Geophysical Research Abstracts
Vol. 18, EGU2016-3565-1, 2016
EGU General Assembly 2016

Water leaving polarization signal measured from space. Is it possible?

Jacek Piskozub (1) and Wlodzimierz Freda (2)

(1) Institute of Oceanology PAS, Physical Oceanography, Sopot, Poland (piskozub@iopan.gda.pl), (2) Gdynia Maritime University, Gdynia, Poland

Improvements in optical techniques for measuring linear polarization have renewed interest in using them to study ocean waters. However, some questions needed answering. Is there any useful information about ocean water optical properties in the polarization signal? Is it possible to discern it from polarization caused by atmospheric Rayleigh scattering polarization reflected by the sea surface and by the reflection itself? Will the signal be still detectable from the top of the atmosphere?

We have recently answered affirmatively to the first question, showing that useful information about in-water single scattering albedo can be derived from the degree of polarization of water leaving radiation [1]. This information, can be combined with reflectance measurements to calculate for example the backscattering ratio of sea water components. Thus, at least in theory, optical remote sensing could be used to get information about the angular distribution of scattering.

To answer the second and third questions, we have performed experiments [2] and used Monte Carlo modelling to study the water leaving polarization through a realistic (Cox-Munk distribution) sea surface. The results are promising, at least in some directions (mostly 90 degrees of azimuth angle from the sun blink). We also performed Monte Carlo calculations with a realistic atmosphere with both Rayleigh and aerosol scattering. The (new and unpublished) results show the polarization signal of water leaving can be also discerned from the top of the atmosphere making satellite remote sensing of ocean leaving polarization a realistic possibility.

[1] Piskozub J. and Freda W, 2013, Signal of single scattering albedo in water leaving polarization, J. Europ. Opt. Soc.-Rapid, 8, 13055, http://dx.doi.org/10.2971/jeos.2013.13055

[2] Freda W., J. Piskozub, H. Toczek, 2015, Polarization imaging over sea surface - a method for measurements of Stokes components angular distribution, J. Eur. Opt. Soc.-Rapid, 10, 15060, http://dx.doi.org/10.2971/jeos.2015.15060