

Investigation of Blind Source Separation Techniques for GPS Time-Series

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In the work, we have carried out the synthetic test to investigate the BSS (Blind Source Separation) methods for the GPS time series. We simulated the residual time series using the Gauss-white noise and heavy-side step function to represent the discontinuity that is often found and described in the scientific literature. For a better understanding of BSS methods of GPS residual time series, we have done fourteen synthetic experiments with different levels of white noise and discontinuity. We have used PCA (Principal Component Analysis), fastICA (fast Independent Component Analysis), and vbICA (Variational Bayesian Independent Component Analysis) decomposition techniques for identifying the simulated transient signal. The results show that all three BSS methods extract the discontinuity present in the signal. However, only principal components or independent components are not sufficient for proper interpretation of the signal. Information about the contribution of each station to the respective principal components (PCs) and clustering the stations into two groups with ICA is the crucial step to extract the discontinuity present in the signal without mixed effect. Further, the contribution of each station to the principal component gives information about the eventual local site effect or clustering in the stations which would be helpful to better constrain the data-processing of real geodetic data sets without a priori information about the data.

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