Analysis of Time Series About IGS Stations in Turkey Using AR and ARMA Models

Ismail Sanlioglu and Tahsin Kara (Turkey)

Key words: GNSS/GPS; Positioning; IGS Stations, Time Series, Autoregressive Models

SUMMARY

The Global Navigation Satellite Systems (GNSS) are used for navigation and precise geodetic position measurements. Data from receivers on the permanent stations have been analyzed at the International GPS Service Analysis Centers (IGS-AC). The softwares of AC are used to produce these time series and other useful data products. Horizontal and vertical displacements are represented on the time series. IGS station position time series mainly consist of trends, discontinuities and seasonal variations. The seasonal variations include displacements due to mass transfers at the Earth's surface (loading), thermal expansion of ground and monuments, other local deformations and artifical variations. Wavelet analysis shows that seasonal movements of station elevation are periodic. In most stations, there are biannual, annual and biennial variation terms. One of the effective methods to study time series is autoregressive moving average (ARMA) model series, which consists of autoregressive (AR) model, moving average (MA) model and ARMA model, in which the systematic characteristic is studied only from system output in the view of systematical identification. AR model and ARMA model are mainly used in geodetic studies. In this study, ARMA model had been applied to modeling GPS time series of IGS stations in Turkey. The coordinate components (north, east, up) of IGS station position time series was separately analysed in terms of time series using autoregressive and autoregressive moving average models which are the linear time series methods. The reason why especially linear time series models were chosen is that when coordinate components of station data are studied, northing ve easting components can be monitored to increase linearly. Also, degrees of northing and easting components are one degree in auto-regression and partial- auto-regression graphics and their autocorrelations are in downward tendency in the positive direction; and decreasing suddenly in the positive direction after the first degree, their partial-autocorrelations make small changes in both positive and negative directions. It can be said that these tendencies are consistent with the auto-regression model, among the models of time series.

Paper 7318   1
Ismail Sanlioglu and Tahsin Kara (Turkey)
Analysis of Time Series About IGS Stations in Turkey Using AR and ARMA Models

FIG Congress 2014
Engaging the Challenges – Enhancing the Relevance
Kuala Lumpur, Malaysia 16-21 June 2014