

Prikaz izračunanega geoida

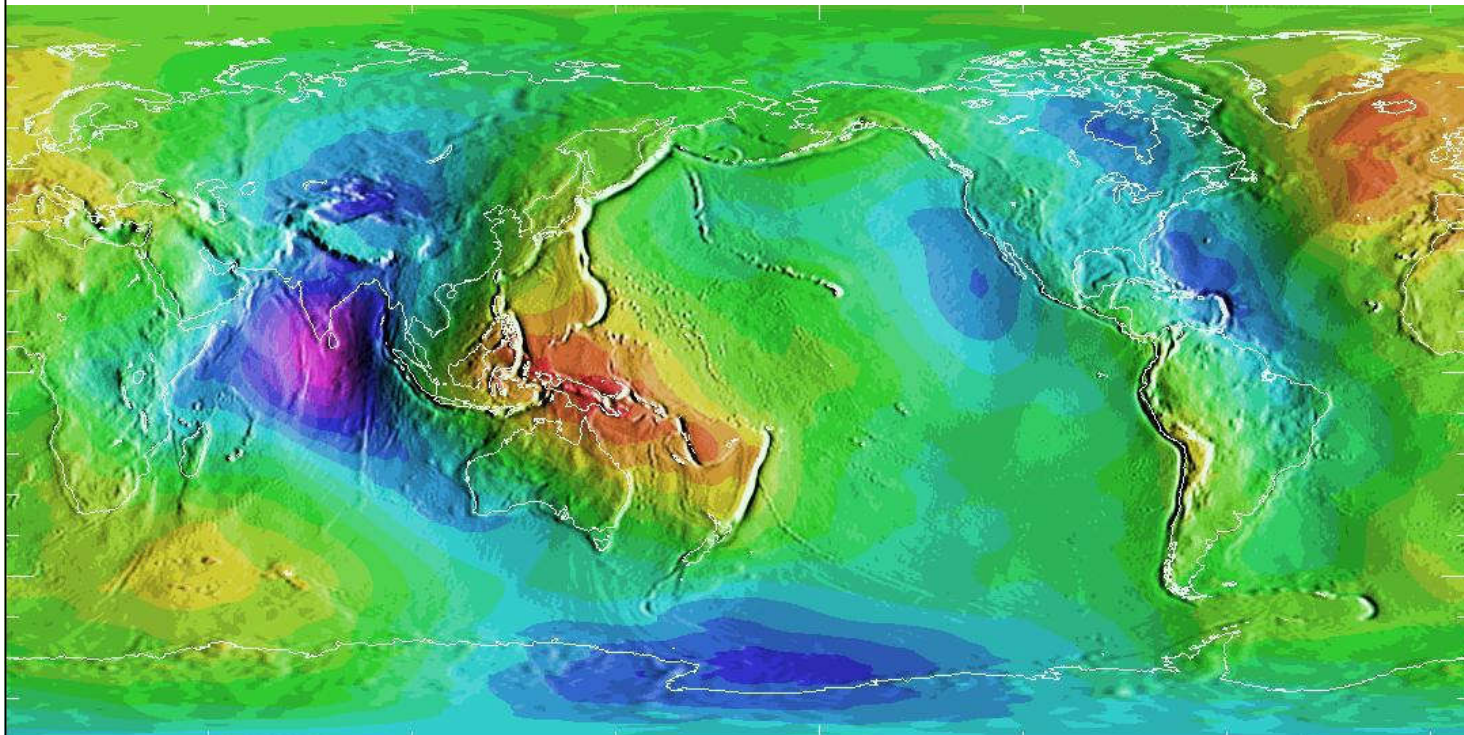
- ✗ Geoid je določen z vrednostmi N (geoidnih višin) oz. ζ (anomalij višin) v neki obliki:
 - + neskončna vrsta (zajema celotno Zemljino oblo),
 - + mreža diskretnih točk z znanim položajem in geoidno višino,
 - + enostavna funkcija (polinom) → aproksimacija na lokalnem območju,
 - + grafično.

Globalni geopotencialni model

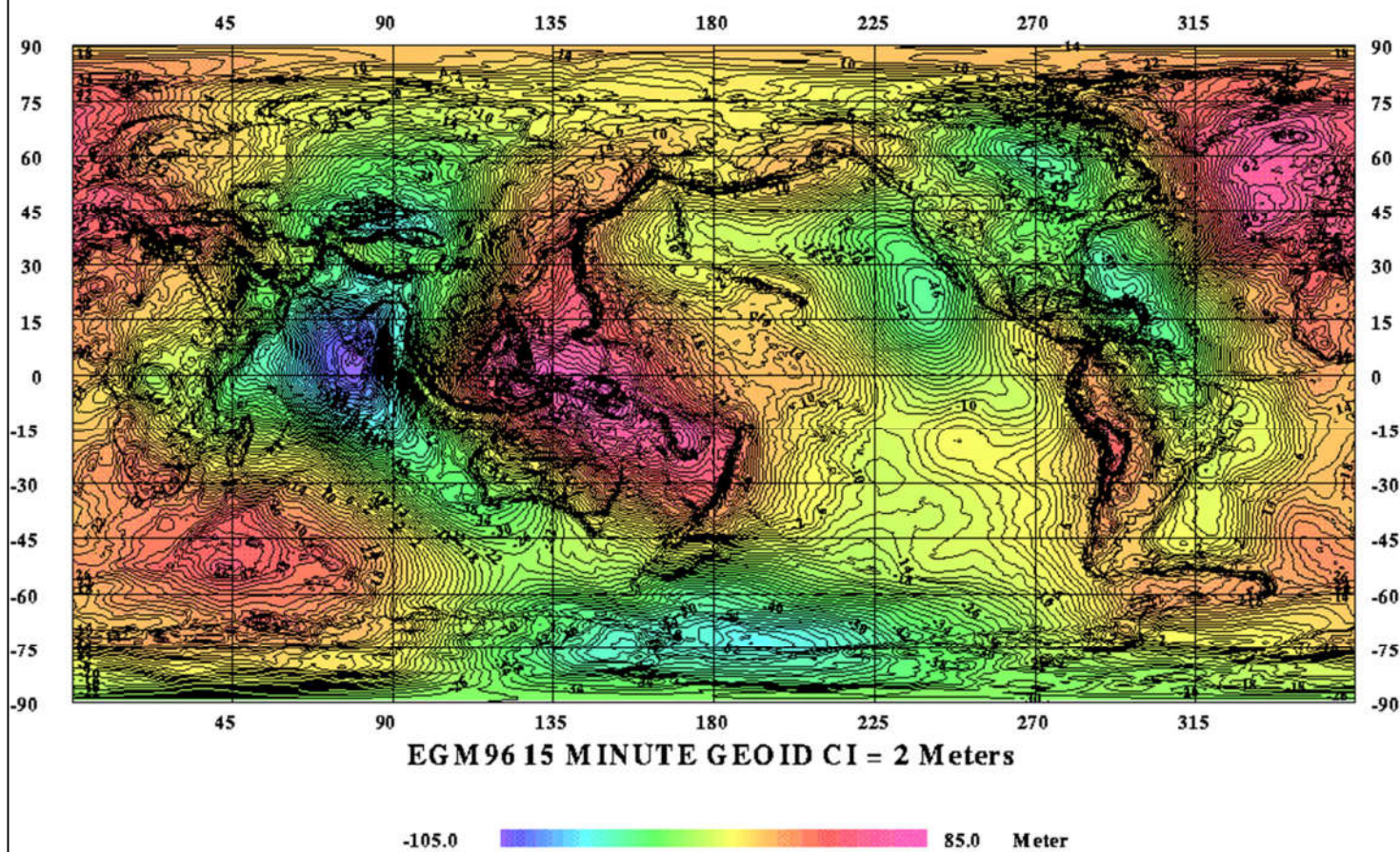
koeficienti razvoja potenciala v vrsto po sfernih funkcijah: A_{nm} , B_{nm} , σ_A , σ_B

| | | | | | |
|---|---|---------------------|---------------------|----------------|----------------|
| 2 | 0 | -0.484165371736E-03 | 0.000000000000E+00 | 0.35610635E-10 | 0.00000000E+00 |
| 2 | 1 | -0.186987635955E-09 | 0.119528012031E-08 | 0.10000000E-29 | 0.10000000E-29 |
| 2 | 2 | 0.243914352398E-05 | -0.140016683654E-05 | 0.53739154E-10 | 0.54353269E-10 |
| 3 | 0 | 0.957254173792E-06 | 0.000000000000E+00 | 0.18094237E-10 | 0.00000000E+00 |
| 3 | 1 | 0.202998882184E-05 | 0.248513158716E-06 | 0.13965165E-09 | 0.13645882E-09 |
| 3 | 2 | 0.904627768605E-06 | -0.619025944205E-06 | 0.10962329E-09 | 0.11182866E-09 |
| 3 | 3 | 0.721072657057E-06 | 0.141435626958E-05 | 0.95156281E-10 | 0.93285090E-10 |
| 4 | 0 | 0.539873863789E-06 | 0.000000000000E+00 | 0.10423678E-09 | 0.00000000E+00 |
| 4 | 1 | -0.536321616971E-06 | -0.473440265853E-06 | 0.85674404E-10 | 0.82408489E-10 |
| 4 | 2 | 0.350694105785E-06 | 0.662671572540E-06 | 0.16000186E-09 | 0.16390576E-09 |
| 4 | 3 | 0.990771803829E-06 | -0.200928369177E-06 | 0.84657802E-10 | 0.82662506E-10 |
| 4 | 4 | -0.188560802735E-06 | 0.308853169333E-06 | 0.87315359E-10 | 0.87852819E-10 |
| 5 | 0 | 0.685323475630E-07 | 0.000000000000E+00 | 0.54383090E-10 | 0.00000000E+00 |
| 5 | 1 | -0.621012128528E-07 | -0.944226127525E-07 | 0.27996887E-09 | 0.28082882E-09 |
| 5 | 2 | 0.652438297612E-06 | -0.323349612668E-06 | 0.23747375E-09 | 0.24356998E-09 |
| 5 | 3 | -0.451955406071E-06 | -0.214847190624E-06 | 0.17111636E-09 | 0.16810647E-09 |
| 5 | 4 | -0.295301647654E-06 | 0.496658876769E-07 | 0.11981266E-09 | 0.11849793E-09 |
| 5 | 5 | 0.174971983203E-06 | -0.669384278219E-06 | 0.11642563E-09 | 0.11590031E-09 |
| 6 | 0 | -0.149957994714E-06 | 0.000000000000E+00 | 0.14497863E-09 | 0.00000000E+00 |
| 6 | 1 | -0.760879384947E-07 | 0.262890545501E-07 | 0.22415138E-09 | 0.21957296E-09 |
| 6 | 2 | 0.481732442832E-07 | -0.373728201347E-06 | 0.27697363E-09 | 0.28105811E-09 |
| 6 | 3 | 0.571730990516E-07 | 0.902694517163E-08 | 0.19432407E-09 | 0.18682712E-09 |
| 6 | 4 | -0.862142660109E-07 | -0.471408154267E-06 | 0.15229150E-09 | 0.15328004E-09 |
| 6 | 5 | -0.267133325490E-06 | -0.536488432483E-06 | 0.89838470E-10 | 0.87820905E-10 |
| 6 | 6 | 0.967616121092E-08 | -0.237192006935E-06 | 0.11332010E-09 | 0.11518036E-09 |

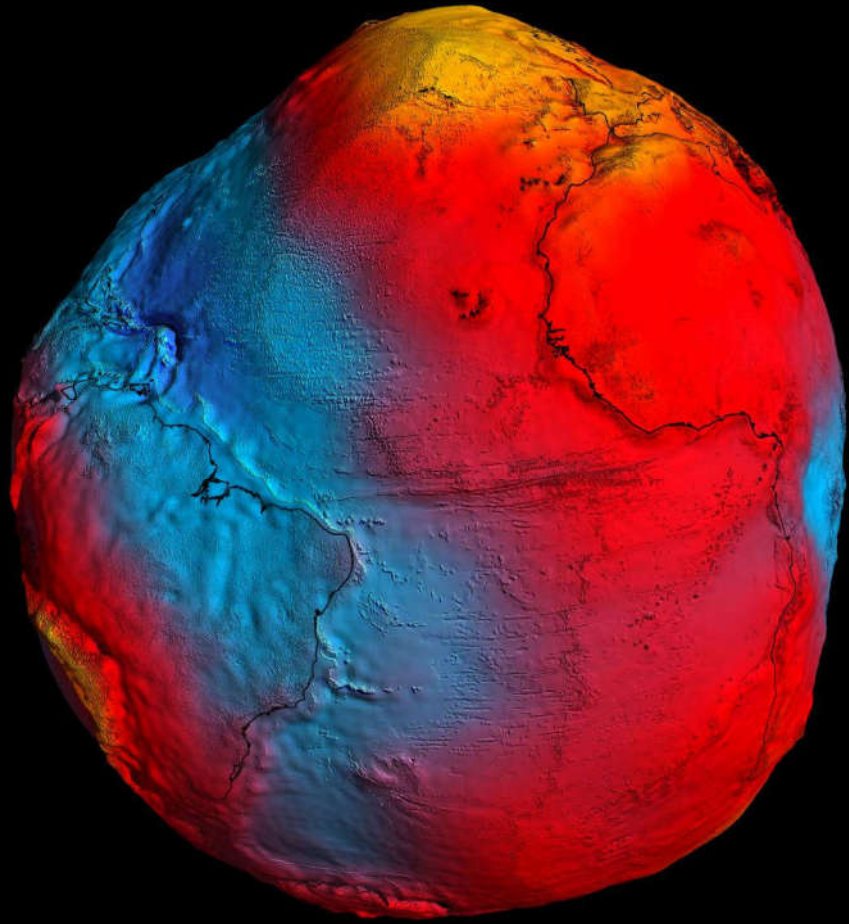
EGM96



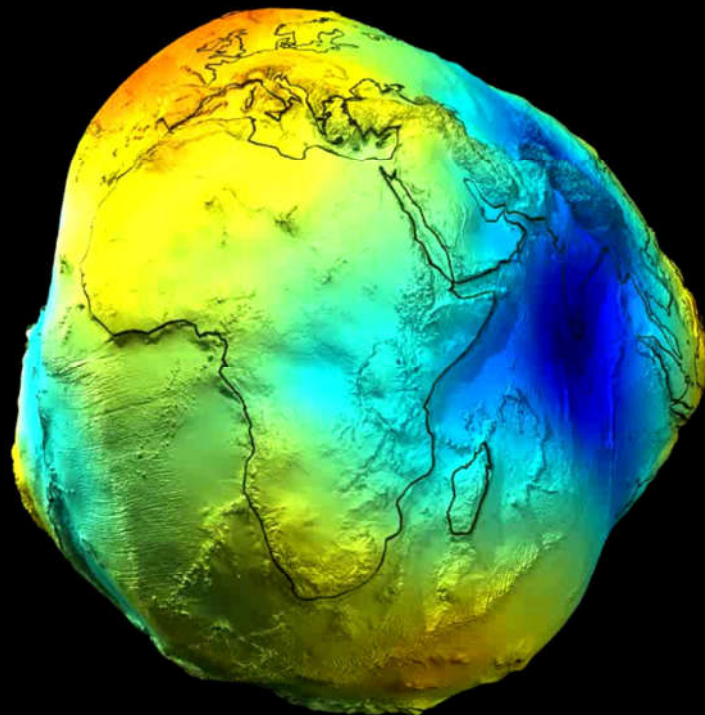
EGM96 geoid



Globalni geoid



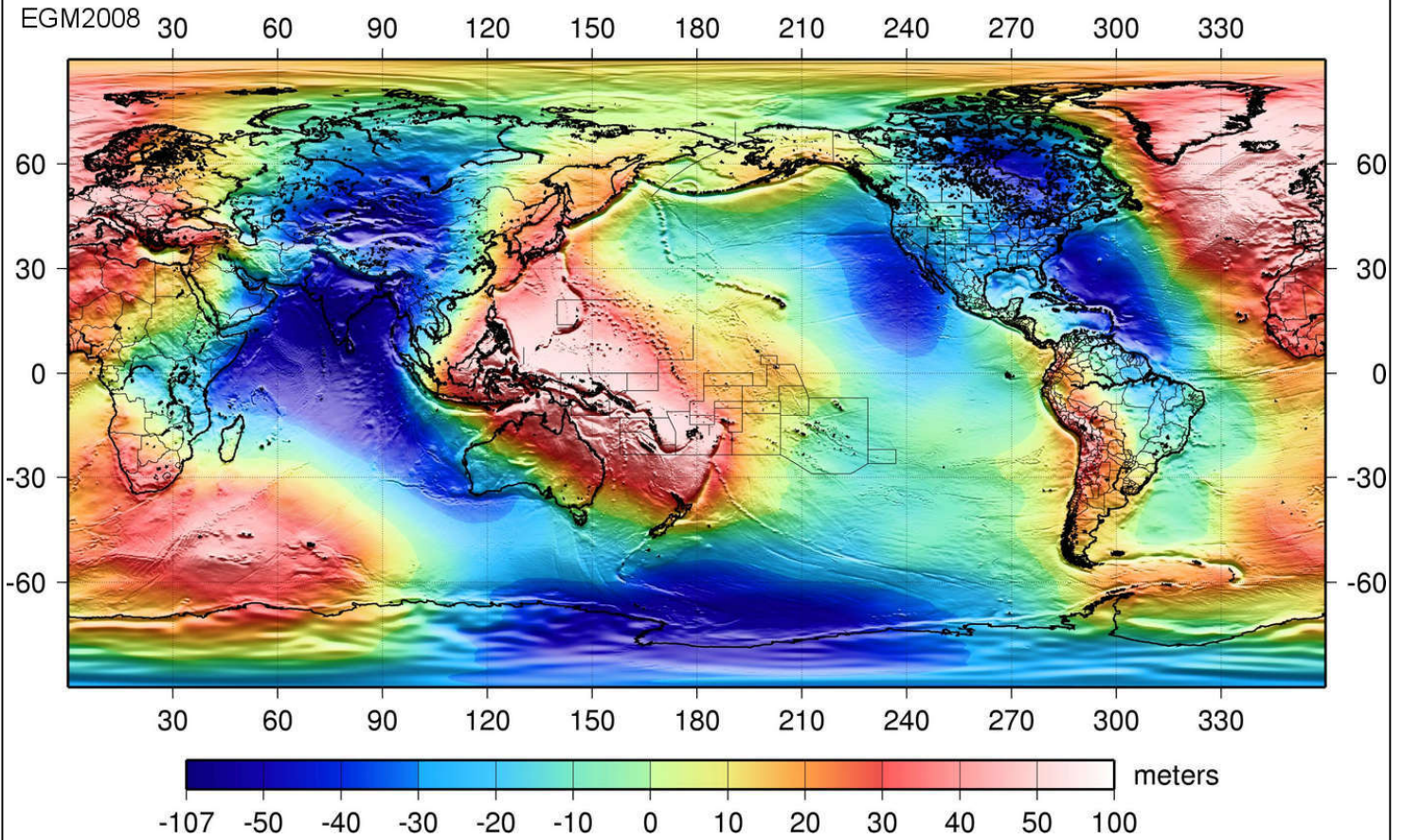
M. Kuhar - Fizikalna geodezija



M. Kuhar - Fizikalna geodezija

EGM2008

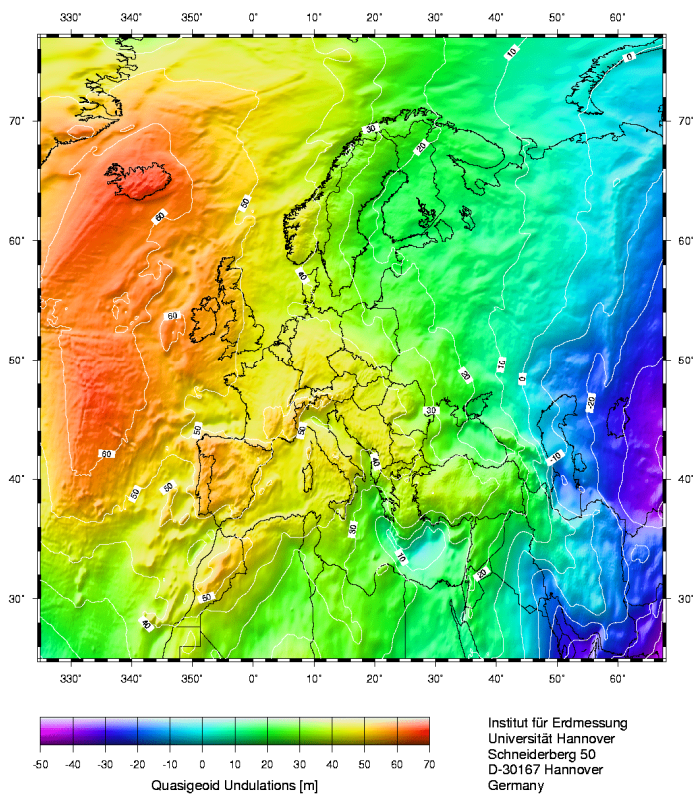
EGM2008



M. Kuhar - Fizikalna geodezija

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Quasigeoid Model EGG97

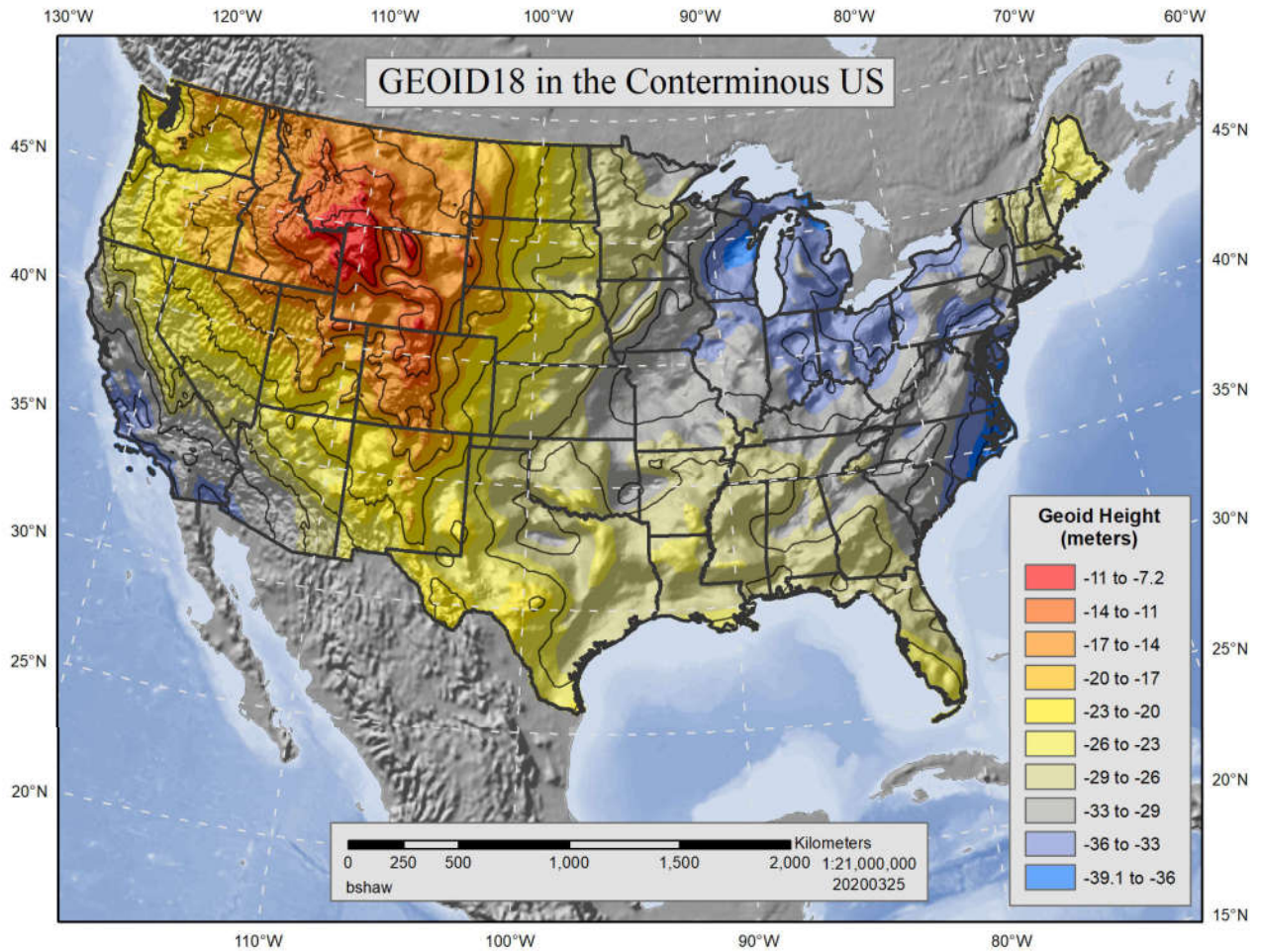


Evropski gravimetrični geoid 1997

M. Ku

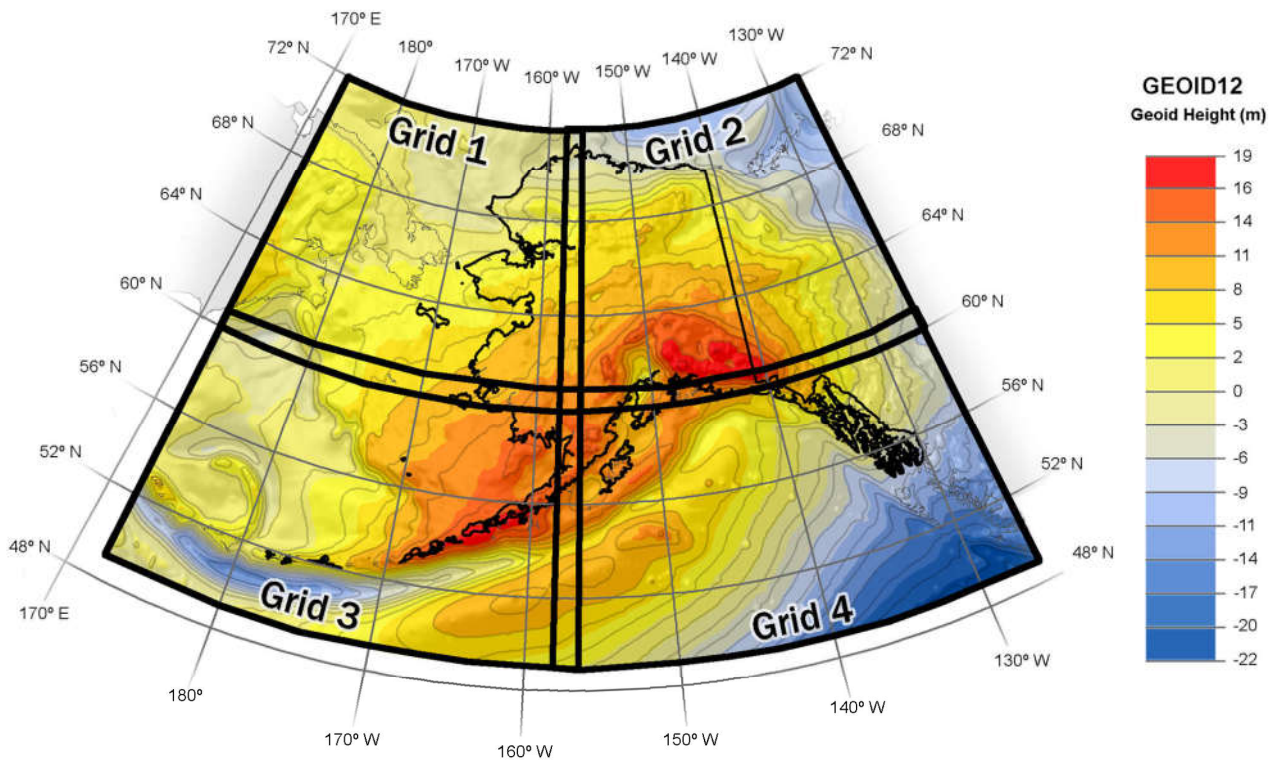
8

Nacionalni geoidi – ZDA, 2018



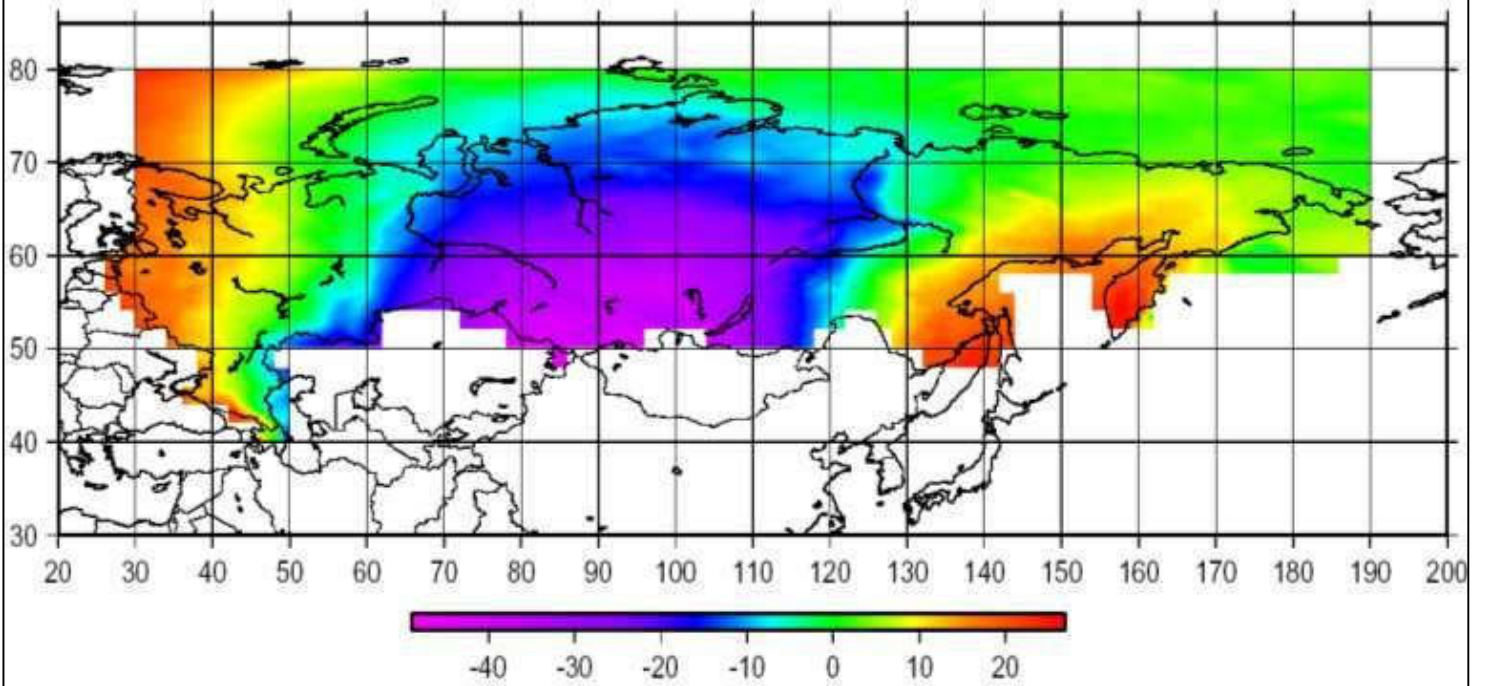
M. Kuhar

Aljaska

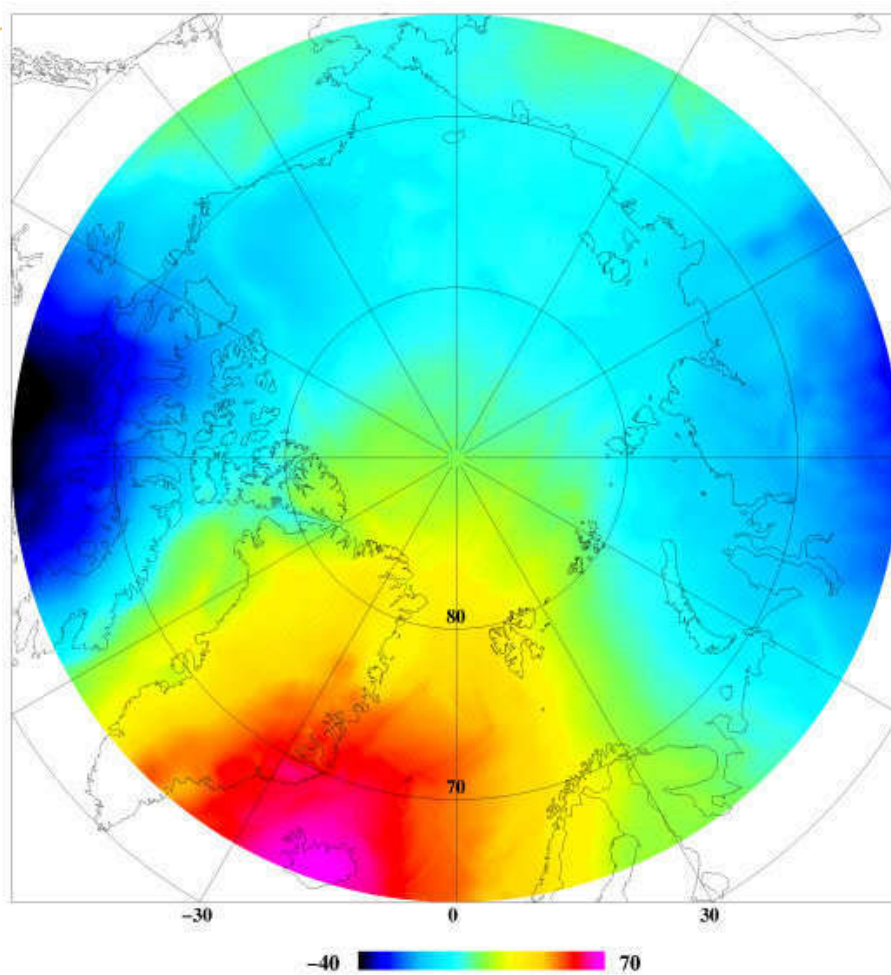


M. Kuhar - Fi

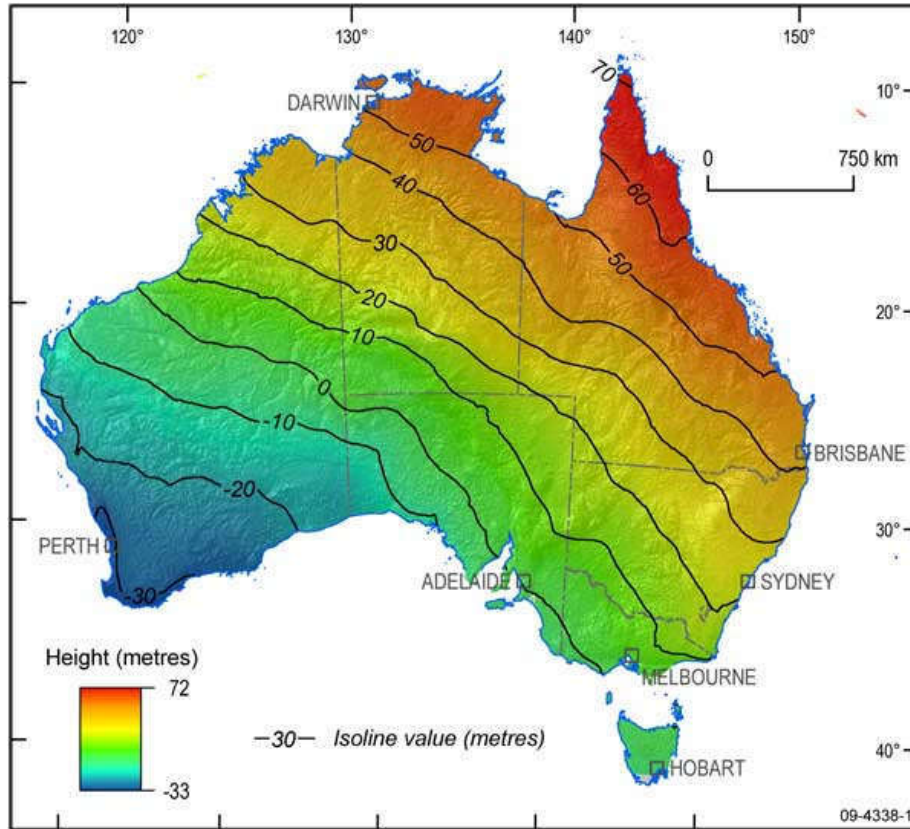
Rusija



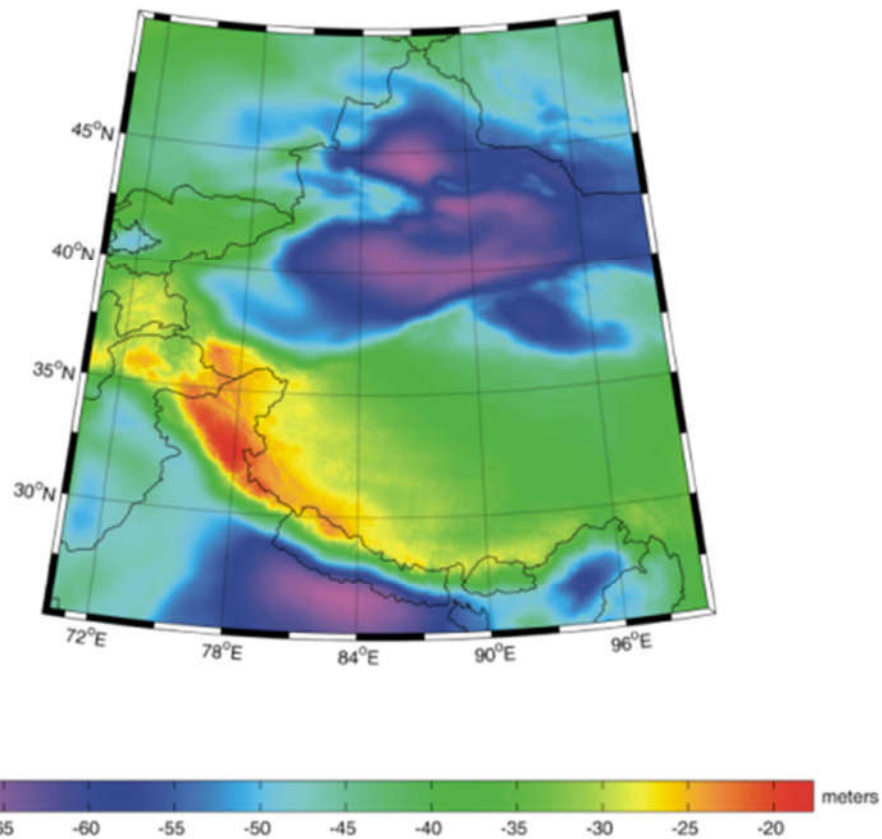
Arktika



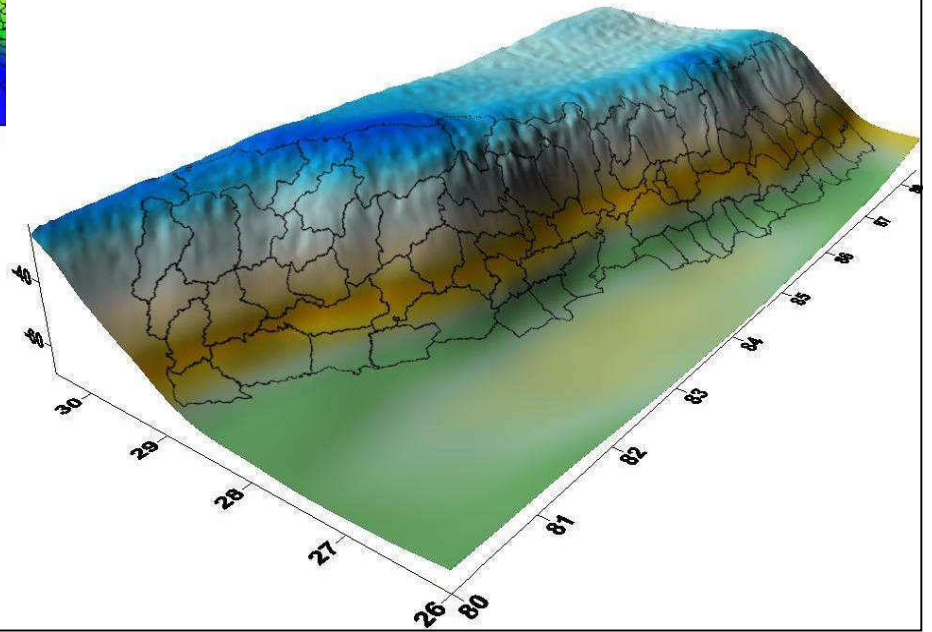
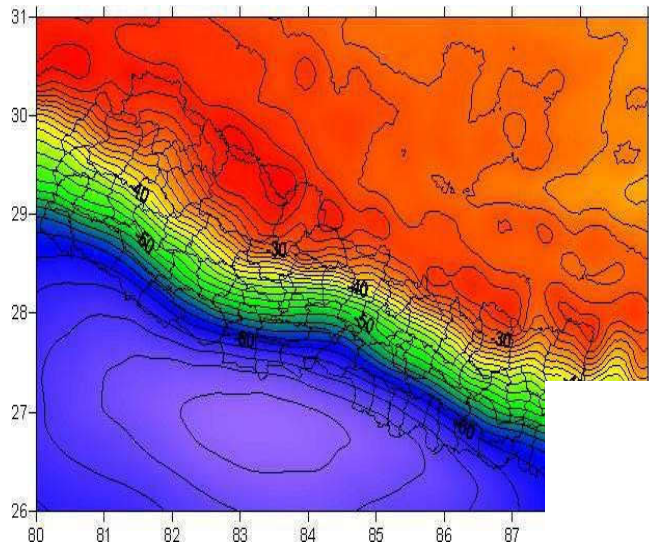
Avstralija (2009)



Xinjiang in Tibet



Nepal



M. Kuhar - Fizikalna geodezija

Iran (2004)

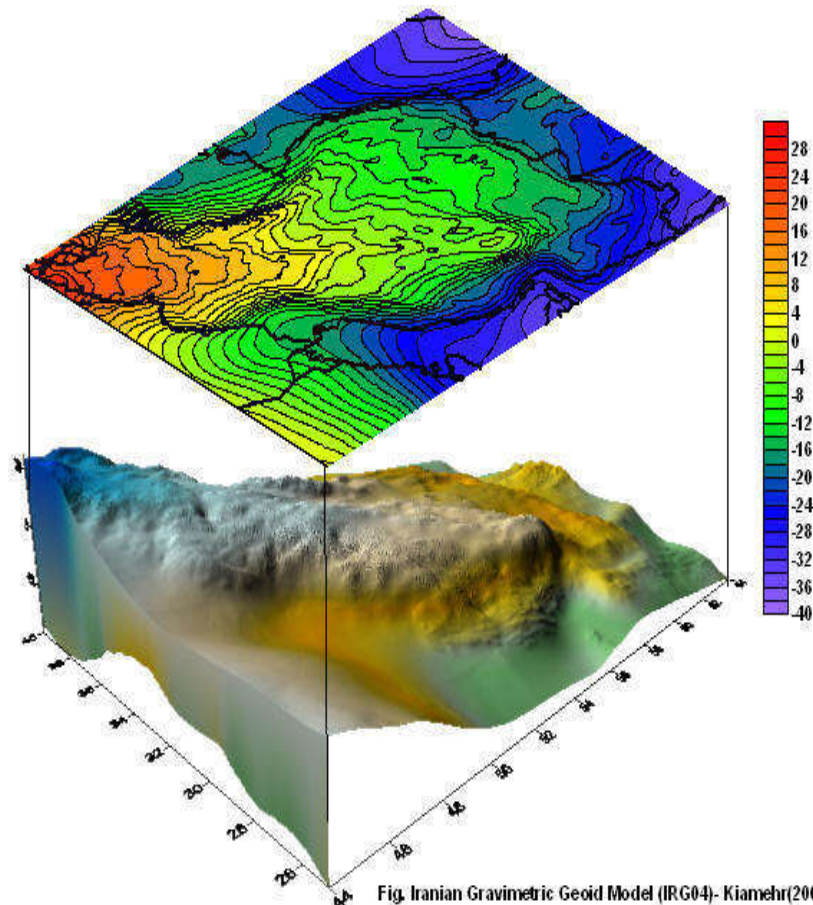
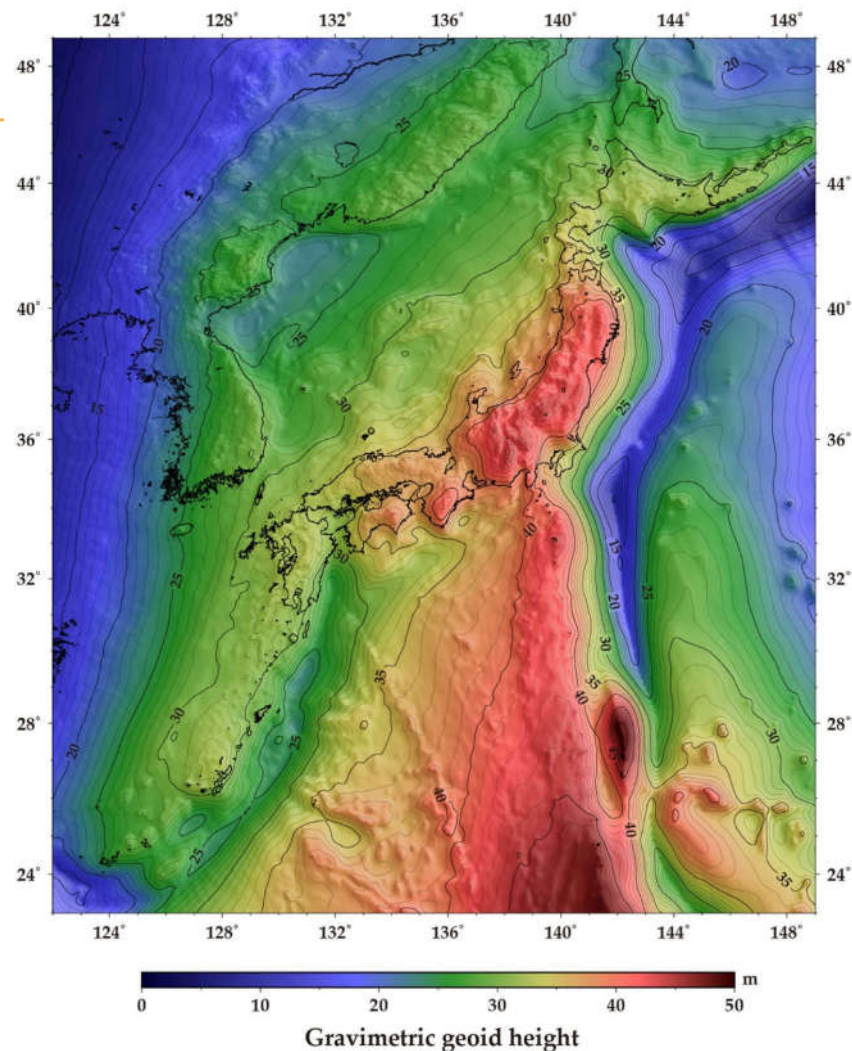


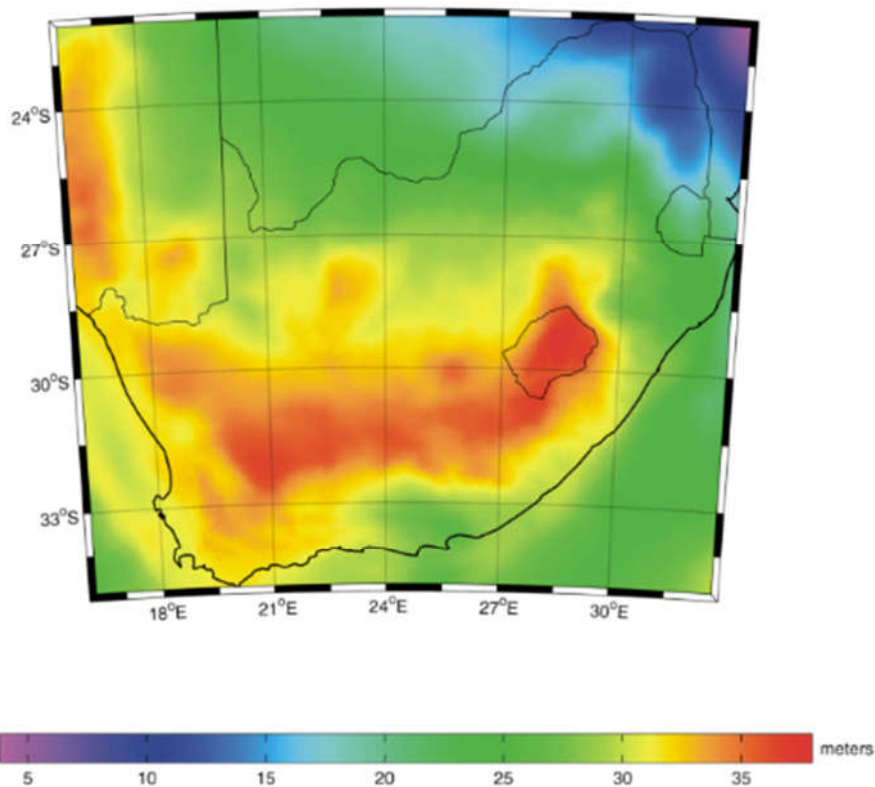
Fig. Iranian Gravimetric Geoid Model (IRG04)- Kiamehr(2006)

M. Kuhar - Fizikalna geodezija

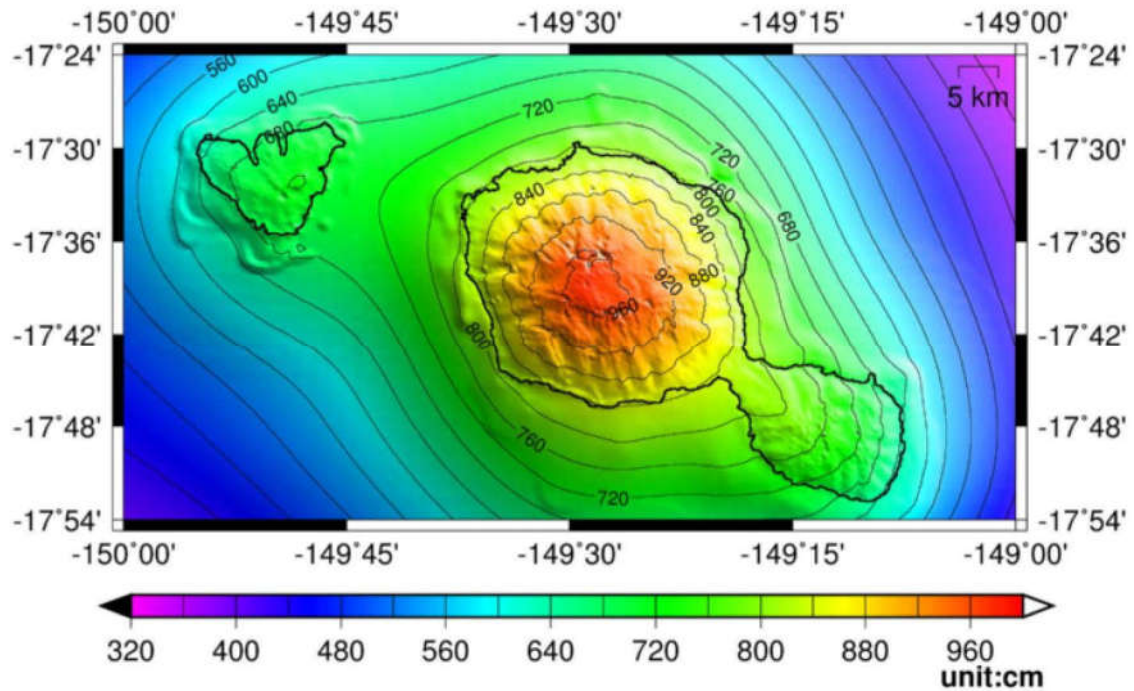
Japonska



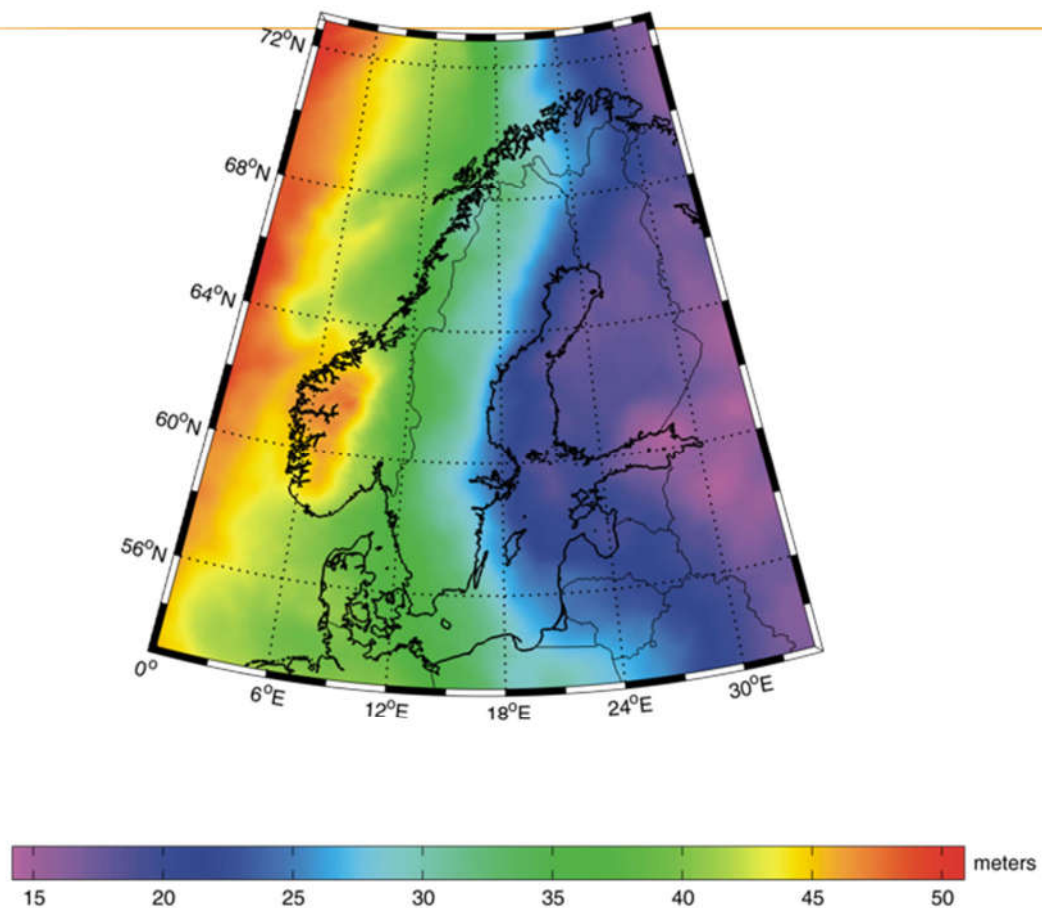
Južnoafriška republika



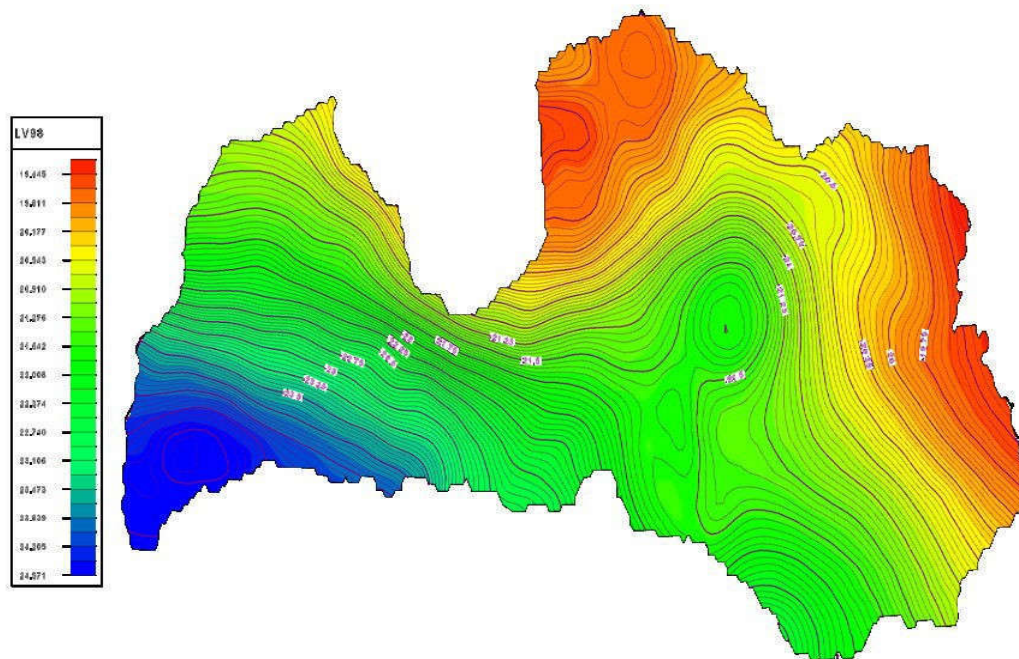
Tahiti



Geoid na območju Skandinavije in Baltika

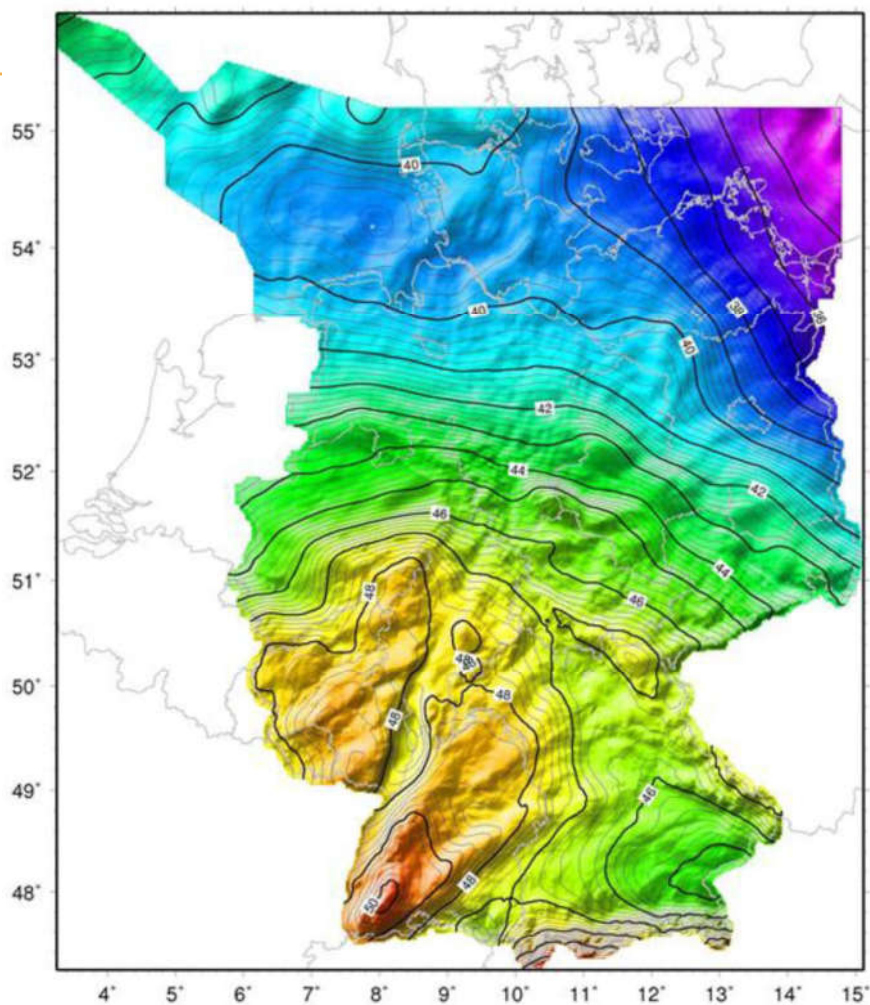


Litva

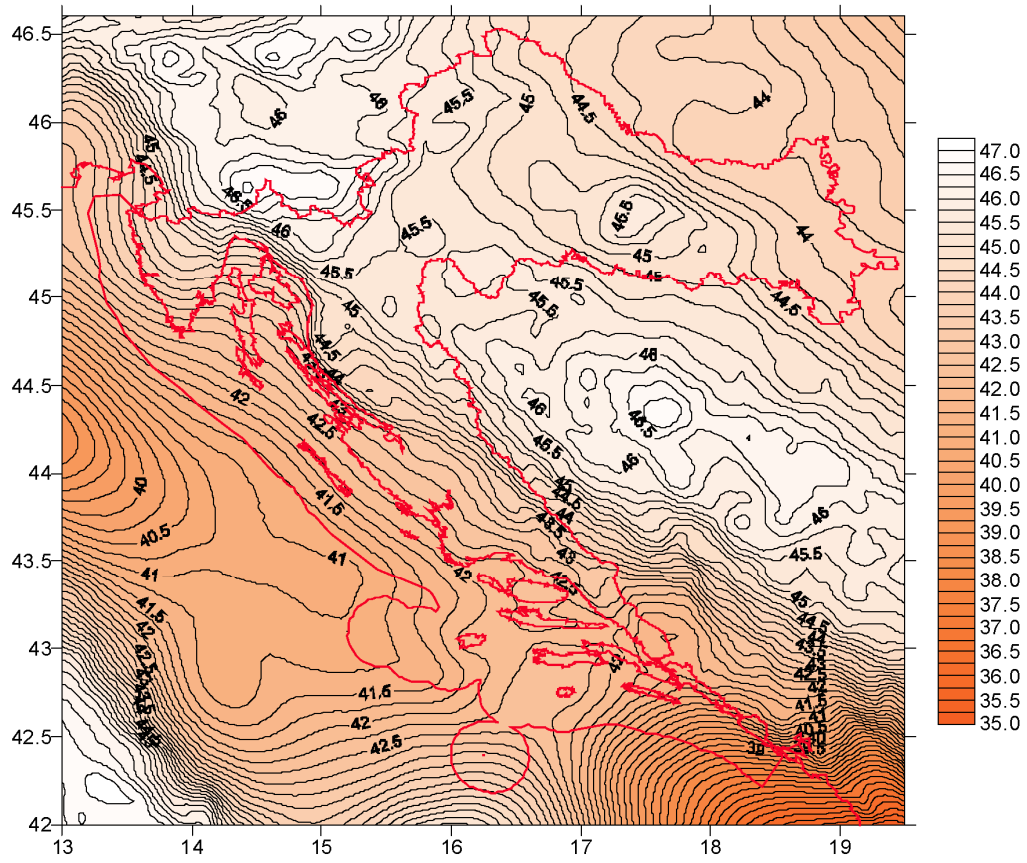


Nemčija

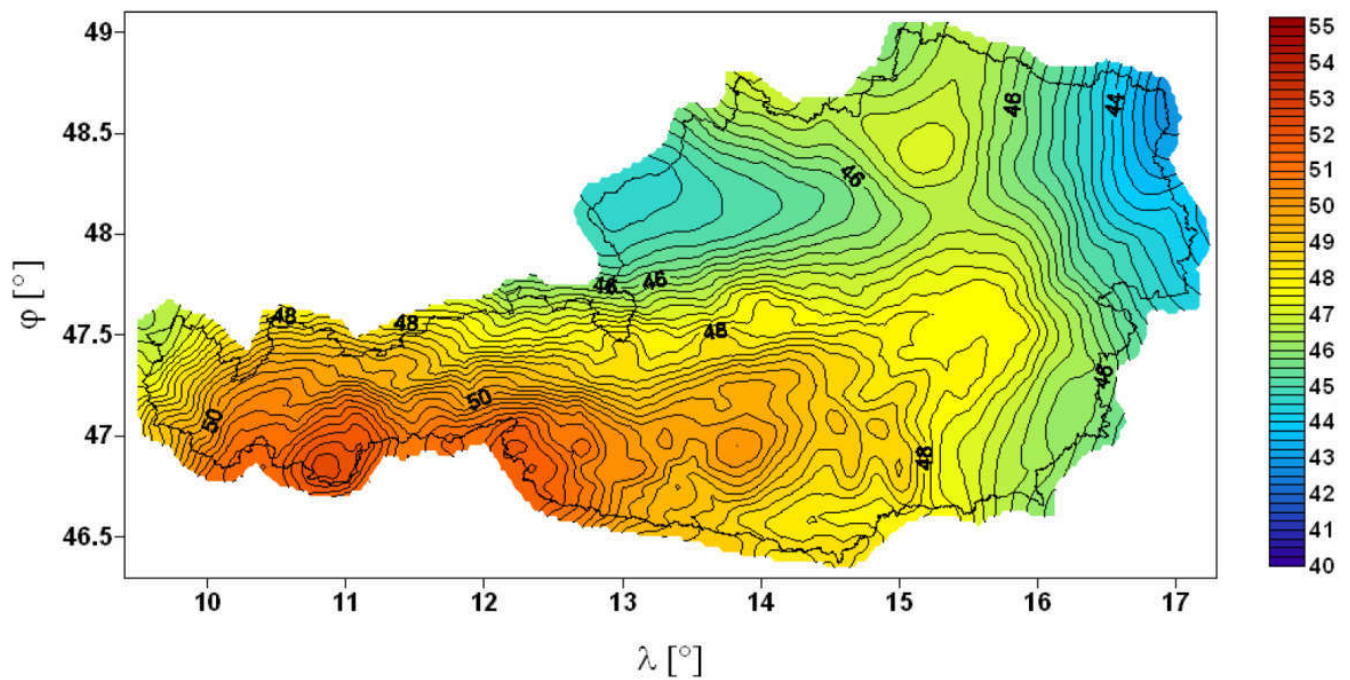
(German Combined QuasiGeoid 2016)



HR in BiH

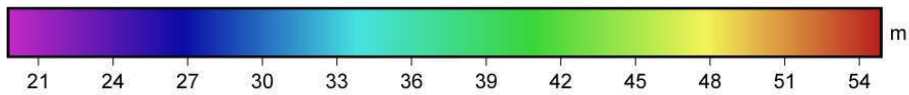
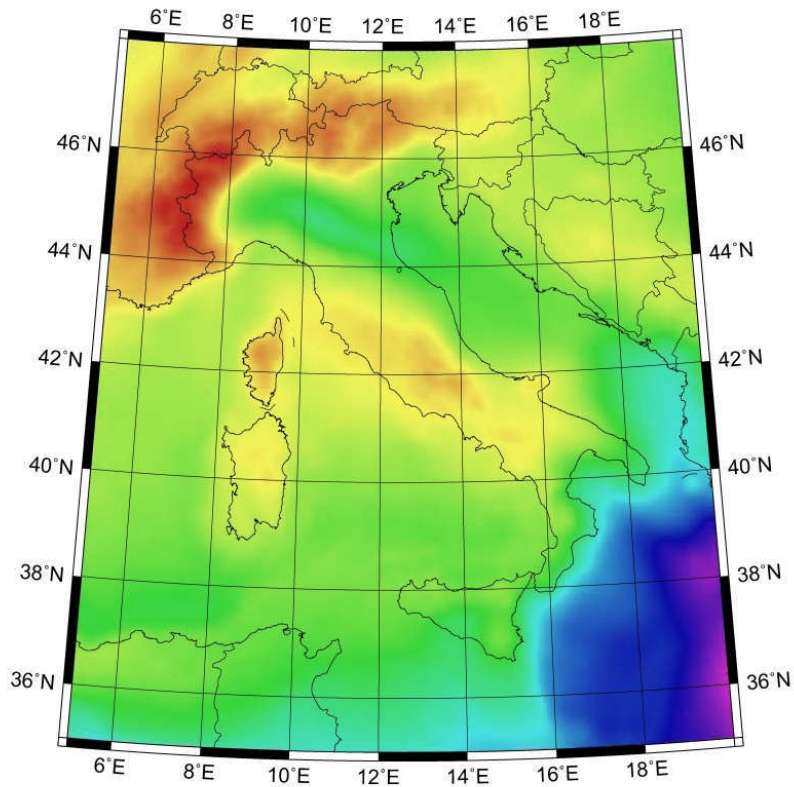


Avstrija

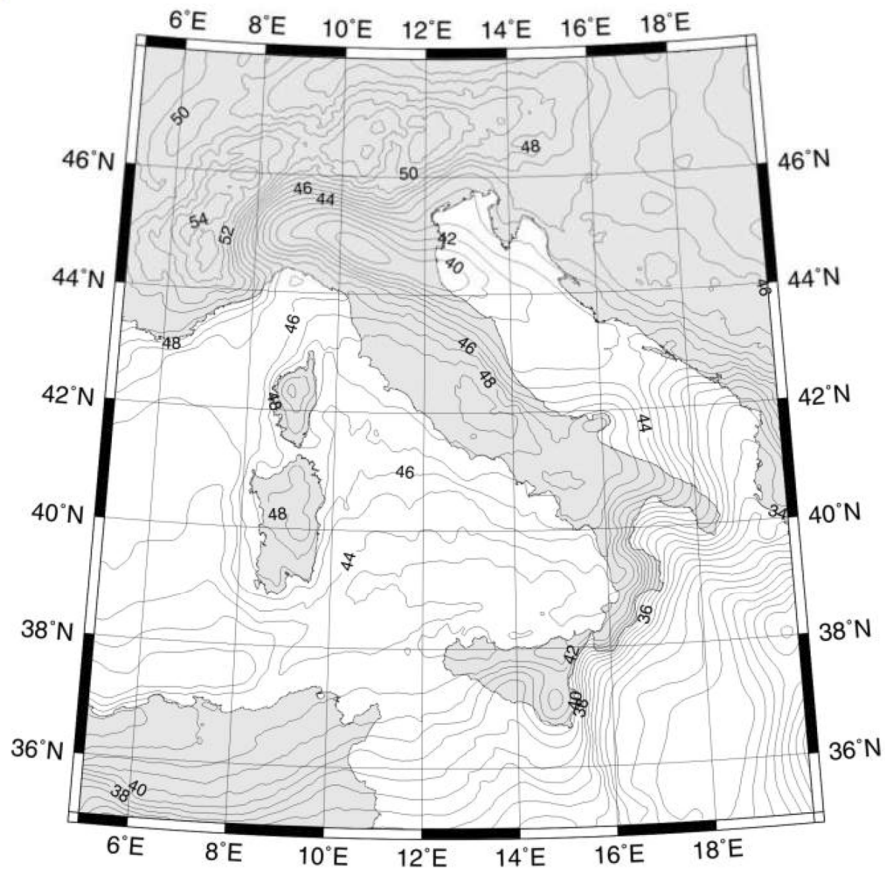


Italija

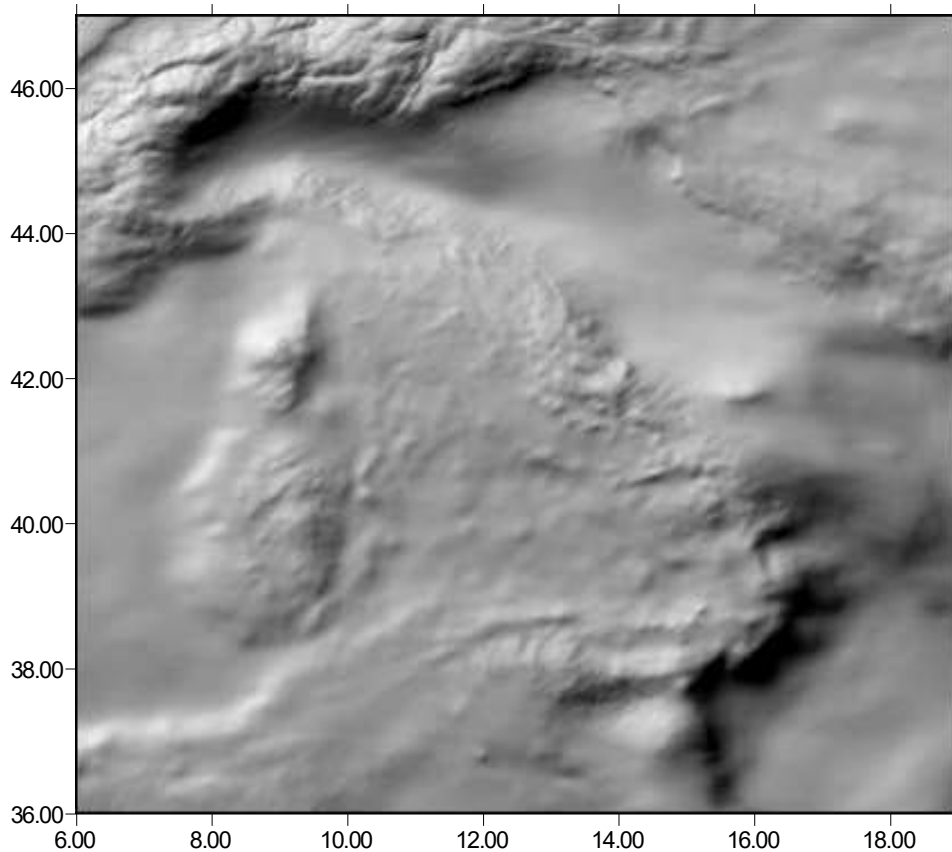
Italgeo05



Italija



Italija



Geoid v digitalni obliki (1)

- ✘ Množica izračunanih točk se preračuna v pravilno točkovno strukturo, celično mrežo točk → **grid**.
- ✘ Predstavitev ploskve s pomočjo grida ima z računalniškega vidika zelo dobro lastnost: ker so horizontalne koordinate točk v gridu podane v enakih presledkih (oddaljenostih), je planimetrični položaj posamezne točke določen z njeno lego v matriki. V računalniškem spominu moramo hraniti samo prostorsko Z koordinato.
- ✘ **Ločljivost grida** ("resolution") pomeni korak s katerim je definirana mreža.

Interpolacija geoidnih višin iz celične mreže

- ✘ Osnovna naloga interpolacije je poiskati funkcijo, katere graf poteka skozi dano zaporedje točk. V primeru geoidnih gridov se uporabljajo bilinearna interpolacija (manjša natančnost) ali pa enodimenzionalna spline funkcija (zlepki).
- ✘ Bilinearna interpolacija:

$$N(\phi, \lambda) = a_0 + a_1X + a_2Y + a_3XY$$

$$a_0 = N_1$$

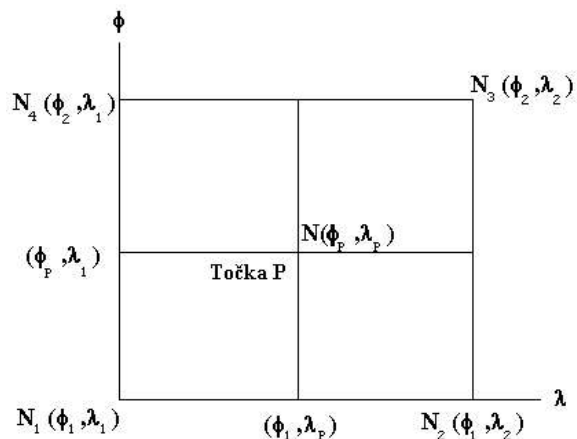
$$a_1 = N_2 - N_1$$

$$a_2 = N_4 - N_1$$

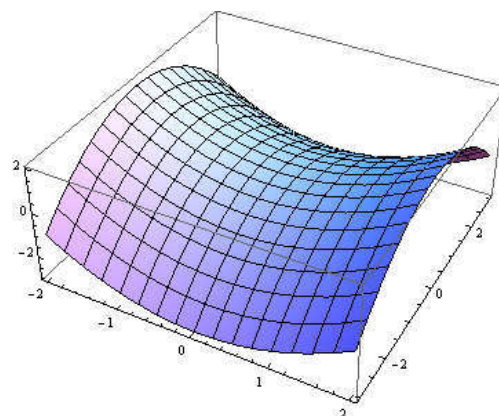
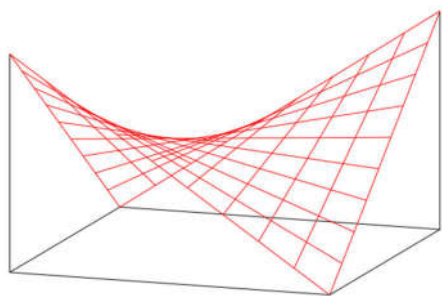
$$a_3 = N_1 + N_3 - N_2 - N_4$$

$$X = (\lambda - \lambda_1) / (\lambda_2 - \lambda_1)$$

$$Y = (\phi - \phi_1) / (\phi_2 - \phi_1)$$



Bilinearna interpolacija - v prostorskem smislu enaka postavitvi hiperboličnega paraboloida skozi štiri točke celice grida.



"Saddle roof" - primeri streh



Ochota žel. postaja, Varšava

London Velopark



M. Kuhar - Fizikalna geodezija

Wolfsburg, mini krog za testne vožnje VW vozil



M. Kuhar - Fizikalna geodezija



Scotia banka, Calgary

Benc. črpalka, Velika Britanija



Bilinearna interpolacija – praktičen primer postavitve ploskve skozi štiri točke celice grida.

