Subject: Re: Map Projection Clarification
Posted by David Fanning on Tue, 18 Feb 2014 21:31:13 GMT
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Morgan Silverman writes:

> I'm trying to set up a map projection using
> mapCoord = Obj_New('cgMap', 'Lambert Conformal Conic', Ellipsoid='WGS 84', /GCTP, limit=limit, $
> position=plotPosition, center_latitude=38.5, center_longitude=-77.5, STANDARD_PAR1=40, STANDARD_PAR2=-39). I honestly am just following examples I've seen but don't understand what each piece means and can't for the life of me find answers anywhere. At the moment I'm just getting a white screen when using mapCoord compared to cgMap_set. I'm creating a filled contour plot of lat/lon data.
>
> Is there a list of different ellipsoid options to use? I see people use 24, 19, etc but I can't find what those correspond to. I know I need to use the same ellipsoid as what the data I have was created with, but I don't know how to relate that to options in IDL. Also, is there a list somewhere of GCTP map projections use in IDL? Lastly, what are standard_par2 and standard_par2. I know they're some sort of defined parallels but I don't know how to choose what those are?
Could someone please explain those settings to me.

The IDL documentation doesn't give you much help when it comes to actually using map projections, which is why most people just starting out in this field do things incorrectly, I suppose. My recommendation is to go get a job with the National Snow and Ice Data Center and start taking the two or three people there you *really* understand map projections to lunch. You should buy, by the way. :-)

The fact that you are seeing a white screen when you create this map coordinate object is good. That is what you are suppose to see! A blank screen set up with map coordinates (projected XY meters, if you have to know) on which you can draw map "things" to your heart's content.

You probably know that a map projection takes a 3D sphere or spheroid and projects or maps it onto a 2D surface. It is a mathematical construct and the job it does is generally agreed to be lousy. Some are worse than others, and some work reasonably well, depending on what it is you are doing with them. But, all of them fail is some way because, well, it ain't possible to do it perfectly.

You try, as much as possible, to pick a map projection that shows what you hope to show with as little distortion as possible. This will vary depending where your data is located on the Earth, etc. For example, you don't pick a cylindrical projection if your data is located near a pole, because cylindrical projections greatly distort the area near the plot.
A Mercator projection, for example, just throws up its hands and admits defeat near a pole. The parallels that you ask about are chosen to avoid

too much distortion in a particular area of the map (ie., between these parallels). Some map projections will use them, others will have other ways handling their inevitable distortions.

To create a map coordinate system, you need a couple of things. You need an ellipsoid. This is the thing that you hope looks like the shape of the Earth you wish to use. Some people just say screw it and use a sphere. It keeps the math simple, a *big* advantage. (This is the Ellipsoid=19 value you have seen used.) The ellipsoid is going to be used to locate a particular latitude and longitude value. The same physical point on the Earth, say, your house, will have different latitude and longitude values, depending upon which ellipsoid you use to assign these values. This is why you have to match the ellipsoid of your map projection with the ellipsoid used to create the lat/lon value you are trying to plot on your map projection. Get a mismatch and you are now pointing at your ex-wife's house, not your house!

The other thing you need is the map projection, which, as I say, is simply a mathematical model that does a lousy job of converting 3D things to 2D things. The ellipsoid and the map projection together can create a map coordinate system that can be used to display map data.

You can find out which map projections IDL supports (and which ellipsoids it can use) by looking at the documentation for Map_Proj_Init. cgMap supports the same projections and ellipsoids, although it does it in a way that avoids some problems.

I use cgMap to set up the map coordinate system. Then I pass this map coordinate object to other routines (cgPlot, cgContour, cgImage, etc.) that need to draw something in this coordinate system. It almost always works. ;-)

Cheers,

David
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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.")