# Momentum fluxes: Implementation and validation within SWAN and WW3

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During the past several years, the wave model SWAN (Simulating Waves Nearshore) has been implemented and thoroughly exercised within the coupled modeling systems COAMPS (Coupled Ocean Atmosphere Mesoscale Prediction System) and ESMF (Earth System Modeling Framework). Work is now well underway at NRL (Naval Research Laboratory) to do the same with WW3 (WAVEWATCH III®). A long-term objective of the coupled modeling is that all momentum should be accounted for, not just within individual modeling components, but across the system as a whole. For example, if a swell dissipation source function in the wave model is postulated as a momentum flux to the atmosphere, then this source function should in fact be used to calculate a stress vector that is utilized by the atmospheric model, as opposed to existing solely within the confines of the wave model. However, these momentum fluxes cannot be performed naively, since many of the basis source functions exist in component models with a primary objective of satisfying a net balance (summation of many source functions) without regard to the accuracy of the individual source functions. With this in mind, we are working to validate these quantities. The present talk will focus primarily on the lowest order momentum fluxes: those associated with the wave-supported wind stress and dissipation by wave breaking. Momentum flux variables are introduced in SWAN as new output variables for this purpose. For verification, we use empirical relations as well as new measurements in the Strait of Juan de Fuca (Schwendeman et al., submitted) and Ocean Station Papa (Thomson et al., submitted). New physics routines are used in this study: for SWAN, the new physics of Rogers et al. (JTECH 2012) and for WW3, that of Ardhuin et al. (JPO 2010). For purposes of estimating individual source terms, these new physics have certain advantages over earlier physics; this will be discussed. We will also describe specific difficulties associated with the estimation of these quantities: difficulties which are not encountered when one is running the wave model strictly for the purpose of predicting wave spectra.