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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 #2

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This ms presents a model of DOM cycling and stoichiometry, and the potential role of DOM for the biogeochemical cycles of C, N, P. The model is calibrated (via a simplified model version and an offline technique for the circulation) with a large recently established database on DOM. The authors compare this calibrated model with an (uncalibrated) reference run and a model version with Redfield DOM stoichiometry, and find that variable stoichiometry behaves better than Redfield. The authors estimate that DOC export contributes about 25% to total C export.

1. General evaluation

I think this is a very nicely designed and performed study. The authors obviously tried

very hard to concentrate on DOM cycling and avoid unnecessary complications possible incurred by employing a more complex model for primary production. This strategy seems to have worked very well. The results give a clear picture of relevant processes involved in DOC, DON, and DOP cycling. Nevertheless, I would like to see the points below addressed appropriately before the ms is accepted for publication.

2. Specific points for revision

The authors claim in the abstract (l. 5) that variations in DOM stoichiometry are often omitted in biogeochemical models, but this is not substantiated in the ms. While indeed very few global biogeochemical models consider DOM, I know of no recent example where DOM is treated with a Redfield stoichiometry.

Indeed, the focus on the difference between Redfield and non-Redfield stoichiometry seems to be somewhat beside the point. The fact that Redfield stoichiometry is unable to explain major patterns of marine biogeochemistry is by now generally acknowledged by most modellers, particularly for DOM (e.g., as early as Anderson and Williams, 1998, ECSS 46:93, and see Hansell and Carlson, Biogeochemistry of Marine Dissolved Organic Matter, Academic, 2002). I would suggest to shift the focus more on the specifics of DOM modelling, rather than the comparison with the, obviously non-sensical, Redfield scenario.

The authors describe their (novel?) offline circulation solution system on pp. 9073–9074. How is this related to the transport matrix method of Khatiwala et al. (2005), Ocean Model. 9:52? I am no expert in physical modelling but it appears that both methods serve the same or a very similar purpose. This should be discussed.

The reference Anderson and Sarmiento (2004) should be 1994 (throughout the text and in the references).

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