

Interactive comment on “Iron triggers colony formation in *Phaeocystis antarctica*: connecting molecular mechanisms with iron biogeochemistry” by Sara J. Bender et al.

Anonymous Referee #1

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The manuscript addresses the important question whether iron triggers colony formation in *Phaeocystis antarctica*. Visual observations of batch cultures and an in situ Southern Ocean *P. antarctica* bloom are linked to (meta)transcriptomic and (meta)proteomic approaches to decipher the underlying processes involved in acclimation to different iron concentrations and colony formation. Considering that *P. antarctica* is a key player in the global carbon and sulfur cycling, a deeper understanding of its physiology is of highest importance. The authors raised extensive gene/protein expression data for the first time for *P. antarctica*. I have, however, several concerns with the work presented: - Biological replication in the physiological experiments is lacking (and in the field work, $n=2$). As far as I understood, each *P. antarctica* strain was

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grown under different iron conditions without replication. Correspondingly, results and discussion rely on single points (but at least statistics was done in a dose-response manner). - Colony formation observations were only taken in case of a single strain 1871, but not for 1374. As this information is lacking, the discussion about the role of iron in colony formation in the latter strain is invalid and, due to a lack of any replication, is not incredibly strongly supported even in the former. This seems to me a weak basis for building the whole paper on the aspect of colony formation. - The second half of the manuscript is a detailed description of metaproteomic data from a *P. antarctica* bloom with barely a bearing on colony formation, and so the title is not representative for the data presented. Also, this section is very descriptive, and hardly linked with the rest of the manuscript. - I also missed the cell density information for strain 1374 and some more observations on the physiology would have been useful to discuss the data such as at least Fv/Fm. - There was no information about applied cut-off for annotation stringency or detection of differentially expressed genes/proteins in the material and methods section. These facts lead me to ask for major revisions. However, as the combined approach of metatranscriptomics/metaproteomics is very valuable, the manuscript could be rewritten in a shorter form focusing on the physiology of the key player(s) of the Ross Sea bloom. The idea to use laboratory experiments to aid interpretation of field transcriptomes/proteomes is also interesting but not really fleshed out in the current manuscript. Since the point on colony formation as a response to iron supply is very weakly supported by the observations presented and only relates to small part of the data presented, the authors might consider to focus more on cellular iron responses in general.

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