

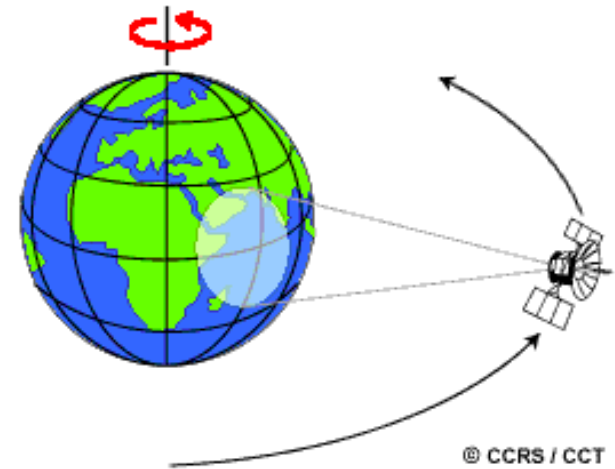
Cartography and Georeference

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Cartography and Geodesy

- Data without reference and coding is *non-spatial or aspatial* and would have no value at all within a geographic information system.
- *Geocoding or (georeferencing)* is the name commonly given to the process of converting object addresses to latitude and longitude, or some similarly universal coordinate system
- *Geometry and projection*
the complex ways in which humans refer to specific locations on the planet, and how they measure locations.

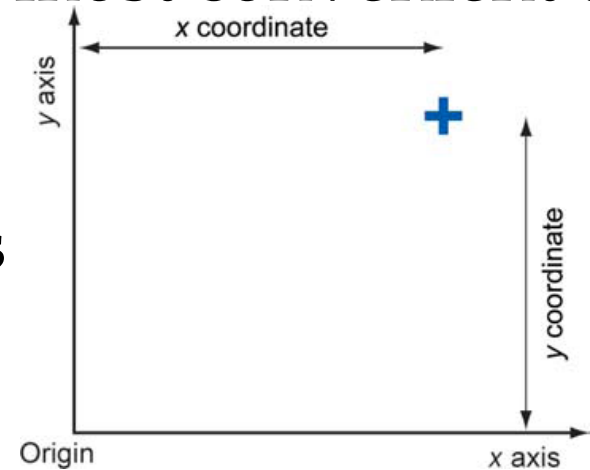


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Map projection and coordinates: in order to see the whole Earth with approximately equal detail it must be distorted in some way, and it is most convenient to make it flat in terms of x and y.

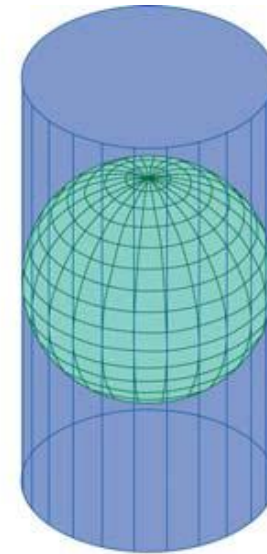
- *The conformal property*, the shapes of small features on the Earth's surface are preserved on the projection (X,Y).

- *The equal area property*, areas on the map are in the same proportion to areas on the Earth's surface.

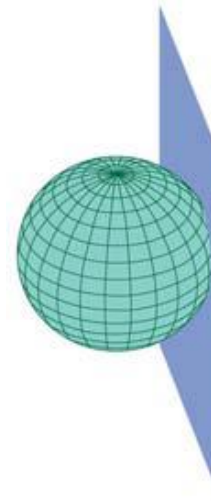


There are three physical models to identify the map projection:

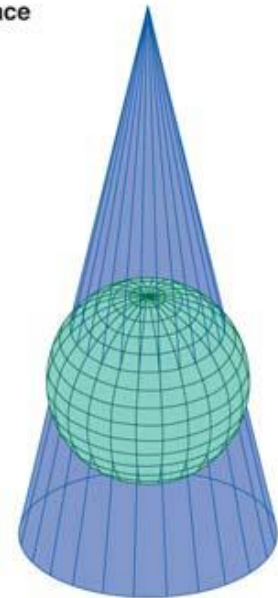
- Cylindrical projections
- Azimuthal or planar projections
- Conic projections



Cylindrical Projection Surface



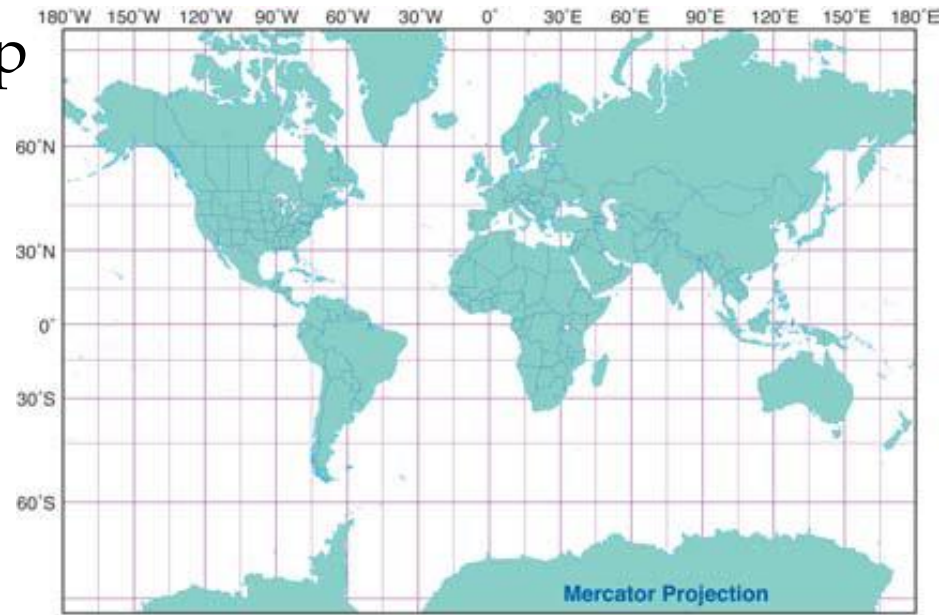
Secant Planar Projection



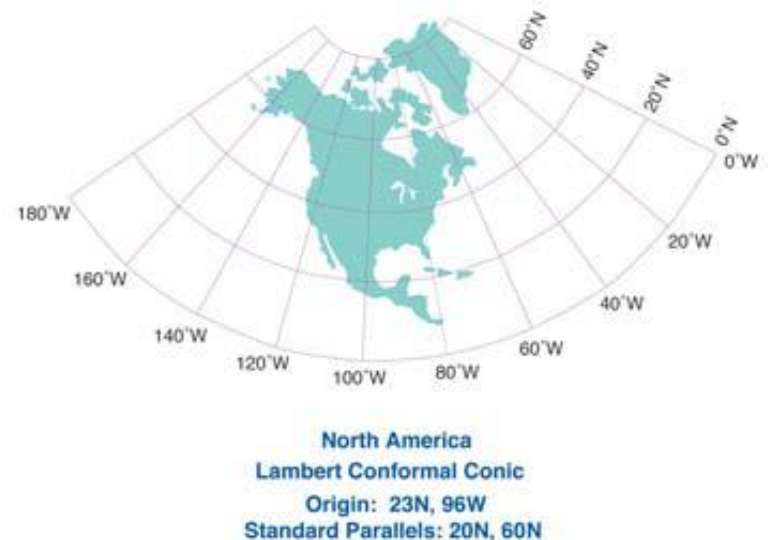
Secant Conic Projection

Examples of some common map projections.

The Mercator projection is a tangent cylindrical type, (cylinder wrapped around the Equator).

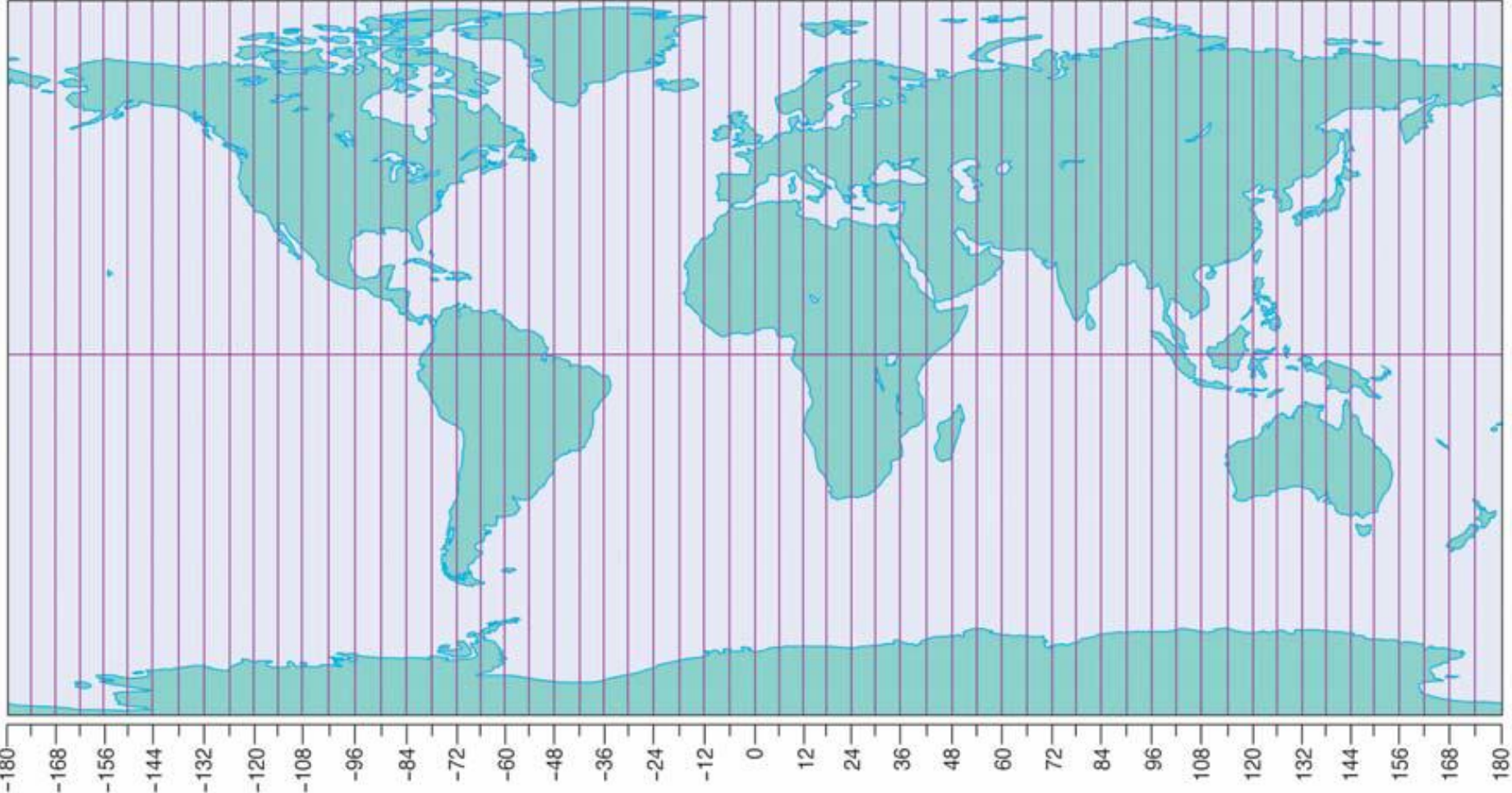


The Lambert Conformal Conic projection is a secant conic type, (the surface was projected intersected the Earth along two lines of latitude: 20 North and 60 North).



UTM Zone Numbers

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60



Universal Transverse Mercator (UTM) System

The coordinate system of the Egyptian Transverse Macerator (ETM)

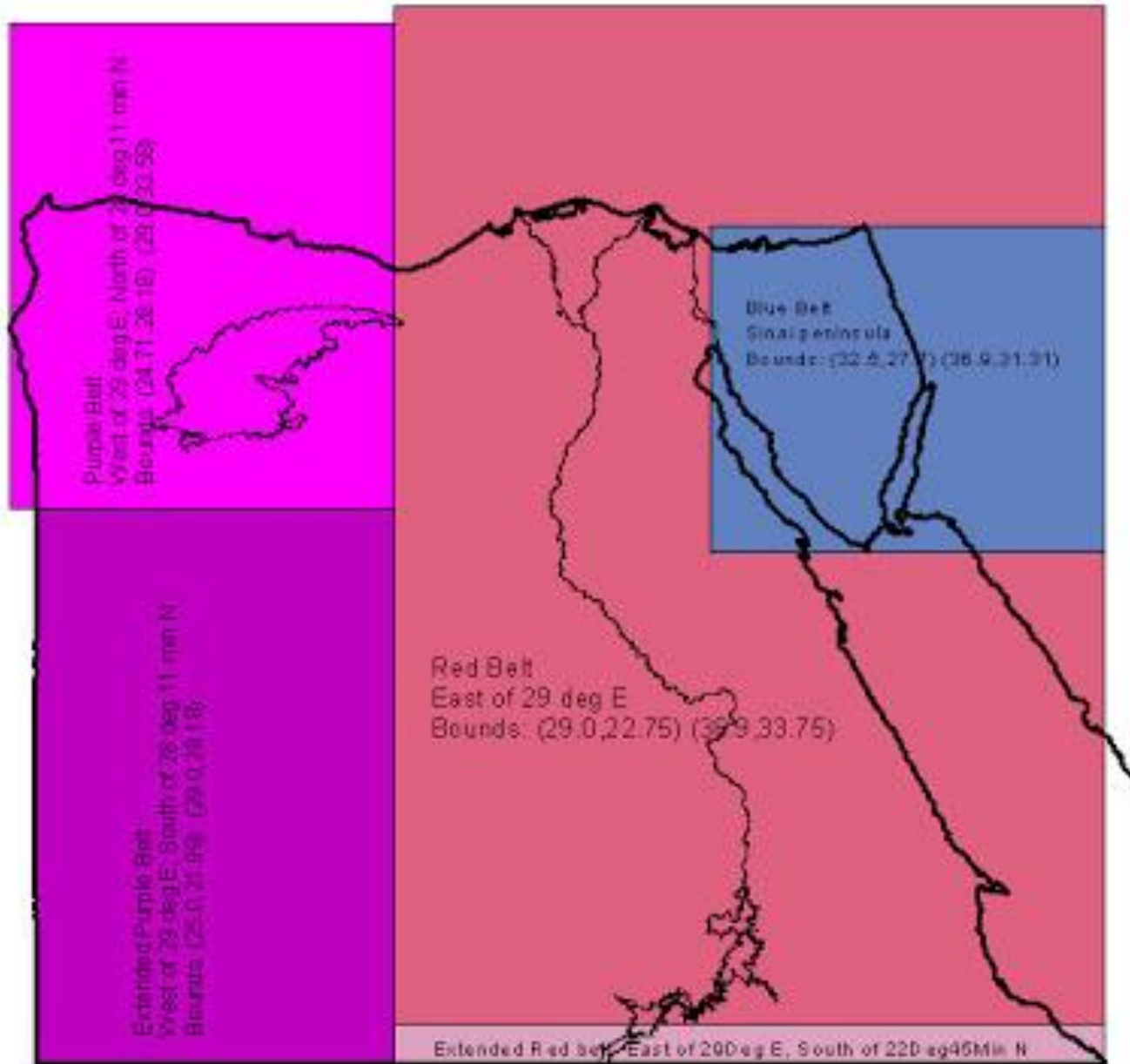
- Coordinate system consists of three maps Egyptian zones (called Belts), with Geodetic Datum Helmert 1906 Ellipsoid.

1- Red Belt: This belt covers the central region of Egypt and that of longitude 29 east to longitude 33 east.

2- Blue Belt: This belt covers the eastern region of Egypt and that of longitude 33 east to longitude 37 east.

3- Purple Belt: This belt covers the western region in Egypt and that of longitude 25 east to longitude 29 east.

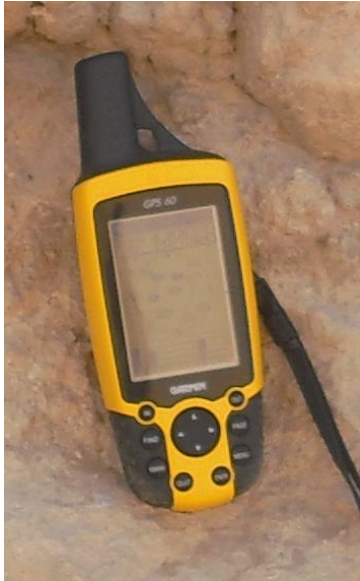
Old Egyptian 1907 Datum



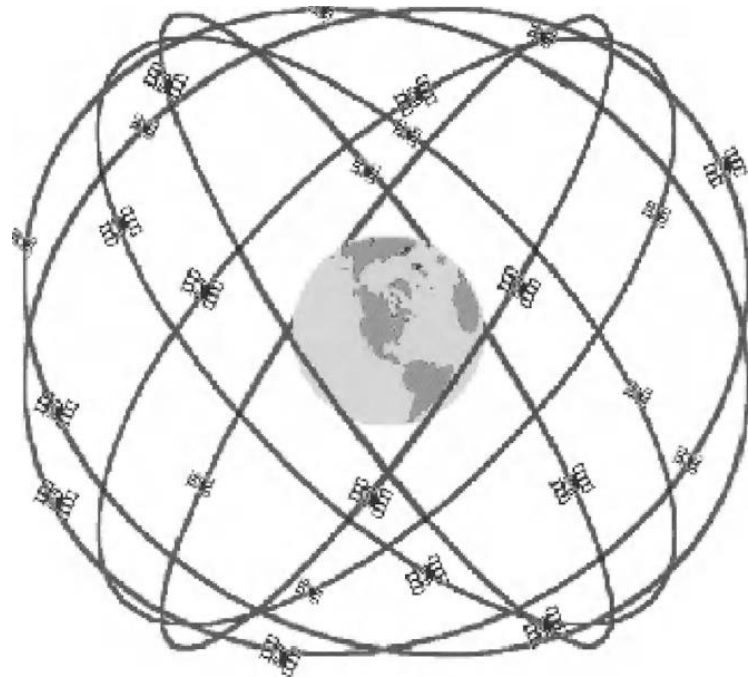
- New Egyptian Geodetic Reference-based GPS (network HARN) Modified Transverse Macerator (MTM) system will depend on the WGS84 geodetic reference .
- MTM divided Egypt into five segments or slides (not only 3 in the former regime).
- The only value that changes from one slide to another Longitude are as follows:
 - Slide 1: Longitude = 25 30
 - Slide 2: Longitude = 28 30
 - Slide 3: Longitude = 31 30
 - Slide 4: Longitude = 34 30
 - Slide 5: Longitude = 37

Global Position System (GPS)

The GPS is a satellite-based navigation system, originally developed by the US Department of Defense.



GPS device



Satellite system

Properties of GPS survey:

- Four GPS satellite signals are used to compute the position of any point in three dimensions on the Earth's surface.
- Select the geographic datum and projection
- Select map unit
- Trace trajectory and field track
- Reduction of the position error (Accuracies)
 - Low cost, single receiver: 10-30m
 - Medium cost, differential receiver: 50 cm-5 m
 - High cost, differential GPS: 1 mm to 1 cm.

Course materials

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