

Interactive comment on “Impact of decadal reversals of the North Ionian circulation on phytoplankton phenology” by Héloïse Lavigne et al.

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Response to anonymous Referee #1.

We would like to thank the referee #1 for its review and the interest he shows to our manuscript. We are also very grateful for the careful review of the English. Regarding linguistic corrections, we changed the manuscript according to his suggestions. Changes appear in red in the new version of the manuscript. In the following we answer the comments he had about science.

(1) To my knowledge, a stationary gyre, such as the great gyres of the oceans, doesn't

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cause up- or down-welling (vertical velocity should be zero in a common stationary case). It's a quasi-geostrophic, i.e. time-evolving situation that does. I do understand, though, that nutrients are kept more (less) distant from the surface at the center of an anticyclonic (cyclonic) feature, e.g. because of its depressed (uplifted) pycnocline. Please correct or comment (and provide reference).

Authors response: We agree that in basin scale quasi-geostrophic gyre, vertical velocity is null so there are no nutrient supplies by this way. We wanted to refer to the impact of cyclonic and anticyclonic circulation on the position (depth) of the nutricline. To avoid confusion, we removed the mention to downwelling/upwelling line 16 (page 2) and changed the text accordingly:

"At basin scale, the trophic status of subtropical (subpolar) gyres is determined by anticyclonic (cyclonic) circulation, which controls the depth of the nutricline. " (page 2, lines 16-17)

(2) I have difficulty in attributing an anticyclonic circulation to the ADT pattern of Fig. 2d. Could the Authors better illustrate this circulation? By eye, it doesn't seem conceptually (sign-wise) different from the cyclonic patterns, though with less negative ADT values in the north. BTW I am OK with Fig. 2b's anticyclonic pattern, but Fig. 2d doesn't look like Fig. 2b. Line 20.

Authors response: We attributed an anticyclonic circulation pattern to the figure 2d because one can observe a tongue of higher ADT values (about -2 cm) expending from the Mid Ionian Jet to the north. A small yellow spot is visible around 38°N in the center of the North Ionian Jet. Although it is less clear than for a typical anticyclonic pattern (Figure 2C and not 2b), a similar structure is observed in Figure 2d. Please note that Figure 2b represents the cyclonic situation.

The following sentence has been added to the text (page 6, line 13)

"Indeed, similarly to Figure 2c, in Figure 2d a tongue with higher ADT values extends

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northward from the Mid Ionian Jet to the center of the NIG."

(3) Section title. I'm not sure about the title construction "Role of... compared to...", a little illogic. Maybe "NIG circulation patterns and MLD variability" or "Role of the NIG circulation in the variability of the MLD" or "The NIG circulation patterns compared to the ... MLD".

Authors response: Title of the section has been changed to: "Role of the NIG circulation patterns compared to the interannual variability in MLD (focus on the region S3)"

(4) Why don't Authors overplot buoyancy loss anomaly w/ respect to average in Fig. 6 and refer to Fig. 6 in sentences like this one? Once again, words are more cumbersome to digest without a figure. (Add another axis on the left with % difference buoyancy loss).

Authors response: We agree that figures are better than words. However, we can't overplot Buoyancy loss anomaly on Figure 6 because it is not a time-series but an annual value per year (it is winter integrated). In addition, Figure 6 is already relatively dense with many time-series in the same figure panel, that is why we estimate that to give winter buoyancy loss values in a table is the best option for clarity.

(5) What is an entrainment bloom? Line 20.

Authors response: An entrainment bloom as defined by Cullen (2002) is a bloom driven by the deepening of the MLD in case of nutrient limitation. To be clearer the following definition has been added line 15 page 10.

"A common explanation for the fall and spring bloom is the succession of an entrainment bloom (i.e. bloom driven by MLD deepening in nutrient-limited conditions) in fall followed by a spring bloom (light-limited, Cullen et al. 2002; Levy et al., 2005)."

(6) Figures:

Figure 1 add the position of the NIG

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Authors response: Thank you for your suggestion, it has been added.

Figure 2 caption. "(S1 – S2, see Figure 1c)" -> "(S1 – S2, see Figure 1b)".

Authors response: Thank you noticing this mistake. It has been corrected in the new version of the manuscript.

Fig. 3 caption. Maybe add "black dots indicate in situ stations used for the maps".

Authors response: Caption of Figure 3 has been modified accordingly:

"Climatological maps of the estimation of the depth of the isopycnal 28.9 kg m⁻³ for cyclonic (panel a) and anticyclonic (panel b) regimes. Data were spatially interpolated with kriging, black dots indicate in situ data used for kriging. Relationship between the depth of the nitracline and the depth of isopycnal 28.9 kg m⁻³ in the North Ionian Sea (panel c) from in situ data collected during three oceanographic cruises (see colors). "

Figure 5. Even though you have units spec'd in the caption, I suggest you add the units on top of the palettes, i.e. mg m⁻³, month (this not strictly necessary) and %. Always for the ease of the reader. It can be done quickly, e.g. w/ Powerpoint.

Authors response: Thank you for your suggestion, units have been added on the top of palettes.

Fig 6. Characters are a bit small, in the Fig. Please enlarge (in view of drastic figure reduction by editorial process). Also, please add units on axes.

Authors response: Thank you for your suggestion, we enlarged all characters in the new version of the manuscript.

Figure 7. Again, characters are small and isopycnal line almost invisible. Please enlarge chars, and thicken and change color to line

Authors response: Thank you for your suggestion. It has been done in the new version of the manuscript

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