

Interactive comment on “The Effect of the 2013–2016 High Temperature Anomaly in the Subarctic Northeast Pacific (The “Blob”) on Net Community Production” by Bo Yang et al.

Anonymous Referee #1

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I read the paper “The effect of the 2013-2016 high temperature anomaly in the subarctic northeast Pacific (the “Blob”) on net community production” by Yang et al. It is a good paper, and I have enjoyed reading it. The paper presents the estimates of annual net community production based on the mass balance of oxygen and dissolved inorganic carbon from floats. The authors found that their annual net community production estimates are consistent with those in previous studies. The annual net community production derived from oxygen mass balance shows a decreasing trend during the “Blob”. By ruling out the potential influence of horizontal advection and temperature on the annual net community production, the authors hypothesized that the decreasing trend in annual net community production likely originates from the change in phytoplankton

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community structure based on HPLC measurements. Specifically, during the “Blob” the ecosystem is dominated by small phytoplankton, as a result displaying low export efficiency. This is definitely an important paper, considering: (1) the importance of net community production or export production in global carbon cycle; and (2) net community production can be derived based on the mass balance of oxygen concentration measurements from floats, which are exponentially increasing in the world’s ocean. The derivation of net community production from floats is a challenging task, because of not well constrained processes controlling the variability of oxygen in the surface ocean (e.g., air-sea gas exchange).

Major comments: 1. The authors derived annual net community production using the mass balance of oxygen and dissolved inorganic carbon. The estimate based on dissolved inorganic carbon is higher than that based on oxygen concentration. The authors argue that this difference stems from residence time scale and horizontal advection. Since the model does not take into account horizontal advection, the latter makes sense to me. However, I cannot catch the explanation of residence time scale. I am not sure whether I am right. For example, if there is no gas exchange (very long equilibrium time scale), dissolved inorganic carbon balance still reflects net community production according to equation (2)?

2. According to the estimates based on oxygen mass balance, the annual net community production decreases during the “Blob”. According to the authors’ analysis, this decrease is likely attributable to the shift in phytoplankton community structure. I am thinking, whether can we dig a little deeper. Fundamentally, the net community production is controlled by light and nutrient availability on bottom-up control. So, I am wondering, whether we could find a connection to photosynthetically active radiation, mixed layer depth, and nutrients (e.g., nitrate). Probably, the authors have already analyzed those.

Minor comments: Lines 23-27: please see major comment 1. Line 28: shows? Line 121: I am curious whether it depends on oxygen concentration gradient. I am thinking

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about this, because net community production is derived from oxygen concentration mass balance. Line 157: Do we need more runs of Monte Carlo simulation? Line 171: The assumption of no net dissolved inorganic carbon change is also related to no change in interannual variability in winter mixing? Or, there is no change in winter mixed layer depth?

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