Effects of optically shallow bottoms on upwelling radiances: Bidirectional reflectance distribution function effects

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ABSTRACT: Radiative transfer simulations were carried out for a variety of measured and modeled benthic bidirectional reflectance distribution functions (BRDFs), incident lighting conditions, bottom depths, and water inherent optical properties. These simulations quantify the errors that occur in predictions of above-surface remote-sensing reflectances and in-water upwelling radiances if non-Lambertian ocean bottoms are replaced by Lambertian bottoms having the same irradiance reflectance. We found that when computing water-leaving radiances, non-Lambertian BRDFs can be replaced by a Lambertian BRDF having the same irradiance reflectance, with errors seldom greater than 10% and often much less, for considerations of above-surface ocean-color remote sensing by Ocean Portable Hyperspectral Imager for Low-Light Spectroscopy (Ocean PHILLS) or similar systems using near-nadir viewing directions. The crucial measurement to make in characterizing the reflectance properties of a benthic surface for such applications is the spectral irradiance reflectance.

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