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Biogeosciences Discussions

Interactive comment on "Functioning of the planktonic ecosystem of the Rhone River plume (NW Mediterranean) during spring and its impact on the carbon export: a field data and 3-D modelling combined approach" *by* P. A. Auger et al.

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Two major objectives are stated for this paper: (1) to validate a model and (2) to evaluate the contribution of the Rhone system to export of organic matter and to identify the processes affecting/controlling that flux. Thus, this paper aims to be a 'model' paper and a "science" paper. However, most of the paper is devoted to the model and its degree of fit with data, with little effort spent on the science question(s) until near

the end of the paper. Furthermore, I have some issues with this section – see below. Overall, I see this paper as mostly of interest to modelers, especially modelers of river plumes, but not of much interest to scientists interested in learning more about processes in plumes or mechanisms controlling C cycling within plumes. The model does not appear ready yet to provide reliable scientific answers.

In general, the paper needs editing for English and clarification of language. It reads as if it is preliminary in nature, with many awkward sentences, incorrect or missing units on figures, etc.

I am not a modeler and cannot comment on the model details, especially the physical model. The biogeochemical model appears to have all the major components known to be important for material cycling in river plumes and so this makes for an excellent start for the paper. The functional groups and number of state variables appear to provide all the basic building blocks for an excellent description of the important processes in river plumes.

The model is then compared to field work done during 2 deployments of a drifter to track in situ processes within 2 FW lenses (61 hrs and 107 hrs). Field results are described in some detail along both T1 and T2. Generally they indicate a lot of biological activity – i.e. simple dilution does not control these organic and inorganic nutrients. Therefore, this makes for a good test case for the biogeochemical model.

Next (starting on p 15) comes a comparison of field and model – a "validation" of the model. Modeled temperature (Fig 3) does not capture observed temperature well but the agreement is pretty good for salinity. This seems a very basic starting point to me and if temperature is off, this indicates something important about the basic physical model that needs to be addressed.

The next section compares biogeochemical properties. Model outputs are compared with cruise data for both T1 and T2, and the degree of fit between model and data for each major component of the ecosystem is described. Possible explanations for

deviance in each parameter are provided. Each component is discussed and many have problems. Most of this material is of interest to modelers but not of wide scientific interest.

The integration of all components into total POC, PON, and POP follows. It is stated that these are reasonable outcomes and therefore these totals can be used to make useful statements about total fluxes, both horizontal and vertical. This is a questionable assumption – if many of the modeled parts are unrealistic but the sum happens to be right, how reliable is the modeled sum? Also, it is validated by data from a different study, not from the field study discussed in the paper. And, the validation data are annual averages, not specific to the time period modeled (i.e. the time period of the field study). This is a poor study design. If the initial intent was to use the model to estimate fluxes, then field data should have included flux measurements. Lastly on this point, the scales of the last few figures are well beyond the scales of the field study and the FW lenses.

In sum, this paper indicates good progress is being made in model refinement although obviously there is still much work to do. This paper provides an update on the status of the model and is mostly of interest to other modelers. The science questions asked and (unconvincingly) "answered" are minor and pretty much already known anyway. Discussion about the controls of flux seems unjustified considering the difficulties and problems with many of the model elements. This is especially true for the proposed major role of large zooplankton, which are poorly handled in the model. Overall, the science is not convincing, nor significant, but the model is making good progress.

Interactive comment on Biogeosciences Discuss., 7, 9039, 2010.