

Interactive comment on “Vertical partitioning of phosphate uptake among picoplankton groups in the P-depleted Mediterranean Sea” by A. Talarmin et al.

Anonymous Referee #2

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Summary comments: The authors have investigated the uptake rates of inorganic phosphate into various picoplanktonic groups in the oligotrophic upper water column by means of radio labeling techniques coupled with flow cytometric cells sorting. They present depth resolved phosphate turnover times from 33 stations along an east-west transect in the Mediterranean Sea. In addition the vertical distribution of group specific P-uptake and experiments to assess the kinetic parameters of the phosphate uptake was conducted on a few selected stations. The authors aimed to address the drivers of the vertical distribution of co-existing microorganisms in terms of competition for limiting resources, here phosphate. They find that *Synechococcus* cells have a higher capacity for rapid P-uptake at higher P concentrations (here ~ 100 nM-P), and also have

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a low half-saturation constant whereas heterotrophic bacteria and *Prochlorococcus* cells have low uptake capacity (i.e. low V_{max}) but also low half-saturation constants and hence would do well in the typically low P environment. The authors conclude that these differences may explain the co-habitation and distribution of diverse groups of picoplankton both temporally and vertically in the Mediterranean Sea.

I find that this manuscript potentially can contribute to and further our understanding of resource utilization and partitioning among picoplankton groups in the oligotrophic oceans. This is of fundamental importance to ultimately understanding the flow of carbon through these large ecosystem. However, I believe that the data has not been presented, or utilized, as well as they can be, and the manuscript is in part a little hard to follow. The material and method section can benefit from more detailed descriptions and the discussion appear to me to in part be more results than a discussion of their findings. I also believe that it should at least be mentioned that other factors than phosphate availability can shape community composition and depth distribution, for example light flux and other key nutrients.

Detailed comments: Abstract: Ln 8 – “..these experiments were completed with..” is it meant to be “..these experiments were complemented with..”? Ln12-15 - Syn cells had the highest V_{max} and the lowest K_{+Sn} . Is that correct? If so why has Syn not outcompeted all other groups investigated? Ln15 – “quickly reactive to” suggest saying “react quickly to” or “quickly respond to”

Introduction: P 14641 Ln 4-5 - This sentence is a little hard to read. Would it suffice to say “Orthophosphate (Pi) is the preferred form of phosphorus for most osmotrophs”? Ln 9-10 - Is it accepted that P uptake capacity is mostly influenced by Pi limitation? And what does that mean? A reference here would be helpful. Ln 19 – “some eukaryotes..” are these flagellates or ciliates or something else? Ln 28 - It's unclear what the list of size classes mean. Does the $<0.8 \mu\text{m}$ size class take up more than $>0.8 \mu\text{m}$? Or is this just a list over what size classes has been tested?

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P14642 Ln 25 – change “picophytopanktonic” to “picophytoplanktonic”

Materials and Methods: P14643 Ln15-17 – Please add the number of depth sampled at the 33 stations. Add what stations were used for the kinetic experiments. Suggest changing “along the euphotic zone” to “within the euphotic zone” or “throughout the euphotic zone”

P14644 Ln15 – of what what size and of what material were the incubation bottles?
P14645 Ln7 – spelling “orthophosphate” Ln8 – How were the samples incubated? In the light or dark, at what temperature? Ln11 – should Station 5 be included here?
Ln13 – how many concentration steps were there between 0 addition and 100 nM-P

P14646 Ln4 – suggest changing “an embarked” to “an onboard” Ln19 – the detection limit for SRP determinations is given as 5 nmol L⁻¹. Is this correct? It seems quite high, but if correct, I would suggest not reporting the SRP values to two decimal points precision in Table 1. Ln20-25 – I am not sure I understand this sentence. What was the minimum number of observations used to create the plots to be fitted to the Michaelis-Menten model? What were the criteria for removal of point?

Results: P14647 Ln8-9 – The range of SRP concentration presented are not found in Table 2 (or 1). Also, 2 nM-SRP would be below the detection limit if 5 nM DL is correct (see above). Ln9-10 – This sentence does not appear to reflect what is given in Table 1 (e.g., SRP concentrations for Stations 21 and 25 are 9.6 and 17.33 respectively, station 9 is reported as 20.22). I would suggest adding another couple of figures, possibly to complement the contour plot of Pi turnover time (Fig 2). Ln19 – think that “below” should be “above” here? Ln20 – is the Syn cell numbers 10⁴ or 10⁵ ml⁻¹? (also see Ln13 on P14648) Ln24-27 – Is this the data range covering the 33 stations along the transect? Is it the horizontal or vertical range in rates? It is unclear as written. Again, I believe a figure complementing Fig 2 with SRP conc and Pi-uptake rates would be welcomed.

P14649 Ln3 – spelling “Menten”

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Discussion: As mentioned above, much of what is presented in the discussion seems to fit better in the results section. Also, I think some of the very large span in rates needs to be discussed in more depth, especially for the kinetic study. What triggered the very long turnover time at Station A (90m). Were there large differences in community composition or other factors that may explain this? Was it consistent with the bulk rates? The ambient SRP was not very different from stations B and C for the kinetic experiments.

P14649 Ln23-24 – Can part of the discrepancy in the recovery of sorted groups to bulk rates be attributed to the inability to resolve Prok in surface waters? Or would that signal be included in the Hprok?

P14651 Ln4-7 – this sentence is confusing to me are we talking surface to volume relationships, or just surface? Is it consistent with Casey et al.'s findings or Vadstein and Olsen's?

Table 1 Could the bulk rates be added to this table, as well as the per volume rates for the picoplankton groups? I think that would add a great deal of information (I do realize this data is presented in Fig 4, but I find it hard to actually see this). Also, the SRP measurements were made in triplicate (in materials and methods), please add the standard deviation here. Is there chlorophyll data per each depth? That seem to me to be the more relevant in this table. Please define NA here too.

Table 2 Should station 5 data be included here, it is in Fig 5?

Figure 2. As mentioned above I think additional panels with SRP and P-uptake rates would be a valuable addition.

Figure 4. What does the * mean?

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