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A minimum time span of TOPEX/Poseidon and Jason-1 global sea level anomalies data required for trend determination and the multivariate autoregressive forecast of these data

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The first part of this study aims to compute the minimum time-span of the global mean sea level anomalies (SLA) data obtained from TOPEX/Poseidon and Jason-1 altimetric measurements, which is required to detect the trend in the global sea level variations. This minimum time span of data is determined by the Cox-Stuart test, which enables one to detect a statistically significant trend within the time series. We infer that the trend in the global ocean level variation can be detected independently of the significance level with the highest probability when the minimum time span of data is equal to 88 months for the combined monthly TOPEX/Posiedon and Jason-1 SLA data and to 55 months for the same data, however, without the seasonal components. In the second part of the study, we predict the global mean SLA data using the multivariate autoregressive forecast technique and the sea surface temperature (SST) data from NOAA as the explanatory variable. The need for combining SLA with SST in the process of forecasting SLA data is indicated by the wavelet time frequency spectra and coherence analyses. The bivariate models of the orders selected by means of the Schwartz Bayesian Criterion and Akaike Information Criterion are fitted to the differenced SLA and SST time series. These models are subsequently used to build the SLA data predictions using the smallest data time span determined by the Cox-Stuart test. The mean prediction errors of the SLA data for few months in the future are discussed.