

Interactive comment on “Dust deposition: iron source or sink? A case study” by Y. Ye et al.

Anonymous Referee #2

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The ms. describes a model experiment that investigates the temporal evolution of dissolved and particulate iron after dust addition into a mesocosm experiment in the western Mediterranean. In particular, the study aims at a better understanding of the processes that cause the observed (and counterintuitive) decrease in dissolved iron after the dust addition. The authors identify the adsorption of DFe on particles (from dust input and biological production) and export to depth as the main responsible process. In general the paper is sound and well written, however, before publication I would like to see the below questions to be addressed, which I hope will improve the paper.

open questions:

1) is the system iron or phosphate limited at the start of the experiment (DFe fairly high) (somehow picked-up on p9231, but without discussion of relevance for findings)

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2) what is the relative importance of phosphate and iron input? is the simulated increase in chlorophyll caused by iron or phosphate?

3) what is the source of particles in the later phase of the experiment (see Fig. 12, with high PFe values towards the

4) how significant are the results in a wider context, can they be generalized to natural dust input?

specific to text:

abstract: I think the identified processes (causal chain) should be put in a more prominent position (rather than the numerical values of the adsorption rates)

p 9223 l 8 add DUNE before 'Experiment description' (to distinguish from model exp.)

p 9224 l 4 if the system is P-limited, how significant is the P addition from dust in stimulating biological production? can the results be transferred to iron limited regions or in other words, is the P-limitation the reason for the existence of the threshold iron concentration?

l19 is the experiment from 11 to 19 june or from 10-18 (as the figures suggest)

l20 'in the beginning of the integration' - specify more exactly here

a reference to the Annex could be given in this section.

p 9225 l 3 the naming of P_d, P_s, P_l is somewhat confusing, since P_s is introduced as 'large' dust particles while the 's' implies small. also it would be more exact to replace 'size' by diameter or radius, or state that either is meant by size (size is used throughout the text, so this is the easiest way of clarifying)

l 8 define PAI here (move from p 9229 l 8)

p 9227 l 2 particles (D_s and D_l) is also involved in PFe_s and PFe_l : it would be useful to state how they are 'involved'

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l 7 here also the input of phosphate could be mentioned (with the given contents and solubility, the relativ scaling numbers are 0.231 for iron and 1.75 for phosphate)

p 9228 l 2 comparing will not 'provide' realistic physical conditions - rephrase

l12 l suggest to move 'similar' after 'of temperature'

l15 cooling of surface waters - add: and warming of subsurface waters ..

l25 similar to above: comparing / improving

p 9229 l 1 the section named simulation of CONTROL-meso also includes observations during DUNE and should be renamed accordingly

l14 similar to 4.2 - include obs in heading

p 9231 l 1 l suggest to move the exact timing of the dust addition to a more prominent position

l 2 l fail to see the 'clear' diurnal pattern of Chl before the dust addition in Fig. 7

l29 remove 's' at end of 'magnitudes'

p 9235 l 9 the first 3 sentences of this para are non sequel

l13 l'm still puzzled by the high concentration of iron adsorbed on particles towards the end of the exp. (Fig 12). what particles are still remaining in the water column to carry the iron? Fig.8 tells us they are all gone (save from P_d) does P_d change from iron source to sink?

p 9241 refer to Table 1 and 2 for variables not explained in the annex

l 9 the layer is not vertical but horizontal - remove vertical

p 9242 l 8 This could be moved to the main text - does it help to understand Fig. 12?o

p 9252 Table 1 l suggest to put the footnote numbers in parentheses to avoid confusing them with exponents

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p 9259 Table 8 how can the export be larger than the stock?

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