

EuVeM2022: A 3D GNSS velocity field for Europe

Rebekka Steffen (Lantmäteriet), Ambrus Kenyeres (Kozmikus Geodéziai Obszervatórium), Holger Steffen (Lantmäteriet) and Martin Lidberg (Lantmäteriet)

Abstract. The increased availability of GNSS (Global Navigation Satellite System) station velocities makes it possible to obtain a complete picture of the horizontal and vertical deformation via an interpolation. However, most well-known interpolation techniques (e.g., triangulation, spline interpolation) have the disadvantage that the entire signal is used while every signal always includes noise due to unknown errors or local effects. Additionally, those interpolation techniques can only be applied to one component at a time. The least-square collocation solves both problems of dividing the dataset into a signal and noise component and applying different datasets simultaneously. In addition, a recent extension to the least-squares collocation allows the usage of the correlation between the horizontal velocity components.

Here, we will show results of applying a combined least-square collocation for the example of Europe using a velocity field solution by the EUREF Permanent Network Densification (EPND2150). This velocity field is obtained by the combination of weekly position SINEX solutions generated by 28 EPND Analysis Centres. More details on EPND can be found on the www.epnd.sgo-penc.hu website. The homogenized and quality-checked velocity field is then interpolated via a least-square collocation using a fixed scale length of 150 km for the east-west and north-south velocity components and 130 km for the vertical velocity component. In addition, the effect of known plate boundaries is considered during the interpolation to avoid a smoothing of nearby velocities on different tectonic plates. We also apply a moving variance approach to avoid effects of non-stationarity, which arise due to the variable station densities. The final dataset (vertical and horizontal velocities) will be freely available and provided in different formats and reference frames to ease application for users with different scientific background.