

## ***Interactive comment on “FABM-PCLake – linking aquatic ecology with hydrodynamics” by F. Hu et al.***

### **Anonymous Referee #2**

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This paper announces through a brief communication the coupling of PCLake to a variety of hydrodynamic models of various spatial representations (0D, 1D, 3D) via the Framework for Aquatic Biogeochemical Models (FABM). Of particular significance is (1) fully coupled linkage and feedback between PCLake and the physical model, (2) open source code with supporting contact persons, (3) compilation of code using Public License software, and (4) tailored output modules for comprehensive visualization.

The abstract states that the study involves a complete redesign of the PCLake model, but I would argue this is not the case and that the changes to the internal structure of PCLake are largely incremental (e.g., sediment resuspension representation). The link to the hydrodynamic models is, however, a “redesign”. I regard announcement of the new PCLake-FABM code as important and the paper fits within the scope of material of interest to the readers of GMDD. My only other major comments are that it

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would be useful to have references associated with the new model developments (p. 5) including sediment resuspension and the additional options to describe light limitation of phytoplankton.

Minor comments: 1) The abstract has repetition; the physical models for heterogeneous environments (l. 7, l. 17). 2) The term “worldwide” at the bottom of the abstract is very open. A better specification would be useful. 3) Coupled 1D models of physics and water quality have been around for 2-3 decades – the text on p. 3, l. 4 could be more specific that few, if any, coupled models are actively used which have detailed representations of higher trophic level processes. 4) p. 4, l. 12: these physical processes are a subset of mixing and diffusion. 5) p. 4, ll. 14-23: the text here was confusing and requires revision. 6) p. 4, ll. 30-31: please associate references with the model. 7) p. 5, l. 3: FABM-PCLake can now be linked to physical process models. 8) p. 5: what is actually passed between the models; a shear stress from the physical model that enables material to be moved from bottom sediments to water? Fig. 1: indication rather than illustration? Could this diagram have something that really looked like a real fish? Fig. 2: I assume that phytoplankton are not restricted to these three groups? p. 5, l. 29: bases p. 5, l. 30: this description appears to imply that PAR in a cell is not depth integrated; the use of a centre point is not technically correct because of the exponential attenuation of light with depth. What is meant by the following: p. 6, l. 16: “enforce certain components” p. 6, l. 21: “overall system processes” p. 6, l. 23: “can prevent a net increase of sediment material”. The latter relates to the fact that sediment accumulates naturally in all lakes, so some clarification is required. The comparison of the “old” and “new” PCLake results (Fig. 3) is impressive but I do not understand how they were almost identical with different resuspension Models? Wouldn't it had been easier to have switched off resuspension or was there calibration involved or did resuspension simply not occur? p. 7, l. 30: spatially p. 8, l. 8: “look at” = “simulate”