Geophysical Research Abstracts
Vol. 14, EGU2012-11722-1, 2012
EGU General Assembly 2012

Bottom friction and wave-induced roughness

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The parameterization of the interaction of waves with a sandy bottom including
ripple generation and relict ripple roughness (Ardhuin et al. 2003) using
the sub-grid roughness algorithm by Tolman (1995) has been implemented in the WAVEWATCH III model and generalized to take into account
the variability of the bottom nature, including rock and cohesive sediments. The model is applied with a triangle-based mesh to both the U.S. East-Coast and the French Atlantic to North Sea coasts. The hindcast wave heights over the North Carolina continental shelf during the SHOaling Waves EXperiment reproduce the results of Ardhuin et al. (2003). The new application in the English Channel and Southern North see shows a general better result that with the JONSWAP parameterization. In particular the use of realistic roughness is important with gravel in the central Channel and sand or sand/silt mixtures in the southern North Sea.