

Interactive comment on “Fe and C co-limitation of heterotrophic bacteria in the naturally fertilized region off Kerguelen Islands” by I. Obernosterer et al.

Anonymous Referee #1

Received and published: 5 December 2014

General comments: This MS presents results of the impact of Fe and C (glucose) on heterotrophic bacterial uptake of leucine and on bacterial cell numbers in experiments performed in 0.5 L bottles, at in situ temperature and in the dark. Samples had been drawn from different stations (4) from surface mixed layer at 25-40 m depths. Incubations lasted for 4-5 days, except in the reference station R2 for 7 days. Measurements from subsamples were done 3 times (day 0, day 2, day 4-5), except from the station R2 four times (day 0, day 2, day 4-5 and day 7). The observations (Figure 1, Table 1) do not support well the given discussion. The main problem arise from the incubation conditions and sampling frequency, growth has been detected from three samplings at other stations, but R2 and thus the third sampling with intensive bacterial growth, e.g.

C7134

station E-3, has been taken when severe resource limitations appears (growth between day 0 and day 2 suggest of higher cell numbers on the third sampling). Environmental variables have been given in the Table 1, but not the basic nutrient (N&P) levels, nor the dominant algal species in the studied waters. This information is needed for the discussion about Fe, C or other limiting factors and thus carbon co-limitation becomes very speculative and is not based on the observations in this study. Discussion on Fe&C limitation, co-limitation during different seasons, pages 10-11 without N&P and species data is loose and speculative and does not reflect the observations from this study. The statements on C limitation and Fe&C co-limitations cannot be based on the third (final) sampling as other limitations are evident at that time, based on growth rates between the first and second sampling. Species succession in Southern Ocean normally proceed from diatom blooms in spring to smaller cells in summer, thus the authors should present data to support their contacting speculation on p. 11.

Specific comments: Table 1 gives values of Chl. a and bacteria, two of the sites have low Chl. a (0.3 and 0.6), but tenfold higher heterotrophic production (2.6 and 24.9) and twice the cell counts (2.7 and 5.1). They are both highly stimulated by the carbon and Fe additions (E3 day 2, R2 day 7 due to slower growth). Why so? Is this related to the age/fate of the blooms and availability of carbon? I would be very careful to conclude C-impacts based on the final sampling (except at R2),(p.7 before the 3.3) as the community has been in the darkness for 4-5 days in 0.5 L bottle and the day 2 growth suggests of higher numbers and activities for the final sampling. (See general comment above). Discussion on temperature control of the co-limitation by Fe and C on p. 10 is not supported by the study, the combined effect gives highest values for leucine incorporation, but at station E-3 on day 2. Samples come from the mixed layer and active bacteria are adapted to their environment, moreover other carbon sources than glucose are available (algal exudates), which makes the speculation even more loose. Figure 1 statistics: the Student's t-test is not a valid for testing the treatment effects as data comes from time series incubations in which each observation is dependent on the previous value. There are more relevant statistics to test the significance in time

C7135

series incubations. Figure 1. The growth rates and values would be better comparable if variable scales were not used in each subfigure. E.g. two different cell growth y-axis scales could be up to 6 and 12 and two scales for heterotrophic production, 20 and 40. Also x-axis scales could be more realistic, ending at 6 (E stations) and 8 (station R3).

Interactive comment on Biogeosciences Discuss., 11, 15733, 2014.

C7136