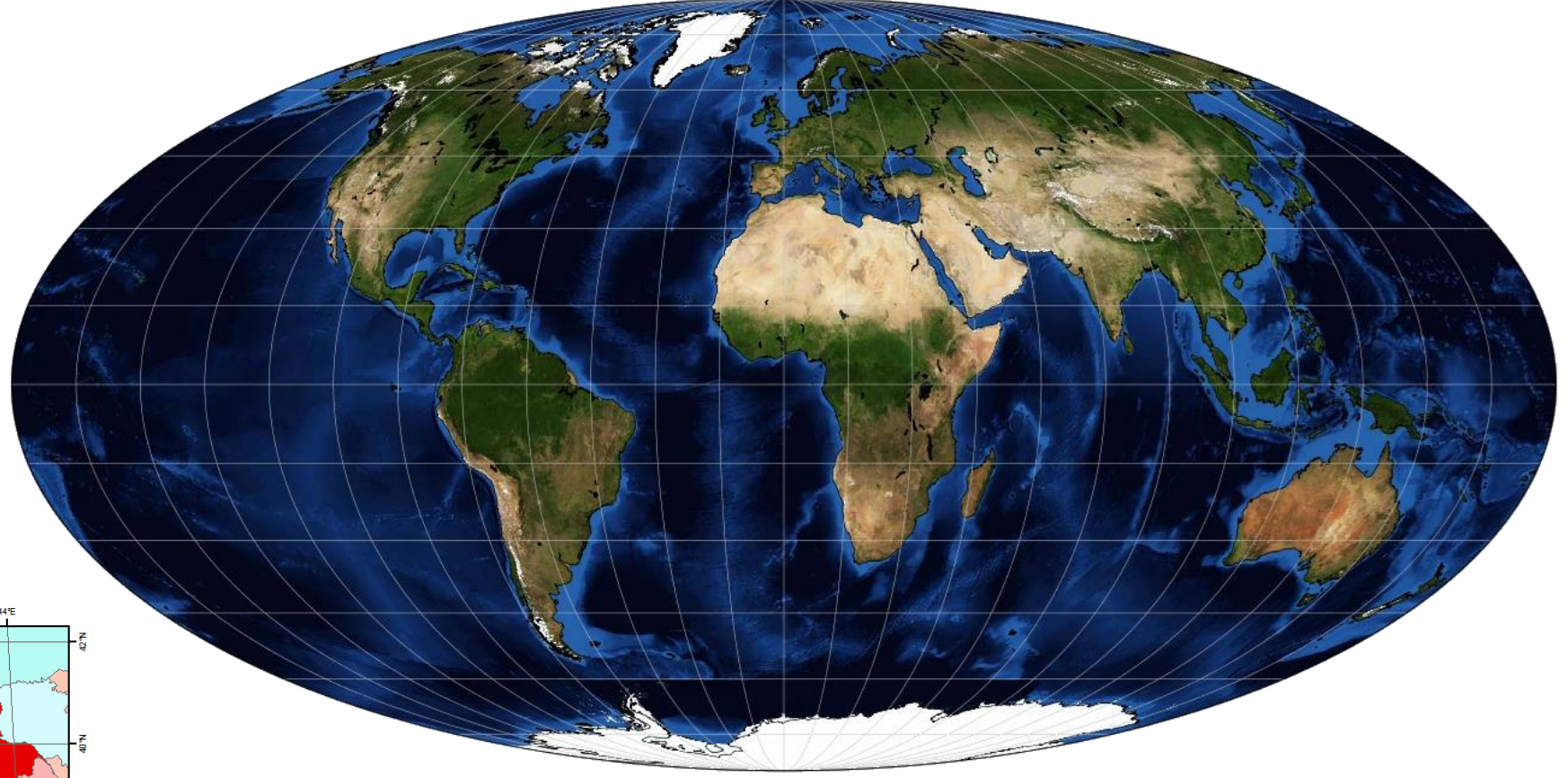
$$\sin\varphi = \frac{opp}{hyp}$$

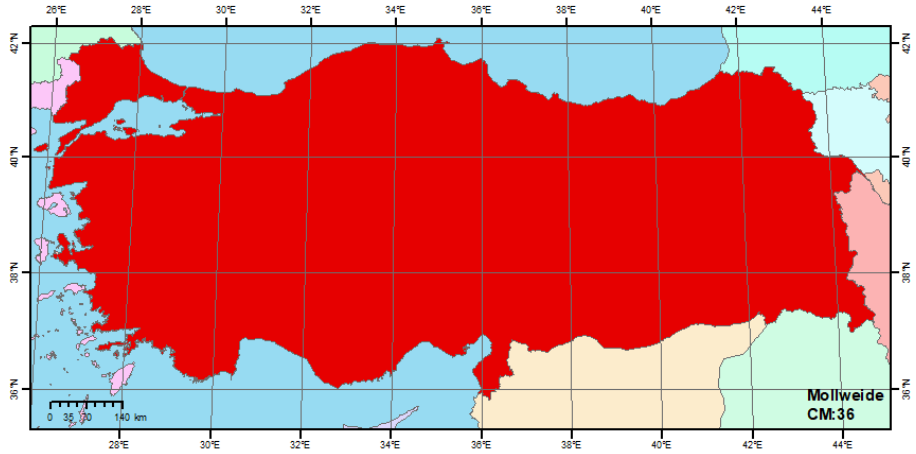
$$\sin\varphi = \frac{h_\varphi}{R\sqrt{2}}$$

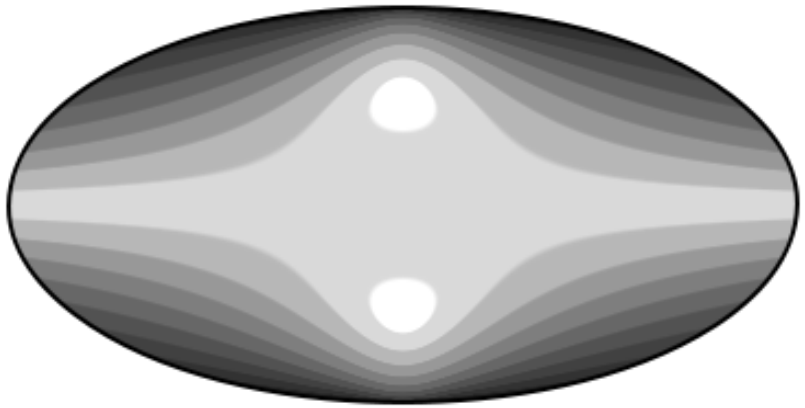
$$h_\varphi = \sin\varphi * R\sqrt{2}$$

Features of Projection

- Entire world.
- Equal area
- Parallels are straight lines parallel to the equator.
- Parallel spaces are narrower away from equator.
- Meridians are circular arcs.
- Meridian spaces are equal at nay parallel.
- The equator and its immediate surroundings have low error.
- Distortion rates increase going away from the equator and central meridian.





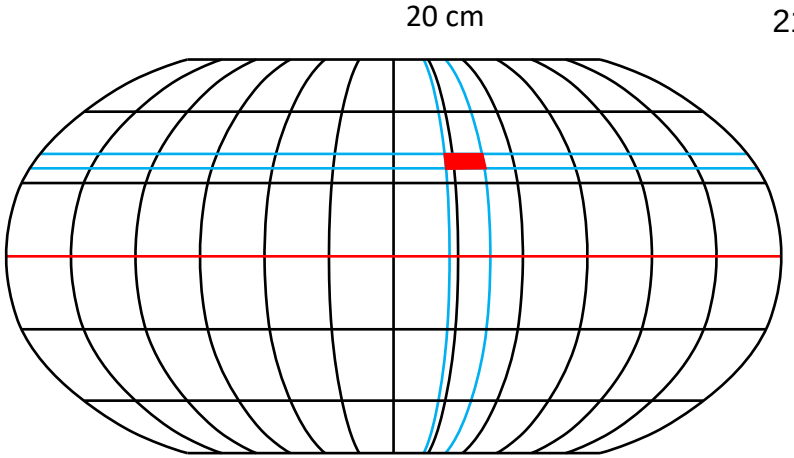


Usage

- Distribution maps.
- Atlas.
- It is used in the making of maps that aim to maintain the area.

ROBİNSON PROJEKSİYON

Drawing of the graticule (grid network) of the Robinson projection at a scale of 1/100,000,000 (Interval: 30 degree) and showing the location of Turkey.



0 2000 km

Pseudo

Equator

$$2\pi R = 2*3,14*6,37 = 40cm$$

Central Meridian

$$\pi R = 3,14*6,37 = 20cm$$

Poles

$$0.5322*40cm = 21.288cm$$

Parallels

$$\frac{20}{360}*30 = 1,67$$

Meridians at equator

$$\frac{40}{360}*30 = 3,33$$

Meridians at the poles

21.288/360*30=1.774 cm

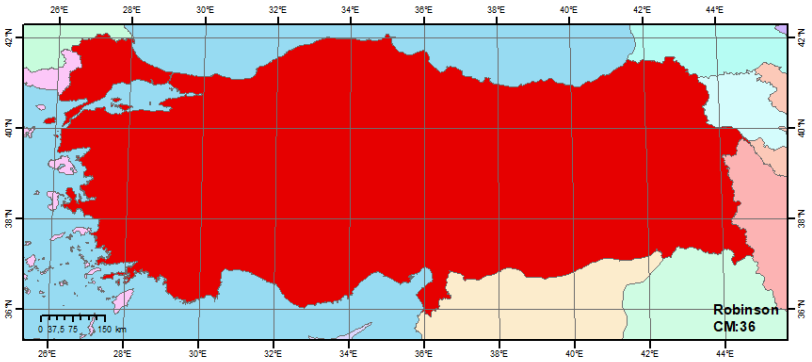
Logic

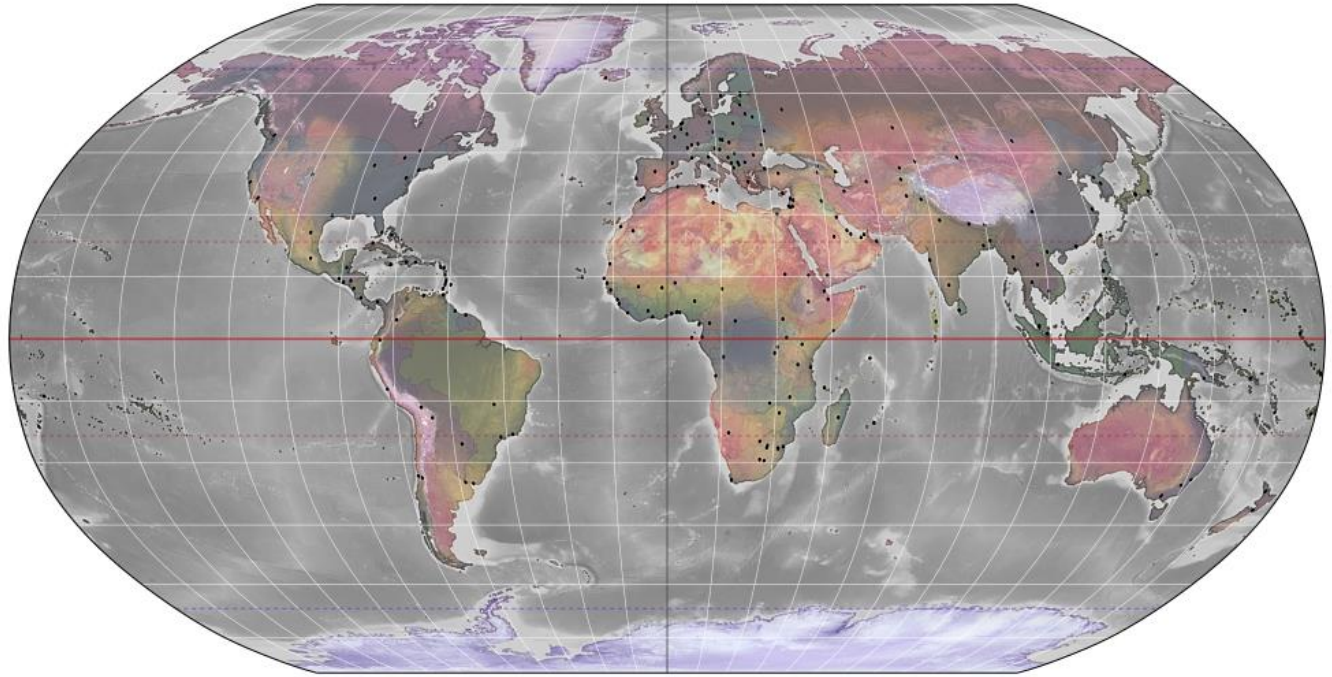
Maintain the equator length
Maintain the central meridian length
Poles are equal to **0.5322** times equator

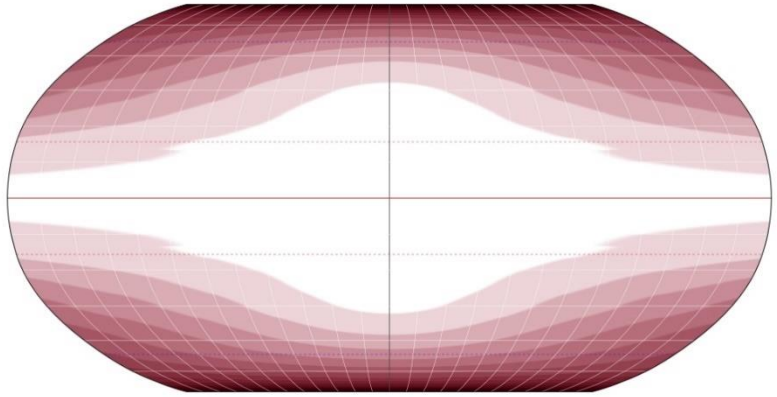
lat ϕ, in degrees	X	Y
90	0.5322	1.0000
85	.5722	.9761
80	.6213	.9394
75	.6732	.8936
70	.7186	.8435
65	.7597	.7903
60	.7986	.7346
55	.8350	.6769
50	.8679	.6176
45	.8962	.5571
40	.9216	.4958
35	.9427	.4340
30	.9600	.3720
25	.9730	.3100
20	.9822	.2480
15	.9900	.1860
10	.9954	.1240
5	.9986	.0620
0	1.0000	.0000

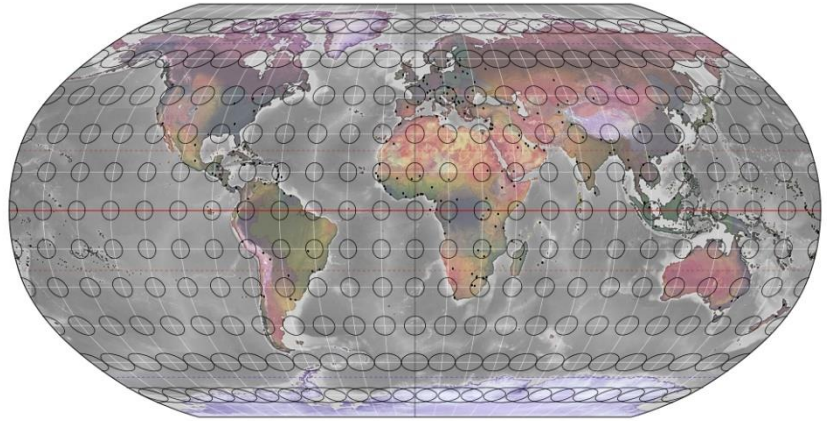
Features of Projection

- Entire world.
- Parallels are straight lines parallel to the equator.
- Parallel spaces are equal.
- Meridians are circular arcs.
- Meridian spaces are equal at any parallel.
- The equator and its immediate surroundings have low error.
- Distortion rates increase away from the equator.

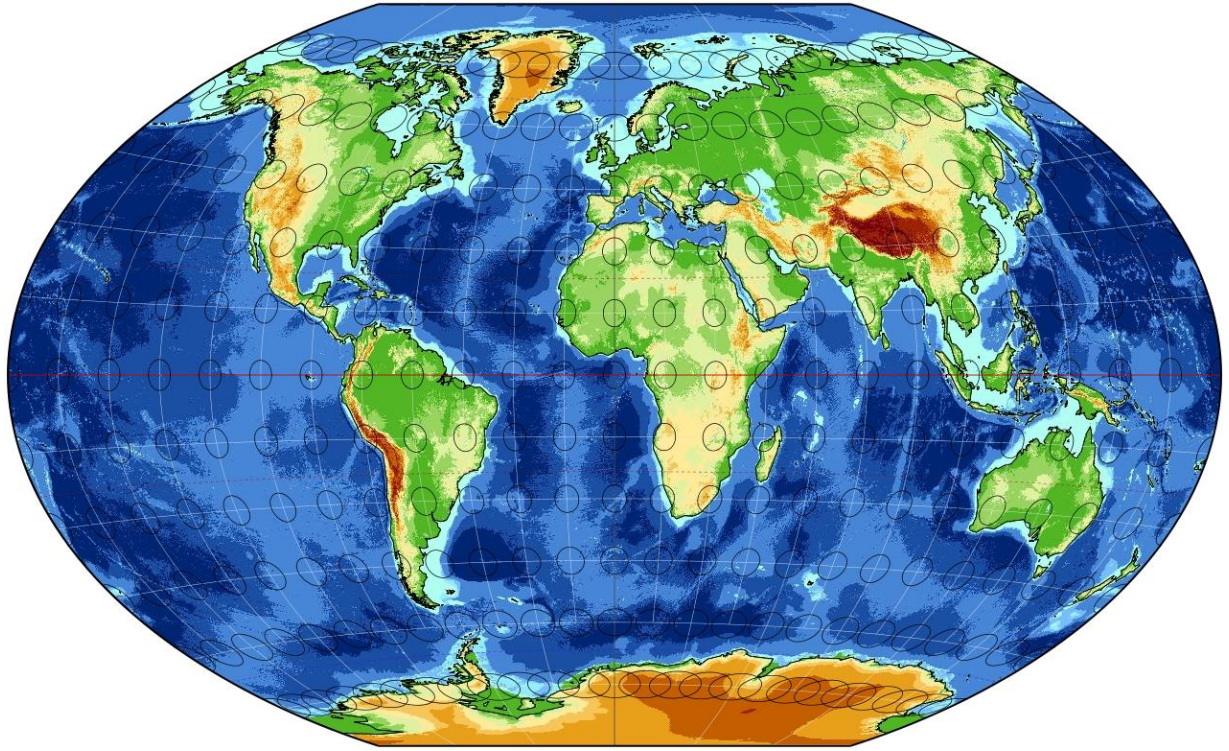






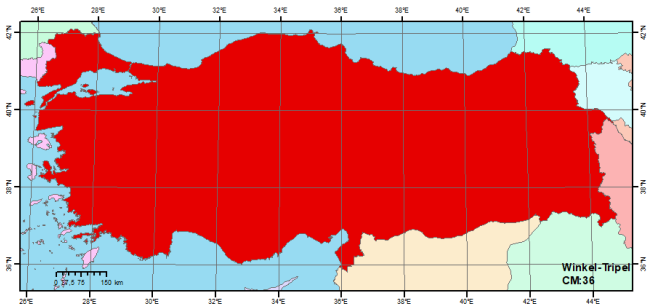


WİNKEL-TRİPEL PROJECTİON

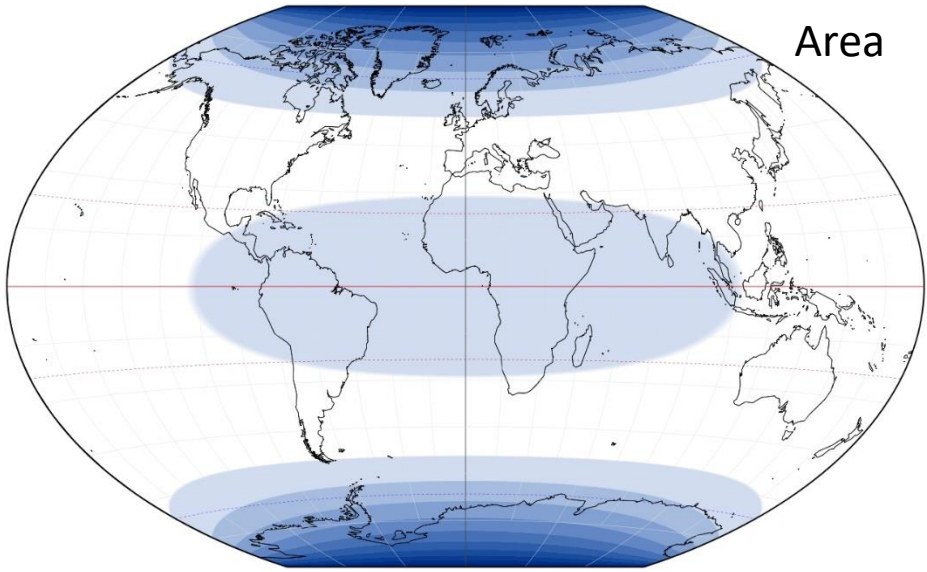


Central Meridian=0,61 equator

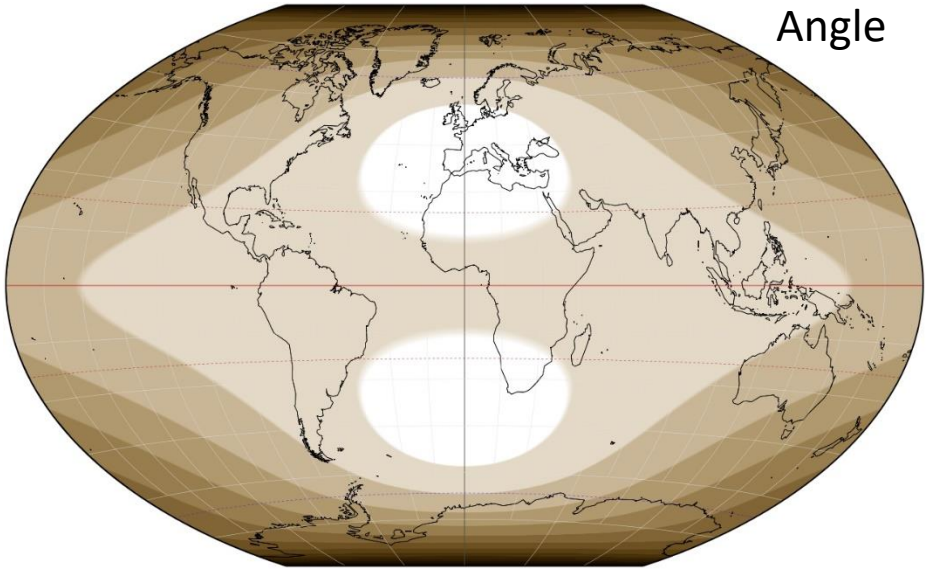
Poles=0,4 Equator



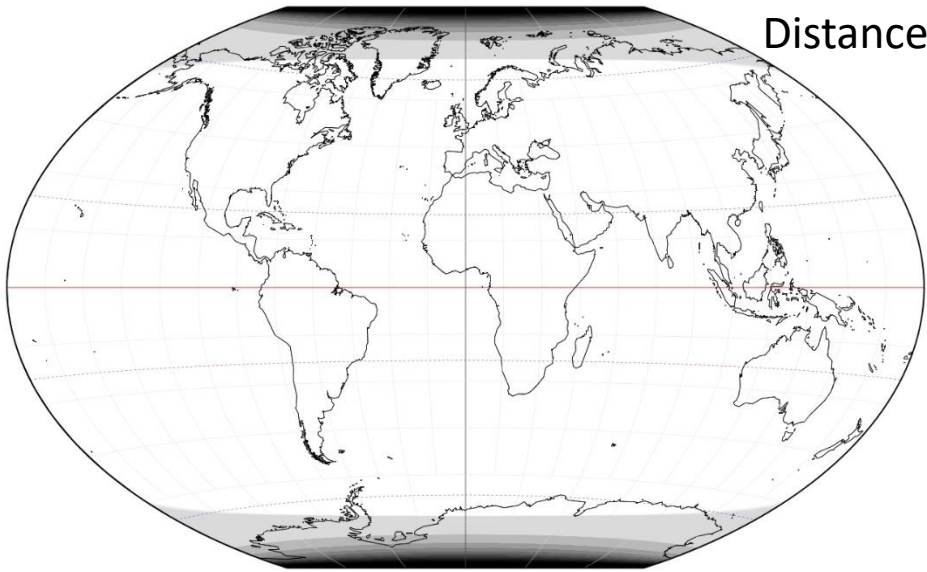
Oswald Winkel, 1921



Area

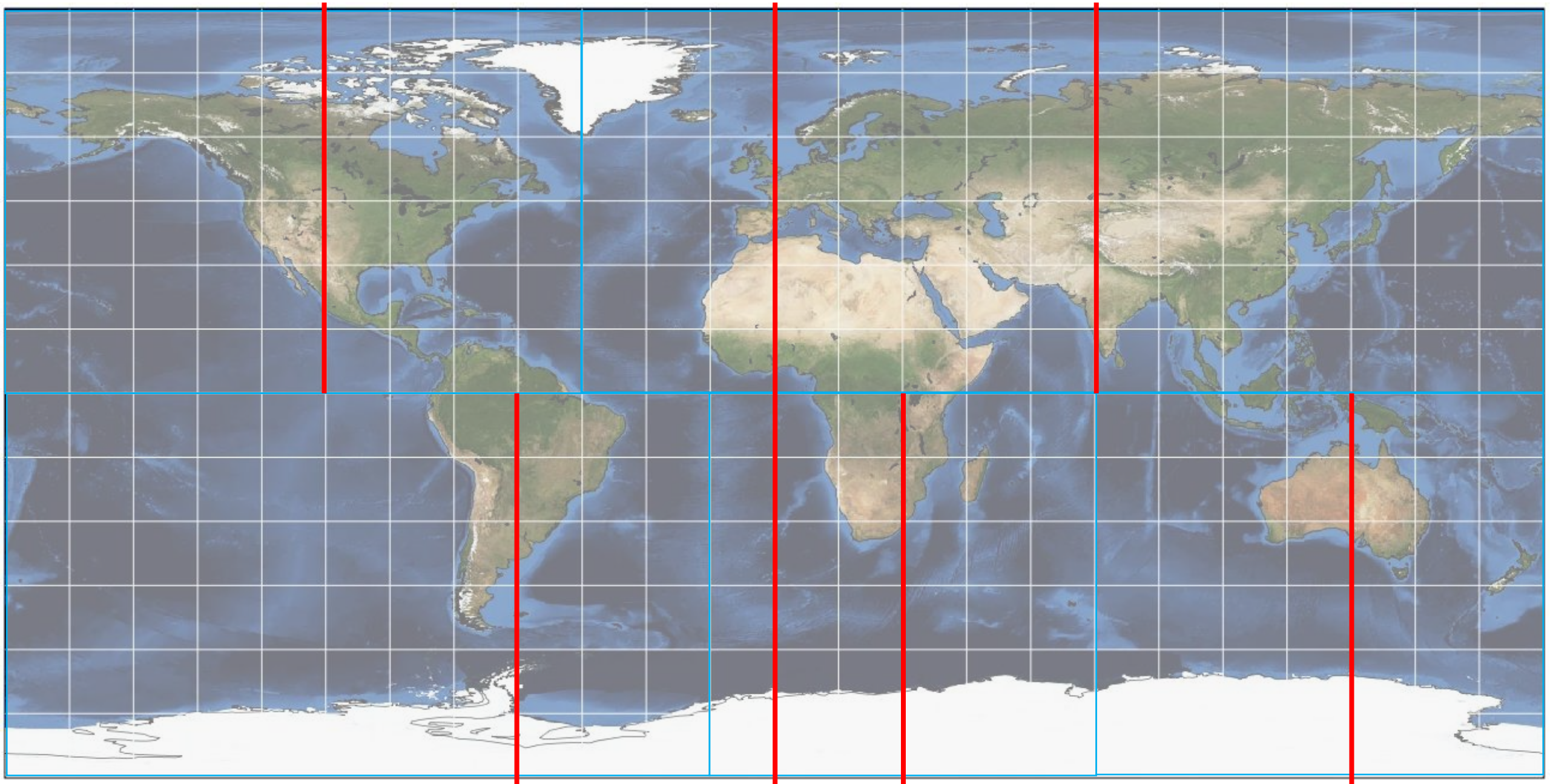


Angle

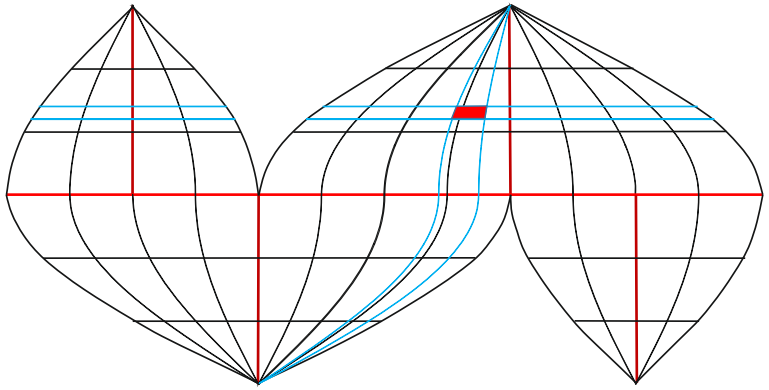


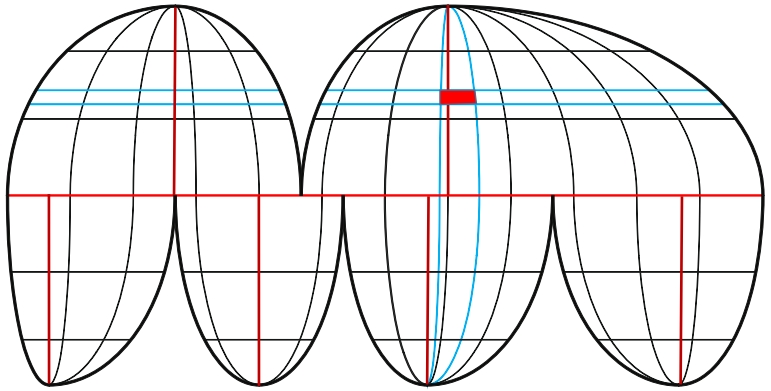
Distance

Duplicating Central Meridians



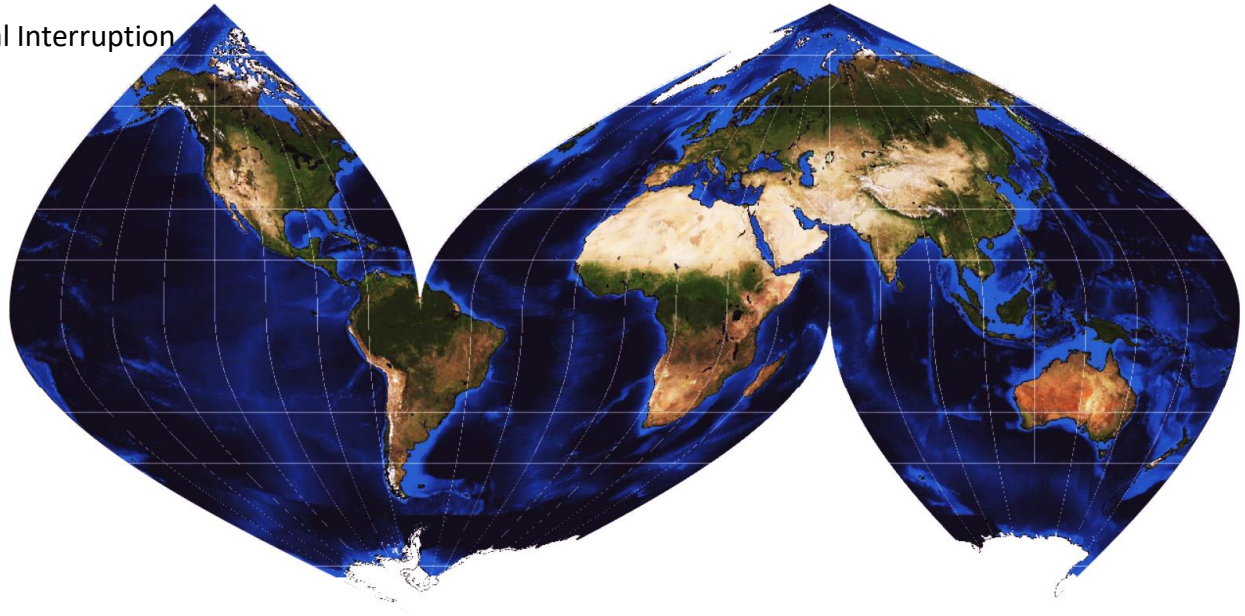
Interrupted Sinusoidal and Mollweide Projections



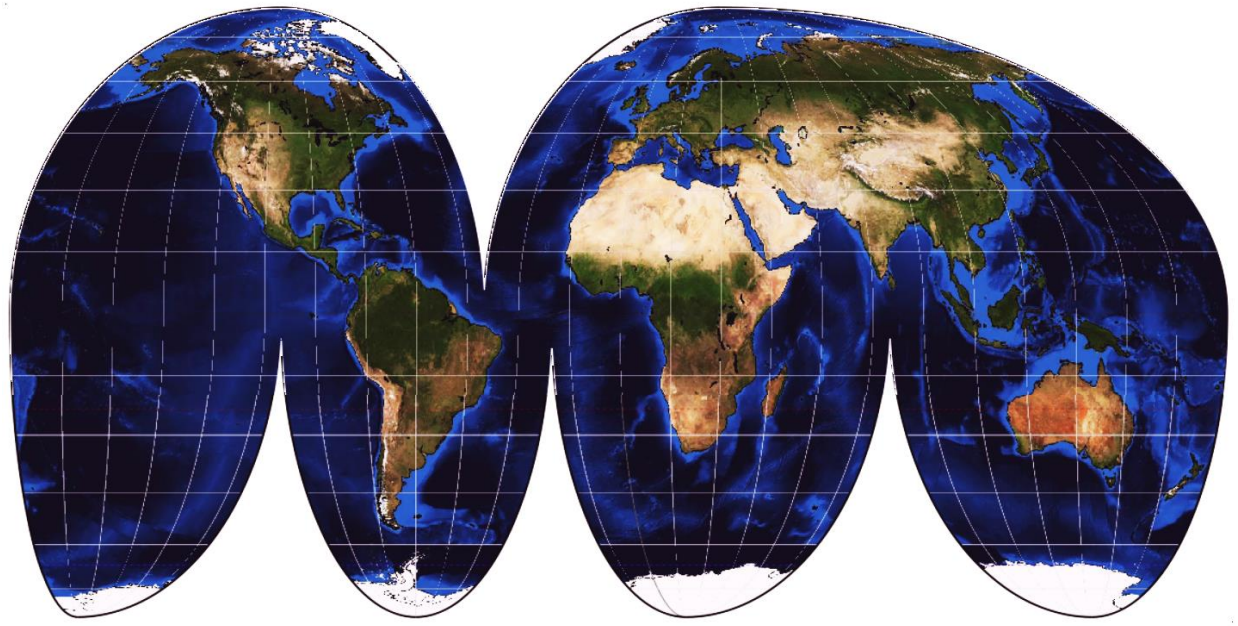


0 2000 km

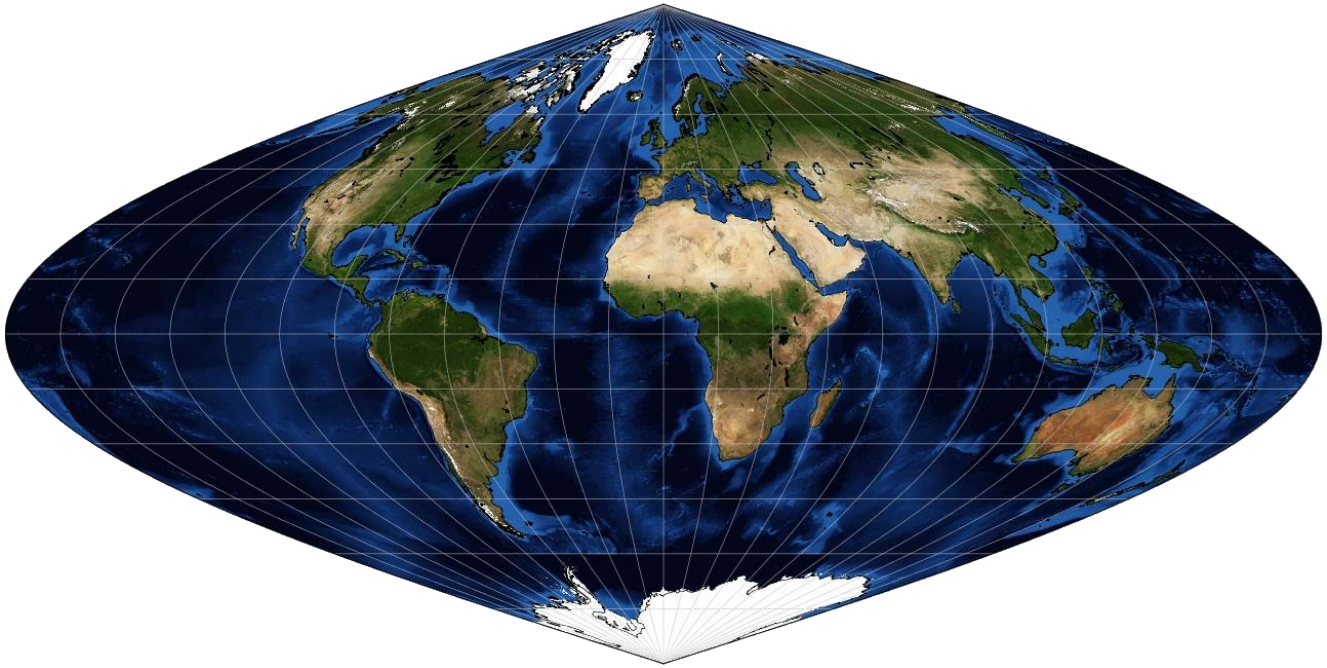
Sinusoidal Interruption

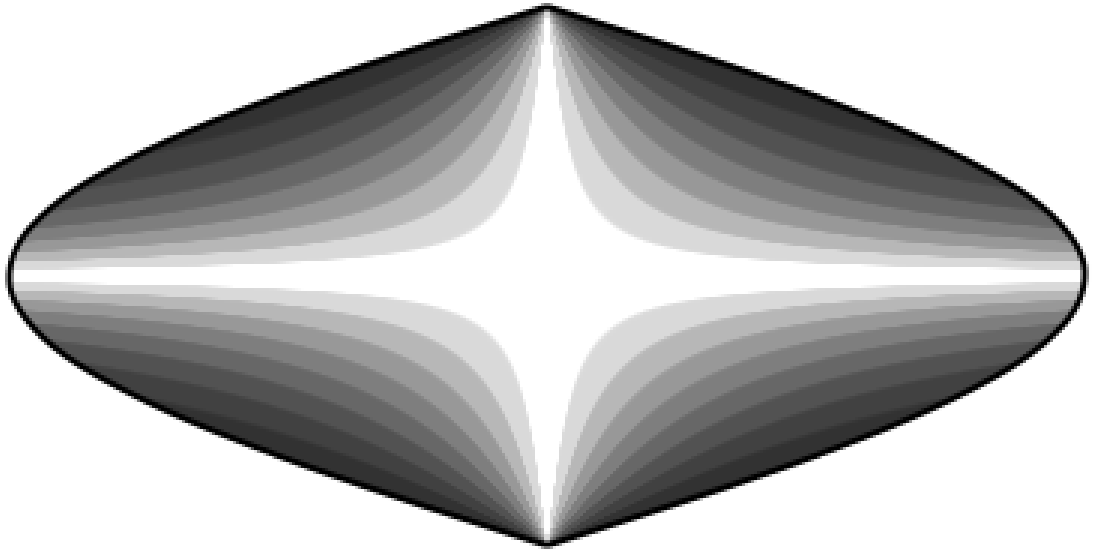


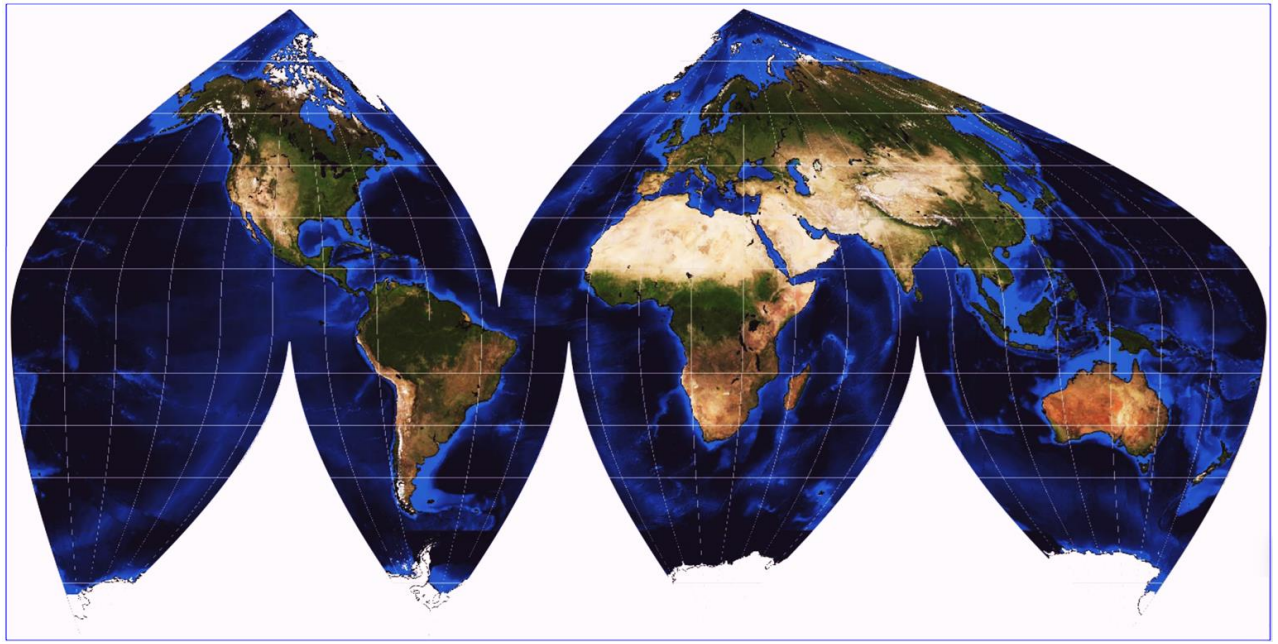
Boogs Interruption

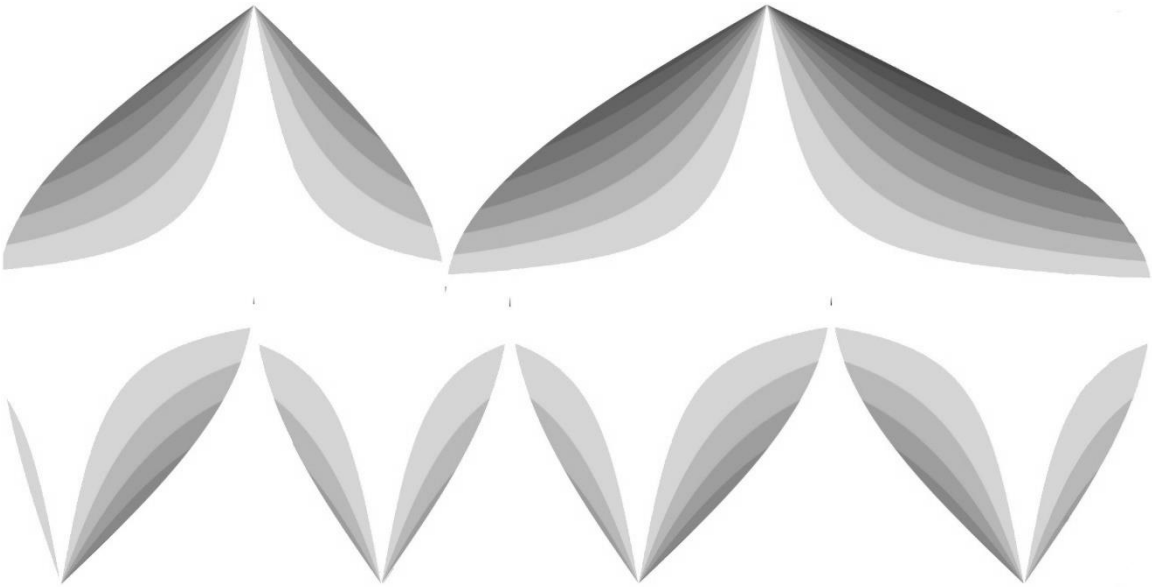


Why are we using interruptions?



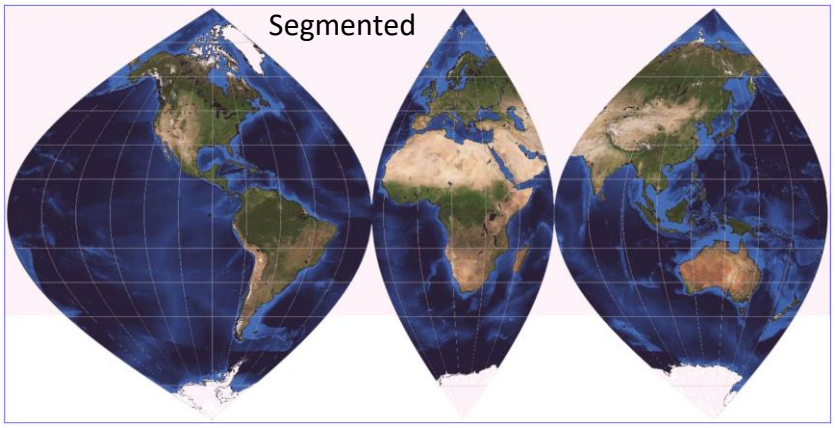


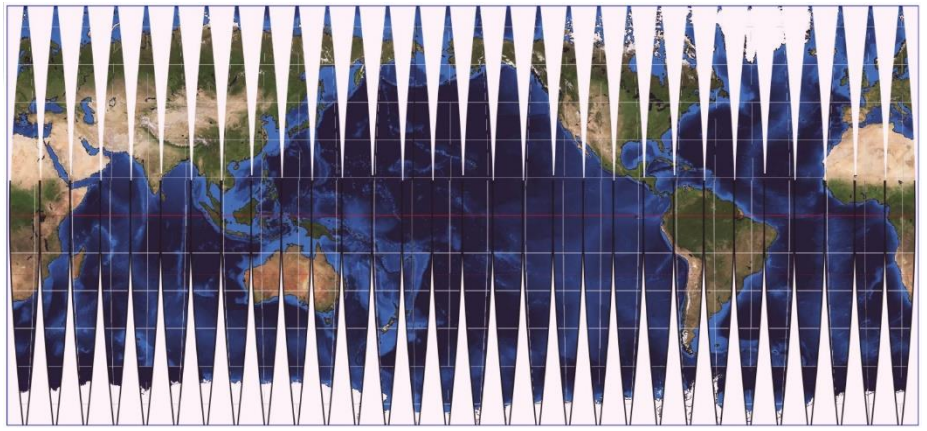




Interruptions

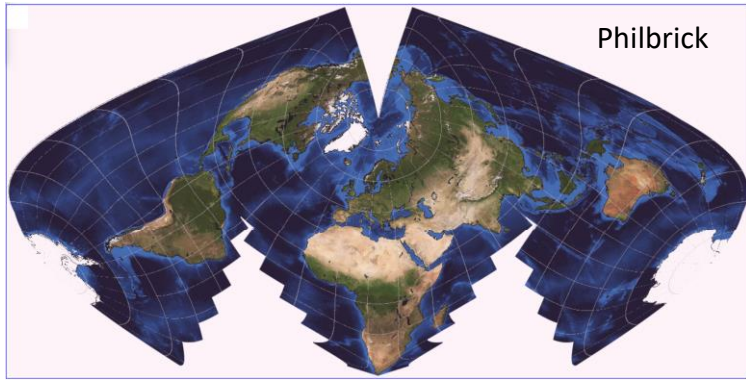
Segmented



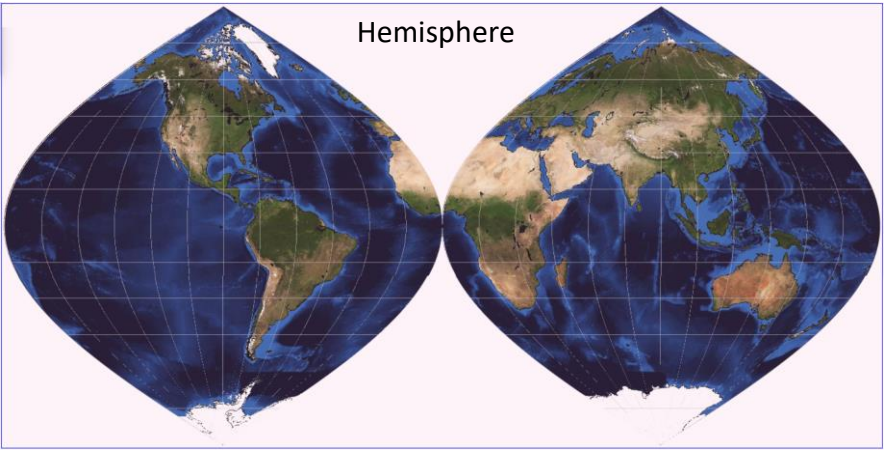


Gores 30

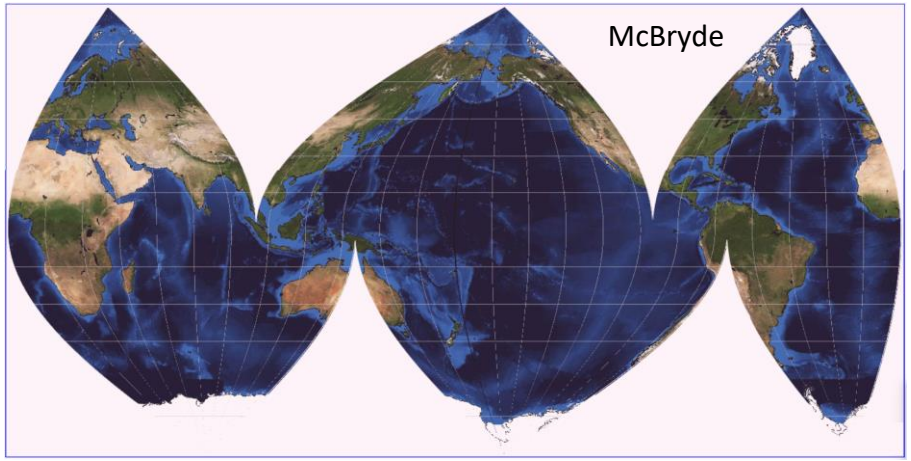
Philbrick



Hemisphere



McBryde



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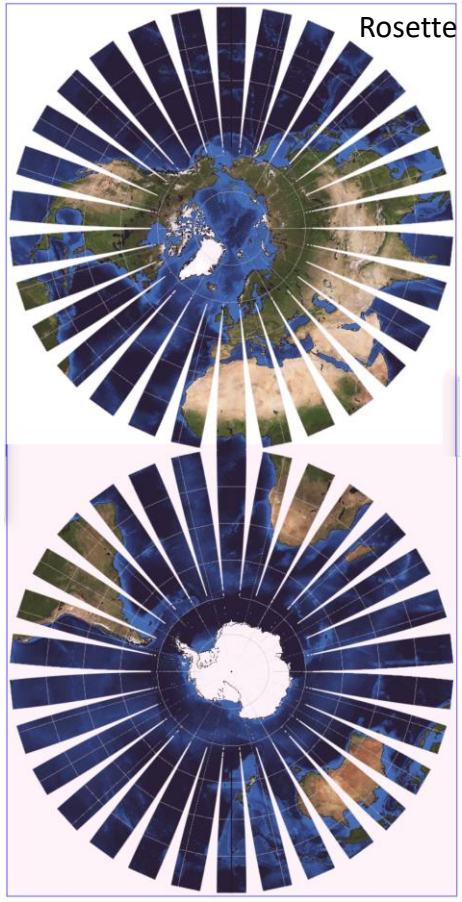
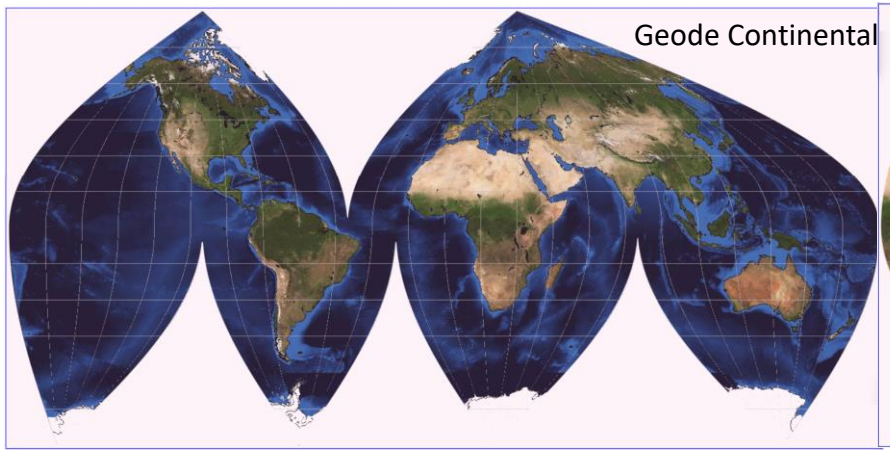
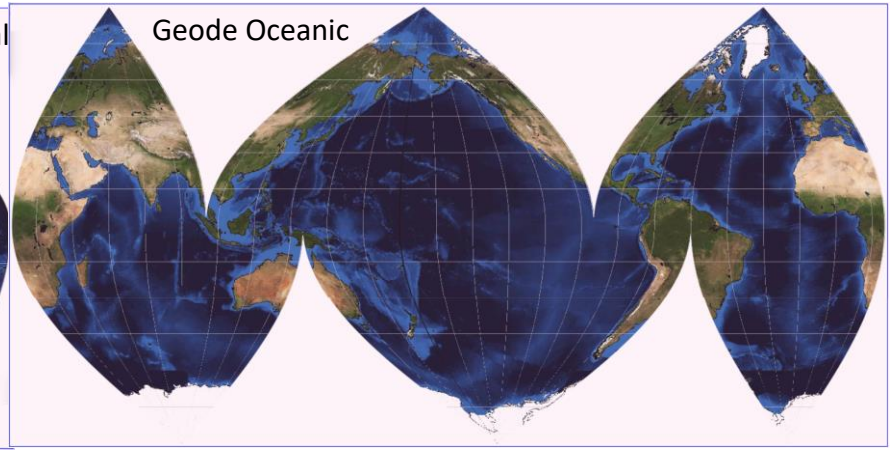
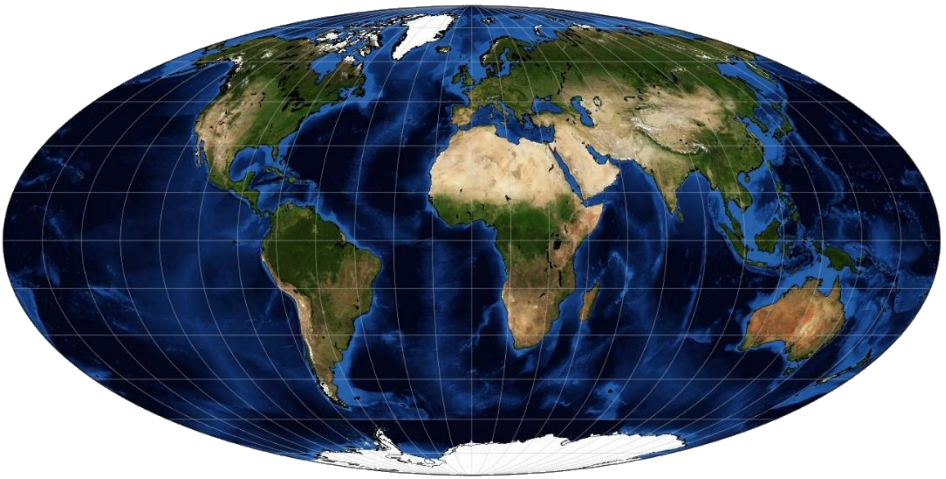
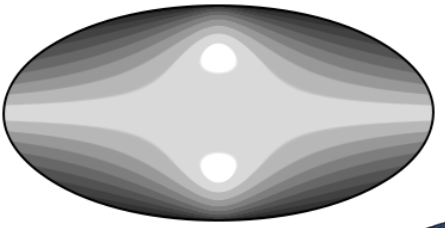
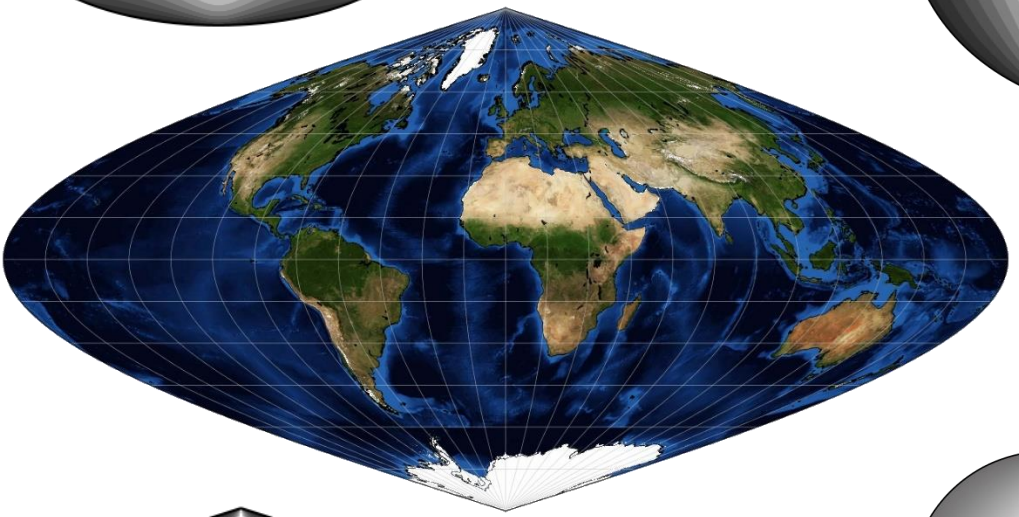
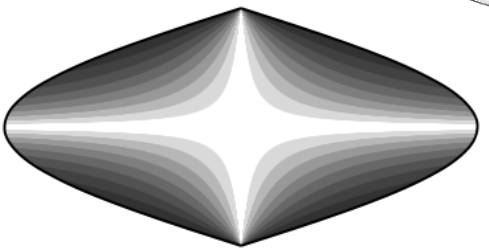
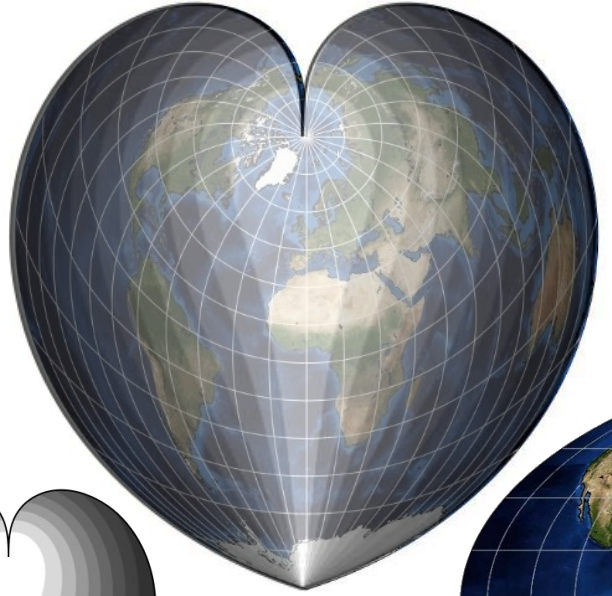
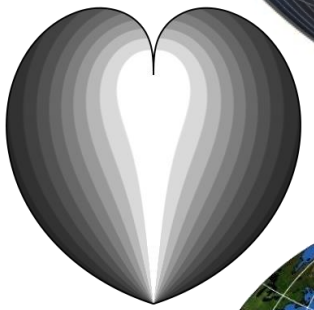
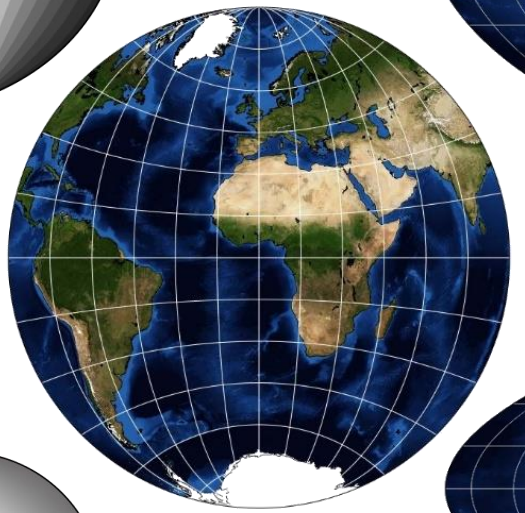
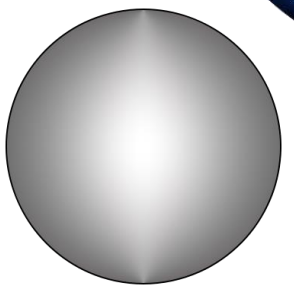
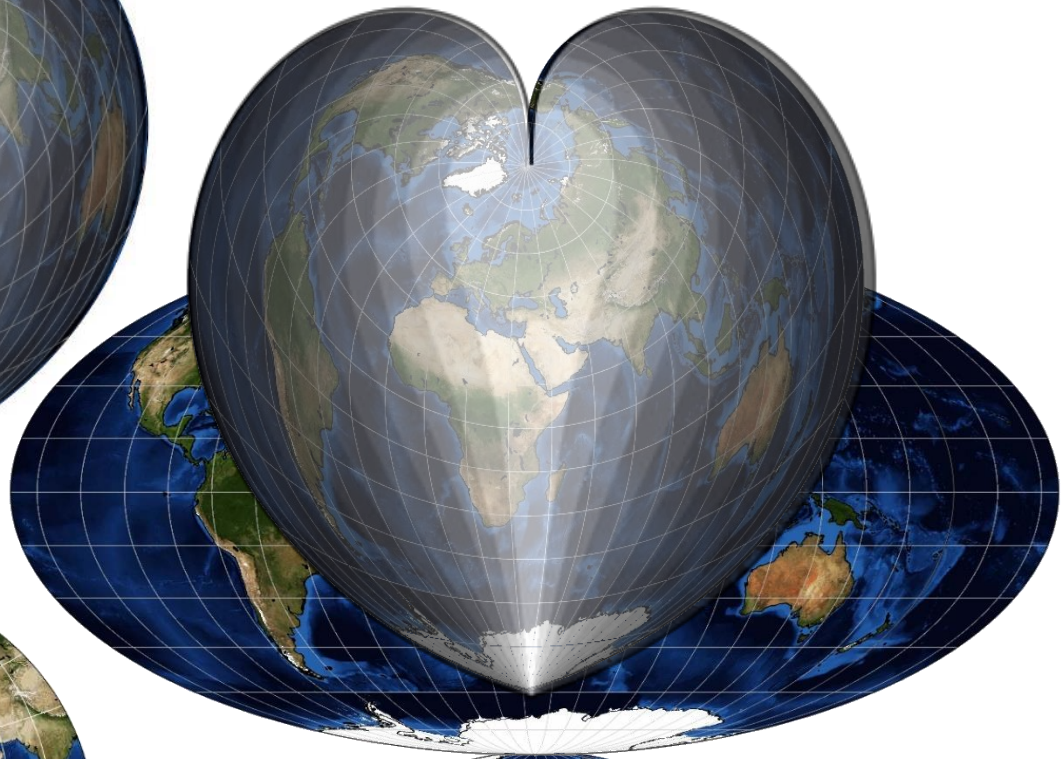
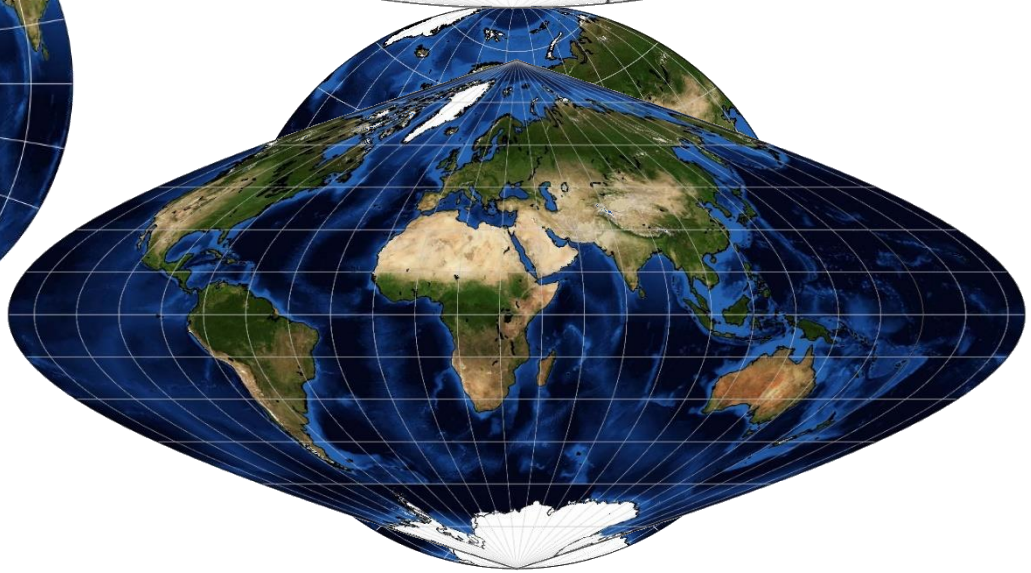


Geode Continental



Geode Oceanic



Changing Central Meridian