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Interactive comment on “Fast and accurate irradiance calculations for ecosystem models” by C. D. Mobley et al.

C. D. Mobley et al.

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Referee # 1 suggests that this paper perhaps be split into two papers, one on the radiative transfer aspects of EcoLight and one on ecosystem modeling. We agree that this is probably a good idea. The first paper would address in detail the accuracy of the radiative transfer calculations as various approximations are made to HydroLight in developing the fully optimized version of EcoLight used in ecosystem simulations. This is worthwhile information and we are happy to add such material. The reason we did not include such radiative transfer numerical aspects of EcoLight was that we thought they would not be of interest to most Biogeosciences readers, whom we felt would likely be more interested in just seeing that the calculations can be made fast enough for use in ecosystem models that currently use simple analytic light models. The simulation of

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generic Case 1 water allowed us to show the differences in run time between a simple analytic light model and EcoLight, with all else being as much as possible the same. We presented our comparisons in terms of chlorophyll because that was a simple metric for comparing model results, in contrast with more detailed presentations of how the different phytoplankton functional groups and associate nutrients evolve with depth and time.

Fully addressing referee #1's request for a study of the effects of the various EcoLight numerical approximations on the computed irradiances (as either spectral E₀ or PAR) requires a study of the approximations for any water type, not just the idealized Case 1 simulations available in the ROMS-EcoSim code used in this initial study. This in turn requires extracting the EcoLight code used within the initial ROMS-EcoSim-EcoLight simulations and making a stand-alone EcoLight code that can simulate any water body (as does HydroLight). That work is underway, but it is not a trivial process and is not yet complete. In doing that work we are, for example, also doing a full internal rewrite of the existing EcoLight code to clean up the old Fortran 77 legacy code and to further speed up the calculations and generalize various features of the code to make it easier to couple into other ecosystem models. When that rewrite is done, it will be possible to address the effects of the EcoLight approximations for simulations of any water body, including Case 2 waters and finite depths with reflecting bottoms. The present paper will then be rewritten to show the new material requested by the reviewer. The ROMS-EcoSim part will be reduced to simply an illustration of the times required for an analytic light model vs. EcoLight in long simulations.

Interactive comment on Biogeosciences Discuss., 6, 10625, 2009.

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