Geophysical Research Abstracts
Vol. 16, EGU2014-8414-2, 2014
EGU General Assembly 2014


# Replacing backscattering with reduced scattering. A better formulation of reflectance function?

Jacek Piskozub (1), David McKee (2), and Wlodzimierz Freda (3)

(1) Institute of Oceanology PAS, Physical Oceanography, Sopot, Poland (piskozub@iopan.gda.pl), (2) Physics Department, University of Strathclyde, Glasgow, Scotland, (3) Gdynia Maritime University, Gdynia, Poland

Modern reflectance formulas all involve backscattering coefficient divided by absorption coefficient (bb/a). The backscattering (or backward scattering) coefficient describes how much of the incident radiation is scattered at angles between 90 and 180 deg. However, water leaving photons are not necessarily backscattered because it is possible for a variable fraction to exit after multiple forward scattering events. Therefore the whole angular function of scattering probability (phase function) influences the reflectance signal. This is the reason why phase functions of identical backscattering ratio may result in different reflectance values, contrary to the universally used formula.

This creates the question whether there may exist a better formula using a parameter better describing phase function shape than backscattering ratio. The asymmetry parameter g (the average scattering cosine) is commonly used to parametrize phase functions. A replacement for backscattering should decrease with increasing g. Therefore, the simplest candidate to replace backscattering has the form of b(1-g), where b is the scattering coefficient. Such a parameter is well known in biomedical optics under the name of reduced scattering (sometimes transport scattering). It has even been used in parametrizing reflectance in (highly turbid) human tissues. However no attempt has been made to check its usefulness in marine optics.

We perform Monte Carlo radiative transfer calculations of reflectance for multiple combinations of inherent optical properties, including different phase functions. The results are used to create a new reflectance formula as a function of reduced scattering and absorption and test its robustness to changes in phase function shape compared to the traditional bb/a formula. We discuss its usefulness as well as advantages and disadvantages compared to the traditional formulation.