



GPS Time Series Analysis in the New Madrid Seismic Zone

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The New Madrid Seismic Zone is an active seismic zone in the Midwestern United States. While in most parts of the continental US seismic activity increased in the last decade largely due to wastewater injections in context with oil and gas production, for the New Madrid Seismic Zone seismicity has been suggested to be related to hydrological loading. Hydrological extreme events such as drought and flooding change the surface loading and can influence the seismicity rates by perturbing the subsurface stress.

Besides affecting seismicity rates, loading and unloading of the Earth due to the hydrological seasonal cycle displaces the ground surface and changes the gravitational potential. For testing this hypothesis, the correlation between vertical displacement, seismicity and hydrological mass change needs to be quantified. In our study, crustal deformations are measured using continuously operating GPS sites in the New Madrid seismic Zone. GRACE data and hydrological models provide useful information about hydrological mass changes. Here, we discuss our GPS processing in the New Madrid Seismic Zone and our analysis of position time series.

GPS raw data are processed for more than 30 sites in the New Madrid Seismic Zones. The raw data are available from public sources (CORS, UNAVCO, SOPAC) with continuous observations up to 20 years. We focus on the period between 2002-2017 that is also covered by the GRACE mission. Daily point position time series are processed, applying the same background geophysical models (solid and ocean Earth tide, atmospheric tidal and non-tidal loading, non-tidal ocean loading) as used in GRACE Level-2 processing. GPS time series resulting from different scientific software can differ in repeatability and show systematic periodic differences. Therefore we process position time series with the Bernese Software and the GipsyX Software and compare the results. Precise Point Positioning and the network strategy are applied.