
Subject: Map Projection

Posted by [morganlsilverman](#) on Tue, 22 Oct 2013 14:47:26 GMT

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Hello,

I'm trying to create a basic plot with a map of the US and trajectory data plotting on top. I'm trying to follow the map projection method using `mapCoord = Obj_New('cgmap', 'Lambert Azimuthal', Limit=limit)`.

I keep coming across an ellipsoid statement in most of the examples I've found but I can't find any explanation as to what it is. Different examples have use `ellipsoid=24`, `ellipsoid=19`, `ellipsoid=WGS84`, etc...I don't know if I need this or how to set it if I do.

Can someone please explain what the ellipsoid statement is? And, is `mapCoord=Obj_New('cgmap', ...)` the best way to go about plotting a map of the United States? Thank you.

Sincerely,
Morgan

Subject: Re: Map Projection

Posted by [David Fanning](#) on Tue, 22 Oct 2013 15:08:04 GMT

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Morgan Silverman writes:

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> Can someone please explain what the ellipsoid statement is?

When most people come to maps for the first time they believe what they learned in grade school: that every point on the Earth can be described with a latitude and longitude value. Which is true. But what they *don't* tell you is that no point on the Earth has a *unique* latitude and longitude value. What you are calling *this* latitude and *this* longitude depend on what reference standard you are using. This is called a "datum", or in your case, the "ellipsoid".

If you use a GPS device to find your location on the Earth, it is probably being calculated with a WGS84 ellipsoid, the standard ellipsoid

for most satellite data. If you plot that point on a map projection using a spherical ellipsoid (the default ellipsoid for many map projections) then the point you place on the map projection to illustrate your position will NOT be the point on the Earth where you are standing! You can be many, many meters off, simply because you are using different reference ellipsoids to calculate latitude and longitude.

> And, is mapCoord=Obj_New('cgmap',) the best way to go about plotting a map of the United States?

It has pretty much always worked for me. :-)

The nice thing about cgMap is that is **doesn't** work in lat/lon space, where people coming to map projections for the first time think you are suppose to be working. It works in projected meter space, which is a MUCH better place to be in if you are working with rectangular map projected images.

If you are trying to put data on top of a coordinate system set up with cgMap, you are going to have to pass the coordinate system object to whatever routine (cgContour, cgPlotS, etc.) you are using, so it knows how to convert the lat/lon values you are trying to plot into the projected meter values of the coordinate system.

If this seems beyond your abilities, then I would simply use cgMap_Set to set up the map and keep working in lat/lon. It's not ideal. But, it often works well enough for the purpose.

Cheers,

David

--

David Fanning, Ph.D.

Fanning Software Consulting, Inc.

Coyote's Guide to IDL Programming: <http://www.idlcoyote.com/>

Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Subject: Re: Map Projection

Posted by [suicidaleggroll](#) on Tue, 22 Oct 2013 15:12:33 GMT

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On Tuesday, October 22, 2013 8:47:26 AM UTC-6, Morgan Silverman wrote:

> Hello,

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>
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> Sincerely,
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> Morgan

You could always use the regular map_set and map_continents procedures:

```
map_set, 0, 0, /cyl, /iso, /noborder, limit=[25,-125,50,-67]  
map_continents, /hires  
map_continents, /hires, /usa  
plots, lons, lats, psym=2
```

Subject: Re: Map Projection

Posted by [morganlsilverman](#) on Tue, 22 Oct 2013 17:25:03 GMT

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On Tuesday, October 22, 2013 11:08:04 AM UTC-4, David Fanning wrote:

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> Cheers,
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> David Fanning, Ph.D.
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> Fanning Software Consulting, Inc.
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> Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Thank you for the explanation. I'm still not sure how to determine what the ellipsoid should be though. I used 19 in my code based on one of your gallery examples but I don't know if that would be correct. I'm plotting model back-trajectories over the map.

```
mapCoord = Obj_New('cgmap', 'Equirectangular', Ellipsoid=19, Limit=limit, $  
  xrange=xrange, yrange=yrange, /latlon_ranges, center_lon=centerlon, position=pp)  
mapCoord -> Draw  
cgMap_Grid, map=mapCoord, /box  
cgMap_Continents, map=mapCoord, /continents, /countries, /usa  
cgplots, lon_1500(index), lat_1500(index), map=mapCoord
```

Thanks.
-Morgan

Subject: Re: Map Projection
Posted by [Andy Sayer](#) on Tue, 22 Oct 2013 17:45:40 GMT
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I'd echo the previous suggestion of regular map_set and map_continents above as a simple(r) way to draw a map, unless you're trying to do something fancy.

Andy

On Tuesday, October 22, 2013 1:25:03 PM UTC-4, Morgan Silverman wrote:

> On Tuesday, October 22, 2013 11:08:04 AM UTC-4, David Fanning wrote:

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>> Morgan Silverman writes:

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>
> cgMap_Grid, map=mapCoord, /box
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> cgMap_Continents, map=mapCoord, /continents, /countries, /usa
>
> cgplots, lon_1500(index), lat_1500(index), map=mapCoord
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>
> Thanks.
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> -Morgan
```

Subject: Re: Map Projection

Posted by [David Fanning](#) on Tue, 22 Oct 2013 18:15:20 GMT

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Morgan Silverman writes:

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> cgMap_Continents, map=mapCoord, /continents, /countries, /usa
> cgplots, lon_1500(index), lat_1500(index), map=mapCoord
```

The ellipsoid you choose should be the same ellipsoid that was used to determine the latitude and longitude values data you are working with. If you don't know and/or can't find out, then you have to default to something "sensible". This is typically WGS84 for any data collected by satellites in the past, say, 20 years, and Spherical if you really don't have the foggiest idea. Some map projections only allow spherical datums. Others allow whatever datum you choose to use.

I've never seen the ellipsoid set by anyone using Map_Set, which makes it extremely easy to use. The downside, of course, (aside from using extremely old map software) is that the results aren't all that accurate. If you are working with global maps, or even maps the size of the United States, clamoring for accurate results can be used as an accurate prediction of an anal personality. Some people just like scientific work to be RIGHT. Other people ascribe to the "close enough" rule. It's really whatever works for you. :-)

Cheers,

David

--

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Sepore ma de ni thue. ("Perhaps thou speakest truth.")

Subject: Re: Map Projection

Posted by [Phillip Bitzer](#) on Wed, 30 Oct 2013 00:23:08 GMT

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Hi Morgan-

Maybe a little late, but here's a little tutorial I've been working on that might help:

<https://www.dropbox.com/s/kp426ff6xy0af46/mapping.pdf>

The rest of this chapter gets heavy into what David is talking about (and using objects!), but it sounds to me your problem is little simpler than that. But, you should definitely try to wrap your head around the difference between plotting in lat/lon and "plane" space. In short, the projection and ellipsoid you choose helps define that coordinate transformation. Basically, if your data is in lat/lon space, you can choose whatever projection/ellipsoid you see fit.
