

Interactive comment on “Simulating the optical properties of phytoplankton cells using a two-layered spherical geometry” by S. Bernard et al.

Anonymous Referee #2

Received and published: 31 March 2009

General comments The manuscript presents simulations of the inherent optical properties (IOPs) (i.e., absorption, scattering, backscattering and attenuation coefficients) of algal populations using two-layered geometry models. Comparisons are carried out with the simple homogeneous spherical model which is currently commonly used for simulating the IOPs of marine particles. The results highlight significant discrepancies with regard to the backscattering coefficients. A preliminary validation of the two-layered spherical model is attempted based on apparent optical properties measurements (e.g., water leaving radiance) carried out during algal blooms events. Despite the use of a simple reflectance model, the results showed a good consistency between the radiance measurements and the radiances calculated using the two-layered spher-

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



ical model. At least, the study reveals that the assumption of a homogenous spherical geometry of algal particles is clearly not relevant for such oceanic conditions.

The manuscript is well thought out, clearly written and very well documented. The approach conducted by the authors is rigorously described. The authors had a relevant critical thought about their methodology and I really appreciated that they moderate themselves some of their results and conclusions. Although previous studies related to the influence of a two-layered spherical model on the computation of optical properties have been performed, the originality of this manuscript mainly relies on the fact that a rigorous quantification of the influence of heterogeneous composition of algal particles on the optical properties, especially the backscattering coefficient which is of great interest for ocean colour remote sensing purposes, is achieved. Here, the authors deeply analyse the best way to simulate the backscattering efficiency for algal populations. Their study examines various cases which are consistent with previous works. The authors even present a preliminary validation of their two-layered model using in-situ reflectance measurements. The results show a satisfactory agreement between measurements and modelling and clearly demonstrate the need for including the two-layered parameterization in calculations of optical properties of algal particles during bloom period. The authors also highlight interesting perspectives of their work. This manuscript is a significant contribution to the ocean optics field of research. Based on these comments, I strongly recommend the manuscript for publication in Biogeosciences journal. I just have a few specific comments.

Specific comments : Even if the manuscript is clearly written, it is a little bit too long and it may be difficult for a reader to catch all the details of the approach.

- Several figures show values of the parameter Q_a^* greater than one (fig 3, 7, 8), which does not make sense from a theoretical point of view. Could you provide any explanation to this ?

- I was a little bit surprised that a simple reflectance model is used for the validation

[Full Screen / Esc](#)[Printer-friendly Version](#)[Interactive Discussion](#)[Discussion Paper](#)

section. I expected that the authors would have performed more accurate computations using a radiative transfer model (such as Hydrolight code) so that they would have been able to evaluate the influence of the volume scattering function (VSF) on their results. Since the VSF was not measured (unfortunately) in their study, they could have used current analytical VSF model (such as Fournier Forand-like VSF) and then discuss their impact on the simulation of the radiance based on the optical properties introduced as inputs. However, the manuscript is already long and the authors highlight that they present a preliminary study so, I do not require for these calculations in the current manuscript. I think such a study could be investigated by the authors in the framework of a future work.

- p. 1534, Line 12 : What does the word "moiety" means ?

Interactive comment on Biogeosciences Discuss., 6, 1497, 2009.

BGD

6, S654–S656, 2009

Interactive
Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

