Responses to Reviewer 4

1. Line 50: You mentioned that “long (e.g., 24 h) measurements approximate net production, but this has not been rigorously examined in polar systems.” Have you tried to address this issue in your dataset? Does “primary productivity” in the paper mean the “net productivity” or the “gross productivity”?
   I never tried to thoroughly understand and investigate the “net vs. gross” issue. One of my colleagues in collecting some of these data, John Marra, looked at this issue more than anyone else, and concluded that 24-h incubations closely approximate net production. Bender et al. (2000) used multiple measures of net and gross production (oxygen isotopes, nitrate inventories) and found that in 24-h incubations “high ratios of net/gross production occurred” which suggest that net production was being approached with this incubation length. While there is undoubtedly variability in this relationship, on the whole publications on this issue strongly imply that a 24-h measurement approaches net production.
   I have now included some of the literature that has addressed this in the revised manuscript (lines 52-53).

2. According to table 1, your data collection sites in different periods are inconsistent. Could the year of measurement of these points be somehow reflected in Fig. 1? Will the distribution of data collection sites across different periods bring bias to the seasonal dynamic analysis (e.g., Fig. 4)? *The reviewer is correct in that most of the data were collected without regard to date, and indeed, many of the studies had objectives that were linked to other oceanographic questions rather than productivity. I tried to graphically convey the temporal (both seasonal and yearly) aspects of the station locations, but concluded that it simply became “too messy” and that the overall information on sampling locations was largely adequate. I do note, and have added to the manuscript text (lines 81-85), that the seasonal differences are greater in magnitude than any observed interannual differences.*

3. Fig. 3: Why not consider using “Julian Date” for the x-axis? *I was a bit surprised at this suggestion, as Julian Date is to me less intuitive than the calendar date. But it also is more quantitative, which is why I included it in the data set. As a compromise, I have added Julian Date and the calendar date to both Figures 3 and 4.*

4. Line 165: I think that photoinhibition is related to the photoprotection level of plankton which can be species-related. Therefore, I suggest mentioning the dominant phytoplankton groups and their photoprotection abilities here. *Again, correct. While most studies on photoprotection have been done on natural assemblages, a number have investigated those in specific species and functional groups. In short, there are a variety of responses that can and do occur that are relevant to the Ross Sea. I have added some discussion and published literature reports on functional group responses to the manuscript (lines 176-184).*