POLITECNICO DI TORINO
DET - DIATI

Cartography Exercises

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Ex.1 Modulus of linear deformation

Plotting the modulus of linear deformation, considering these cases:

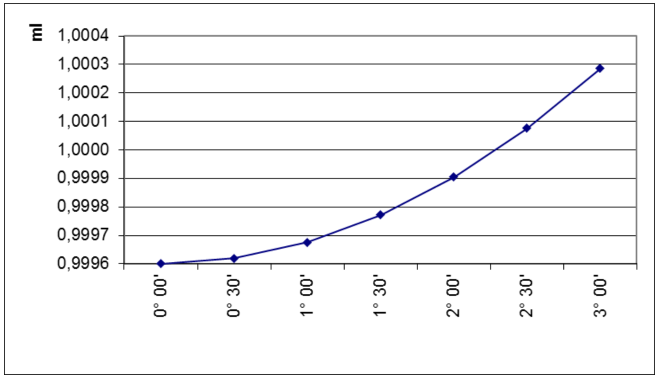
$$m_l = 0,9996\left(1 + \frac{\lambda^2}{2}\cos^2\varphi\right)$$

Case 1: lat= 30° long': 0°- 3°, with 0,5° of resolution

Case 2: lat= 37° long': 0°- 3°, with 0,5° of resolution

Case 3: lat= 45° long': 0°- 3°, with 0,5° of resolution

Case 4: lat= 60° long': 0°- 3°, with 0,5° of resolution



To compare the results.

Using the Hirvonen equation, to transform these coordinates from geographic to cartographic.

P1 → lat = 45° 3' 45,717" long = 7° 47' 26,292"

SR = WGS84 - UTM

Central meridian = 9° UTM-ZONE= 32

P2 → lat = 38° 32' 34,649" long = 16° 50' 06,493"

SR = WGS84 - UTM

Central meridian = 15° UTM-ZONE= 33

Ex.2 Hirvonen

$$x = R_P \; arcsenh \frac{\cos\xi \tan\lambda'}{v}$$

$$y = a\,(A_1\xi - A_2 \sin 2\xi + A_4 \sin 4\xi - A_6 \sin 6\xi)$$

where

$$R_P = \frac{a^2}{c}$$ Radius of polar curvature

$$\lambda' = \lambda - \lambda_{mc} \qquad \xi = arctg \frac{\tan\varphi}{\cos(v_1\lambda')}$$

$$v_1 = \sqrt{(1 + e'^2 \cos^2\varphi)} \qquad v = \sqrt{(1 + e'^2 \cos^2\xi)}$$

$\lambda' = (\lambda_P - \lambda_{mc})$ Where λ_{mc} Is the central meridian of the fuse

Ex.2 Hirvonen

$$A_1 = 1 - \frac{e^2}{4} - \frac{3e^4}{64} - \frac{5e^6}{256}$$

$$A_2 = \frac{3e^2}{8} + \frac{3e^4}{32} + \frac{45e^6}{1024}$$

$$A_4 = \frac{15e^4}{256} + \frac{45e^6}{1024}$$

$$A_6 = \frac{35e^6}{3072}$$

East= x*m_c + False East

North = y*m_c

where m_c= contraction modulus 0,9996

*False East = depend for RS

Using the Hirvonen equation, to transform these coordinates from cartographic to geographic.

P → East = 470139,66 m **North** = 5031468,37 m

SR = WGS84 – UTM-ZONE 32

Long=8° 37’ 5’’,6209

Lat = 45° 26’ 9’’,9617