EGU21-10998
https://doi.org/10.5194/egusphere-egu21-10998
EGU General Assembly 2021

Small wavelength features of the strain rate distribution for the St. Lawrence paleo-rift zone, eastern Canada

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Continuous and increasingly dense geodetic monitoring in the last couple of decades has enabled resolving deformation heterogeneities in intraplate environments, where seismic hazard assessment is inhibited by low historical seismicity rates, but damaging earthquakes do occur infrequently. It has also revealed the degree of uncertainty with which we have been able to constrain how elastic strain accumulates in mid-continental faults. The St. Lawrence Valley (SLV) in east North America is the most seismically active region along a paleo-rift system in eastern Canada, and is also located around the general post-glacial rebound hinge-line. Earthquakes along the SLV are mainly located in three active seismic zones, from south to north, the Western Quebec, Charlevoix, and Lower St Lawrence Seismic Zones, but the mechanism for the spatial clustering is not clear. Along the SLV, the crustal deformation or strain rate has been calculated to date as part of global estimations or discrete regional measurements, at a resolution that does not enable detection of small-wavelength features. The aim of this work is to create a high-resolution strain rate map that can detect local changes of the deformation style to quantify possible correlation with intraplate seismicity, taking into account the slow tectonic loading rate and the interaction between ancient basement geological structures and glacial isostatic adjustment. We calculate a preliminary strain rate map with high spatial resolution using publicly available continuous GPS data from Nevada Geodetic Laboratory (NGL), with time series covering up to 20 years. We use a 2D velocity interpolation method: *gpsgridder*, a module from Generic Mapping Tools (GMT) that grids discrete vectors using a model based on 2D elasticity. This approach includes velocity uncertainties and performs better than biharmonic interpolations for sparse vectors because it considers coupling between the velocity components. We test spatial resolution of the method and station configuration using an approach similar to checkerboard tests applied in seismic tomographic inversions. In addition, the resolution analysis gives a spatial quantification of the reliability of the obtained continuous strain rate distribution, which is key to identify zones that can be improved in terms of GPS coverage including campaign data. We will show that for our 2-D velocity field and using a mesh grid of 0.25° X 0.25°, the method begins to resolve checkerboard lengths of ~50 km in regions where the average spacing between stations is ~40 km. Finally, we will present the length resolution of the station configuration in the SLV, along with the interpolated strain rate map.