

Sea Level Time Series Gap-Filling With Satellite Altimetry Using A Bi-Directional SARIMA Model

MAJID MOSTAFAVI¹, NICOLE DELPECHE-ELLMANN², ARTU ELLMANN¹

¹ *Department of Civil Engineering and Architecture, Tallinn University of Technology, Tallinn, Estonia*

² *Department of Cybernetics, Tallinn University of Technology, Tallinn, Estonia*

Accurate forecasting of absolute sea level (ASL) is a main requirement in coastal management due to various warnings about increasing sea levels which is a threat to coastal habitation, navigation and engineering. ASL forecasting is a significant challenge for researchers specially in offshore areas where limited in-situ data exist. Instead satellite altimetry (SA) is known for being a long-term reliable source of sea level data for both coastal and offshore, with some limitations. The main challenge of SA data is to provide reliable data temporally which has higher or same consistency with tide gauge data. For instance, it has been shown that high-inclination orbits of SA missions (e.g., Envisat, Sentinel series, etc.) are providing different results than that of the Topex/Posidon – Jason series, especially over subarctic regions including Baltic Sea. These missions however have temporal data gaps during 2011-2013 and in 2016 which cause some overestimation for sea level forecasting. These gaps include 13% of whole timeseries during 1995-2019. As a result, this study examines using bi-directional data gap filling technique using seasonal autoregressive integrated moving average (SARIMA) model to provide adequate temporal resolution for ASL forecasting. In this study a careful lag selections procedures have been adopted for autoregression methods are employed using long-term time series. The SA data have been deseasonalized and detrended to provide a stationary time series for the gap filling. The results show much better match (around 14 cm RMSE) rather than linear interpolation by comparing the in-situ gauge observations.