# Answer to Referee #1

1- We agree with Referee 1 that some results and discussion about an term of sea to air emission CO can be added to the paper (this is also requested by referee 2 . However this will be only local production and it should not be extended and extrapolated to the Arctic.

Therefore a paragraph will be added in the results.

2- As in our answer to referee 2 we would like to point out that the scope of our paper is not to present a detailed budget of CO. Equation 6 and Table 5 compare the ratio of destruction to production terms of CO and alkenes in order to show that data are consistent with photo-production process in both cases. it is based on average surface concentrations and on an averaged profile. This is the only part of the discussion where the apparent quantum yields are used. They are weighted mean quantum yields and take into account the wavelength variation.

We could probably improve the description of the CO production using accurate AQY proposed by the referee, in artic zones. We will revise the calculations according to this remark. However it will not be possible to use the same approach for alkenes, only rough budgets of NMHC could be presented and compared..

Then the further interpretation is based only on the CO and NMHCs profiles and sinks. We agree that microbial consumption term for NMHCs must be added or at least discussed if any quantitative estimates can be available. Sensitivity analysis and estimates of accuracy of the budgets will be added to the discussion.

3- CDOM measurements and data. The Sensor is a Cyclops-7 by Turner Design (USA) equipped with a CDOM/FDOM sensor, Excitation wave length: 325nm, Emission wave length 425 nm, and is integrated in a ferry box system, continuously monitoring data from the surface water (6m) The entire instrument provides a self-cleaning every day and is maintained by the technicians on board of R/VPolarstern. Usually no drift has been observed for this instrument. In general it would be possible to transfer the relative units into a range between 0 - 20 ppb Quinine Sulfate, however, it will still be relative units and goes beyond the scope of this paper.

4- Biological source of CO. We agree that this field experiment does not enable to distinguish for CO an indirect production by biology through the photo degradation of CDOM from a direct production by phytoplankton cells. However, in our recent paper of Gros et al. (2009) we have clearly shown on the filtered culture acting as ‘control’ that no production occurred under PAR radiation on the CDOM of the media. Our hypothesis of a secondary and minor production way of CO is confirmed by the comparison of emissions rates (normalized to chlorophyll) deduced from the field and from laboratory experiments.