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Multivariate autoregressive models for prediction in geodesy

Tomasz Niedzielski (1,2)

(1) Space Research Centre, Polish Academy of Sciences, Warsaw, Poland (niedzielski@cbk.waw.pl), (2) Oceanlab, University of Aberdeen, UK (t.niedzielski@abdn.ac.uk)

The objective of the talk is to show a considerable potential of a multivariate autoregressive method in modelling and forecasting selected geodetic and geophysical time series. A variety of multidimensional interactions between different geodetic, geophysical, meteorological, oceanographic, and hydrologic data univocally indicates that solely univariate techniques are not efficient enough to capture much of the aforementioned complexity. Indeed, some vital dependencies may occur not only in time, but also between dissimilar time series being components of a given multivariate data. There exists a wide class of multivariate time series techniques designed to detect and mathematically describe such problems. In particular, a multivariate autoregressive method serves well the purpose of linear stochastic modelling the most meaningful interactions in question. Such a model, if satisfactorily fitted, can be easily applied to predict univariate components of a multivariate geodetic time series. This talk comprises (1) the presentation of the theory behind a multivariate autoregressive technique and (2) a few examples of already implemented as well as potential geodetic and geophysical applications. Satisfactory results have been obtained for multivariate autoregressive modelling the length-of-day time series along with the axial component of atmospheric angular momentum leading to a reduction in prediction errors of the Universal Time with respect to the univariate technique. It has also been shown that a multivariate autoregressive method serves well the purpose of hydrologic forecasting. A few recommendations and prospects for future investigations are also discussed.