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Improving Coseismic Offset Estimation Using Statistical Tests

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Coseimic offset is an important parameter in the study of any earthquake, because that allows to observe directly the magnitude of the nominated event at the location of the GPS stations. At a larger scale, the validation of the dislocation theory of spherically symmetric models is investigated through the study of post-seismic displacements. But due to the characteristics of the noise in the GPS time series and other complex phenomenon (i.e. annual and semi annual signals), there is a debate in the scientific community over the length of the GPS time series for a reliable estimation of the coseismic offset. This issue can be similarly linked to some studies of the geodetic velocity estimates. Previous studies correlate the characteristics of the GPS time series (noise, periodic signals) and the bias error in the velocity estimate. This work is taking another approach with the study of the stochastic model of a coseismic offset time series. This time series is obtained by varying the time window length of the GPS time series centered on a nominated event when estimating the coseismic offset. An algorithm is then developed with the application of hypothesis testing onto the coseismic offset time series. Throughout the study of the correlation of the amplitude of the coseismic displacement with the parameters such as the velocity rate, the amplitude of the noise and remaining error due to the estimation of other coseismic offsets, the results underline how much data is needed to get a reliable estimation of the coseismic offset. In addition, they also show the adaptive characteristics of the presented algorithm.