LANTMÄTERIET

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Validation procedures and quality checks for EPOS strain rates calculated by Lantmäteriet

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1. Introduction

Lantmäteriet is within EPOS responsible for producing strain rate fields as Level 3 GNSS data product (integrated data products coming from complex analyses or community shared products). Input/output formats are defined in Ganas & Chousianitis (2016).

This document outlines the validation procedures and quality checks we propose to perform during a new product generation.

This document is subject to change and will develop during the implementation phase.

2. Validation procedure

At current stage (February 2018) the procedure strongly depends on the method and software chosen for the strain rate calculation. Likely option is to use the open access SSPX program (Cardozo & Allmendinger 2009) which uses the velocity interpolation for strain rate (VISR) method by Shen et al. (1996, 2015). This method is strongly recommended by Ganas & Chousianitis (2016).

Assume we apply SSPX, the validation procedure depends on the input velocities, grid resolution, Alfa (how far from the center of grid cell we include the stations in strain rate calculations), and more. SSPX calculates the errors/uncertainties of the strain rate parameters and one way for evaluation (not validation) of the results is looking at those errors and deciding for possible recalculation of the strain rates by removing some suspicious velocities. This is eased with an option in SSPX which allows selection/deselection of all stations inside an arbitrary polygon and then calculation of the strain rates for those selected stations.

This allows a region-wise calculation of strain rates based on input velocities. If a high rate of deformation is found in one zone it is however unclear if that is introduced by a possible error in a set of input velocities or if it is a real local deformation. External information from other resources (geology, seismology, hydrology, etc.) is then needed.

We identified two possibilities:

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1. Compare our strain rate results with the ones from CNRS and INGV. However, we should expect differences because of different methods/software used in each processing center. If there are big differences in some zones, then those zones should be investigated further. How big the difference is allowed and investigated, is difficult to say until we perform the first comparison with the other solutions.
2. Compare with earlier studies for selected areas in Europe. This depends however on those input data with their resolution, time span, time interval, number of stations, ... used in such studies as well as the method. Differences might quite likely occur. Moreover, the local deformation seen in our solutions might have happened after the published studies.

The second option appears less attractive due to many input differences but should be tested, at least. The first is therefore our recommended option. Currently, it is difficult though to suggest quantitative measures for the quality of the strain rate product. We suggest to

1. Make decision about the calculation approach at Lantmäteriet,
2. Compare to the CNRS and INGV results,
3. Analyze the statistics of possible differences to clearly quantify maximum allowances of differences,
4. Provide a final validation procedure based on the results.
5. Outline and quantify the quality check.

References

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