
NORTH AMERICA
SIBERIA
NORTH ATLANTIC


GRAND CANYON

Maps


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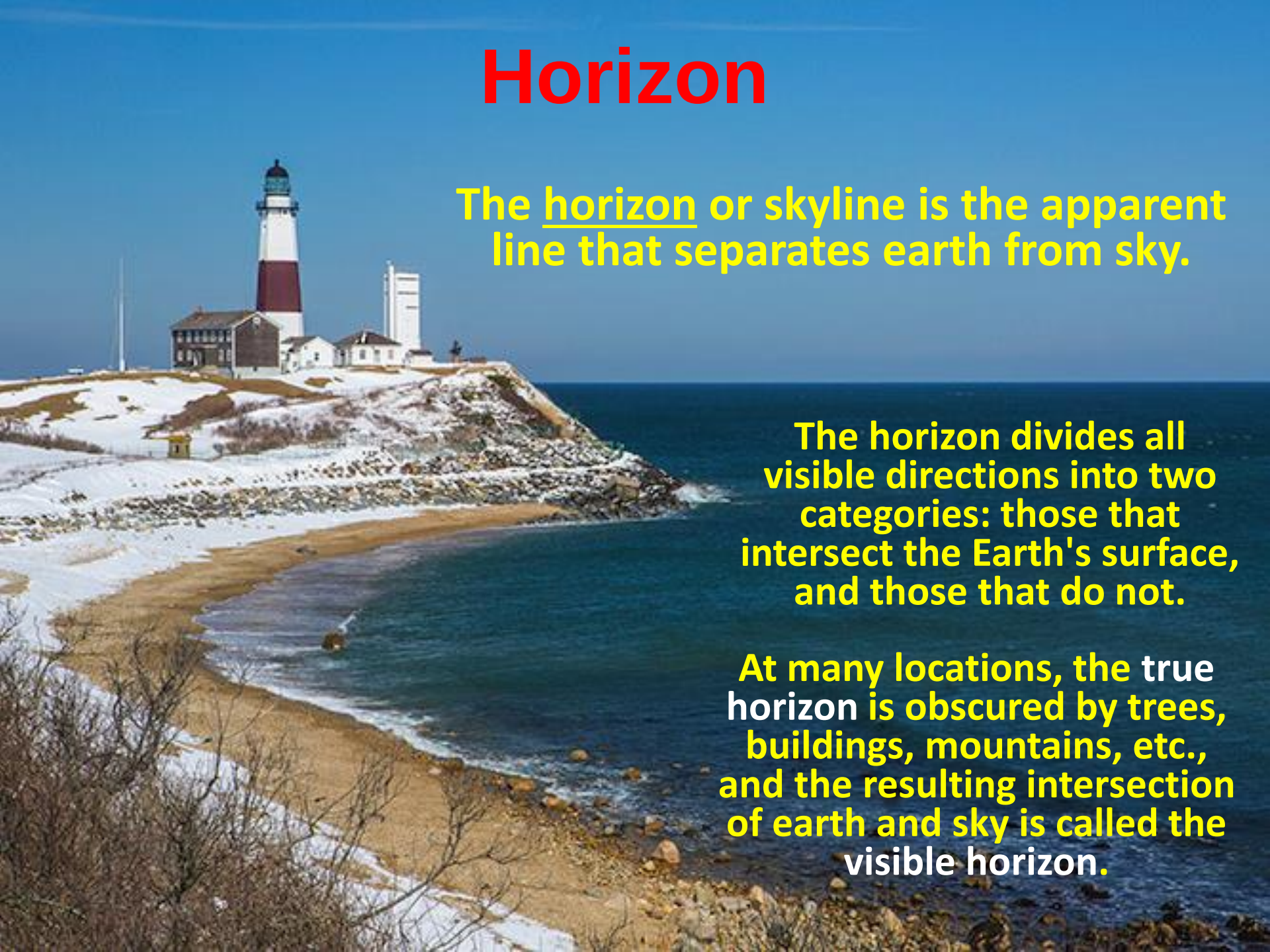
Horizon



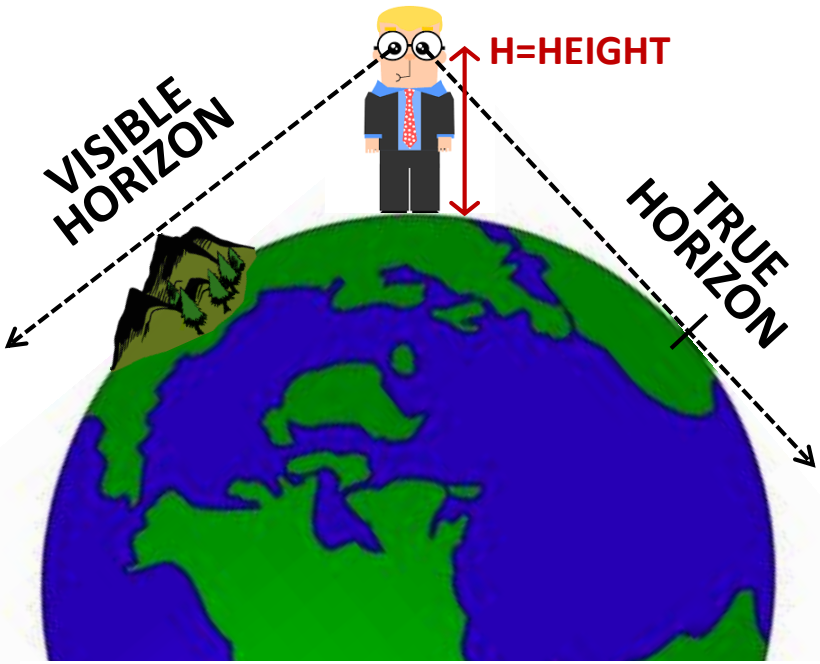
The horizon or skyline is the apparent line that separates earth from sky.

The horizon divides all visible directions into two categories: those that intersect the Earth's surface, and those that do not.

At many locations, the true horizon is obscured by trees, buildings, mountains, etc., and the resulting intersection of earth and sky is called the visible horizon.

How Far is the Horizon?

Historically, the distance to the horizon has long been vital to survival and successful navigation, especially at sea.

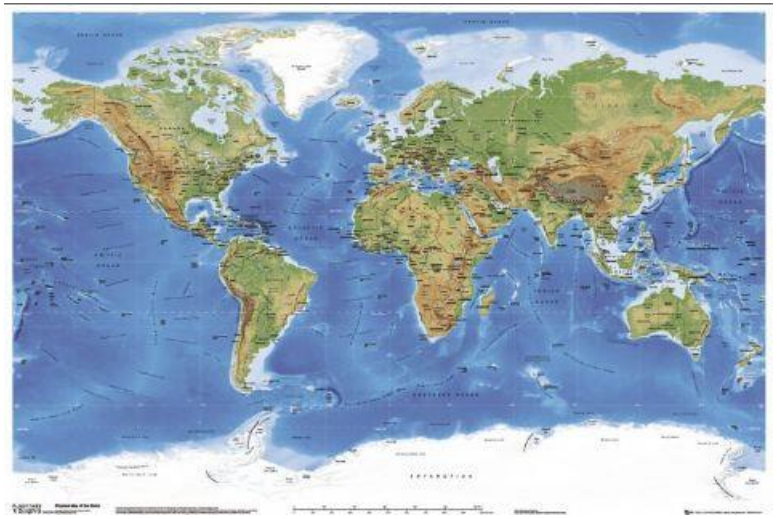


OBSERVER	HEIGHT	DISTANCE to TRUE HORIZON
On the ground	1.7 m (5 ft 7 in)	4.7 km (2.9 mi)
At the Eiffel Tower observation deck	276 m (906 ft)	58.7 km (37 mi)
Atop Mount Everest	8,848 m (29,029 ft)	336 km (209 mi)

In reality, one typically sees further along the Earth's curved surface than a simple geometric calculation allows for because of downward light refraction in the atmosphere. With standard atmospheric conditions, the difference is about 8%.

From Globe to Map

- A map is a graphic representation of geographic information on a flat surface.
- Transferring information from the spherical, or ball-shaped, surface of Earth onto a flat piece of paper is called projection.

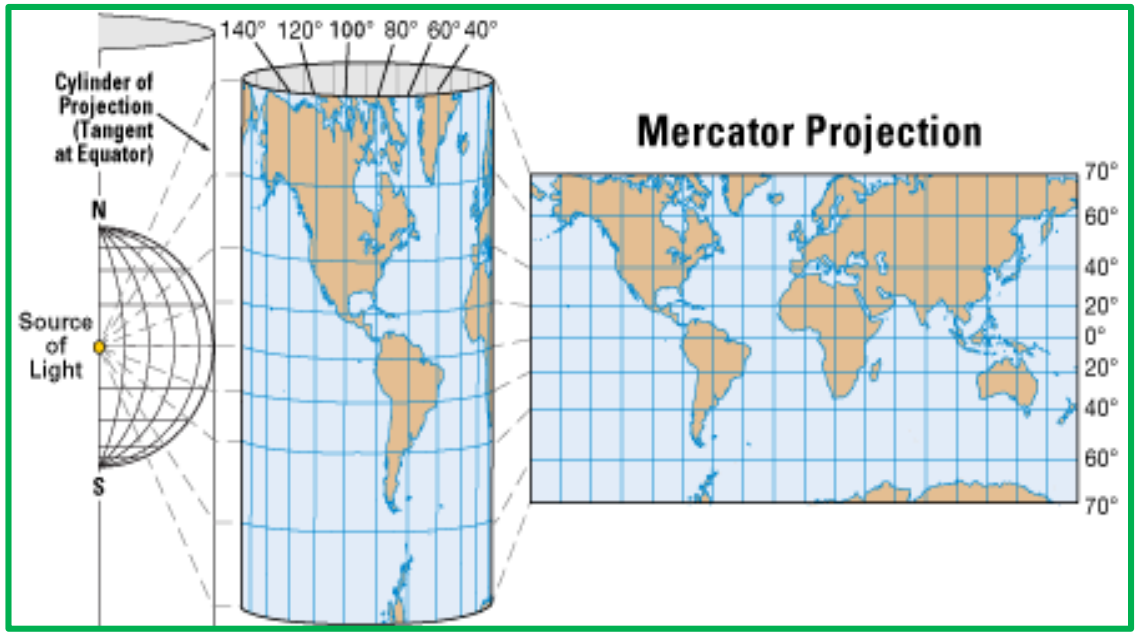


A globe, a spherical model of Earth, accurately represents the shapes and locations of the continents.

What about a map?

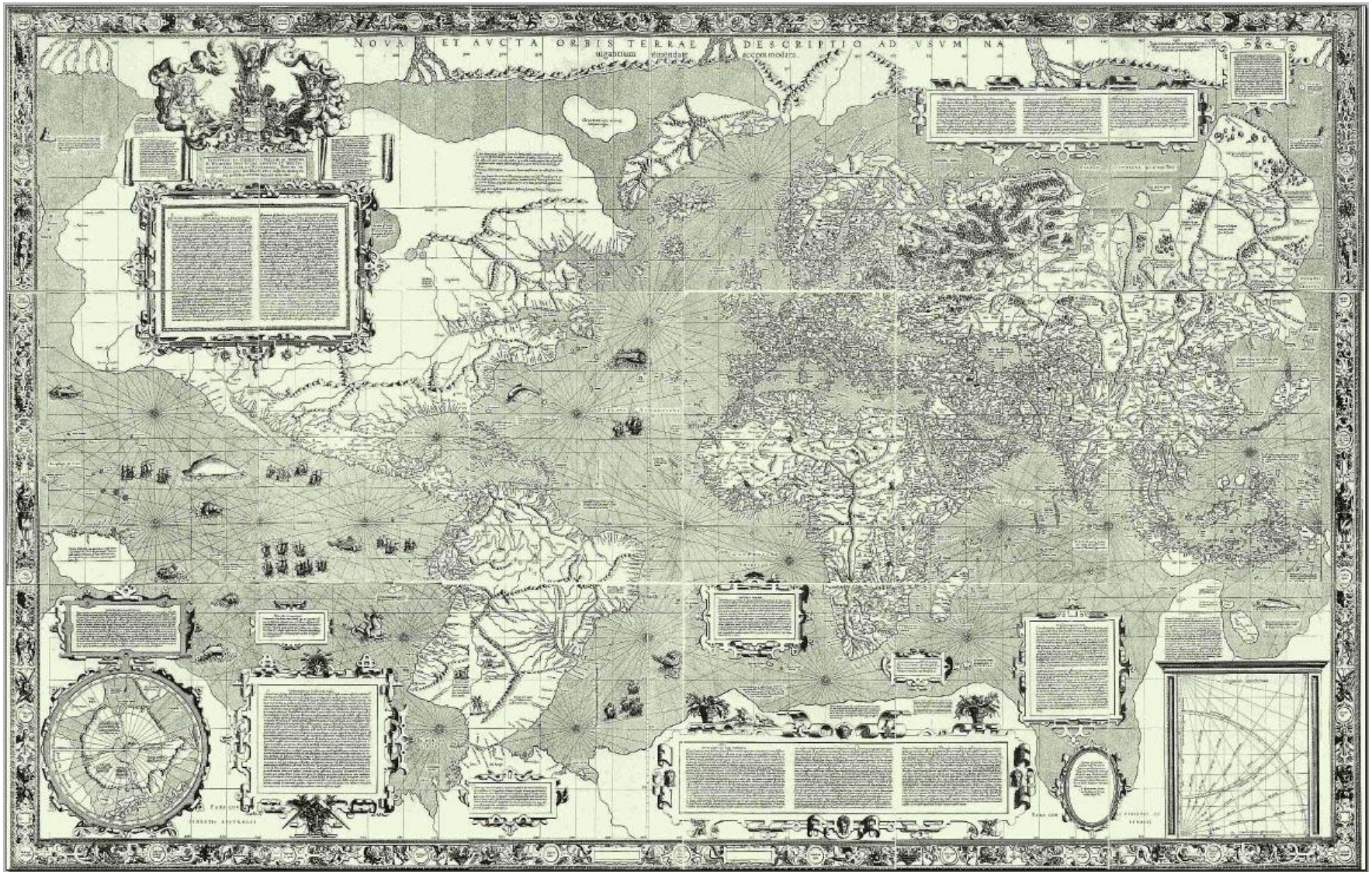
Map Projections

Projection is a **major challenge** for cartographers. Every map has some sort of **distortion**: it can retain ***either*** **the correct sizes** of landmasses ***or*** **the correct shapes** of very small areas, **but not both**.



- **Cylindrical** (Mercator): projection onto a tube that is wrapped around the globe and touches it along one line, most often the Equator (the regions **near the Equator** are the **most accurate**, regions **near the poles** are the **most distorted**).

1679 Mercator Map of the World

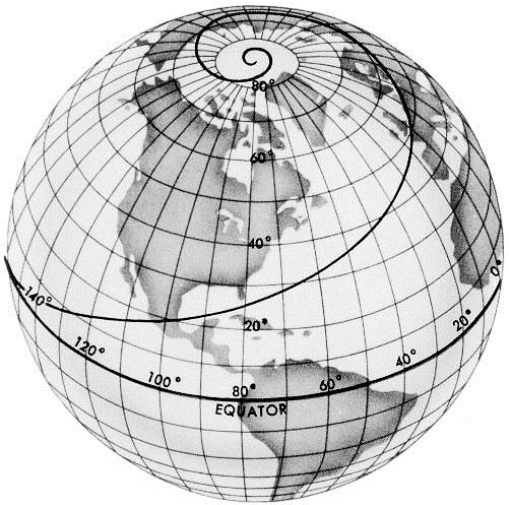


Direction: Tricky Questions

Where are you going to get to if you go:

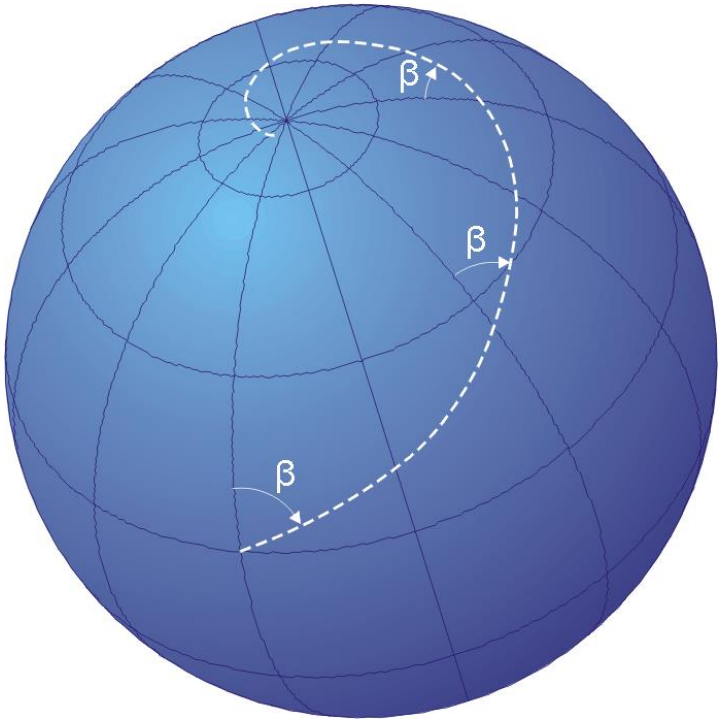
North? **South?**
West? **East?**

Northeast? **ENE?**
Southwest? **WSW?**



Direction on the Globe

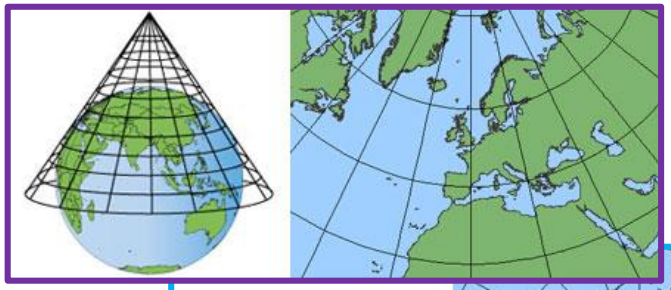
- In navigation, a **rhumb line** (*loxodrome*) is a **path with constant bearing** (**constant course**) as measured relative to true or magnetic north; it is an <u>arc crossing all meridians of longitude at the same angle</u>.

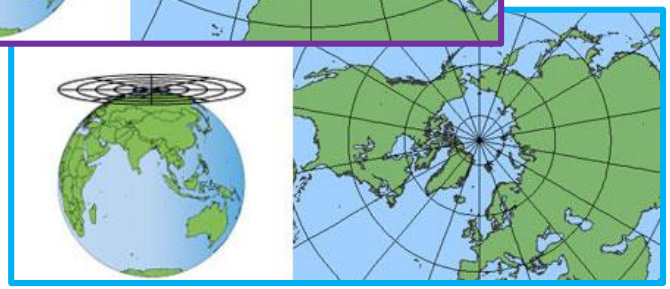


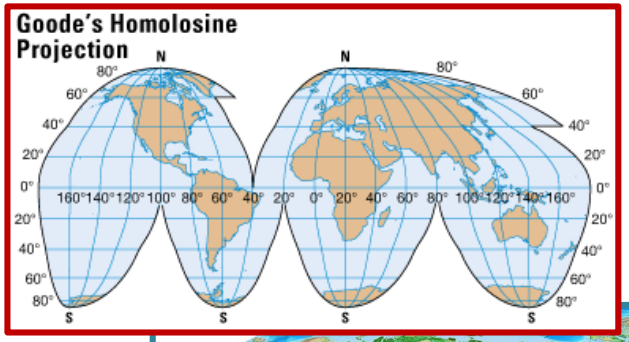
- Early navigators in the time before the invention of the marine chronometer used rhumb line courses on long ocean passages, because the ship's latitude could be established accurately by sightings of the Sun or stars but there was no accurate way to determine the longitude.

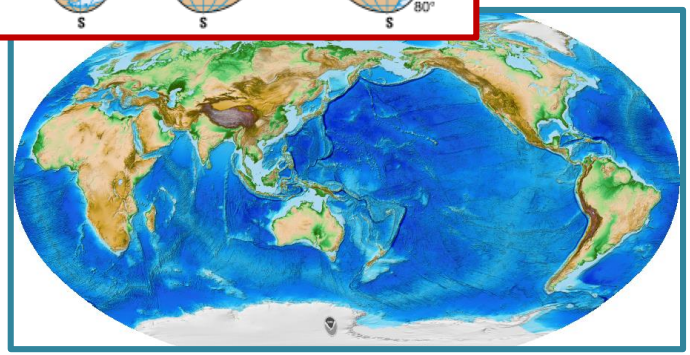
- On a <u>Mercator projection</u> map, ***a rhumb line is a straight line***, which makes this projection uniquely suited to marine navigation!

More Map Projections



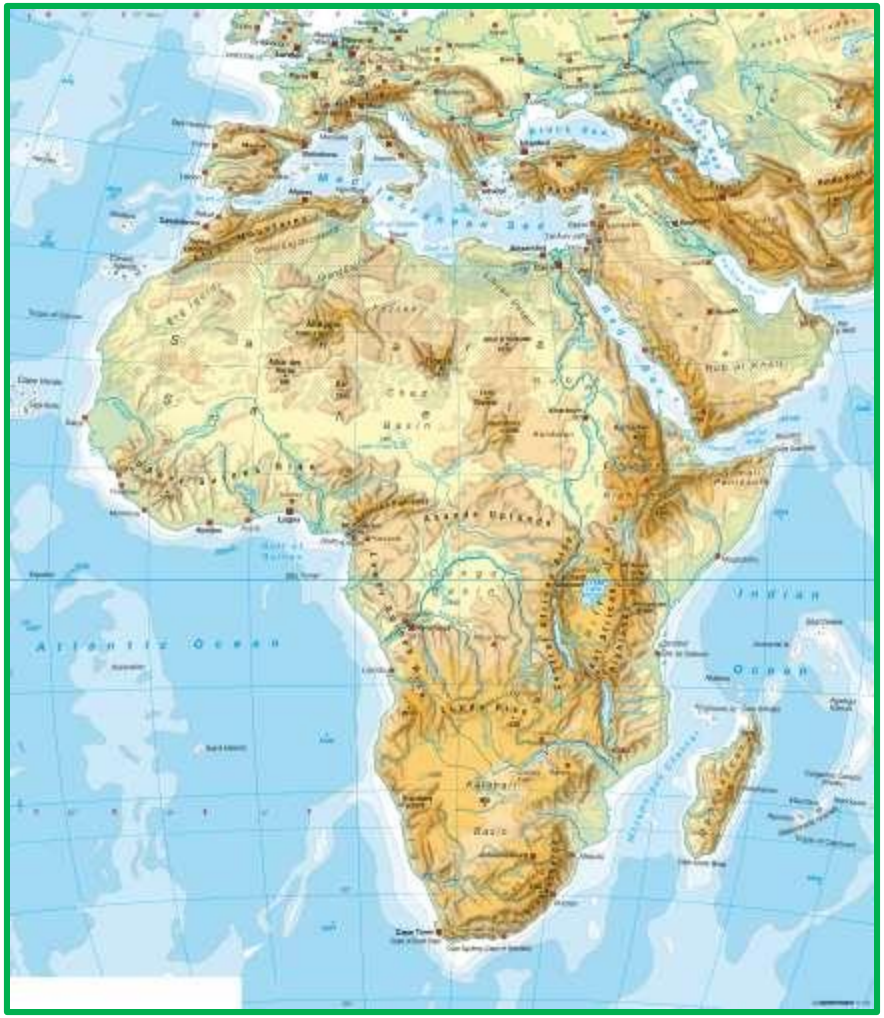






- **Conical**: projection on a flattened cone, with curved lines of latitude and straight meridians (great for mapping mid-latitudes, for example the US Map).
- **Planar**: projection onto a plane with a single point of contact (most accurate at that point; often used for maps of one of the poles).
- **Interrupted**: "orange-peel map" equal-area projection (preserves area measure, generally distorting shapes).
- **Winkel-Tripel**: compromise projection; it minimizes all three kinds of distortion - area, direction and distance.

Types of Maps



Physical

Political