

Determination and evaluation of Estonian Fitted Geoid model Est-Geoid2003

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Goal

This poster focuses on issues related to the calculation of a high precision geoid and height transformation model (fitted geoid) on Estonian territory.

1. Gravimetric geoid determination using Gravsoft package
2. Adopting the model to local reference systems using points with ellipsoidal and normal heights.

Coordinate systems and realisations

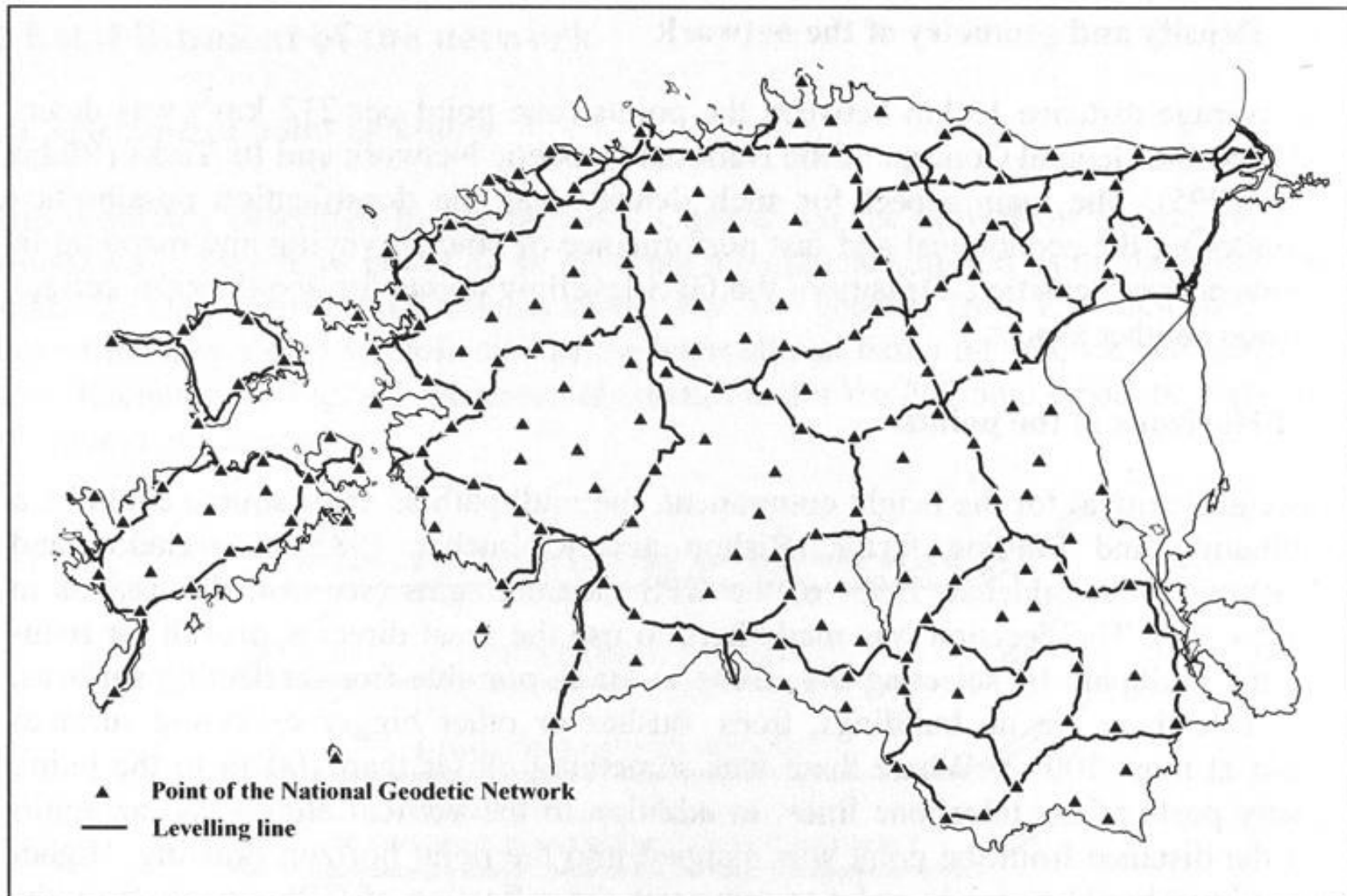
- ETRS89 is realized in 1997, called as EUREF-ESt97. This is homogenous and completely new network
- BK77 - Baltic height system, normal heights, epoch about 1960
- New height system will come after finalizing new leveling, probably in 2011.

Integrated geodetic network

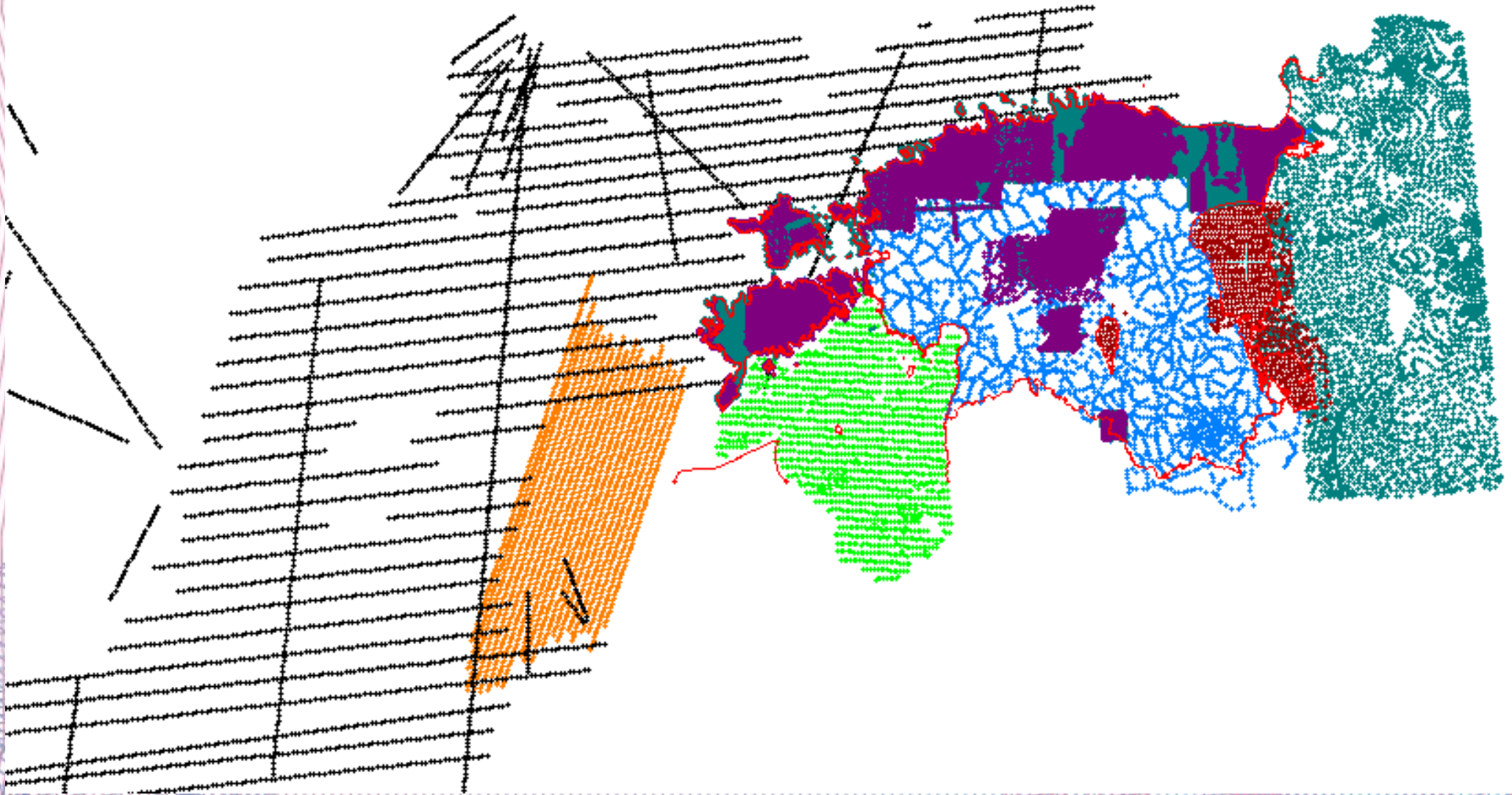
Geodetic network (212 p) was planned together with spirit levelling, half of GPS points (about 110) get precise normal height as well

New precise leveling (2002-2010) is finished on mainland already, islands will come this year

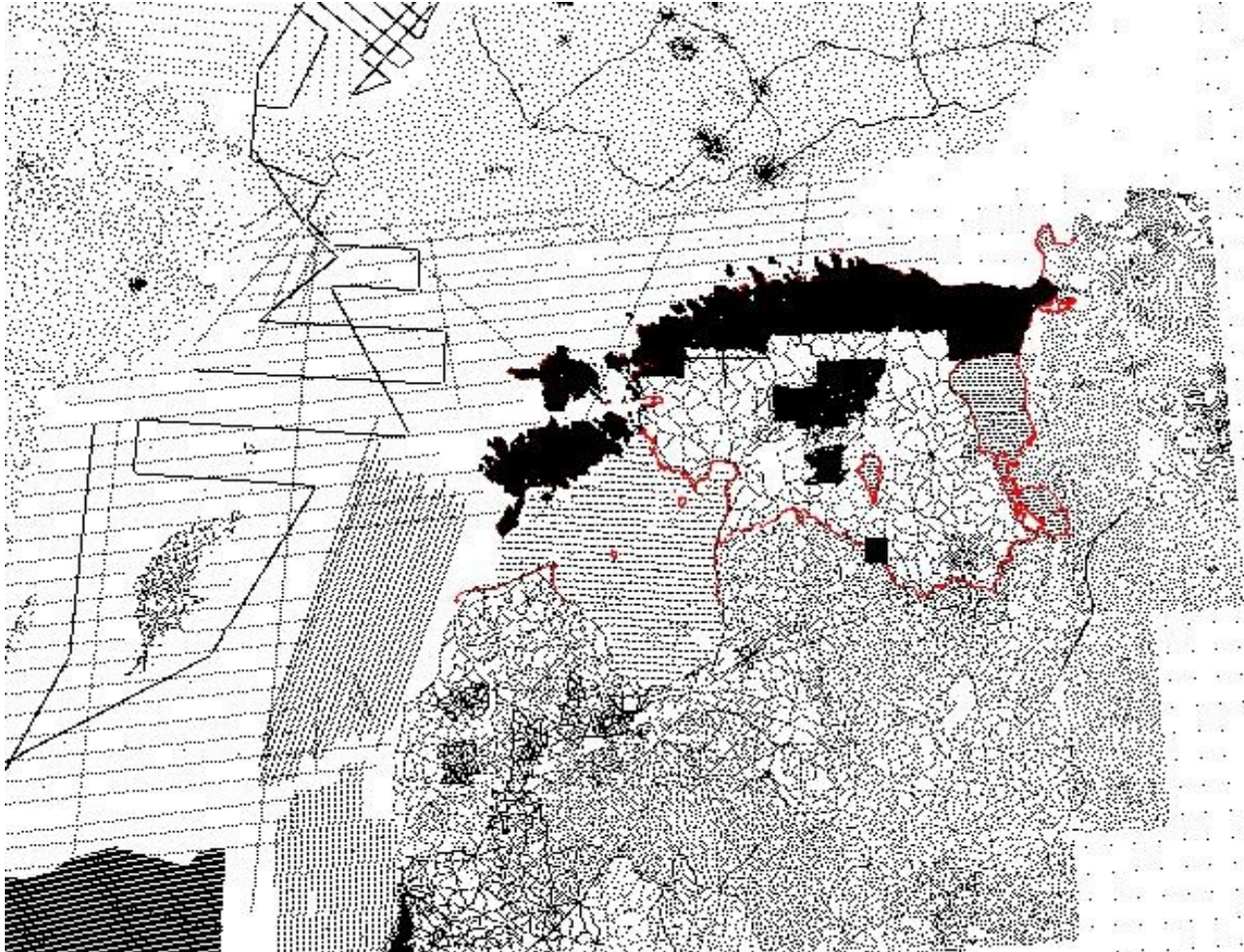
Integrated georeference (developed by State Land Board) is perfect for geoid evaluation and fitting



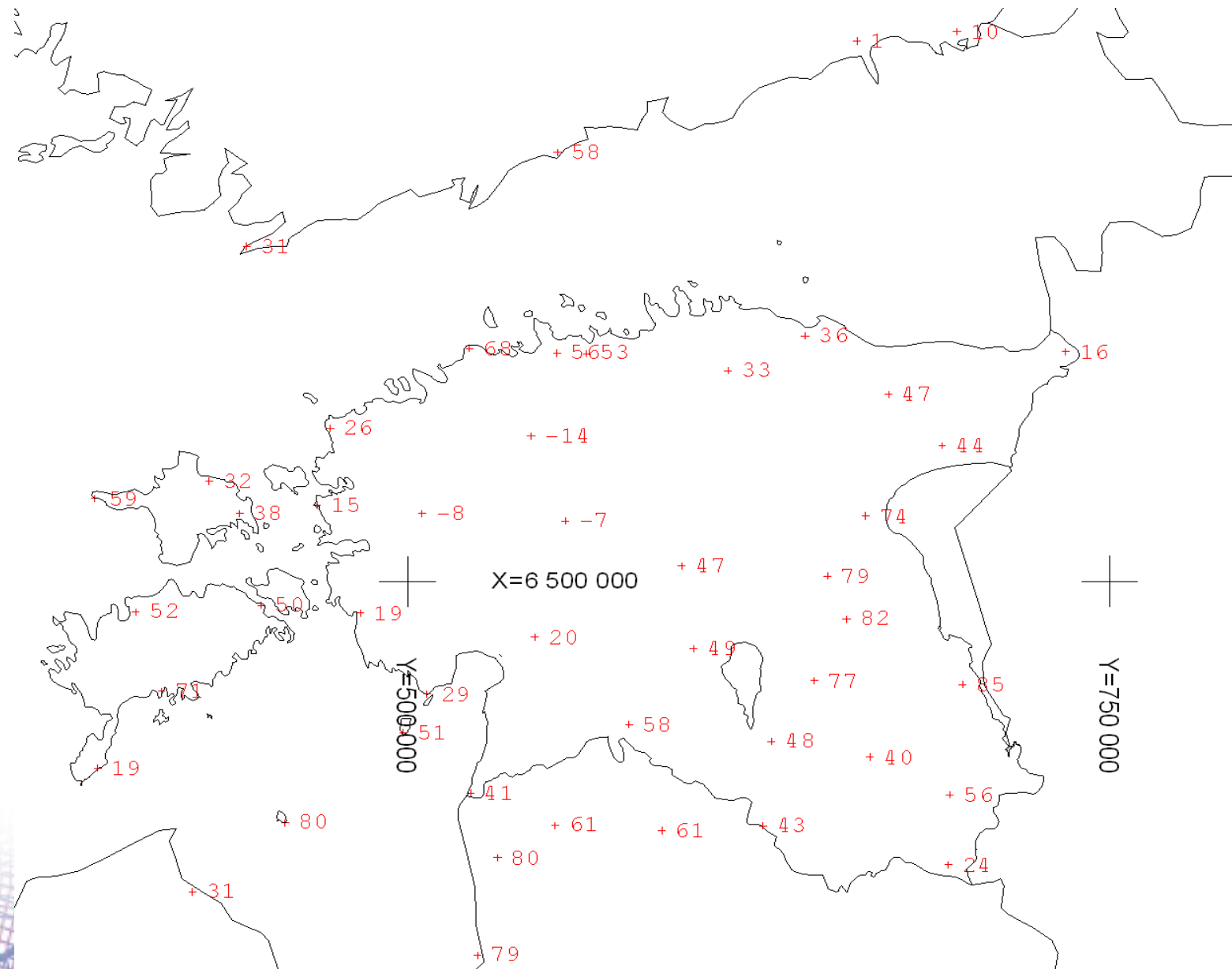
Gravity database



KMS gravity database in region

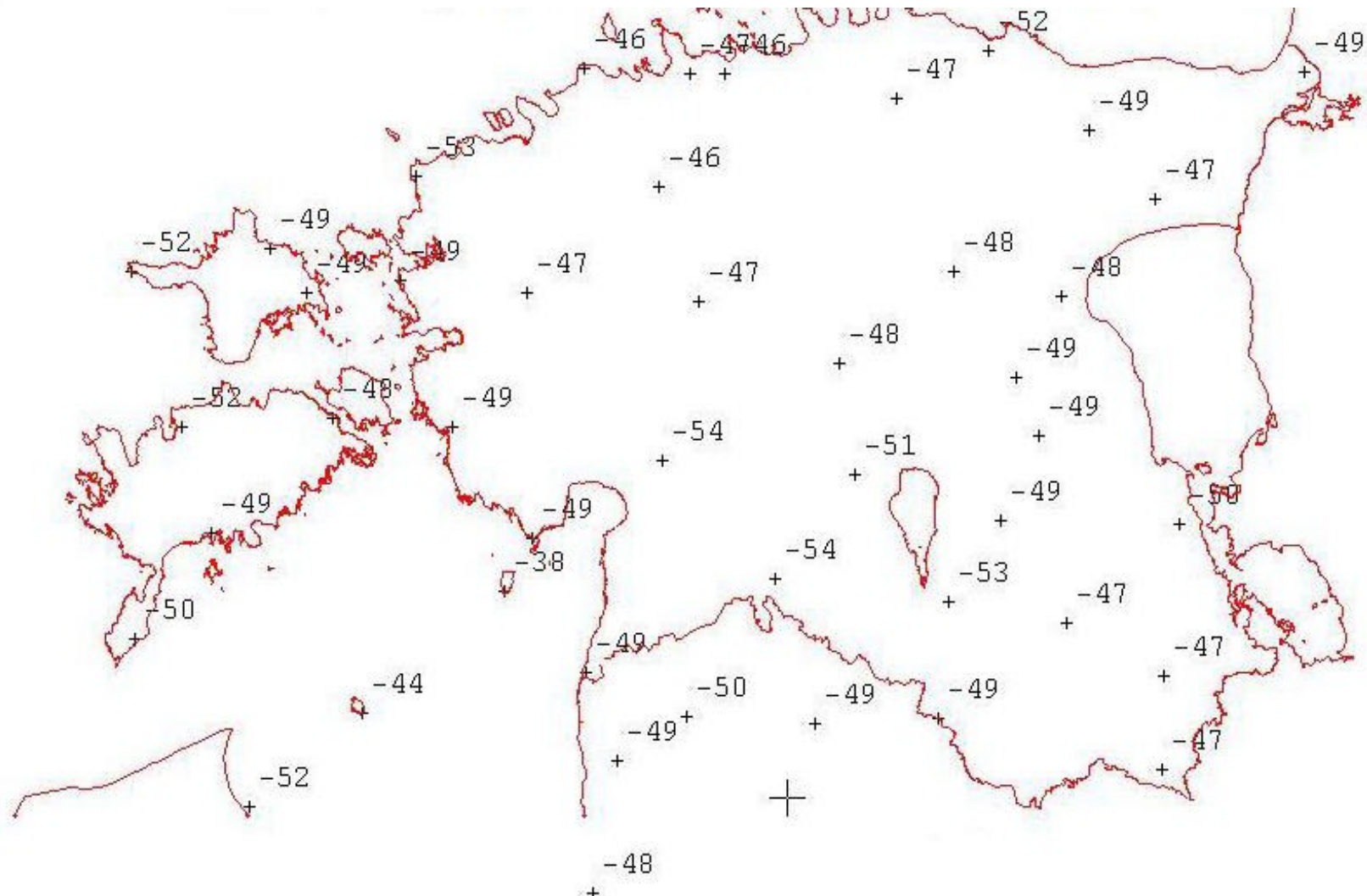


Difference between Grace satellite only model ITG-Grace2010s and GPS-levelling points in geoid heights (cm)



A topographic map showing a mountainous region with black contour lines. A red line, likely a boundary or path, winds through the terrain. Several contour lines are labeled with numerical values: 16.8, 17, 17.2, 18, 18.2, 18.4, 18.6, 18.8, 19, 19.2, 19.4, 19.6, 19.8, 20, 20.2, 20.4, 20.6, 20.8, 21, 21.2, 21.4, 21.6, 21.8, 22, 22.2, 22.4, 22.6, 22.8, 23, 23.2, 23.4, 23.6, 23.8, 24, 24.2, 24.4, 24.6, 24.8, 25, 25.2, 25.4, 25.6, 25.8, 26, 26.2, 26.4, 26.6, 26.8, 27, 27.2, 27.4, 27.6, 27.8, 28, 28.2, 28.4, 28.6, 28.8, 29, 29.2, 29.4, 29.6, 29.8, 30, 30.2, 30.4, 30.6, 30.8, 31, 31.2, 31.4, 31.6, 31.8, 32, 32.2, 32.4, 32.6, 32.8, 33, 33.2, 33.4, 33.6, 33.8, 34, 34.2, 34.4, 34.6, 34.8, 35, 35.2, 35.4, 35.6, 35.8, 36, 36.2, 36.4, 36.6, 36.8, 37, 37.2, 37.4, 37.6, 37.8, 38, 38.2, 38.4, 38.6, 38.8, 39, 39.2, 39.4, 39.6, 39.8, 40, 40.2, 40.4, 40.6, 40.8, 41, 41.2, 41.4, 41.6, 41.8, 42, 42.2, 42.4, 42.6, 42.8, 43, 43.2, 43.4, 43.6, 43.8, 44, 44.2, 44.4, 44.6, 44.8, 45, 45.2, 45.4, 45.6, 45.8, 46, 46.2, 46.4, 46.6, 46.8, 47, 47.2, 47.4, 47.6, 47.8, 48, 48.2, 48.4, 48.6, 48.8, 49, 49.2, 49.4, 49.6, 49.8, 50, 50.2, 50.4, 50.6, 50.8, 51, 51.2, 51.4, 51.6, 51.8, 52, 52.2, 52.4, 52.6, 52.8, 53, 53.2, 53.4, 53.6, 53.8, 54, 54.2, 54.4, 54.6, 54.8, 55, 55.2, 55.4, 55.6, 55.8, 56, 56.2, 56.4, 56.6, 56.8, 57, 57.2, 57.4, 57.6, 57.8, 58, 58.2, 58.4, 58.6, 58.8, 59, 59.2, 59.4, 59.6, 59.8, 60, 60.2, 60.4, 60.6, 60.8, 61, 61.2, 61.4, 61.6, 61.8, 62, 62.2, 62.4, 62.6, 62.8, 63, 63.2, 63.4, 63.6, 63.8, 64, 64.2, 64.4, 64.6, 64.8, 65, 65.2, 65.4, 65.6, 65.8, 66, 66.2, 66.4, 66.6, 66.8, 67, 67.2, 67.4, 67.6, 67.8, 68, 68.2, 68.4, 68.6, 68.8, 69, 69.2, 69.4, 69.6, 69.8, 70, 70.2, 70.4, 70.6, 70.8, 71, 71.2, 71.4, 71.6, 71.8, 72, 72.2, 72.4, 72.6, 72.8, 73, 73.2, 73.4, 73.6, 73.8, 74, 74.2, 74.4, 74.6, 74.8, 75, 75.2, 75.4, 75.6, 75.8, 76, 76.2, 76.4, 76.6, 76.8, 77, 77.2, 77.4, 77.6, 77.8, 78, 78.2, 78.4, 78.6, 78.8, 79, 79.2, 79.4, 79.6, 79.8, 80, 80.2, 80.4, 80.6, 80.8, 81, 81.2, 81.4, 81.6, 81.8, 82, 82.2, 82.4, 82.6, 82.8, 83, 83.2, 83.4, 83.6, 83.8, 84, 84.2, 84.4, 84.6, 84.8, 85, 85.2, 85.4, 85.6, 85.8, 86, 86.2, 86.4, 86.6, 86.8, 87, 87.2, 87.4, 87.6, 87.8, 88, 88.2, 88.4, 88.6, 88.8, 89, 89.2, 89.4, 89.6, 89.8, 90, 90.2, 90.4, 90.6, 90.8, 91, 91.2, 91.4, 91.6, 91.8, 92, 92.2, 92.4, 92.6, 92.8, 93, 93.2, 93.4, 93.6, 93.8, 94, 94.2, 94.4, 94.6, 94.8, 95, 95.2, 95.4, 95.6, 95.8, 96, 96.2, 96.4, 96.6, 96.8, 97, 97.2, 97.4, 97.6, 97.8, 98, 98.2, 98.4, 98.6, 98.8, 99, 99.2, 99.4, 99.6, 99.8, 100, 100.2, 100.4, 100.6, 100.8, 101, 101.2, 101.4, 101.6, 101.8, 102, 102.2, 102.4, 102.6, 102.8, 103, 103.2, 103.4, 103.6, 103.8, 104, 104.2, 104.4, 104.6, 104.8, 105, 105.2, 105.4, 105.6, 105.8, 106, 106.2, 106.4, 106.6, 106.8, 107, 107.2, 107.4, 107.6, 107.8, 108, 108.2, 108.4, 108.6, 108.8, 109, 109.2, 109.4, 109.6, 109.8, 110, 110.2, 110.4, 110.6, 110.8, 111, 111.2, 111.4, 111.6, 111.8, 112, 112.2, 112.4, 112.6, 112.8, 113, 113.2, 113.4, 113.6, 113.8, 114, 114.2, 114.4, 114.6, 114.8, 115, 115.2, 115.4, 115.6, 115.8, 116, 116.2, 116.4, 116.6, 116.8, 117, 117.2, 117.4, 117.6, 117.8, 118, 118.2, 118.4, 118.6, 118.8, 119, 119.2, 119.4, 119.6, 119.8, 120, 120.2, 120.4, 120.6, 120.8, 121, 121.2, 121.4, 121.6, 121.8, 122, 122.2, 122.4, 122.6, 122.8, 123, 123.2, 123.4, 123.6, 123.8, 124, 124.2, 124.4, 124.6, 124.8, 125, 125.2, 125.4, 125.6, 125.8, 126, 126.2, 126.4, 126.6, 126.8, 127, 127.2, 127.4, 127.6, 127.8, 128, 128.2, 128.4, 128.6, 128.8, 129, 129.2, 129.4, 129.6, 129.8, 130, 130.2, 130.4, 130.6, 130.8, 131, 131.2, 131.4, 131.6, 131.8, 132, 132.2, 132.4, 132.6, 132.8, 133, 133.2, 133.4, 133.6, 133.8, 134, 134.2, 134.4, 134.6, 134.8, 135, 135.2, 135.4, 135.6, 135.8, 136, 136.2, 136.4, 136.6, 136.8, 137, 137.2, 137.4, 137.6, 137.8, 138, 138.2, 138.4, 138.6, 138.8, 139, 139.2, 139.4, 139.6, 139.8, 140, 140.2, 140.4, 140.6, 140.8, 141, 141.2, 141.4, 141.6, 141.8, 142, 142.2, 142.4, 142.6, 142.8, 143, 143.2, 143.4, 143.6, 143.8, 144, 144.2, 144.4, 144.6, 144.8, 145, 145.2, 145.4, 145.6, 145.8, 146, 146.2, 146.4, 146.6, 146.8, 147, 147.2, 147.4, 147.6, 147.8, 148, 148.2, 148.4, 148.6, 148.8, 149, 149.2, 149.4, 149.6, 149.8, 150, 150.2, 150.4, 150.6, 150.8, 151, 151.2, 151.4, 151.6, 151.8, 152, 152.

Differences between gravimetric geod and geometric geoid



Accuracy of the fitted geoid model EstGeoid2003

Comparision with stand alone GPS levelling
points shows better accuracy than 2 cm.