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Description of barotropic shelf model errors due to bathymetry - Performance of a Wide Swath Altimeter in controlling these errors.

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In this work we estimate the abilities of a Wide Swath Altimeter to control model error due to uncertainties in bathymetry in a barotropic model implemented on the North Sea shelf. The focus is on the specific high-frequency response of the ocean to meteorological forcing, involving temporal scales from a few hours to a few days. Due to the specificities of the shelf dynamics, special attention is paid to properly specifying the shape and evolution of model error statistics needed to assimilate sea level data into the MOG2D model. In this framework, we develop a simple configuration of an observing system representing the Wide Swath Altimeter contribution. It is composed of a 10 day orbit satellite measuring both the sea level and the oceanic slope at the nadir. The simulated data are then assimilated in the MOG2D model using an EnKF. The slope measurement happens to have a wider influence zone than a single sea level measurement, and to significantly improve the reduction of the current velocity error variances. This system is also used to investigate the impact of the roll of the satellite. Indeed the interferometer is much more sensitive to the platform behavior, whose roll can lead to large measurement errors if not adequately processed. The EnKF is currently one of the best assimilation techniques for dealing with non linear errors, such as roll errors which exhibit correlation along the track of the satellite. As an overall result, these roll errors, when they are well prescribed, do not seem to significantly deteriorate the quality of a cross-track observation system based on a wide-swath instrument.