Interactive comment on "ARIOS: An acidification ocean database for the Iberian Upwelling Ecosystem (1976–2018)" by Xosé Antonio Padin et al.

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The data set surely will be relevant also for the future understanding of the interactive effects on acidification in the Iberian Upwelling System of coastal processes and global changes. However there is a need of a careful revision of the data set and of improvements in the ms. In the abstract the author give acidification rates ranging from – 0.0016 to -0.0032 pH units/yr whereas in the ms (L. 566) they give a -0.0039 ph units/yr for the inner waters. This discrepancy should be resolved.
The discrepancy has been corrected. The correct acidification rate is -0.0039 pH units yr-1.

As the estimated acidification rate is higher than the average ocean acidification it would be important to discuss the potential effects of the gaps in the times series some spanning also 7 consecutive years.

It would be relevant to compare the trends on periods without long gaps of data, which could strongly affect the slope of the trend.

Following the reviewer's recommendation, the long-term trend in acidification was partially assessed in those periods best analysed, namely 1981-1998 and 2001-2009. The main conclusion of the results obtained was the loss of statistical significance of acidification rates. In fact, every interannual changes of deseasonalized pH time serie during the period 1981-1998 showed p-values> 0.05 while only the surface waters of the ocean and the continental shelf with pH trends of -0.0040±0.0006 yr^{-1} and -0.0140±0.0017 yr^{-1}, respectively, were significant. In any case, we understand that the inclusion of the data shown in Table 2 beyond an intense study on the evolution of acidification in an upwelling system want to highlight the fact that direct observations in the Iberian Upwelling System over the last 40 years indicate that pH is decreasing.

A comparison with other articles reporting ranges for coastal acidification trends could be interesting for improving the discussion of results.

Other measures of acidification rates in near-shore areas such as the well-known ESTOC or CARIACO stations show year-on-year trends of -0.0018±0.0001 yr^{-1} and -0.0025±0.0004 yr^{-1}, respectively. Other acidification rates like the one found at the DYFAMED station in the Mediterranean Sea was -0.0028±0.0003 yr^{-1} (https://hal.sorbonne-universite.fr/hal-01534516/document). In general these rates of change are in the range of the information obtained from the ARIOS database as well as the acidification rates used as reference by Lauvset et al. 2015.

Coastal acidification includes local changes in water chemistry from changes in temperature or salinity, high nutrient inputs or inputs from freshwater rivers, or excess nutrient runoff (e.g., nitrogen and organic carbon). An ecosystem's ability to cope with acidification is influenced by the number of local stresses it faces. Some ecosystems may be more resilient to ocean acidification by minimizing biogeochemical changes. Because of these characteristics, the impact of acidification between coastal areas is difficult to compare, and extensive work is needed to analyse the similarities and differences between coastal areas.

In the section “Cruises in the 2000s and recent years” (L. 261- 265), the information about each cruise is given but not always the months and years are given. I strongly suggest to provide similar information for each cruise or to refer to a more specific table where the time span of each cruise is given. In particular, regarding the last ARIOS project it is not clear in which months was carried out.
The number of days between the start and the end of the sampling period of each project was included in the Table 1.

It would be important if the authors could be the precision for the temperature and salinity measurements in the period 1976-1984.
The information has been included in the new version of the manuscript. Namely, the precision of the temperature and salinity measurements in that period was 0.02ºC and 0.005 respectively.

For chlorophyll measurements, as different filters were used, could the authors provide an estimation of the pore size given and of potential effects of the change. The indication of the volume filtered (range) could be also important if available.
The 6 cm Schleicher and Scholl and Whatman GF/F 2.5 cm filters are made of glass fibre and have a similar nominal pore of 0.7 micron. The Schleicher and Scholl filters were used for chlorophyll measurements with spectrophotometers that needed a larger sample volume because of their lower detection sensitivity while the Whatman filters always for fluoremetric measurements.

Regarding the adopted Quality control procedure (L.370-L.382) it would be useful if the authors could provide a synthetic information on the first and second level of the quality control cited in this section.

Regarding the presented ARIOS data set there are some corrections to the data that the authors should consider as there are many negative concentrations for nitrites (n=4), nitrates (n=16), ammonia (n=13), and chlorophyll a (n=2).
The values of any parameter lower than the precision of those measurements as well as the negative measurements were replaced by zero and their corresponding flag by 6.

There are concentrations for nutrients and chlorophyll a in the range of 10-3 to <10-7 that should be correctly reported, presumably, as less than the detection limits given in the methods, and properly flagged with QF = 6.
The values of any parameter lower than the precision of those measurements as well as the negative measurements were replaced by zero and their corresponding flag by 6.

For all nutrients there are many values equal to 0 with QF= 2, these values presumably are below the detection limits and should be flagged with QF=6.
The values of any parameter lower than the precision of those measurements as well as the negative measurements were replaced by zero and their corresponding flag by 6.

There are three in situ pH values in the range 7-7.6 that should be checked to evaluate if they can be considered reliable or doubtful.
These 3 measurements of pH were flagged = 3

Below some minor comments are given:
L.52 I suggest to correct as follows: to help a sustainable management of the : : :
The suggestion has been included in the new version of the manuscript

L. 290 I think that "as well" should be omitted and I suggest to substitute "to create" with "to record".
The suggestion has been included in the new version of the manuscript

L. 306 "pH value to do so": unclear.
The sentence was rewritten as follows: "the seawater pH measurements were determined with a spectrophotometric method following Clayton and Byrne (1993), subsequently adding 0.0047 to the pH value according to DelValls and Dickson (1998)."

L325-327 it is unclear if for the titration the HCl concentration was 0.1 or 0.13 M.
0.1M

L.338, L.341 change the conjugation of verb to the past.
The suggestion has been included in the new version of the manuscript

L.351 "Cl2Mn" should be written as "MnCl2".
The suggestion has been included in the new version of the manuscript

L.352 change the conjugation of verb to the past.
The suggestion has been included in the new version of the manuscript

L. 382 check the year in the reference list is 2010.
The correct year is 2010. The manuscript has been corrected.

L. 506 "large seasonable variability" change with " large seasonal variability".
The suggestion has been included in the new version of the manuscript

L. 523 "and so it would" I suggest changing as: "and therefore it would".
The suggestion has been included in the new version of the manuscript

I suggest changing the yellow colour in Figure 1, as on the printed version is not clearly visible.
The suggestion has been included in the new version of the manuscript. The new line is a green line.

To enhance the readability of Figure 2, I suggest to enlarge them or to split the figure in two.

In Figures 3 and 4, for Salinity, I suggest omitting "psu" as it is not a real measurement unit, but a conductivity ratio. I suggest to indicate the pH is on the total scale similarly to figure 5.
The pH on the total scale was indicated as pH_T in every figure. The psu is mentioned to indicate salinity is reported in practical salinity scale. The new Figures 3 and 4 are attached to the reply to the referee.

There is the need to correct the units of oxygen in micromole kg-1 in figure 4.
The units of oxygen has been corrected.

The subscript of pHT in the Figure 5 is not well readable and should be explained in the caption.

I suggest, all over the figures, to indicate the pH as pHT for clarifying that is expressed on the total scale, moreover, to increase the readability, I suggest to enlarge or split the two graphs.

TABLE 1. According to the data set, the ARIOS cruises were carried out during different months of 2018 and not in one month of 2017. As some cruises/projects could span over more month perhaps it would be better to provide the period of the study instead of a single date.
The number of days (#d) between the start and the end of sampling period of each project was included in the Table 1 that is attached at the end of the reply to the referee.

EXPOCODE	PROJECT	DATE	#d	IP	#	CTD	O_2	Nut	pH	Alk	Chla	CRM	Data Repository	REGIONS
29LP19761026	Ría Vigo 1977	26/10/76	413	F Fraga	135	N	N	S*	Sº	N	N	N	http://dx.doi.org/10.20350/digitalCSIC/9917	Co^{RB}
29LP19810929	Ría Vigo 1981-83	29/9/81	472	F Fraga	748	N	S*	S*	Sº	S	N	N	http://dx.doi.org/10.20350/digitalCSIC/9918	$RV^{O,M,I}$
29LP19830215	Ría Vigo 1983-84	15/2/83	322	F Fraga	312	N	S*	S*	Sº	S	N	N	http://dx.doi.org/10.20350/digitalCSIC/9919	$RV^{O,M}$
29GD19840711	GALICIA-VIII	11/7/84	28	F Fraga	1865	N	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9908	$O^{N,S}$, Sh^{RB}, $Co^{P,RB}$, $RV^{O,M,I}$, $RA^{O,I}$, $RP^{O,I}$, RM
29GD19860121	Ría Vigo 1986	21/1/86	203	F Fraga	332	N	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9910	Sh^{RB}, Co^{RB}, $RV^{O,M,I}$
29GD19860904	GALICIA-IX	23/9/86	5	F Fraga	1640	N	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9911	$O^{N,S}$, $Sh^{RB,N}$, $Co^{P,RB,N}$, $RV^{O,M,I}$, $RA^{O,I}$, $RP^{O,I}$, RM
29LP19870120	PROVIGO	17/9/87	3290	F F Pérez	2317	N	S	S	Sº	N	S	N	http://dx.doi.org/10.20350/digitalCSIC/9924	RV^{M}
29LP19880212	LUNA 88	12/2/88	367	A F Rios	468	N	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9907	$RV^{M,I}$
29IN19890512	GALICIA-X	5/5/89	171	F F Pérez	3113	N	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9920	Co^{RB}, $RA^{O,I}$
29IN19900914	Ría Vigo 1990	14/9/90	13	FG Figueiras	108	Y	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9921	$RV^{O,M,I}$
29IN19910510	GALICIA-XI	5/5/91	4	F F Pérez	327	Y	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9922	$O^{N,S}$, $Sh^{P,RB,N}$, $Co^{P,RB,N}$, RA^{O}
29IN19910910	GALICIA-XII	15/9/91	10	F G Figueiras	663	Y	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9923	$O^{N,S}$, $Sh^{P,RB,N}$, $Co^{P,RB,N}$, $RV^{O,M,I}$, RA^{O}
29LP19930413	Ría Vigo 1993-94	22/3/94	344	F G Figueiras	406	Y	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9927	$RV^{O,M,I}$
29JN19940505	Ría Vigo 1994-95	5/5/94	504	M Cabanas	669	Y	S	S	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9926	Sh^{RB}, Co^{RB}, RV^{O}
29MY19970407	CIRCA-97	7/4/97	248	F F Pérez	547	Y	S	N	Sº	S	S	N	http://dx.doi.org/10.20350/digitalCSIC/9928	$RV^{O,M,I}$
29MY20010515	DYBAGA	15/5/01	344	F F Pérez	1421	Y	S	S*	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9929	$Sh^{P,RB}$, Co^{RB}, RV^{O}
29MY20010702	REMODA	2/7/01	451	X A Alvarez	203	Y	S	S*	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9930	RV^{O}
29MY20040419	FLUVBE	19/4/04	283	C G Castro	187	Y	S	S*	S	S	S	Y	to be submitted	$RV^{M,I}$
29CS20041004	ZOTRACOS	4/10/04	389	M Cabanas	371	Y	S	S	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9932	$Sh^{P,RB}$, $Co^{P,RB}$, RP^{O}
29MY20060926	CRÍA	26/9/06	275	D Barton	197	Y	S	S*	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9931	$RV^{O,M,I}$
29MY20070917	RAFTING	17/9/07	301	C G Castro	287	Y	S	S*	S	S	S	Y	to be submitted	RV^{M}
29MY20081105	LOCO	5/11/08	378	X A Alvarez	72	Y	S	S	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9936	Co^{RB}
29AH20090710	CAIBEX-I	16/7/09	11	D Barton	191	Y	S	S	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9934	$Co^{P,RB}$
29MY20170609	ARIOS	9/6/17	382	FF Pérez	1114	Y	S	S*	S	S	S	Y	http://dx.doi.org/10.20350/digitalCSIC/9963	$Sh^{P,RB}$, Co^{RB}, $RV^{O,M,I}$