



A high resolution water level forecast for the German Bight

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Many coastal regions worldwide are potentially endangered by storm surges which can cause disastrous damages and loss of life. Due to climate change induced sea level rise, an accumulation of such events is expected by the end of the 21st century. Therefore, advanced storm surge warnings are needed to be prepared when another storm surge hits the coast. In the shallow southeastern North Sea these storm surge warnings are nowadays routinely provided for selected tide gauge locations along a coastline through state-of-the-art forecast systems, which are based on a coupled system of empirical tidal predictions and numerical storm surge forecasts. Along the German North Sea coastline, the Federal Maritime and Hydrographic Agency in cooperation with the German Weather Service is responsible for the storm surge warnings. They provide accurate, high frequency and real-time water level forecasts for up to six days ahead at selected tide gauge sites via internet, telephone and broadcast. Since water levels along the German North Sea coastline are dominated by shallow water effects and a very complex bathymetric structure of the seabed, the pointwise forecast is not necessarily transferable to un-gauged areas between the tide gauges. Here we aim to close this existing gap and develop water level forecasts with a high spatial (continuously with a resolution of at least 1 kilometer) as well as a high temporal (at least 15-minute values) resolution along the entire German North Sea coastline. We introduce a new methodology for water level forecasts which combines empirical or statistical and numerical models. While the tidal forecast is performed by non-parametric interpolation techniques between un-gauged and gauged sites, storm surges are estimated on the basis of statistical/empirical storm surge formulas taken from a numerical model hindcast. The procedure will be implemented in the operational mode forced with numerical weather forecasts.