# Evolution of coherent interference in random waves

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## ABSTRACT

The interaction of ocean swell with currents and topography on the continental shelf and in coastal areas can result in fast spatial variations in the mean wave statistics due to coherent interferences between non-collinear waves. These inhomogeneous effects can be important to wave-driven circulation and transport in the coastal, but they are not accounted for in stochastic wave models based on the radiative transfer equation (or action balance).

In this paper we present a derivation of a more general stochastic spectral model that accounts for the generation and propagation of coherent interferences in random waves in a variable medium. Through a multiple scales analysis, we derive a quasi-coherent approximation to the general transport equation for the complete second-order statistics, which resolves inhomogeneous effects due to coherent interferences, and includes the radiative transfer equation as a special case. We will discuss the properties and limitations of the new quasi-coherent approximation, and compare to analytic solutions and laboratory observations to show the model's ability to resolve the effect of interferences on wave statistics in the presence of caustics and diffraction.