On the role of colloidal particles in light scattering in the ocean

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ABSTRACT: We calculated the optical scattering and backscattering coefficients for assemblages of marine colloids from the measured size distribution and the assumed refractive index of colloids. The comparison of pure seawater scattering and backscattering coefficients with our results from 11 samples of small colloids (sized between 0.01 and 0.2 μm) and 10 samples of large colloids (~0.4-1 μm) suggests that (1) the role of colloids in light scattering in the ocean can vary from insignificant to very important as a result of variations in the concentration, size distribution, and refractive index of particles; (2) whereas small colloids generally play an insignificant role in particulate scattering, large colloids can make a sizable contribution because their scattering can exceed that of pure water by more than an order of magnitude; and (3) small colloids appear to play an important role in the overall colloidal backscattering. The combined backscattering of small and large colloids is typically higher than that of pure seawater over most of the visible spectrum (e.g., by a factor of 2.5 at 550 nm and 5.6 at 700 nm from our average results). This indicates that the contribution of colloids to the particulate backscattering is typically significant.