

This manuscript makes an important and needed revision of the photosynthesis-irradiance relationships that have been determined in the Ross Sea. Although the review of the light absorbed by phytoplankton is not included, the approach carried out here, trying to see how photosynthetic variables are influenced by environmental factors and/or phytoplankton composition, is relevant. Despite all this, the manuscript needs to improve the presentation of the results, where it is essential to correct some inaccuracies. Consequently, the discussion should be amended to incorporate what the results in fact say.

In the first paragraph on page 18053 was wrote “Irradiance variations generated significantly increases in photosynthetic variables at low irradiances (Fig. 2)”. However, Fig. 2 shows significantly increase in  $\alpha$  and significantly decrease in  $P_s^B$  at low irradiances. This can be considered a logical and expected response because this is a way that phytoplankton has to adapt to lower irradiances. Certainly, it should be expected a decrease in  $E_k$ , a decrease that in fact occurred though it was not significant. The lack of significance of this decrease in  $E_k$  must be due to the high variability (error bars) observed in  $\alpha$  and  $P_s^B$  values.

On this page 18053 it is also commented that  $P_s^B$  values were significantly greater at lower iron concentrations (Table 3) during PRISM cruise, but Table 3 does not show values related to Fe. In contrast, the results in Fig. 2 show no difference between high and low (0.1 nM) iron concentrations. This is another issue that needs to be amended. The results in Table 5 are somewhat surprising. The manuscript constantly emphasises (from the introduction to the discussion) about the differences between *Phaeocystis antarctica* and diatoms, indicating that *Phaeocystis antarctica* growth or develops in spring in well mixed water columns whereas diatoms dominate in more stratified water columns in summer. From the results presented in Table 4 with a large number of samples (159 for spring and 268 for summer) and differences between spring and summer in  $P_s^B$  and  $\alpha$ , it can be quickly inferred that these differences were caused by differences in phytoplankton composition, with *Phaeocystis antarctica* having greater values than diatoms. The results in table 5 also show higher values for *Phaeocystis* than for diatoms, though not significantly different. Then the question is: could this absence of significant differences in table 5 be attributed to the low number of samples used for these comparisons? How many of the 40 stations used for the comparisons were assigned to *Phaeocystis* and how many to diatoms? A bias in this distribution (few samples in one group) can hide real differences. Moreover, the high variability (standard deviation) that the photosynthetic variables have within each group can also camouflage the existing variability among groups if few samples were used for statistical comparisons.

#### Specific comments

##### Methods

Page 18049, line 22. The first CORSACS cruise began on 27 December 2005, not in January 2006, according to Table 1.

Page 18049, line 23. Many or **all** of the P-E results from CORSACS involved experimental manipulation? This question is important because Fig. 1 does not show stations from CORSACS cruises but on page 18053, line 15 we can read “...IVARS, PRISM and CORSACS field data...”

Page 18052 in Statistical analysis. Were the comparisons made with ANOVA? I understand that this was the case but, could you specify it?

## Results

Please, check numbers in the text and in the tables. For example, on page 18052, line 17 the standard deviation of saturated photosynthetic rate is 0.75, while in table 2 is 0.72. There are more cases like this throughout the text.

Ek values must be given without decimal digits and quanta instead of photons must be in the units of light.

Page 18054, line 8.  $R^2 = 0.383$  in the text but  $R^2 = 0.246$  in the legend of Fig. 3. For  $R^2$  values two significant digits should be enough.

Table 2. I cannot see the range of values; I can only see mean and standard deviation. Please, specify that in brackets is the number of samples. Units of irradiance should be quanta instead of photons (for this and all the other tables) and values of  $\alpha$  should be given with 3 decimal digits,  $P_s^B$  with 2 and Ek without decimal digits.

Table 5. Number of samples (N) must be given for each phytoplankton group.

Figure 2. Labels: Please, replace  $P_b^S$  by  $P_s^B$  and quanta by photons; Also replace Hi FE by Lo Fe for the group of bars at the right side of the graph.

Figure 3. Labels:  $P_s^B$  instead of  $P_b^S$ ; quanta instead of photons.