



An evaluation of a coupled atmosphere-ocean modelling system for regional climate studies: extreme events in the North Atlantic

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We investigate the ability of a coupled regional atmosphere-ocean modelling system to simulate two extreme events in the North Atlantic. In this study we use the Coupled-Ocean-Atmosphere-Wave-Sediment Transport (COAWST; Warner et al.) modelling system with only the atmosphere and ocean models activated. COAWST couples the atmosphere model (Weather Research and Forecasting model; WRF) to the ocean model (Regional Ocean Modelling System; ROMS) with the Model Coupling Toolkit. Results from the coupled system are compared with atmosphere only simulations of North Atlantic storms to evaluate the performance of the coupled modelling system. Two extreme events (Hurricane Katia and Hurricane Irene) were chosen to assess the level of improvement (or otherwise) arising from coupling WRF with ROMS. These two hurricanes involve different dynamics and present different challenges to the modeling system. This provides a robust assessment of the advantages or disadvantages of coupling WRF with ROMS for regional climate modelling studies of extreme events in the North Atlantic. We examine the ability of the coupled modelling system to simulate these two extreme events by comparing modelled storm tracks, storm intensities, wind speeds and sea surface temperatures with observations in all cases. The effect of domain size, and two different planetary boundary layers used in WRF are also reported.