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Real time prediction of sea level anomaly data with the Prognocean system – comparison of results obtained using different prediction techniques

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Prognocean is a near-real time modeling and prediction system elaborated and based at University of Wroclaw, Poland. It operates on gridded Sea Level Anomaly (SLA) data obtained from the Archiving, Validation and Interpretation of Satellite Oceanographic data (AVISO), France. The data acquisition flow from AVISO to Prognocean is entirely automatic and is implemented in Python. The core of the system – including data pre-processing, modeling, prediction, validation and visualization procedures – is composed of a series of R scripts that are interrelated and work at three levels of generalization. The objective of the work presented here is to show the results of our numerical experiment that have been carried out since early 2012. Four prediction models have been implemented to date: (1) extrapolation of polynomial-harmonic model and the extrapolation of polynomial-harmonic model with (2) autoregressive model, (3) threshold autoregressive model and (4) autocovariance procedure. Although the presentation is limited to four models and their predictive skills, Prognocean consists of modules and hence new techniques may be plugged in at any time. In this paper, the comparison of the results into forecasting sea level anomaly maps is presented. Along with sample predictions, with various lead times up to two weeks, we present and discuss a set of root mean square prediction error maps computed in real time after the observations have been available. We identified areas where linear prediction models reveal considerable errors, which may indicate a non-linear mode of sea level change. In addition, we have identified an agreement between the spatial pattern of large prediction errors and the spatial occurrence of key mesoscale ocean eddies.