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Prediction of altimetric sea level anomalies using time series models based on spatial correlation

Bartłomiej Miziński and Tomasz Niedzielski
University of Wrocław, Wrocław, Poland (tomasz.niedzielski@uni.wroc.pl)

Sea level anomaly (SLA) times series, which are time-varying gridded data, can be modelled and predicted using time series methods. This approach has been shown to provide accurate forecasts within the Prognocean system, the novel infrastructure for anticipating sea level change designed and built at the University of Wrocław (Poland) which utilizes the real-time SLA data from Archiving, Validation and Interpretation of Satellite Oceanographic data (AVISO). The system runs a few models concurrently, and our ocean prediction experiment includes both uni- and multivariate time series methods. The univariate ones are: extrapolation of polynomial-harmonic model (PH), extrapolation of polynomial-harmonic model and autoregressive prediction (PH+AR), extrapolation of polynomial-harmonic model and self-exciting threshold autoregressive prediction (PH+SETAR). The following multivariate methods are used: extrapolation of polynomial-harmonic model and vector autoregressive prediction (PH+VAR), extrapolation of polynomial-harmonic model and generalized space-time autoregressive prediction (PH+GSTAR). As the aforementioned models and the corresponding forecasts are computed in real time, hence independently and in the same computational setting, we are allowed to compare the accuracies offered by the models. The objective of this work is to verify the hypothesis that the multivariate prediction techniques, which make use of cross-correlation and spatial correlation, perform better than the univariate ones. The analysis is based on the daily-fitted and updated time series models predicting the SLA data (lead time of two weeks) over several months when El Niño/Southern Oscillation (ENSO) was in its neutral state.