Development of a monitoring platform for permanent GNSS stations analysis in the region of the EnCeladus Hellenic Supersite, preliminary results.

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Introduction

Dionysos Satellite Observatory (DSO) of National Technical University of Athens (NTUA) have developed an automated processing scheme to accommodate the daily analysis of all available continuous GNSS stations in Greece.

As part of the operation of the EnCeladus Hellenic Supersite, DSO undertook the monitoring of the Corinth Gulf area through GPS/GNSS stations and the development of a multidisciplinary platform.

Currently, we have focused our efforts in reprocessing all the available GNSS data up to date, via Bernese GNSS Software v5.2[1].

In this paper, data from 36 permanent GNSS stations, installed in the Gulf of Corinth, were analyzed. All available station data freely available from the providers have been used. Also, data from private organizations made available for the specific project have been used, for better coverage of the region and distribution of the stations.

Finally, the results are available on the web portal that has been developed as part of the DSO website.

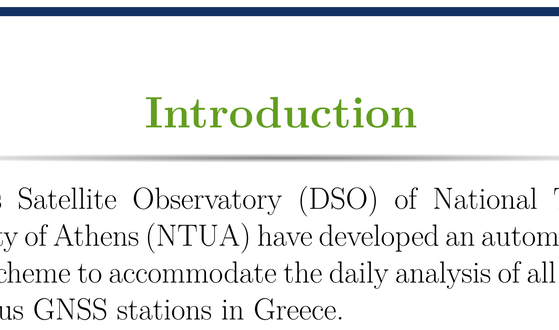

Figure 1:Processed stations and baselines for a typical run of the processing scheme.

Data

In our daily processing scheme, we incorporate all GPS/GNSS stations placed in Greece, for which the data are made available. These stations, are established and maintained by various institutions thus varying in quality, spatial distribution, hardware and data aquisition methods and rates.

At the moment, we analyze data from over 36 stations in region of Corinth Gulf (Figure 2). This accounts for a more homogenous spatial distribution and computational efficiency.

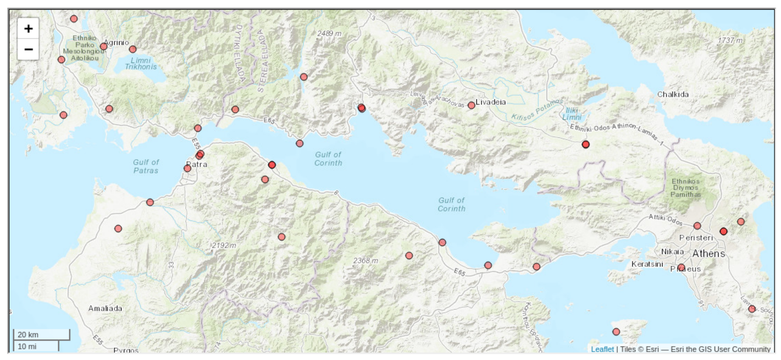

Figure 2:GNSS stations prosseced at DSO.

Acknowledgments...

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The authors would like to thank you National Observatory of Athens, Corinth Rift Laboratory, Geodetic Observatory Pecny for making GNSS data freely available. We would also like to thank the private companies Tree Company SA, Metrica SA, and the public organization Hellenic Cadastre for making data from specific stations free available for this project.

All figures and maps produced using Generic Mapping Tools software [2]

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Processing & Analysis

The processing routine (Figure 3) starts a few hours after the end of day (typically at 3 am). All available data are collected and quality checks are performed. The required products are retreived from CODE Analysis Center [3]. All stations are processed in a single network, using the Bernese GNSS Software Version 5.2 [1], in baseline mode, using a double-difference approach. In a last step, the networks are alligned to IGb14 [4].

The processing of each network is performed twice for each day; first using ultra-rapid/rapid products and then, with a time lag of approximately 20 days, using final products.

Coordinate estimates are inserted in respective time-series files, which are then processed to estimate tectonic velocities, offsets and annual and semi-annual harmonic coefficients.

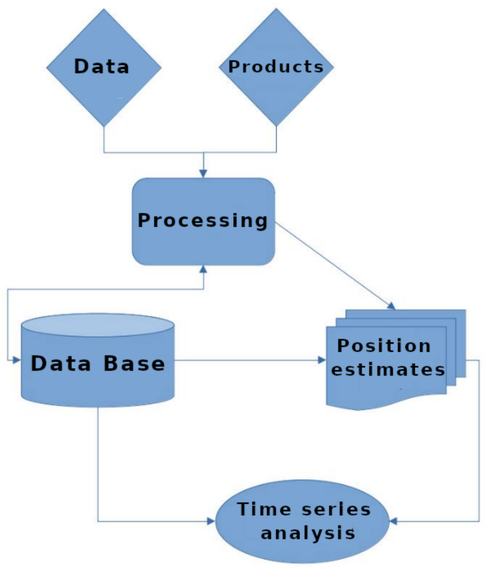

Figure 3:Flowchart of processing work.

Preliminary Results

Time series analysis follows an iterative process, where at each step one and/or more new parameters are tested based on their statistical significance.

Tectonic velocities were estimated and the velocity field was produced, in principle with respect to IGb2014 for stations with data availability greater than 2.5 years. A velocity field with respect to a stable Europe was estimated (Figure 4) using the model Kreemer et al.(2014)[5].

The StrainTool software is used with minor modifications [6], to estimate strian rates (Figure 5), dilatation (Figure 6) and the other parameers of strain thw strain tensor on a grid with 0.25 deg. grid step.

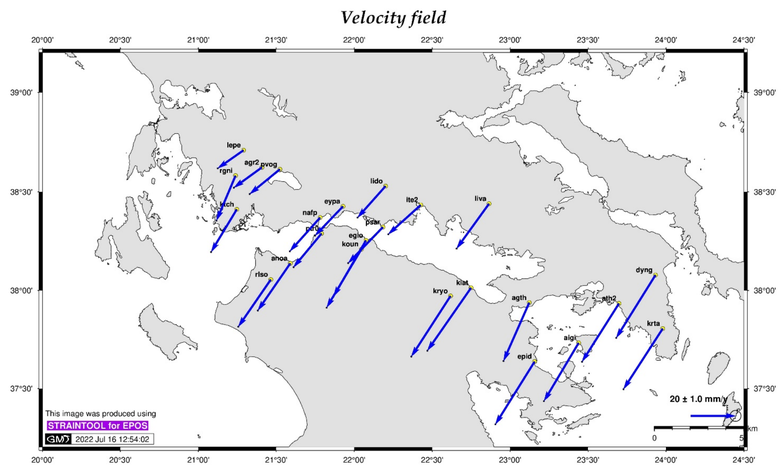

Figure 4:Velocity field

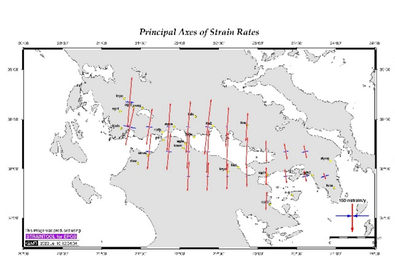

Figure 5:Strain rates

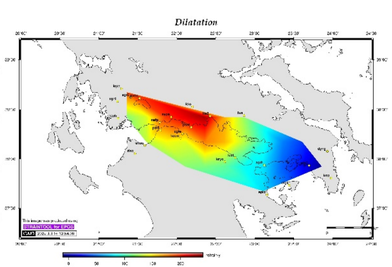

Figure 6:Dilatation.

Online Platform

The development of the website has been carried out with the programming tool (web framework) Django (djangoproject.com). At the same time, different parts of the website require the development of code in javascript, html and css, mainly for the visualization and formatting of the page. The platform is accessible at `http://dionysos.survey.ntua.gr/dso/enceladus/`

The website presents the permanent GNSS stations whose data are available for processing by all networks.

A dynamic page is created for each station that participates in the monitoring of the Gulf of Corinth. Each page includes the station's data and all the necessary hyperlinks so that the user can access the processing products and the results.

For each solution day, at the end of the processing, the time series of the station is updated and the corresponding parameters obtained after the analysis of the position time series are given (Figure 7).

Finally, separate sections of the platform have been developed where the velocity fields and the estimation of the strain tensors are presented.

Figure 7:Times series analysis on platform.

Conclusion

The main purpose of the project was to utilize all available GNSS data solution for the Corinthian Gulf region, to estimate the kinematic behavior. The use of a large number of stations installed in the area has created a dense network that is analyzed daily. A reliable velocity field has been produced from the time series analysis analysis, while correspondingly a primary strain field has been estimated. The online platform, connected to the website of the EnCeldus Supersite, is the hub for the distribution of the results of the analysis for all the available data. The scientific community can use the platform to enhance the research in different scientific fields.

References

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