



32nd EUREF Symposium

# National Report of Slovenia



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MINISTRY OF NATURAL RESOURCES AND SPATIAL PLANNING  
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GEODETC INSTITUTE OF SLOVENIA



University of Ljubljana  
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Geodetic Engineering*

Gothenburg, Sweden, May 24–26, 2023

# Terrestrial Reference Frame

**SLO4D Project** started in Slovenia in 2022:

- to introduce the fourth dimension of the national spatial reference system (time-dependend system)
- to establish a quality asurance system to support the national spatial reference system and its users

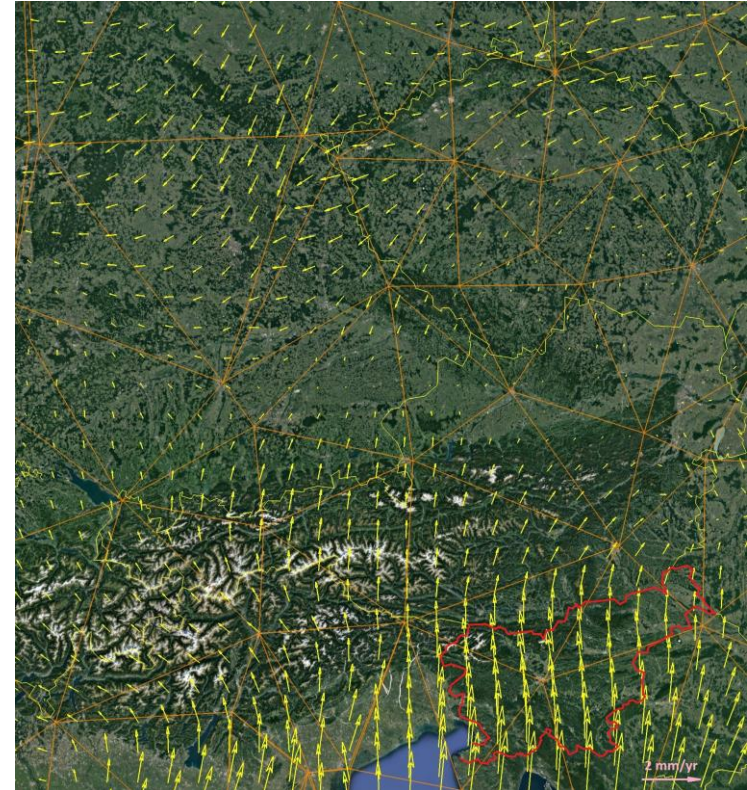


Kick-off conference, April 2023

# Terrestrial Reference Frame

## SLO4D Project · motivation:

- active geodynamics in the area  
(as compared to more central part of Europe)
- estimated lifetime of the national ETRS realization  $\approx 10$  years  
(as static reference frame)

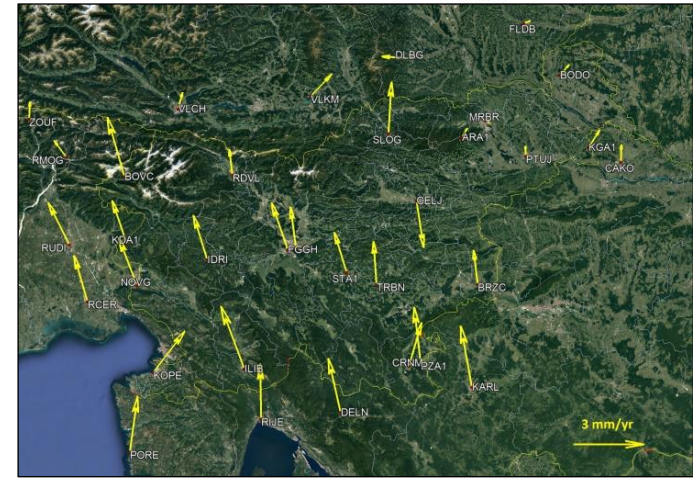
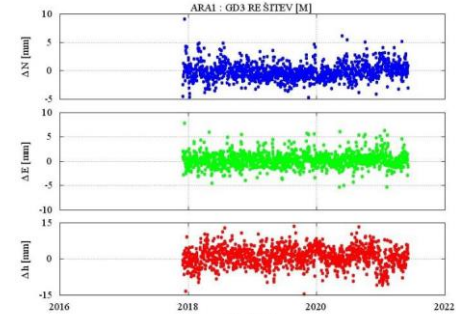


ETRF200 Hz velocities  $> 3$  mm/yr

# Terrestrial Reference Frame

## Coordinate time series & velocity field modelling

- first release of the velocities for the Slovenian CORS networks
- extra effort put into dealing with discontinuities in order to provide more reliable velocities



SIGNAL & Zero-Order Networks  
ETRF2000 Hz velocities



# Terrestrial Reference Frame

## Campaign GNSS measurements at geodynamic sites

- mostly GNSS sites from the nineties of the last century
- densification of the national CORS networks
- 72-hour measurements
- few-year period

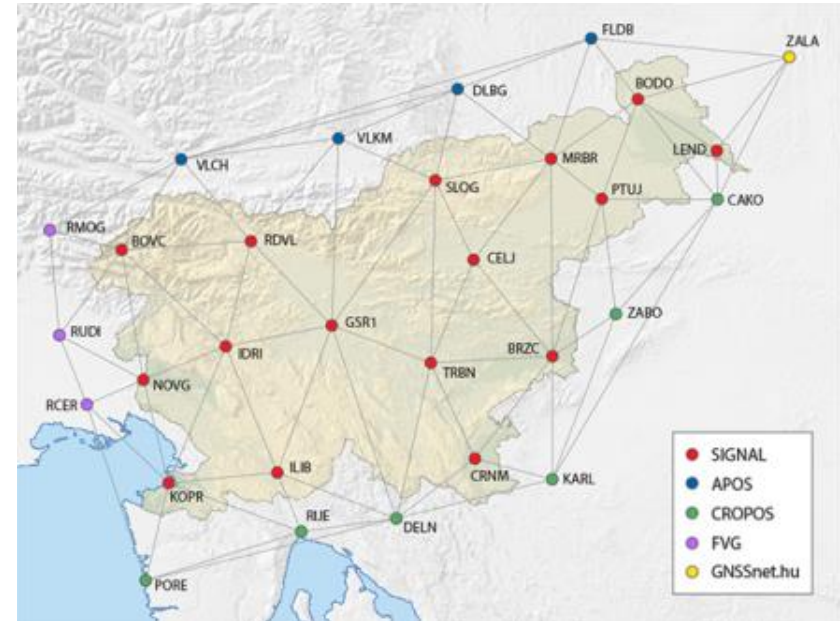


Static GNSS survey at the Socerb geodynamic site

# National GNSS Networks

## SIGNAL (16 stations) & Zero-Order Network (10 stations)

- two receiver changes
- Alberding GNSS Status Software upgraded
- Trimble Pivot Platform upgraded
- new 4G compatible routers
- etc.

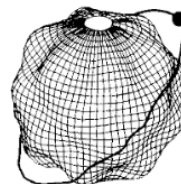


SIGNAL network

# Vertical Reference Frame

## Levelling, gravity measurements & other activities

- new Slovenian height reference surface (SLO-VRP2016/koper) in the ISG Repository (CC BY 4.0 license)
- ~70 km of levelling polygons remeasured
- some new GNSS/levelling points
- systematical checking of heights of old trigonometric (II to IV order) network points
- development of the height transformation model in progress (SVS2000/Trieste  $\leftrightarrow$  SVS2010/Koper)



**ISG**

International Service for the Geoid



# Vertical Reference Frame

## New compound coordinate reference systems (CRS):

- **EPSG 10245** ... ETRS89-D96/ $\phi\lambda$  + SVS2010/H
- **EPSG 10246** ... ETRS89-D96/TM + SVS2010/H



## New CRS transformations:

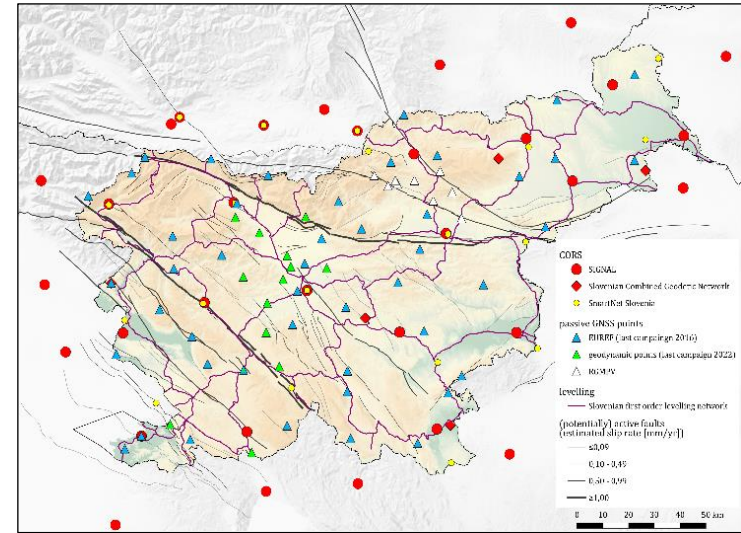
- **EPSG 10247** ... ETRS89-D96/ $\phi\lambda h$   $\rightarrow$  SVS2010/H
- **EPSG 10248** ... ETRS89-D96/ $\phi\lambda h$   $\rightarrow$  ETRS89-D96/ $\phi\lambda$  + SVS2010/H



# SLOKIN Research Project

## Geokinematic model of Slovenian territory

- GNSS measurement campaigns on sites of geological importance (re-measurements on 14 sites in 2022)
- 39 permanent GNSS stations
- ~100 sites in order to create a national geokinematic model
- vertical geokinematic model based on repeated levelling measurements, GNSS data, and InSAR



Distribution of sites with GNSS data

# Geodetic Heritage Research Project

## Research on permanent geodetic marks

- analysis of different types of trigonometric marks in various regions
- initiatives for the inscription of selected geodetic marks in the Slovenian Cultural Heritage Register
- activities to preserve old boundary stones and trigonometric marks and their promotion – a local open air museum



Boundary stone in the Rodik  
Mythical Park

# Other Activities

## 8<sup>th</sup> EUPOS<sup>®</sup> Council and Technical Meeting held in Ljubljana



The topics raised at the Technical Meeting:

- Online GNSS post-processing services
- GNSS-InSAR collocation
- GNSS data in the light of the EU2019/1024 Directive on Open Data
- GNSS signal jamming and spoofing



Participants of the 8<sup>th</sup> EUPOS Meeting

Details in written report

**Thank you for your attention!**