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Interactive comment on “Variable C : N : P stoichiometry of dissolved organic matter cycling in the Community Earth System Model” by R. T. Letscher et al.

Anonymous Referee #1

Received and published: 12 July 2014

Review: “Variable C:N:P stoichiometry of dissolved organic matter cycling in the Community Earth System Model” by R.T. Letscher, J.K. Moore, Y.-C. Teng, and F. Primeau

General comments:

The well and clearly written manuscript addresses the interesting and relevant question of the influence of considering a variable elemental stoichiometry when modeling the dissolved organic matter (DOM) pool on improving the representation of its spatial distribution patterns. The topic is of great importance to the scientific community since DOM is regarded to play an important role as a significant component of the marine biological carbon pump. Deviations in the elemental DOM composition between carbon

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(C), nitrate (N), and phosphorus (P) from a constant Redfield ratio would have direct impacts on the simulated marine CO₂ sink.

The authors employ a new method by applying a direct matrix inversion solver technique to a linear model of DOM cycling by using available observational data. By performing an “objective calibration” of their model parameters, determining the production of DOM, the authors found that about 7% of the primary production is routed into the DOM pool and, hence, contributes to the marine carbon pump. The strength of this study can be found in a rigorous comparison of observational distributions of DON and DOP with model results.

Subject to minor revisions (see below), I recommend publication in BG.

Specific comments:

Page 7, section 2.3.1: In order to determine the specific rate constants for DOM sources/sinks in the “offline mode” the advection-diffusion transport operator is determined from a specific OGCM run. I wonder to what an extend the parameters (f_i , k_i) will depend on the specific choice of the underlying circulation field. Adding one or two sentences of clarification would be helpful.

Page 8 section 2.3.1, line 1: Could you please specify your “objective function that measures the misfit between the model-predicted and observed DOM concentration” a bit more?

Page 28, Figure 3: Please use the same scale for figures A and C as well for figures B and D for a better comparability.

Minor comments:

Page 5, lines 20 – 22: I cannot understand the sentence starting with: “Rather, BEC semilabile and refractory DOM ...” Please rephrase!

Page 13, line 23: Please change the sentence starting with: “We also wished to test

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other hypothesis ...” into “We also have tested other hypothesis ...” , since, you have done it.

Interactive comment on Biogeosciences Discuss., 11, 9071, 2014.

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