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Aspects of incorporating surface wave spectral information in an ocean turbulence model

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The freely available turbulence closure model GOTM (Burchard et al. 1999, see http://www.gotm.net) has proven a flexible valuable tool for applications within hydrography, sediment transport, marine ecology, and so on. The present work enhances the GOTM model by providing an explicit treatment of the effects of the surface wave field, including the momentum associated with the wave-induced Stokes drift, and employs the spectral source terms associated with wind-wave generation and wave energy dissipation, as was done by Jenkins (Dt. Hydrogr. Z. 1989). In agreement with C.L. Tang et al. (JGR 2007) and observations of the drift of oil slicks and floating objects, we observe that the Stokes drift maintains a substantial near-surface vertical shear in the mass transport velocity, even in the presence of a large water-side hydrodynamic roughness. It is important for the applied wave spectral source terms to maintain the correct balance of wave momentum even for wave frequencies higher than those normally resolved explicitly in spectral wave forecasting models.