Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07616, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07616
EGU General Assembly 2008

On the correct choice of depth weighting function in optical remote sensing of vertically inhomogeneous waters.

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Reflectance (in fact is several variants including RSR) is the main tools of optical remote sensing of the ocean surface waters. Its value for homogeneous waters is proportional to back scattering divided by absorption of the sea water. However, the homogeneity assumption is not true in the presence of water layers of different optical properties as well as bubble clouds generated by breaking waves. In such cases, a depth weighting function is used in order to relate the IOP profiles to the remotely measured reflectance values. The usual practice is to choose a normalized combination of collimated and diffused irradiance transmissions (depending on the variant of reflectance used) to the given depth as the depth weighting (roughly a measure of how much light returns to the sea surface). Recently, this approach has been shown to be wrong in the general case of vertically non-homogeneous sea. The correct approach is to use instead of transmission its first derivative. We used both the approaches to calculate spectral remote sense reflectance over a submerged modelled bubble clouds and chlorophyll rich layers and compared the results with the modelling result generated by a radiative transfer solving Monte Carlo code. We also compared several methods of approximating diffuse attenuation (not measured directly) to estimate the effect on derived reflectance. Our results, show that the traditional method of IOP weighting is inadequate in the presence of bubble clouds and/or chlorophyll rich layers. This is important for both "ground truth" studies and inverse methods of remote sensing (including lidar ones) for vertically inhomogeneous ocean sea waters.