5.2 Conic Projections

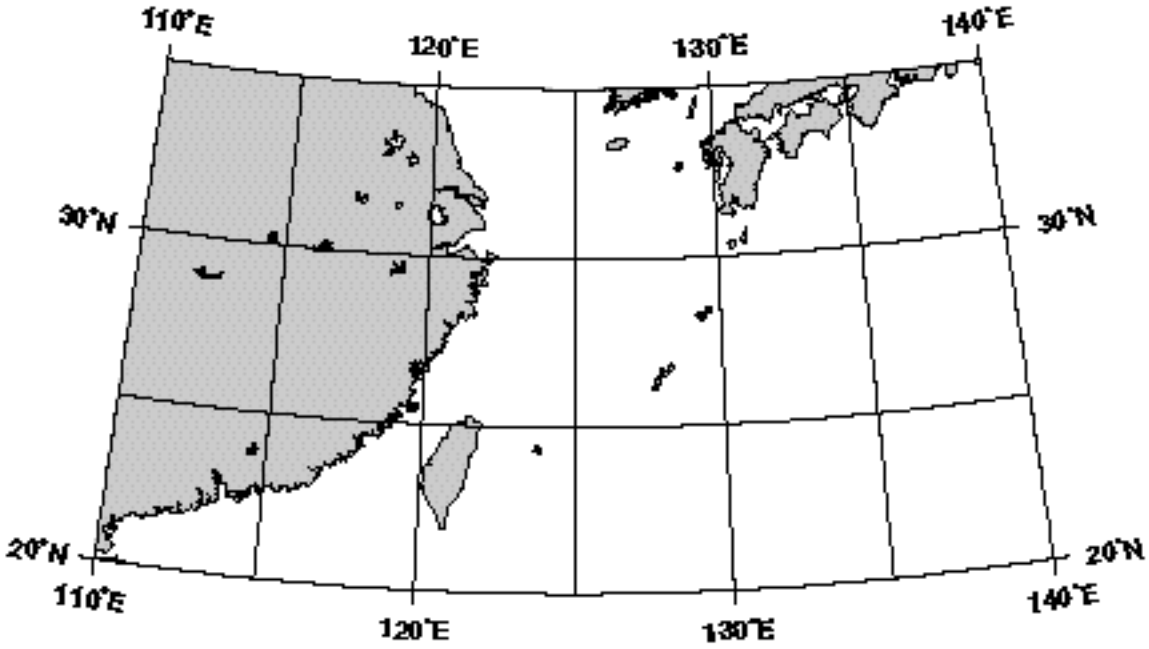
5.2.1 Albers Conic Equal-Area Projection (–Jb or –JB)

This projection, developed by Albers in 1805, is predominantly used to map regions of large east-west extent, in particular the United States. It is a conic, equal-area projection, in which parallels are unequally spaced arcs of concentric circles, more closely spaced at the north and south edges of the map. Meridians, on the other hand, are equally spaced radii about a common center, and cut the parallels at right angles. Distortion in scale and shape vanishes along the two standard parallels. Between them, the scale along parallels is too small; beyond them it is too large. The opposite is true for the scale along meridians. To define the projection in GMT you need to provide the following information:

- Longitude and latitude of the projection center
- Two standard parallels
- Map scale in inch/degree or 1:xxxxx notation (**–Jb**), or map width (**–JB**)

Note that you must include the '1:' if you choose to specify the scale that way. E.g., you can say 0.5 which means 0.5 inch/degree or 1:200000 which means 1 inch on the map equals 200,000 inches along the standard parallels. The projection center defines the origin of the rectangular map coordinates. As an example we will make a map of the region near Taiwan. We choose the center of the projection to be at 125˚E/20˚N and 25˚N and 45˚N as our two standard parallels. We desire a map that is 5 inches wide. The complete command needed to generate the map below is therefore given by:

```
pscoast -R110/140/20/35 -JB125/20/25/45/5 -B10g5 -Dl -A250 -G200 -W1 -X0.5 -Y0.5 -P > albers.ps
```



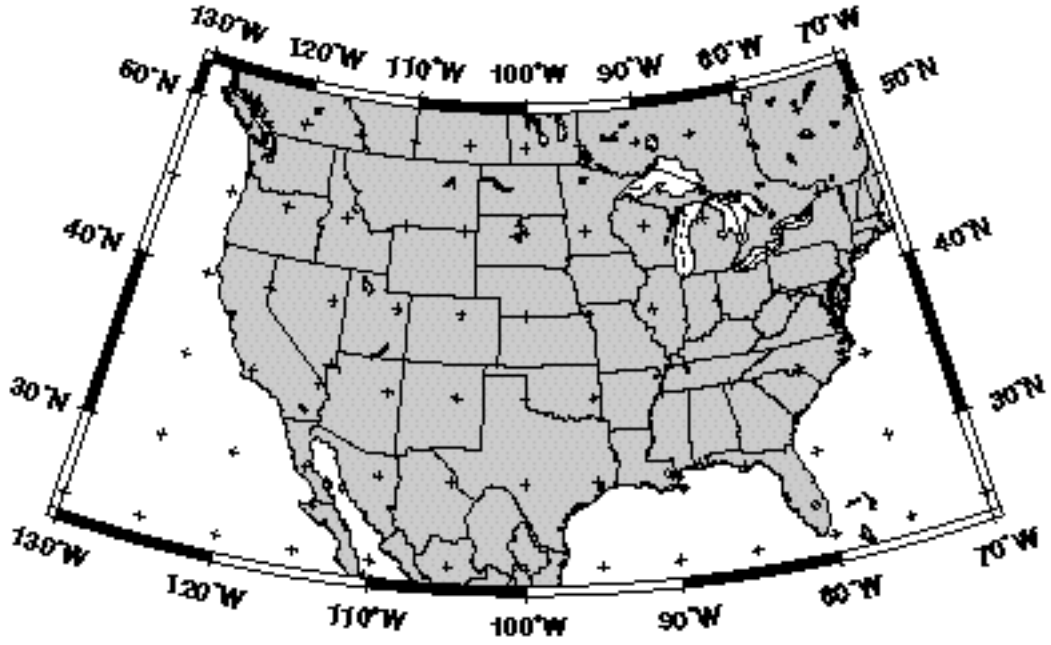
5.2.2 Lambert Conic Conformal Projection (–Jl or –JL)

This conic projection was designed by Lambert (1772) and has been used extensively for mapping of regions with predominantly east-west orientation, just like the Albers projection. Unlike the Albers projection, Lambert's conformal projection is not equal-area. The parallels are arcs of circles with a common origin, and meridians are the equally spaced radii of these circles. As with Albers projection, it is only the two standard parallels that are distortion-free. To select this projection in GMT you must provide the same information as for the Albers projection, i.e.

- Longitude and latitude of the projection center
- Two standard parallels
- Map scale in inch/degree or 1:xxxxx notation (**–Jl**), or map width (**–JL**)

The Lambert conformal projection has been used for basemaps for all the 48 contiguous States with the two fixed standard parallels 33˚N and 45˚N. We will generate a map of the continental USA using these parameters. Note that with all the projections you have the option of selecting a rectangular border rather than one defined by meridians and parallels. Here, we choose the regular WESN region, a FANCY basemap frame, and use degrees west for longitudes. The generating commands used were

```
gmtset BASEMAP_TYPE FANCY DEGREE_FORMAT 3 GRID_CROSS_SIZE 0.05
pscoast -R-130/-70/24/52 -Jl-100/35/33/45/1:50000000 -B10g5 -Dl -G200 -A500 -N1/5 -N2/1 -P -
X0.5 -Y0.5 > lambert.ps
```



The choice for projection center does not affect the projection but it indicates which meridian (here 100˚W) will be vertical on the map. The standard parallels were originally selected by Adams to provide a maximum scale error between latitudes 30.5˚N and 47.5˚N of 0.5-1%. Some areas, like Florida, experience scale errors of up to 2.5%.