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# Effects of water depth and spectral bandwidth on Stokes drift estimation based on short-term variation of wave conditions

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The Stokes drift represents an important transport component of ocean circulation models. Locally it is responsible for transport of e.g. contaminated ballast water from ships, oil spills, plankton and larvae. It also plays an important role in mixing processes across the interphase between the atmosphere and the ocean. The Stokes drift is the mean Lagrangian velocity obtained from the water particle trajectory in the wave propagation direction; it is maximum at the surface, decreasing rapidly with the depth below the surface. The total mean mass transport is obtained by integrating the Stokes drift over the water depth; this is also referred to as the volume Stokes transport.
The paper provides a simple analytical method which can be used to give estimates of the Stokes drift in moderate intermediate water depth based on short-term variation of wave conditions. This is achieved by using a joint distribution of individual wave heights and wave periods together with an explicit solution of the wave dispersion equation. The mean values of the surface Stokes drift and the volume Stokes transport for individual random waves within a sea state are presented, and the effects of water depth and spectral bandwidth parameter are discussed. Furthermore, example of results corresponding to typical field conditions are presented to demonstrate the application of the method, including the Stokes drift profile in the water column beneath the surface. Thus, the present analytical method can be used to estimate the Stokes drift in moderate intermediate water depth for random waves within a sea state based on available wave statistics.