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Information Agency

Latvian national coordinate system – why ETRF2020 realization

EUREF 2024 symposium National and local activities

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Nordic/Baltic cooperation NKG

Latvian geospatial information agency is active partner.

NKG power is Working groups with clear focus and best geodesists in area:

GEODYNAMICS AND EARTH OBSERVATIONS ***(GIA AND INSAR)***

HEIGHT AND GEOID ***(QUASIGEOID FOR AREA AND IHRF)***

REFERENCE FRAMES ***(LOCAL ANALYSES CENTER FOR EPN)***

GNSS POSITIONING ***(POSITIONING SERVICE AND PROBLEMS WITH SIGNALS)***

BalMarGrav
MODERNIZED GRAVITY MAPS OF THE BALTIC SEA

LANTMÄTERIET

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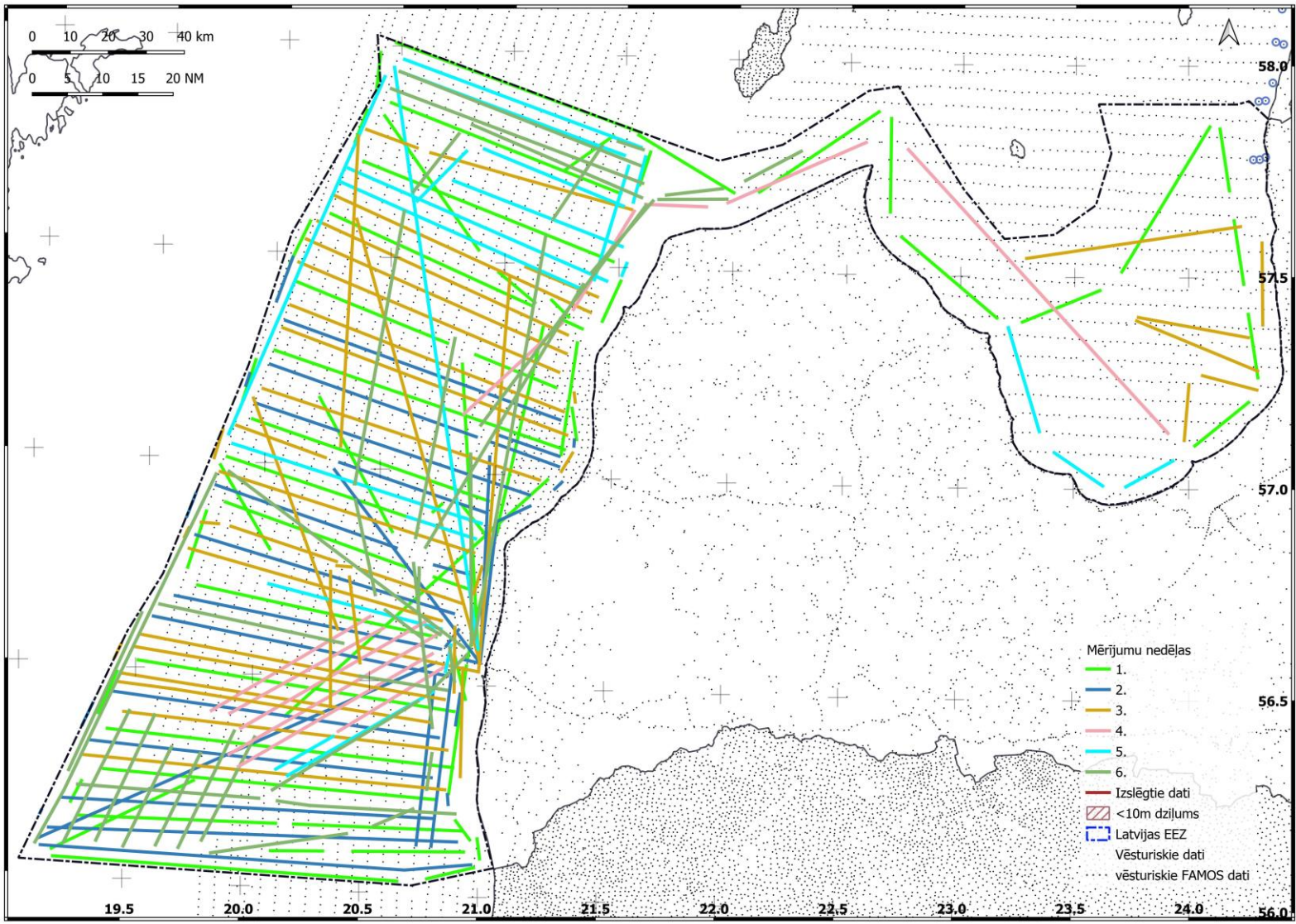
Example of cooperation for better good



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Short historical notice

In year 1992 September and October came with global positioning measurements in three Baltic countries known as EUREF BAL.

That is beginning of global positioning civil era and two year after end of occupation.

Lithuania and Estonia is not directly using results of EUREF BAL. Made additional measurements and established new coordinate systems in 1994 and 1997.

Only Latvia directly used results and established LKS-92

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International and European frames

ITRS – International Terrestrial Reference System

…
ITRF94
ITRF96
ITRF97
ITRF2000
ITRF2005
ITRF2008
ITRF2014
ITRF2020

ETRS89 – European Terrestrial Reference System 1989

…
ETRF94
ETRF96
ETRF97
ETRF2000
ETRF2005
ETRF2014
ETRF2020

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Life of LKS-92

Till real time global positioning base station development in Latvia at 2006, there were just old and new coordinate relate problems. Reason secret old coordinates of points.

After 2008 when Realtime Latvian base station positioning system start fully operate first notice of inside accuracy of LKS-92 and it place in ETRF realization map came out.

LKS-92 have bag in East component around 7 cm in plane

In 2011 alignment of LKS-92 original point Riga and LatPos coordinates in LKS-92 was done. Make gap between realizations of same ‘system’ in different time smaller.

Question how to procced arise?

Idea of LATREF stations start to realize in 2016

Irbene

Riga

Alūksne

Vainode

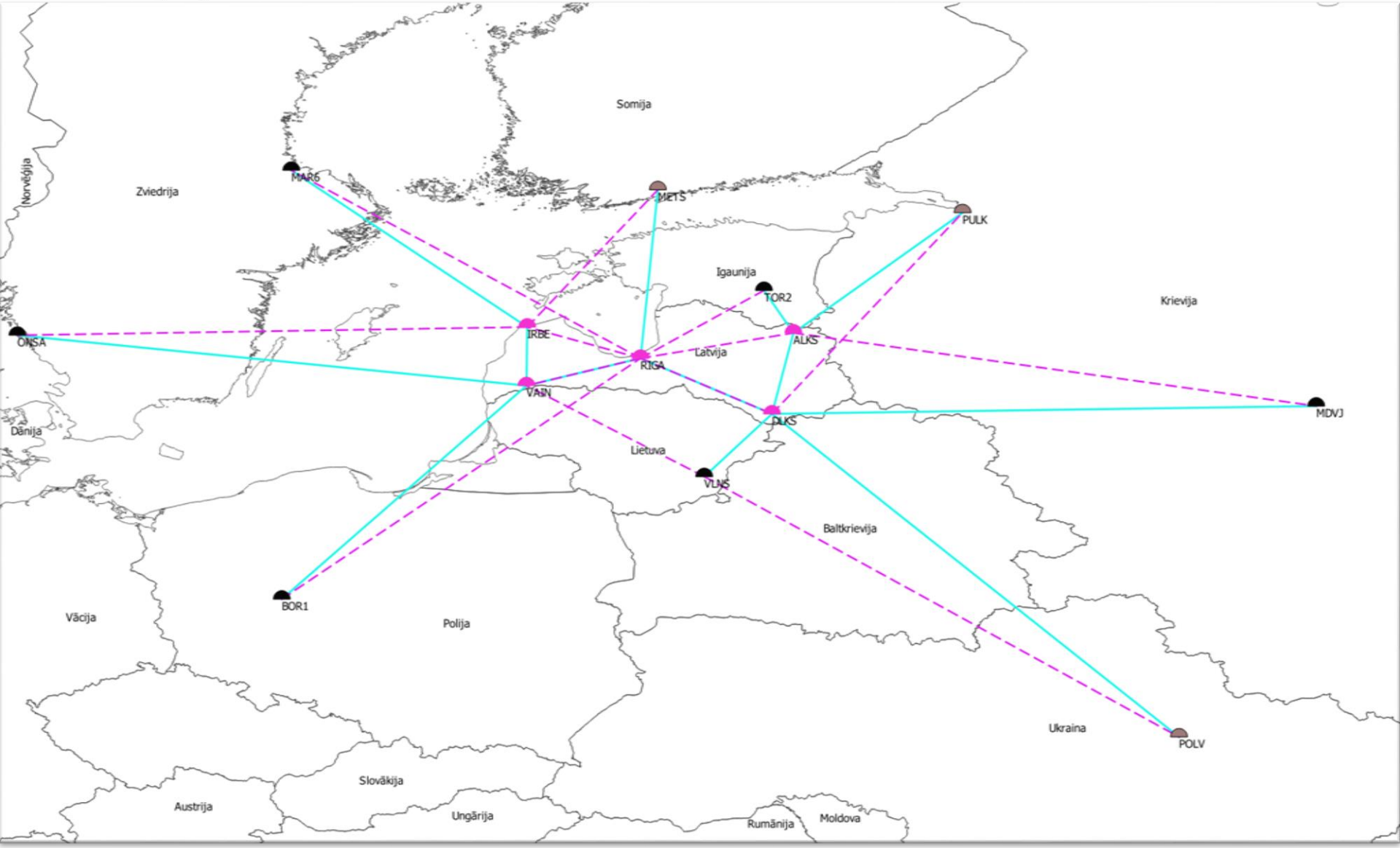
Daugavpils

Legend

LATREF station

Calibrated antenna

LKS-2020 modernisation LATREFV8 defined baselines



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Idea of realization of LKS-2020

Base stations LATREF and LatPos with dynamic and static coordinates.

Dynamic will have add time.

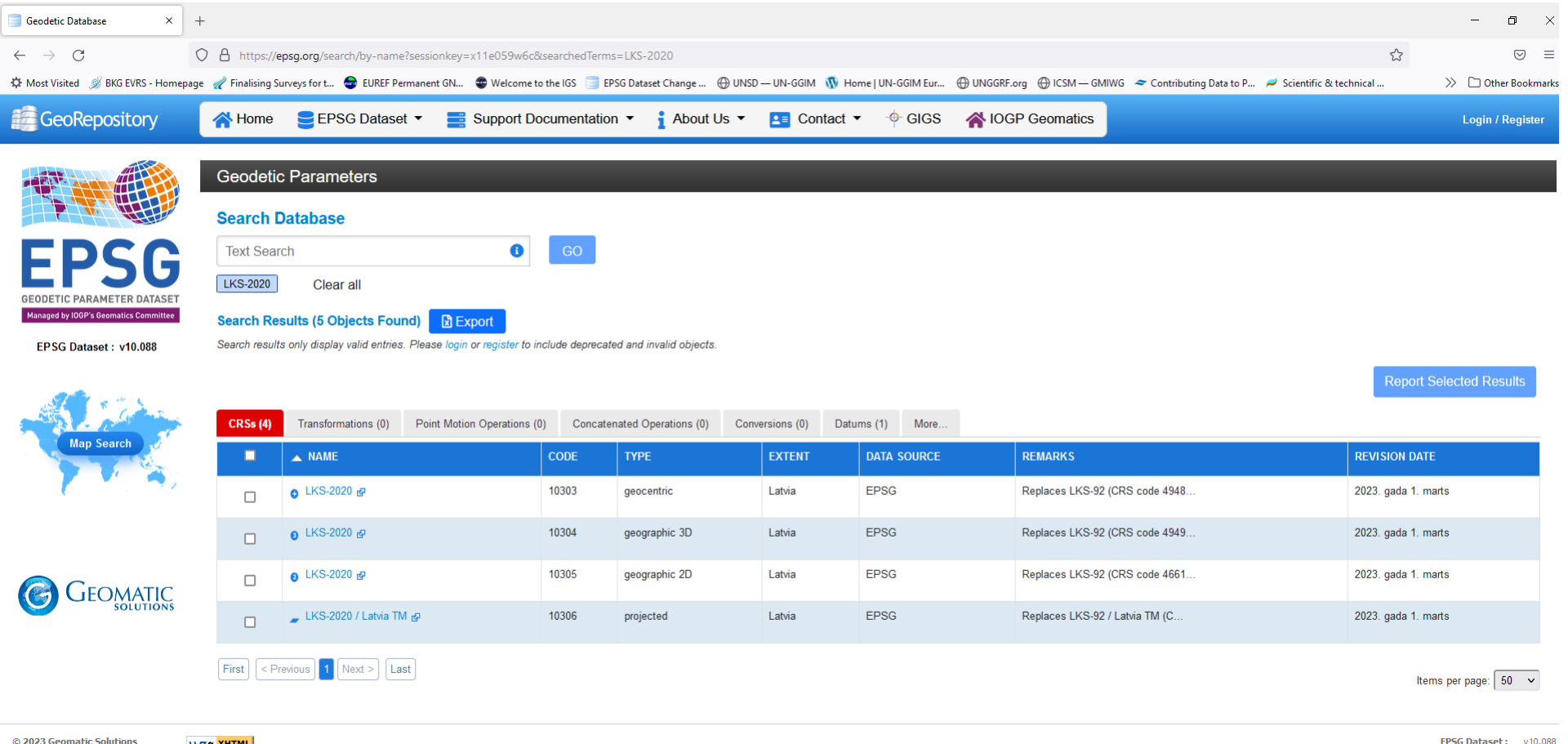
Velocity field/speed vectors will be introduce.

All other coordinates in static frame.

New coordinates with new ellipsoidal/geodetic height change also quasigeoid.

From around 150 points measured in spring 2020 make transformation surface nTV2.

EPSG codes from 1st of March 2023 but in stand by position



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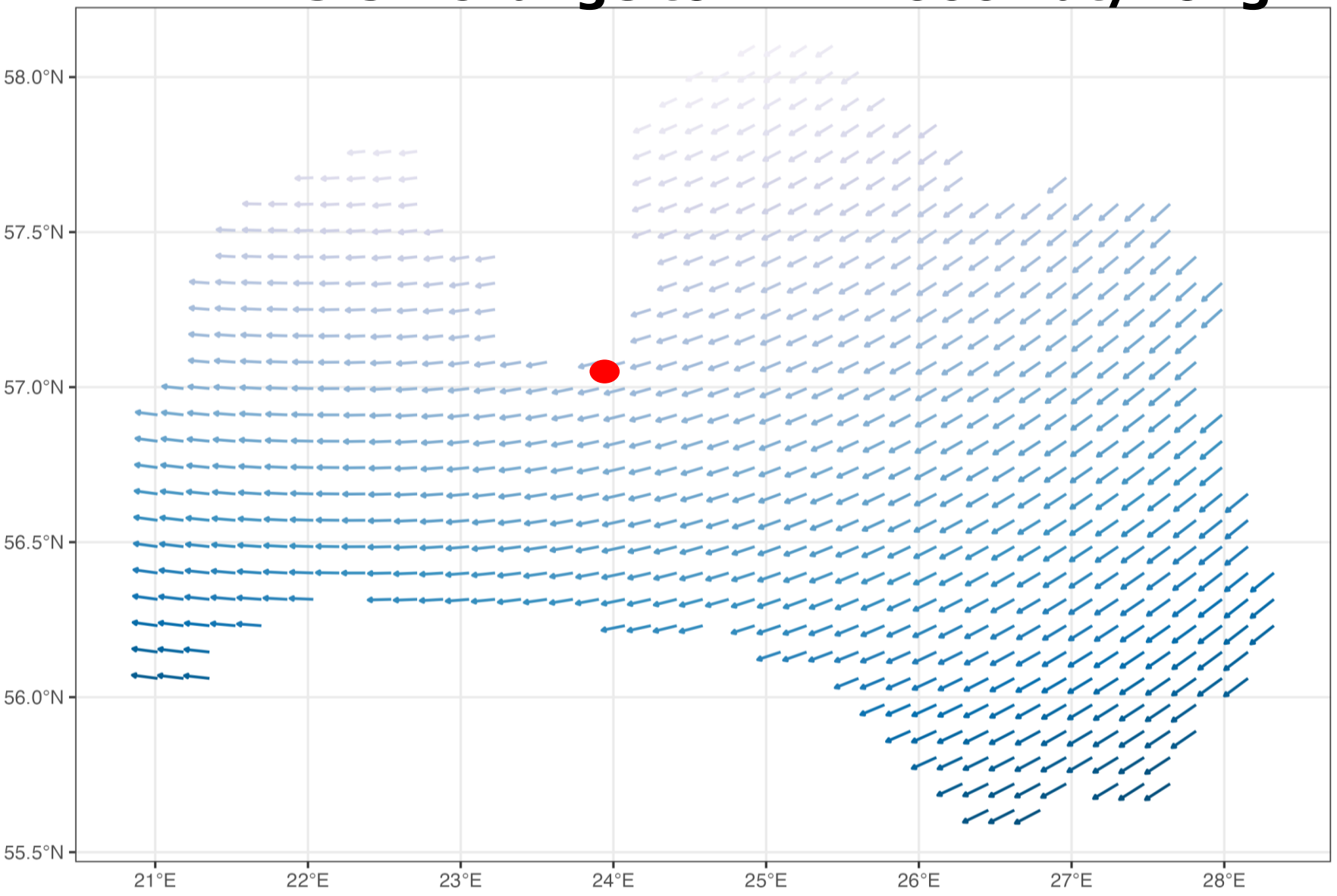
Transformation surface nTV2

Check several option: krigging, 1st, 2nd,3rd and 4th degree polynomic.

Best fit to reality second order polynomic.

All GIS community easy access and use nTV2 transformations.

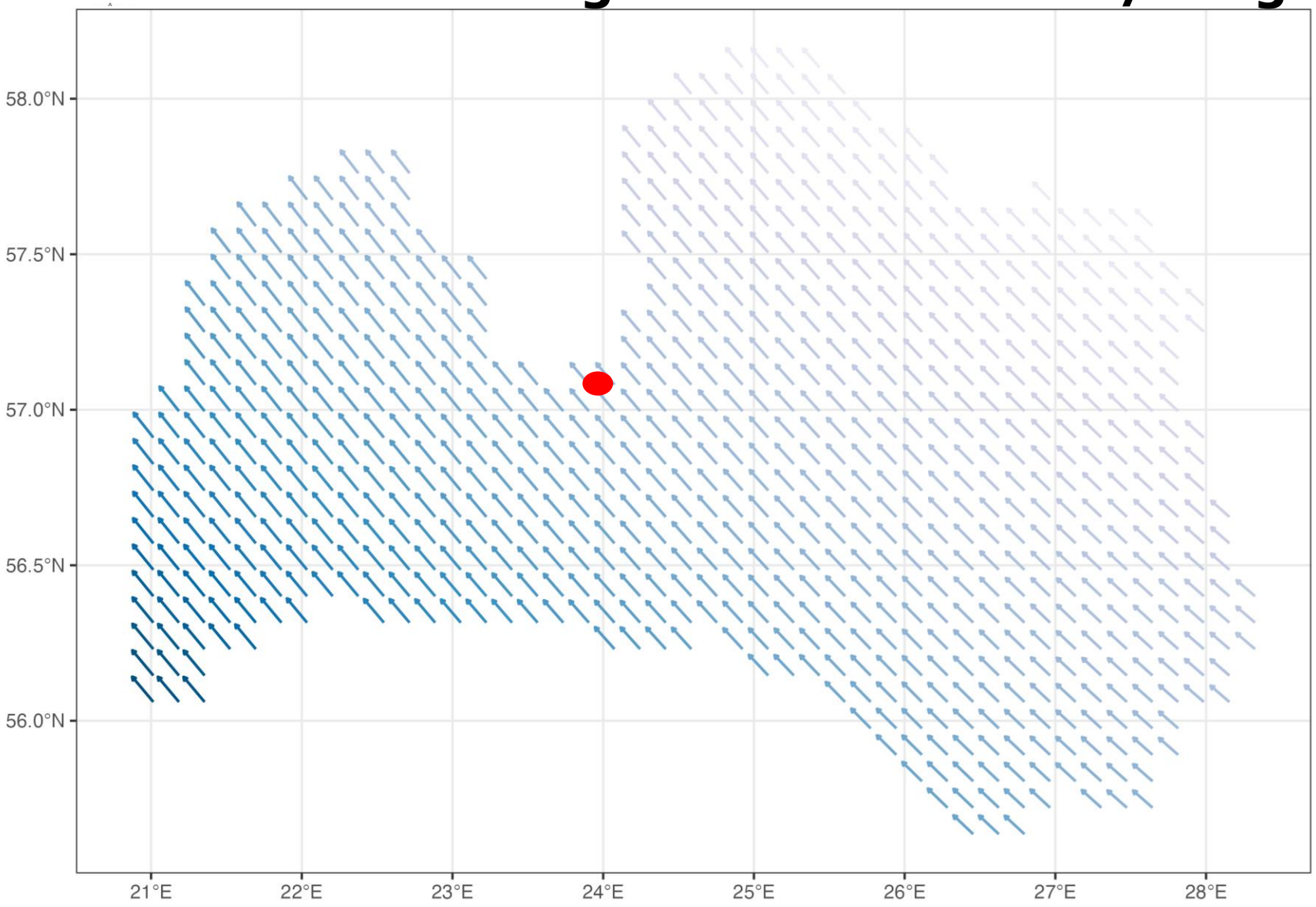
LKS-92 change to ETRF2000 Lat/Long



Absolute change in mm

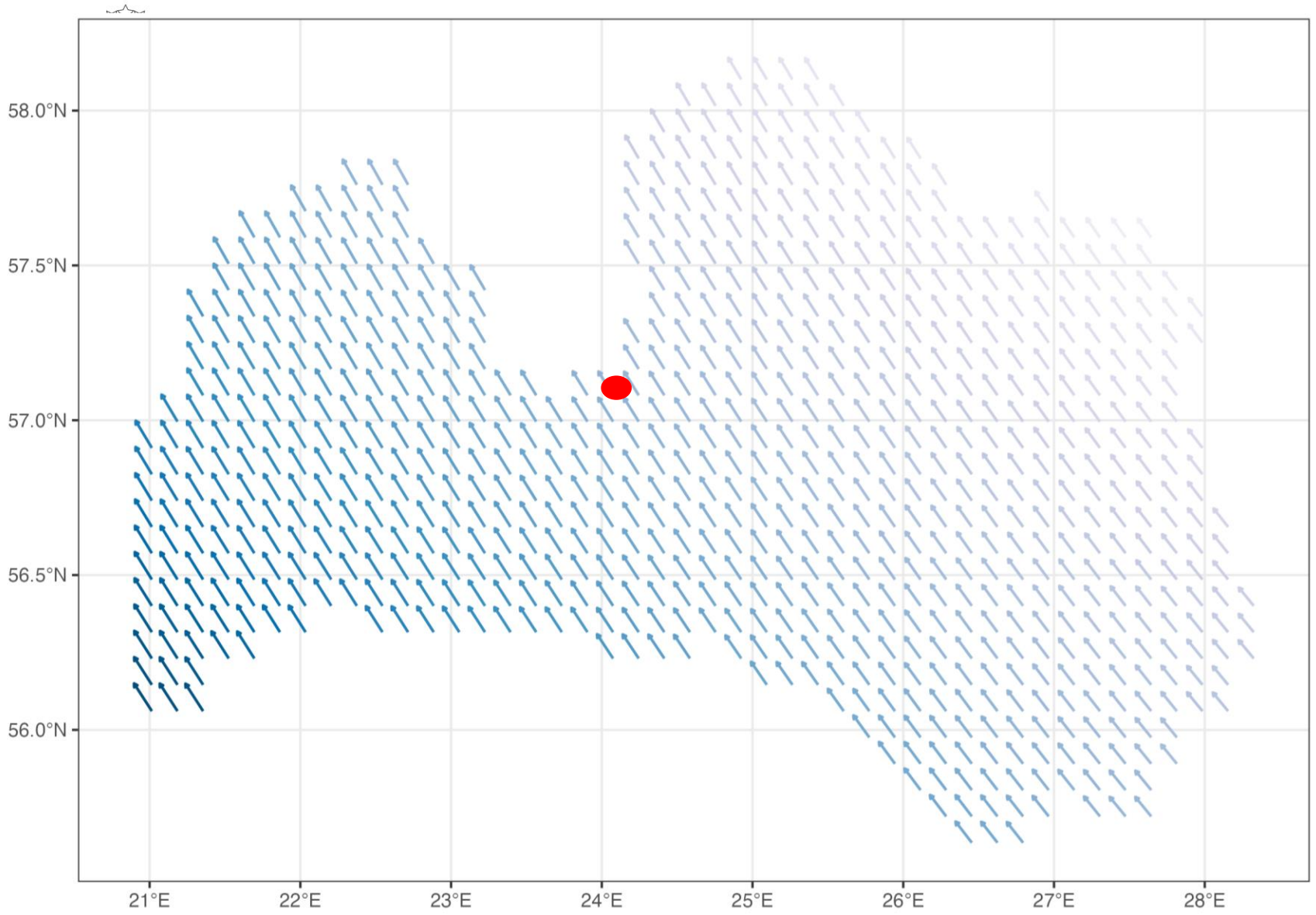
55 60 65 70 75 80

LKS-92 change to ETRF2014 Lat/Long

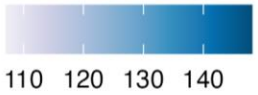


Absolute change in mm

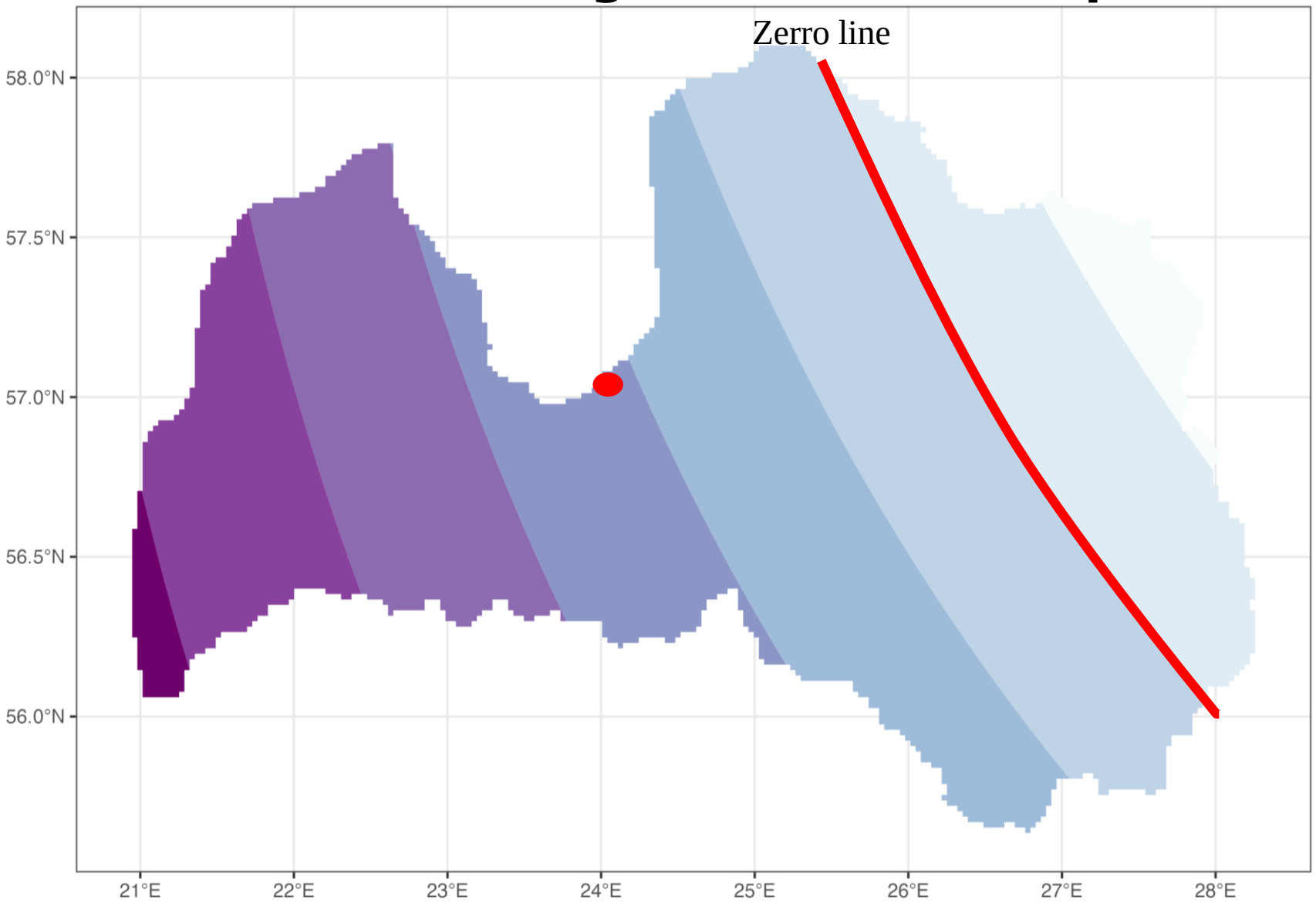
LKS-92 change to ETRF2020 Lat/Long



Absolute change in mm

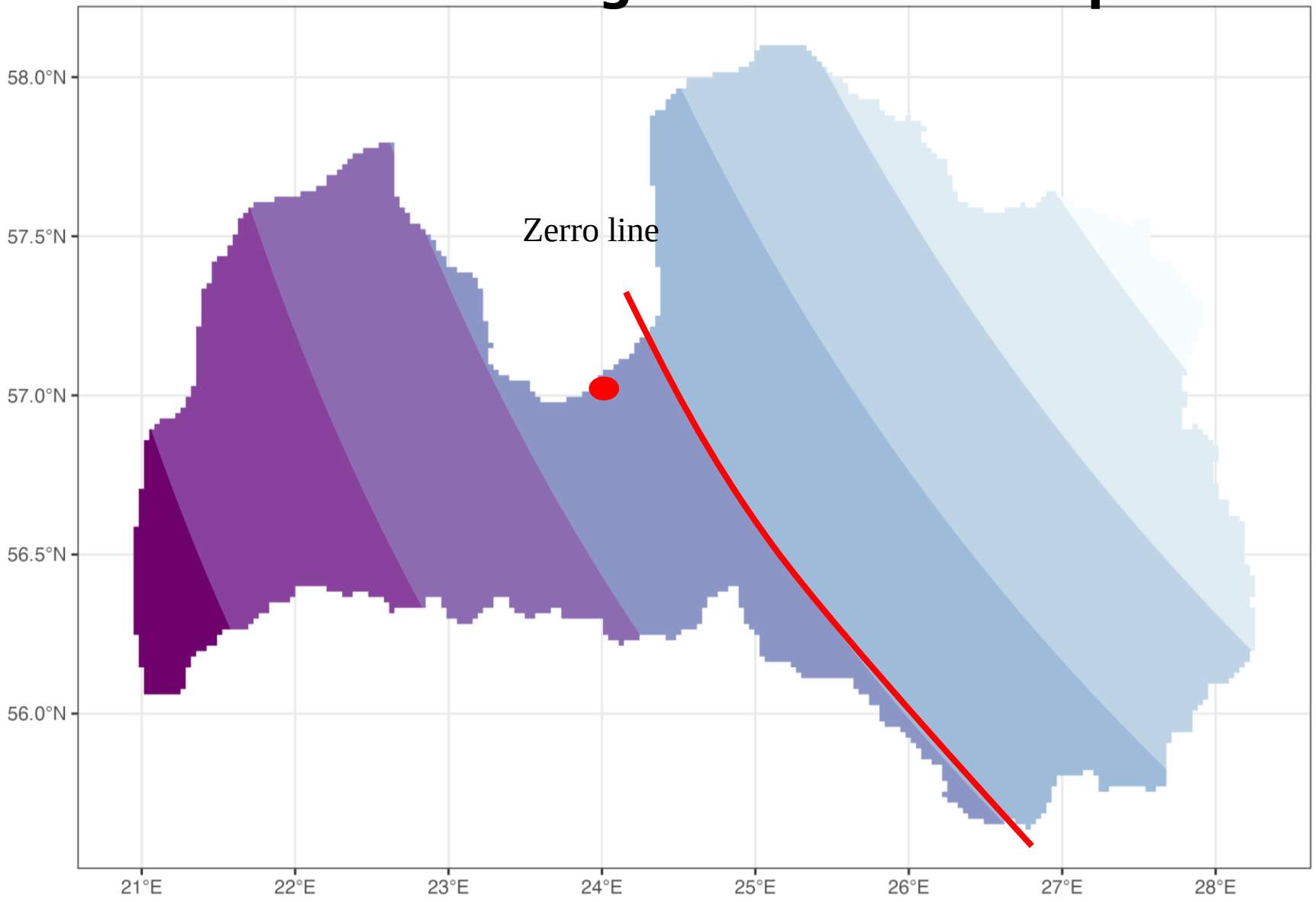


LKS-92 change to ETRF2000 Up



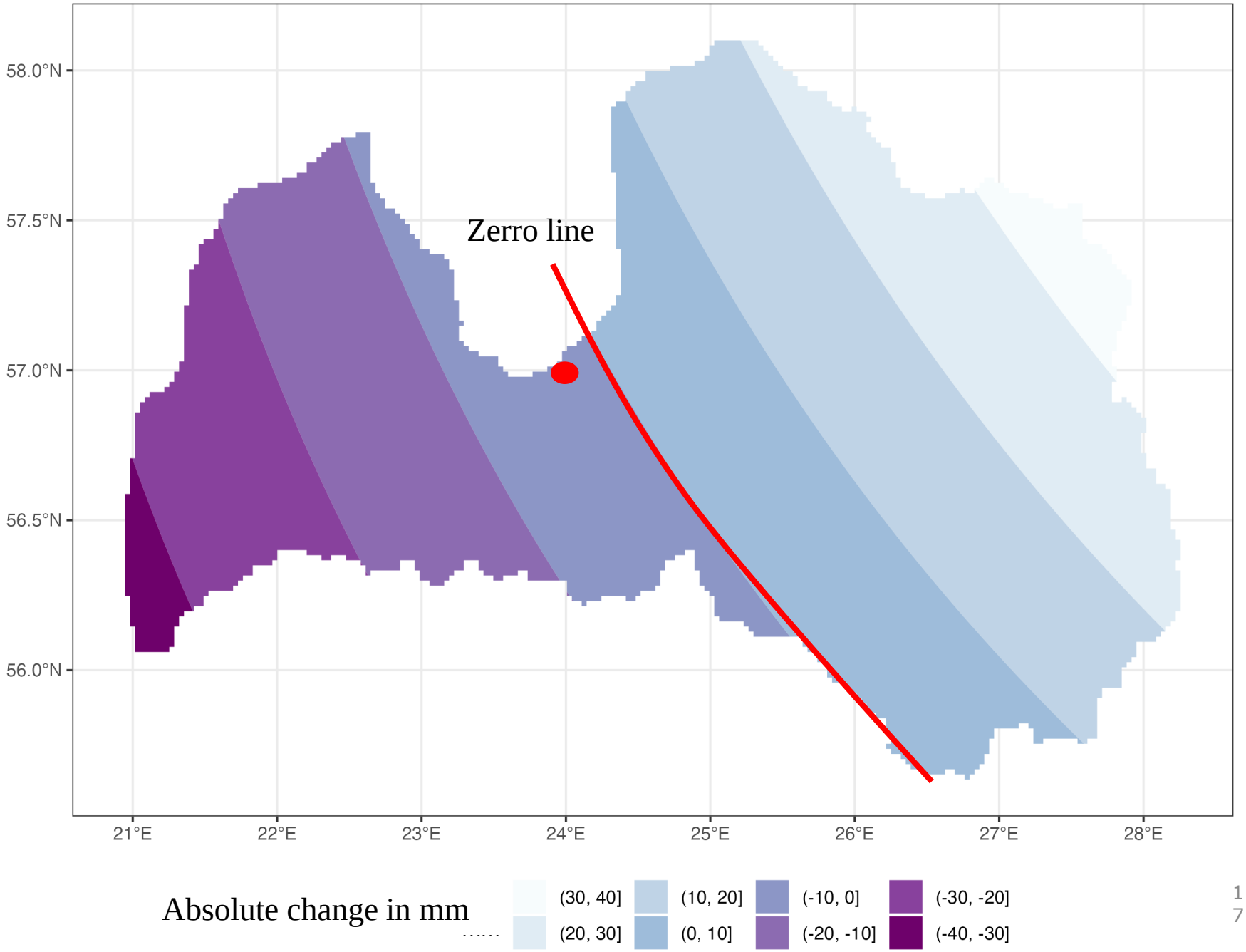
Absolute change in mm

LKS-92 change to ETRF2014 Up

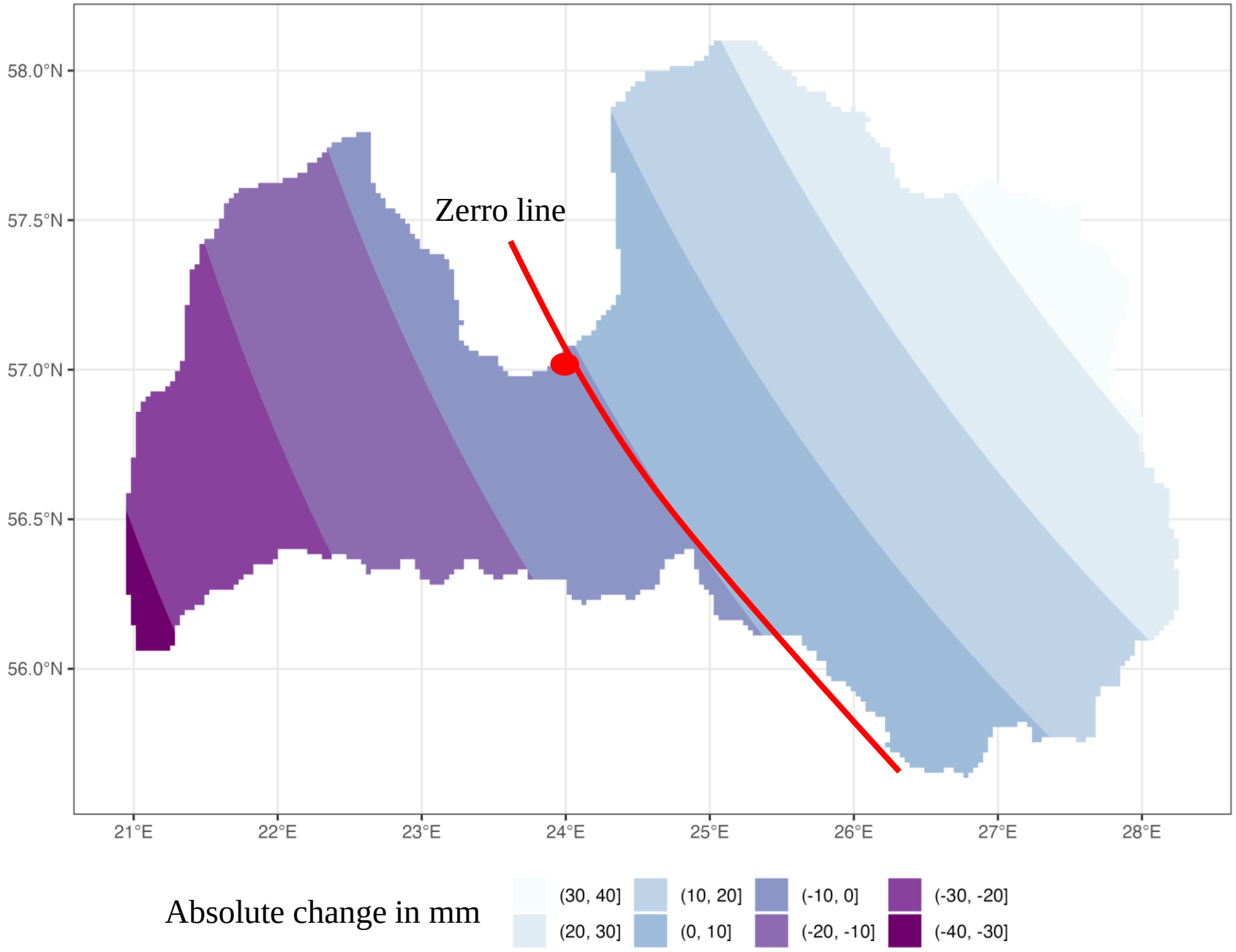


Absolute change in mm

LKS-92 change to ETRF2020 Up



LKS-92 change to ITRF2020 Up



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Why ETRF2020 realization

LKS-92 born with 7 cm inaccuracy. So swich to any of ETRF realizations will have change at least 5 cm in plane and 6 cm in up.

Users says, if change coordinate, do it with as big difference as it can be.

Change to ETRF2020 in plane is linear without rotation around Riga

Up change is tilt in all ETRF but in ETRF2020 it is more realistic and values is close to ITRF2020 from which IHRS/F is coming

Changes must be as up-to-date as possible with look forward not backward for 20 years.

ETRF2000 is like Euro it is good but not all countries in EU join it

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Thank you for your attention!