



A wave-driven surge model for the deep ocean

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We derive a new relation that connects form drag, virtual wave stress, rate of change with time of total wave momentum, and horizontal divergence of wave momentum flux (= radiation stress) for a single deep-water wave train with an amplitude that varies slowly in time and space due to the effect of the wind. The same relation can be derived from the equation for the evolution of the wave spectrum, when averaged over the spectrum. This relation is utilized in deriving the wave-induced forcing terms for a barotropic surge model. We compute the wave forcing terms from the WAM model (Komen et al. 1994) at selected stations in the North Atlantic for analyzed winds for February 2004. The results are compared with results from calculating the total surface stress from the 10 m wind speed (Large and Pond 1981). For the present simulations, we find that the wave-induced stress constitutes about 50 percent of the total atmospheric stress for moderate to strong winds.