Subject: Lat/lon to UTM coords
Posted by Luis Alonso on Fri, 07 Jul 2000 07:00:00 GMT
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Hello!

I need to change coordinates from Latitude/Longitude to UTM.
I know that with MAP one can proyect on either one, but i don't know how to
transform a vector from one into the other.

Thanks
Luis Alonso

Subject: Re: Lat/lon to UTM coords
Posted by Ben Tupper on Mon, 10 Jul 2000 07:00:00 GMT
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Luis Alonso wrote:

> Hello!
>
> I need to change coordinates from Latitude/Longitude to UTM.
> I know that with MAP one can proyect on either one, but i don't know how to
> transform a vector from one into the other.
>
> Thanks
> Luis Alonso

Hello,

The book by Snyder (referenced below) is very much worth the $40US. I have
used the following code
to convert Lon/Lat to UTM in meters.

Ben

--------SNIP-------
;+
; NAME:
; ll_to_utm
;
; PURPOSE:
; This function converts latitude/longitude measurements to UTM coordinates.
; Two map data are are available: NAD27 and WGS84.
;
; The formulae come from: J.P. Snyder, "Map projections - A working
manual',1987,

```
;  U.S.G.S. Professional Paper 1395, Supt. of Docs No: I 19.16:1395,
;  U.S. Govt Prinitng Office,Washington, DC 20402.
;
; Constants used in formulae come from this source also unless otherwise
noted.
;
;
; CATEGORY:
; Mapping.
;
; CALLING SEQUENCE:
; Result = ll_to_utm(lon,lat)
;;
; INPUTS:
; LAT/LON   Identically sized vectors containning the decimal degrees of
latitude and longitude.
; Degrees west and south are negative.
;
; OPTIONAL INPUTS:
;  None.
;
; KEYWORD PARAMETERS:
; DATUM Set this keyword to 1 for NAD27 (default) and to 2 for WGS84.
; NOFALSE Set this keyword to prevent the return of False Easting. Default is
to
;  return a False Easting (NoFalse = 0).
;
; OUTPUTS:
; A 2,n elements double precision array where [0,*] = Easting
;    and [1,*] = False Northing.
;
; OPTIONAL OUTPUTS:
; None.
;
; COMMON BLOCKS:
; None.
;
; SIDE EFFECTS:
; None known.
;
; RESTRICTIONS:
; None known.
;
; EXAMPLE:
; Lat =double( [44.0551666000000000, 44.0551999,44.0552166])
; Lon =double( [-69.5231832999999990, -69.5231999,-69.5232166])
; UTM = ll_to_utm(Lon, Lat, Datum = 2)
;  For i = 0,2 Do Print, Lon[i],UTM[0,i], Lat[i],UTM[1,i]
```

```
;   -69.523186      458092.92      44.055168      4878133.2
;      -69.523201      458091.72      44.055199      4878136.6
;      -69.523216      458090.51      44.055218      4878138.8

;
; MODIFICATION HISTORY:
;  Written by: Ben Tupper  Spring 1998
; Pemaquid River Company
; email: pemaquidriver@tidewater.net
; tel:  (207) 563 - 1048
;       248 Lower Round Pond Road
; POB 106
; Bristol, ME 04539-0106
;
;  SEP 1999 Cleaned up documentation and added NoFalse keyword.
;  DEC 2, 1999  Reversed order of input and output arguments to fit familiar
x,y ordered pair sense.
;  4 FEB 2000 Documentation change on 2 DEC 1999.
;-



FUNCTION ll_to_utm, lonV,latV,datum=datum, NoFalse = NoFalse

On_Error,2

Num = n_elements(LatV)  & Utm = DblArr(2,Num)
Lon=Double(LonV)   & Lat=Double(LatV)

If n_elements(NoFalse) Eq 0 Then NoFalse = 0
If n_elements(Datum) EQ 0 Then Datum = 1
Data = ['Blank','NAD27','WGS84']

;A   emimajor axis of the of ellipsoid earth
;eccsq    eccentricity of ellipsoid (squared)
;k0    relative scale factor along parallel of latitude
;lon   longitude in +/-ddd.dddddd
;lat  latitude in +/-dd.ddddddd
;X  the rectangualar coordinate output...measured in meters from central
meridian
;   this is converted to a false easting by adding half the distance between
;   the bounding meridians
;Y  the rectangular coordinate output.... measured in meters from the equator



Case Data[datum] of
```

```
'NAD27': BEGIN
 ; based on Clarke 1866 (aka NAD27) or
 ; assign constant values for NAD 27 to UTM
 A = 6378206.4d
 eccsq = 0.00676866d
 k0 = 0.9996d

   END

'WGS84':BEGIN
 ; WGS84 (Aka NAD83)
 ; from Chuck Gantz via http://gpsy.com/gpsinfo/geotoutm.htm
 ; assign constant values for WGS 84 datum for lat/lon to UTM
 A = 6378137.d
 eccsq = 0.00669439d
 k0 = 0.9996d

   END

EndCase ;which datum

 ;determine central meridian (lambda0 in Snyder)
central_meridian = double(long(lon/6)*6+3*long(lon/6.)/abs(long(lon/6.)))

 ;determine lon origin in radians
lon_orig = central_meridian*!dtor

 ; convert to radians
lon = lon*!dtor  &  lat = lat*!dtor

 ;
eccsq_prime =eccsq/(1.-eccsq)

N = a/(1.-eccsq*sin(lat)*sin(lat))^.5

T = tan(lat)*tan(lat)

C = eccsq_prime * cos(lat)*cos(lat)

AA = cos(lat)*(lon-lon_orig)

M = a*((1-eccsq/4.-3.*eccsq^2/64.-5.*eccsq^3/256.)*lat - $
 (3.*eccsq/8. + 3.*eccsq^2/32.+45.*eccsq^3/1024)*sin(2.*lat)+$
 (15.*eccsq^2/256.+45.*eccsq^3/1024.)*sin(4.*lat)- $
 (35.*eccsq^3/3072.)*sin(6.*lat))

 ; k is unused for UTM... default to k0
```

```
;k = k0*(1.d+ (1.d+C)*A^2/2.d + $
; (5.d - 4.d*T + 42.d*C + 13.d*C^2 -28.d*eccsq_prime)*A^4/24.d + $
; (61.d - 148.d*T + 16.d*T^2)*A^6/720.d)

 ;  Easting or X in Snyder
UTM[0,*]=  k0*N*(AA+(1.-T-C)*AA^3/6.d $
 + (5.d - 18.d*T + T^2 + 72.d*C - 58.d*eccsq_prime)*AA^5/120.d)

 ; make False Easting if desired (default)
If NoFalse EQ 0 Then UTM[0,*] = UTM[0,*] + 500000.0d


 ;Northing or Y in Snyder
UTM[1,*] =  k0*(M+N*tan(lat)*( AA^2 / 2.d + ( 5.d - T + 9.d *C + 4.d * C^2 ) *
$
 $ AA^4/24.d + (61d - 58d*T + T^2 + 600d*C - 330d*eccsq_prime)*
 AA^6 / 720.d ))

Return,UTM

end
```

------SNIP------

--
Ben Tupper

Bigelow Laboratory for Ocean Science
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pemaquidriver@tidewater.net

Subject: Re: Lat/lon to UTM coords
Posted by David Bowman on Thu, 13 Jul 2000 07:00:00 GMT
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In article <3969C58D.4877FE1B@seadas.bigelow.org>, Ben Tupper
<tupper@seadas.bigelow.org> wrote:
> Hello,
>
> The book by Snyder (referenced below) is very much worth the $40US. I have
> used the following code to convert Lon/Lat to UTM in meters.
>
> Ben

Many thanks for the lat/on to UTM code.... Not to impinge on your
generosity, but do you have a similar code for the inverse problem, UTM

to Lat Lon? USGS Professional Papers are not easy to come by in France... :-)

cheers,
David Bowman

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