

Application of the Allan Variance to Time Series Analysis in Astrometry and Geodesy: A Review

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Abstract

© 2015 IEEE. The Allan variance (AVAR) was introduced 50 years ago as a statistical tool for assessing the frequency standards deviations. For the past decades, AVAR has increasingly been used in geodesy and astrometry to assess the noise characteristics in geodetic and astrometric time series. A specific feature of astrometric and geodetic measurements, as compared with clock measurements, is that they are generally associated with uncertainties; thus, an appropriate weighting should be applied during data analysis. In addition, some physically connected scalar time series naturally form series of multidimensional vectors. For example, three station coordinates time series X, Y, and Z can be combined to analyze 3-D station position variations. The classical AVAR is not intended for processing unevenly weighted and/or multidimensional data. Therefore, AVAR modifications, namely weighted AVAR (WAVAR), multidimensional AVAR (MAVAR), and weighted multidimensional AVAR (WMAVAR), were introduced to overcome these deficiencies. In this paper, a brief review is given of the experience of using AVAR and its modifications in processing astrogeodetic time series.

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Keywords

Analysis of variance, data analysis, time series analysis