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Geoscientific Model Development Discussions

Interactive comment on "CSIRO Environmental Modelling Suite (EMS): Scientific description of the optical and biogeochemical models (vB3p0)" *by* Mark E. Baird et al.

Anonymous Referee #1

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The manuscript provides a compilation of many individuals' past coding efforts to develop the EMS. The model, consisting of biogeochemical, optical, and sedimentary components, is within the scope of GMD and scientifically relevant. Collecting the mathematical descriptions of the major model components into a single document linked to the model code and User Guide might improve convenience for EMS users. The authors provide sufficient documentation to reproduce their results. The language is clear and the presentation is well-structured, though a spellchecker should be run on the document as there are a number of typos.

Most if not all of the material has been previously published in the peer-reviewed lit-

erature. Hence, the material cannot be considered novel, nor does the manuscript represent a substantial advance in modelling. Because this manuscript represents a collection of previously published work, little effort is spent explaining why parameterisations are the way they are. While methods and assumptions may be valid, they are not always clearly outlined. References to the primary literature are given, but the manuscript cannot be understood by a non-expert reader as a stand-alone document. Likewise, the model is given a perfunctory evaluation that includes no discussion of the biases. More detailed assessments are cited, but the reader of the present manuscript is left with no real understanding of why the model performs well (and what biases may be due to) in the examples provided.

It is difficult to make recommendations that could improve this manuscript, in its present form, with respect to the principal review criteria because added detail with respect to model formulation and more complete model assessments have already been published. Reproducing earlier work at length is not feasible. My recommendation is to refocus the manuscript to a summary of the equations (as already done), followed by a meta-analysis of model performance across past applications. A thorough discussion of systematic biases across ecosystems could represent a major advance for the model. Included in this meta-analysis should be a description of how the many "not attributed" parameters (in the supplement) are tuned. Perhaps the authors could even go further, and address those biases by presenting an improved model.

More specific comments can be found in the Supplement.

Please also note the supplement to this comment:
https://www.geosci-model-dev-discuss.net/gmd-2019-115/gmd-2019-115-RC1-supplement.pdf

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