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Discrete GNSS velocity field filtering: an OCSVM based approach

Balint Magyar and Ambrus Kenyeres

Satellite Geodetic Observatory, Government Office of Capital City of Budapest, Budapest, Hungary
(magyar.balint@gnssnet.hu)

The main research scope is to develop a robust, highly automated filtering process for the discrete velocity field end product of the EPN Densification. The Pan-European GNSS network consists nearly 3300 permanent GNSS stations irregularly distributed throughout Europe, so the further multidisciplinary utilization of the EPN discrete velocity field recommends the removal of the outliers and local anomalies as well as modeling it as a continuous field. To investigate the specific deformation patterns and major tectonic units as near homogeneous pre-defined clusters, a large scale plate tectonic model was constructed for the stable- and dynamic Europe as well, basing on geophysical and geological considerations. For each tectonic unit, an unsupervised anomaly detection algorithm called One-Class Support Vector Machine (OCSVM) was applied to detect and remove velocity outliers in multiple dimensions. Usage of OCSVM is preferable due to its property that it does not require any parameter of the data distribution so it has outstanding performance in non-Gaussian cases and can capture the structure of the dataset. To derive the continuous velocity field, the ordinary kriging technique was applied with embedded haversine metric to avoid the regional scaled latitude dependent distortion of the interpolation. We will show the current results of the research with a full solution for Europe and some regional examples as well.