Response to referee RC2: Dinasquet et al. Impact of dust addition on the microbial food web under present and future conditions of pH and temperature - bg2021-143.

https://bg.copernicus.org/preprints/bg-2021-143/bg-2021-143.pdf

General comments

The manuscript "Impact of dust addition on the microbial food web under present and future conditions of pH and temperature" by Dinasquet et al. investigated atmospheric wet dust deposition impacted on the microbial food web under warming and acidification environmental conditions in 300 L climate reactors. The authors found that the effect of dust deposition on the microbial loop is dependent on the initial microbial assemblage and metabolic state of the tested water, and that predicted warming, and acidification will intensify these responses, affecting food web processes and biogeochemical cycles. This manuscript addresses interesting scientific issues and was generally well written with meaningful results. Some minor issues are listed below for further improvements for publication.

We appreciate the reviewer interest and thank them for the suggestions.

Specific comments

L97, how did the authors maintain the constant pH in the incubations, did you measure it over the time?

pH was measured throughout the experiment onboard and is presented in Gazeau et al. (2021a). pCO_2 enriched air was flushed above the tanks, and only moderate pH increases were observed over time. We added a sentence in the M&M to briefly describe acidification and warming of the water prior to the dust addition as: "Water was acidified by addition of CO_2 saturated 0.2 µm filtered seawater and slowly warmed overnight (Gazeau et al, 2021a)."

L116, both top-down and bottom-up contribute the bacterial mortality. Shouldn't nutrient-depleted in late incubations play more important roles?

DIP depletion may have affected growth rates at TYR and ION at the end of the experiment. This was clarified in the manuscript as "Towards the end of the experiment bacterial growth and mortality may also have been linked to DIP depletion at TYR and ION."

L191-196, please give more details about the result instead of general description (e.g., the highest growth rates, a similar trend)

Some details were added as follows:

'Significant increases in heterotrophic bacterial cell specific growth rates ($p \leq 0.016$ after 24 h and 72 h) were observed in all experiments with dust under D and G (Fig. 1) relative to C, the highest growth rates relative to C were observed already 24 h after dust seeding (up to 2.7 d^{-1} in G2 at FAST). Bacterial net growth rates were also higher in D and especially in G relative to C (Table 2). *Synechococcus* and picoeukaryotes net growth rates showed were also higher in D and

G relative to C (Table 2). Already after 24h, in both D and G, heterotrophic bacterial mortality rates were higher than in C, especially at TYR in D (up 0.4 d^{-1}) and in G at ION (up to 0.3 d^{-1}) and FAST (up to 0.5 d^{-1}) (Fig. 1).'

L323-324, top-down control on the bacterioplankton would be strengthen under future conditions in the Mediterranean Sea? Too speculated.

This statement was rephrased:

'…..and potential increase under future conditions as suggested by the higher top-down index in G (G = 0.92 vs. C/D= 0.80, Morán et al., 2017) should be further assessed.'

L345-351, shorten this contents and added related citations.

We revised this section according to reviewer's suggestions to:
"Viruses represent pivotal components of the marine food web, influencing genome evolution, community dynamics, and ecosystem biogeochemistry (Suttle, 2007). The impacts of marine viruses differ depending on whether they establish lytic or lysogenic infections (Zimmerman et al. 2019, Howard-Varona et al. 2017). Understanding how viral infection processes are influenced by changes in environmental conditions, is thus crucial to better constrain microbial mortality and cascading effects on marine ecosystems."

Added references:

Zimmerman, A.E., Howard-Varona, C., Needham, D.M. *et al.* Metabolic and biogeochemical consequences of viral infection in aquatic ecosystems. *Nat Rev Microbiol* **18,** 21–34 (2020).

Howard-Varona, C., Hargreaves, K., Abedon, S. *et al.* Lysogeny in nature: mechanisms, impact and ecology of temperate phages. *ISME J* **11,** 1511–1520 (2017).

L481-482, Erythrobacter sp. and OM60 group are potential AAP, the authors may test pufM gene or bacteriochlorophyll using fluorescent microscopy to back this description.

We thank the reviewer for the suggestion, we did measure bacteriochlorophyll through HPLC and have added these results as figure S9. It shows an increase in bacteriochlorophyll with dust addition in particular under future conditions. These results were added in the discussion:
"Moreover, bacteriochlorophyll a, a light harvesting pigment present in AAP, was generally higher in dust addition treatments especially under future conditions compared to controls (Fig. S9)."

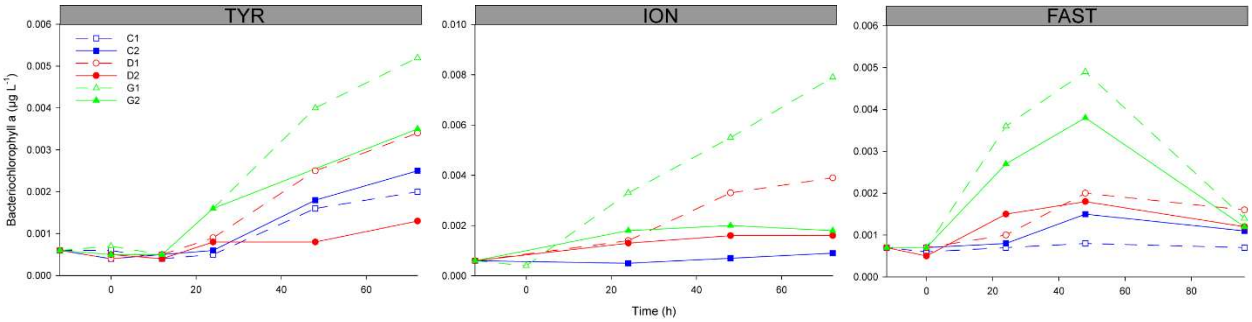

Figure S9: Bacteriochlorophyll a concentration measured by HPLC (see Gazeau et al 2020 for pigments measurements) over the course of the three experiments (TYR, ION and FAST).