VELOCITY FIELD ESTIMATED FROM HEPOS PERMANENT GNSS NETWORK IN GREECE, PRELIMINARY RESULTS.

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INTRODUCTION

In this study we present preliminarily results of an ongoing research project between Dionysos Satellite Observatory (DSO) and the Hellenic Cadastre. The latter, has installed since 2007 a dense national network of 98 GPS/GNSS sites, spatially covering the whole country. Selected datasets of the network data were incorporated into the automatic processing infrastructure developed and maintained by DSO to perform an in-depth study and monitoring of the geodynamic and seismic setting of Hellenic region. Further collaboration and integration of both historic and contemporary data can signifficantly strengthen our understanding of the complicated geotectonic setting in one of the most actively tectonic regions of the world.

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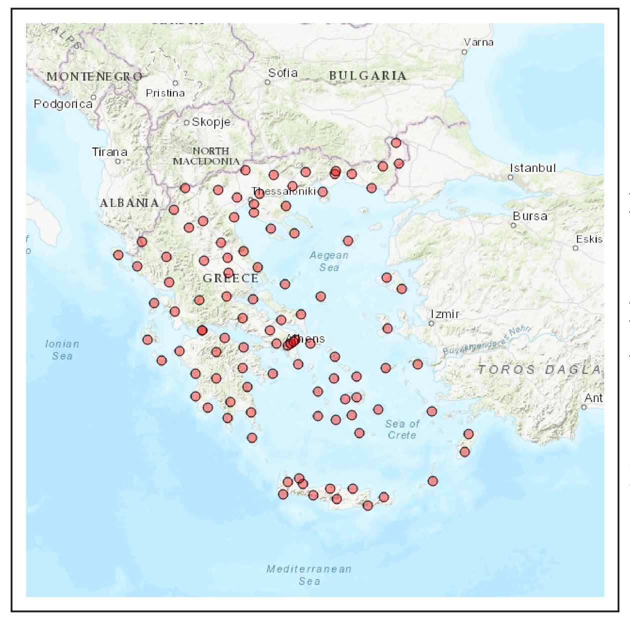
HEPOS NETWORK

Hellenic Cadastre has since 2007 established a network of 98 continuous GPS sites,spatially covering the whole country. The network is since maintened by the office, and its products and data used for surveying and supporting national infrastructure.

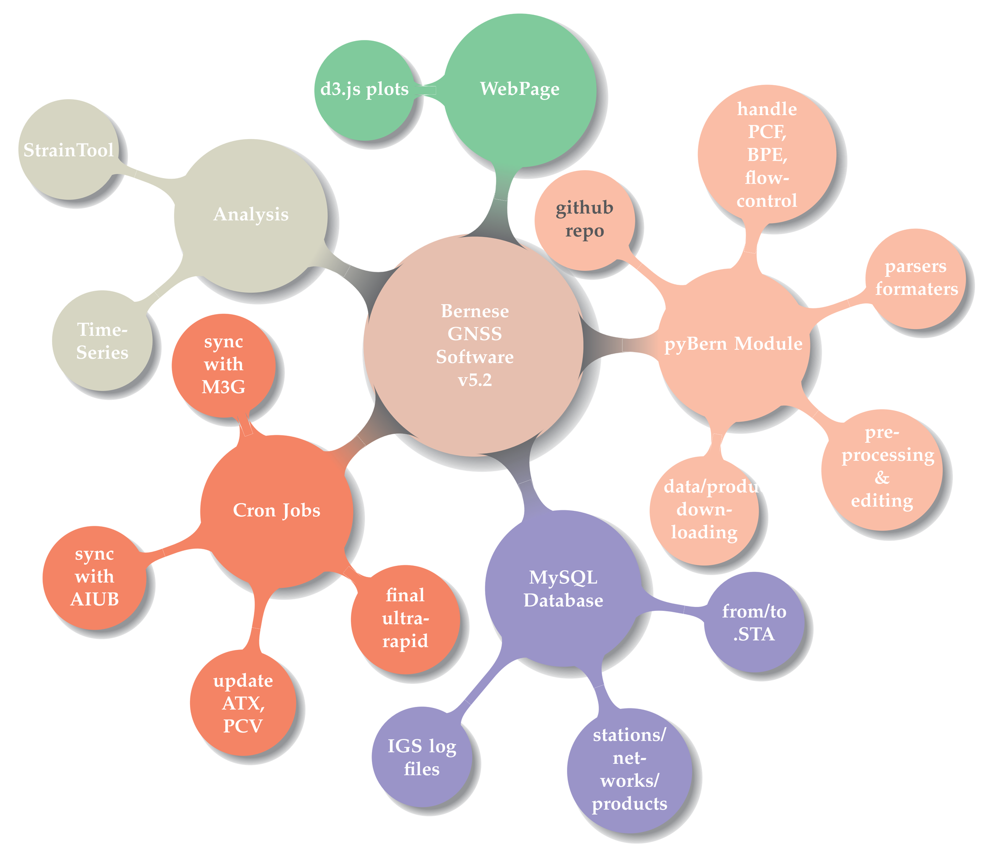


In 2020, Hellenic Cadastre successefully concluded a large-scale upgrade of its network, introducing a full switch to multi-GNSS. All network sites were equiped with modernized firmware and hardware to support all major GNSS systems (GPS, Glonass, Galileo and Beidou).

For this study we analyzed daily RINEX (v.2) files of four individual years, namely 2011, 2015, 2021 and 2022. The data were provided under a special agreement from Hellenic Cadastre to DSO and were selected in a way that could enable the estimation of tectonic behaviour on the one hand, yet require minimum effort and align with the needs and interests of the cadastral office.

DATA ANALYSIS

The data described above were analyzed using the Bernese GNSS Software (v. 5.2) (Dach et al., 2015). Both GPS and GLONASS observation were used when available (most of 2021 and 2022). IGb14 was used as the frame of reference, using a set of 19 IGS stations for alignment. CODE final products were incorporated in the analysis, consistent with the frame of choice. The key parameter of interest was station coordinates.



Processing is consistent with EUREF standards (Guidelines for Analysis Centres).

- SINEX with required info/blocks,
- Reference frame IGb14,
- IERS Conventions 2010,
- IGS/CODE products,
- ocean loading corrections (FES2004),
- 3° elevation cut-off angle; elevation dependent weighting,
- GMF and/or VMF1; Chen-Herring gradient parameter,
- amiguities fixed (length-dependent algorithm),
- use GLONASS obs (when available)
- use ATX files (epn_14.atx) - individual calibrations

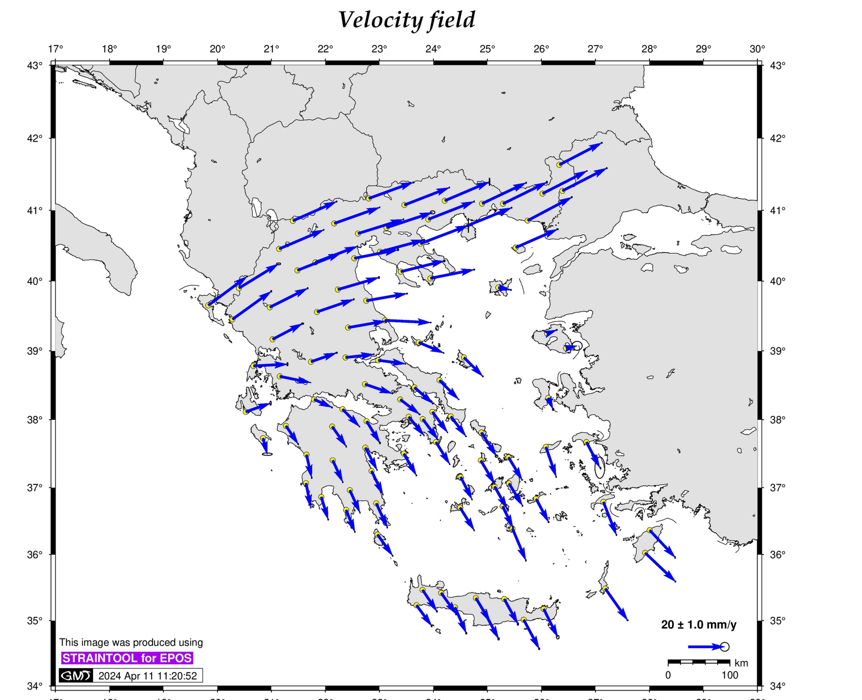
ESTIMATION OF VELOCITY FIELD

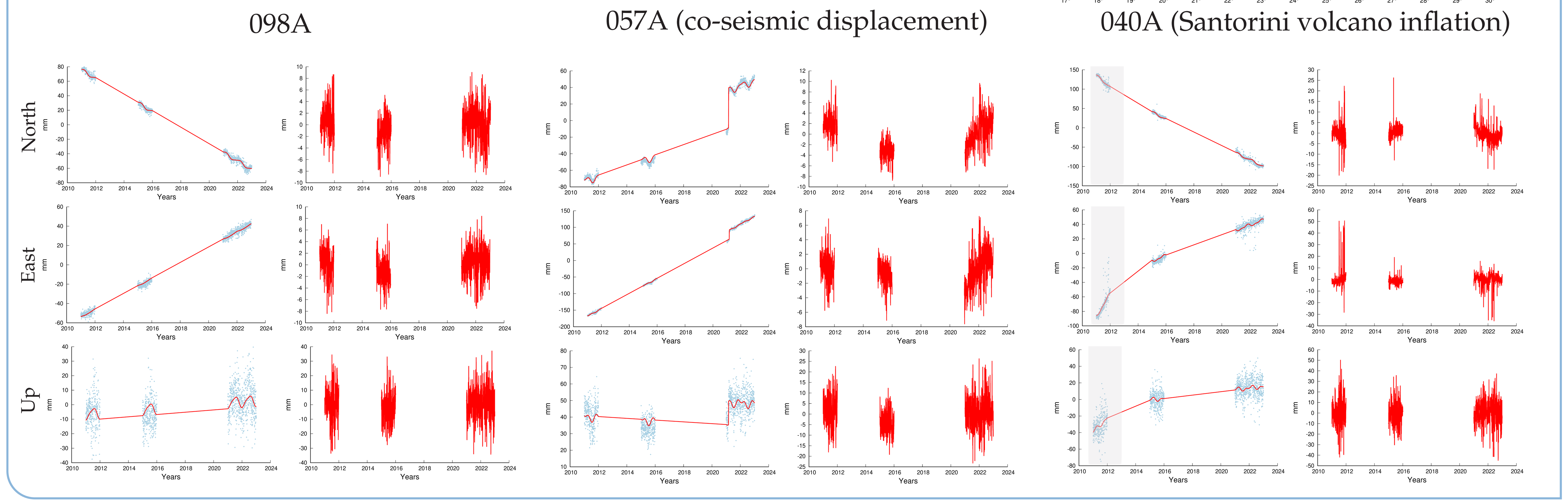
Following the estimation of daily site coordinates, position time-series were stacked for every site of the network. The latter wre in turn analyzed using the Hector software (Bos et al., 2013) for the estimation of tectonic velocities and harmonic signals. The time span of more than ten years allows estimation of site velocities, yet the temporal density of data could inhibit the accuracy that can be obtained.

Time series analysis of three different station are presented. Velocity field with respect to IGb14 presented on the following map.

Velocities vary per component:

comp	min (mm/yr)	max (mm/yr)
North	-17.9	15.5
East	2.4	26.0
Up	-5.5	4.7



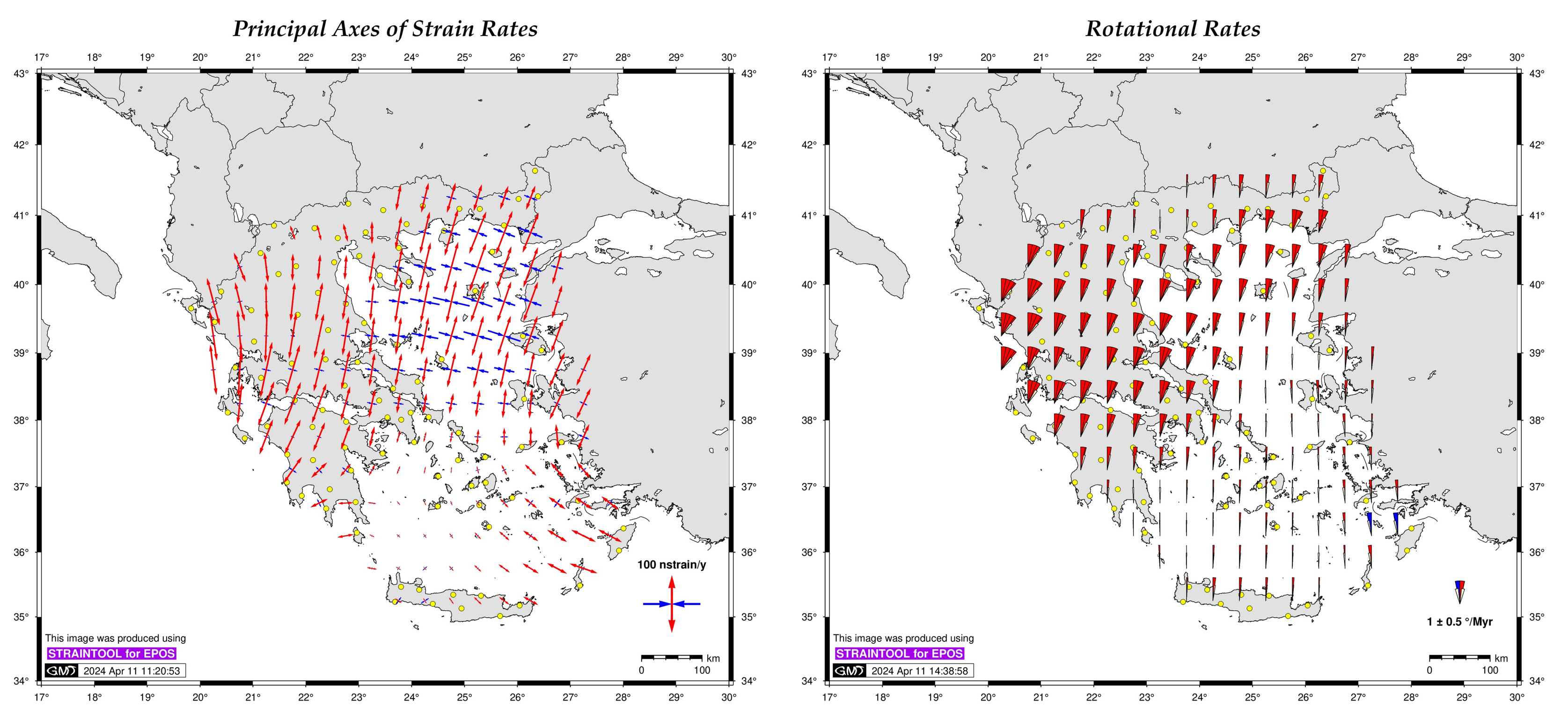


STRAIN AND ROTATIONAL RATES

Strain and rotational rates presented in the following maps. We present results obtained using StrainTool Software (Anastasiou et al., 2021) and the following input parameters:

grid-size	ltype	Wt
0.5°x0.5°	gaussian	24

Overall, our first results reproduce the gross features of tectonic deformation in Greece such as N-S Extension in mainland Greeece and clockwise rotational rates on the west.



REFERENCES

Anastasiou D., Papanikolaou P., Ganas A., and Paradissis D. (2021). "StrainTool: A software package to estimate strain tensor parameters (v1.0-r1)". In: Zenodo. DOi:10.5281/zenodo.1297565. URL: https://doi.org/10.5281/zenodo.1297565

Bos, M. S., Fernandes, R. M. S., Williams, S. D. P., and Bastos, L. (2013). Fast Error Analysis of Continuous GNSS Observations with Missing Data.J. Geod., Vol. 87(4), 351–360, doi:10.1007/s00190-012-0605-0.

Dach, R., Lutz, P. Walser, P. Fridez (Eds); 2015: Bernese GNSS Software Version 5.2. User manual, Astronomical Institute, University of Bern, Bern Open Publishing. DOI: 10.7892/boris.72297; ISBN: 978-3-906813-05-9.

Wessel, P., W. H. F. Smith, R. Scharroo, J. F. Luis, and F. Wobbe, Generic Mapping Tools: Improved version released, EOS Trans. AGU, 94, 409-410, 2013

Photography encouraged

FUTURE RESEARCH

We consider this study to be a work-in-progress; we plan to go on with data analysis for all the available years. Currently, we are working on :

- the analysis of vertical velocities
- the investigation of the deformation field in smaller areas

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HELLENIC CADASTRE