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# ***Interactive comment on “Assessing net community production in a glaciated Alaska fjord” by S. C. Reisdorph and J. T. Mathis***

**Anonymous Referee #3**

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## General Comments

The manuscript “Assessing net community production in a glaciated Alaska fjord” by Reisdorph & Mathis addresses the important question of how deglaciation, impact the marine biogeochemistry of fjord ecosystems. The research work was undertaken in Glaciator Bay, a high latitude fjord that lies within the Gulf of Alaska. Specifically, the work presented by Reisdorph & Mathis seeks to contribute to the better understanding of ecosystem production in a glacially dominated environment representative of much of the southern coastal Alaskan region.

The methodological approach used in the work presented relies on the water column determination of seasonally averaged data on dissolved inorganic carbon (DIC), inorganic macronutrients, dissolved oxygen (DO) and particulate organic carbon (POC).

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These parameters were used to determine Net Primary Production (NPP), air-sea CO<sub>2</sub> exchange and community respiration between July 2011 and July 2012 in Glaciar Bay. The data was presented on a regional basis to account for spatial differences within the fjord an important aspect to consider as fjord ecosystems usually generate distinct gradients in water column conditions running from head to mouth.

The data presented reflect the expected seasonal changes in NPP making a positive contribution to the understanding of carbon biogeochemistry and food web conditions that may have an impact on key marine species within Glaciar Bay. The paper however makes cumbersome reading and there are important aspects/issues that have not been treated with enough depth. Seasonal water column DIC concentration changes can be a good approximation to determine seasonal NPP (especially in open ocean). This methodological approach has however important limitations mainly because it is difficult to constrain several processes that can add or take out inorganic carbon from the water column (besides the air-sea exchange of CO<sub>2</sub> that has been properly addressed in this paper). Boundary conditions in a highly dynamic environment such a fjord are difficult to constrain. The respiration of allochthonous organic carbon from terrestrial (and maybe to a lesser extent oceanic ) origin can severely distort in situ NPP estimations hence its implications need to be better addressed (at least the caveats that need to be considered). Another important flaw of the paper is the poor consideration of physical processes that drive NPP within Glaciar Bay. The interplay between seasonal freshwater fluxes, influence of nutrient laden more oceanic waters and wind, tidal and other type of water column mixing/stratification processes (including internal waves, the impact of constrictions etc.) have been poorly treated.

### Specific comments

#### Introduction

The introduction and background need to be shorten and it should focus on more relevant aspects that i) influence NPP fluxes within Glaciar Bay and ii) that better explain

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11, C8827–C8829, 2015

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the caveats that underlay the methodological approach used (see the general comments above). The justification of the work is poorly presented (one phrase at the end of the background section)

## Methods

While the number of cruises is specified the duration of the sampling at each geographical station has not been informed. Conventional naming of the vessel or type of research vessels is lacking.

The depth used provide information on the whole water column nonetheless the choice of water depth is not fully justified (photic layer or mixed layer depth considerations for instance ??). The term “surface” water is used but it is difficult to ascertain what portion of the water column are the authors talking about. Number of replicates and indication of precision of the analysis are lacking

## Results and discussion

This section is very difficult to follow. I suggest that an improved version of the manuscript should separate the result from the discussion section. The use of tabulated results is encouraged.

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11, C8827–C8829, 2015

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