
Subject: Re: How to plot great circles on a map?

Posted by [Hermann Mannstein](#) on Wed, 05 May 1999 07:00:00 GMT

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Liam Gumley wrote:

```
>
> I seem to recall there is a way to draw great circles on a map. However
> the best I can come up with is
>
> map_set, /orth, /isot, /cont, /grid
> plots, [-45,-45], [45,-45]
>
> I really want a line between the two points that takes the shortest
> distance (in this case it would follow the longitude grid line).
>
> Any hints?
>
> ---
> Liam E. Gumley
> Space Science and Engineering Center, UW-Madison
> http://cimss.ssec.wisc.edu/~gumley
```

Hello Liam,
that's what I do:

```
;----- --
function interp_circle,p1,p2,n    ; interpolate on a great circle
    ; last point is p2
ll2rb,p1(1),p1(0),p2(1),p2(0),dist,azi    ; sterner's range,bearing
a_c=(indgen(n) + 1) * dist/float(n)    ; array of angles (distances)
res=fltarr(2,n)    ; array for the results
rb2ll,p1(1),p1(0),a_c,azi,lon,lat    ; from range_array,bearing to latlon
res(0,*) = lat & res(1,*) = lon
return,res
end
;----- --

;----- --
;+
; NAME:
;   LL2RB
; PURPOSE:
;   From latitude, longitude compute range, bearing.
; CATEGORY:
; CALLING SEQUENCE:
;   ll2rb, lng0, lat0, lng1, lat1, dist, azi
; INPUTS:
;   lng0, lat0 = long, lat of reference point (deg).    in
```

```
; lng1, lat1 = long, lat of point of interest (deg). in
; KEYWORD PARAMETERS:
; OUTPUTS:
;   dist = range to point point of interest (radians). out
;   azi = azimuth to point of interest (degrees).    out
; COMMON BLOCKS:
; NOTES:
;   Notes: A unit sphere is assumed, thus dist is in radians
;   so to get actual distance multiply dist by radius.
; Useful constants:
;   Radius of Earth (mean) = 6371.23 km = 3958.899 miles.
; MODIFICATION HISTORY:
;   R. Sterner, 13 Feb,1991
;
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;-
;----- --
```

```
pro ll2rb, lng1, lat1, lng2, lat2, dist, azi, help=help
```

```
if (n_params(0) lt 4) or keyword_set(help) then begin
  print, ' From latitude, longitude compute range, bearing.'
  print, ' ll2rb, lng0, lat0, lng1, lat1, dist, azi'
  print, ' lng0, lat0 = long, lat of reference point (deg). in'
  print, ' lng1, lat1 = long, lat of point of interest (deg). in'
  print, ' dist = range to point point of interest (radians). out'
  print, ' azi = azimuth to point of interest (degrees).    out'
  print, ' Notes: A unit sphere is assumed, thus dist is in radians'
  print, ' so to get actual distance multiply dist by radius.'
  print, ' Useful constants:'
  print, ' Radius of Earth (mean) = 6371.23 km = 3958.899 miles.'
  return
endif
```

```
polrec3d, 1., (90.-lat2)/!radeg, lng2/!radeg, x1, y1, z1
rot_3d, 3, x1, y1, z1, -(180.-lng1)/!radeg, x2, y2, z2
rot_3d, 2, x2, y2, z2, -(90.-lat1)/!radeg, x3, y3, z3
recpol3d, x3, y3, z3, r, dist, ax
azi = (360. - ax*!radeg) mod 360.
```

```
return
```

end

```
;----- --
;+
; NAME:
;   RB2LL
; PURPOSE:
;   From range, bearing compute latitude, longitude .
; CATEGORY:
; CALLING SEQUENCE:
;   rb2ll, lng0, lat0, dist, azi, lng1, lat1
; INPUTS:
;   lng0, lat0 = long, lat of starting point (deg).    in
;   dist = range to point of interest in RADIANS.      in
;   azi = azimuth to point of interest (degrees).      in
; KEYWORD PARAMETERS:
; OUTPUTS:
;   lng1, lat1 = long, lat of point of interest (deg). out
; COMMON BLOCKS:
; NOTES:
;   Notes: A unit sphere is assumed, thus dist is in radians.
;   Useful constants:
;   Radius of Earth (mean) = 6371.23 km = 3958.899 miles.
;   Distance to horizon from height H above surface:
;   For small H: dist = sqrt(2*H/R) in Radians
;   For large H: dist = acos(R/(R+H)) in Radians
;   To plot horizon from lat0, lng0, H:
;   rb2ll,lng0,lat0,dist,makex(0,360,1),plng,plat
;   plots,plng-360.,plat,psym=3
; MODIFICATION HISTORY:
;   R. Sterner, 13 Feb,1991
;
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disclaimer.txt.
;-
;----- --

pro rb2ll, lng1, lat1, dist, azi, lng2, lat2, help=help

if (n_params(0) lt 4) or keyword_set(help) then begin
  print, ' From range, bearing compute latitude, longitude .'
```

```

print,' rb2ll, lng0, lat0, dist, azi, lng1, lat1'
print,' lng0, lat0 = long, lat of starting point (deg).    in'
print,' dist = range to point of interest in RADIANS.    in'
print,' azi = azimuth to point of interest (degrees).    in'
print,' lng1, lat1 = long, lat of point of interest (deg). out'
print,' Notes: A unit sphere is assumed, thus dist is in radians.'
print,' Useful constants:'
print,' Radius of Earth (mean) = 6371.23 km = 3958.899
miles.'
print,' Distance to horizon from height H above surface:'
print,' For small H: dist = sqrt(2*H/R) in Radians'
print,' For large H: dist = acos(R/(R+H)) in Radians'
print,' To plot horizon from lat0, lng0, H:'
print,' rb2ll,lng0,lat0,dist,makex(0,360,1),plng,plat
print,' plots,plng-360.,plat,psym=3'
return
endif

ax = (360. - azi)/!radeg
polrec3d, 1., dist, ax, x3, y3, z3
rot_3d, 2, x3, y3, z3, (90.-lat1)/!radeg, x2, y2, z2
rot_3d, 3, x2, y2, z2, (180.-lng1)/!radeg, x1, y1, z1
recpol3d, x1, y1, z1, r, az, ax
lng2 = ax*!radeg
lat2 = 90. - az*!radeg

return
end

```

;-----
but if you have an old IDL Version (2.0??), you will find in the
map - demo programm a routine
called cir_2p, which does the same.

--
Regards,

Dr. Hermann Mannstein

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