

Interactive comment on “Controls on pH in surface waters of northwestern European shelf seas” by V. M. C. Rérolle et al.

Anonymous Referee #1

Received and published: 27 February 2014

General comments:

The manuscript by Rerolle et al. provides an assessment of the pH dynamic in the various coastal seas of the NW European shelf based on a high-frequency dataset of pH and ancillary data from one summer cruise. The manuscript provides statistical analysis of the various processes controlling the dynamic of the pH distribution in each studied region. My main concern is that these regions are very well studied in terms of carbonate chemistry and the manuscript sometimes fails to highlight its new findings. This might be due to the organization of the manuscript, which is a bit confusing (see specific comment below). Also, the authors chose to investigate the pH signal which has been less studied than pCO₂ and air-sea CO₂ fluxes in the area. They should therefore provide a discussion on how the observed dynamic in each region might

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respond to ocean acidification. I would recommend publication if the authors manage to highlight their new findings, especially in the Irish, Celtic and Maline Seas, which have been much less studied than other regions and attempt to discuss these findings in view of future ocean acidification.

Specific comments:

Introduction:

P945, l12-13: rephrase, not clear.

P946, l16: Do not cite Borges & Thomas 2012 as it is an introduction to a special issue; rather cite the articles on the North Sea/English Channel mentioned in their paper. I would suggest to read 2 recent papers on the carbonate chemistry of the North Sea and English Channel, by Marrec et al., *Marine Chemistry* 2013, 155:29-41 and Salt et al., *Journal of Geophysical Research* 2013, 118 : 1584–1592, doi:10.1002/2013JG002306, 2013, respectively. Method : Section 2.2.1. p949 l10-11: You mention the precision of the pH measurements and describe various corrections of the underway pH values, what is missing here is the total accuracy of your instrument. Since it is not present in the paper by Ribas Ribas currently under review in BGD, I suggest adding a figure comparing the pHT measured and the pHT computed with CT and TA and discuss this in the new result section 3.2. See comment below. P949 l16-20: Please indicate the frequency of calibration of the instrument with NOAA standards, precision and accuracy of the system. P949 l21-24: Please define Sea Surface temperature as SST and Sea Surface Salinity as SSS here and elsewhere in the manuscript and give precision/accuracy of the SBE45. Section 2.2.2. P950 l1-6: Indicate the precision and accuracy of CT and AT and the frequency of measurements of the CRMs. P950: Precision/accuracy of nutrients, O₂ and DOC should also be given.

Results and Discussion

For me this section was a bit confusing: - I would recommend having a section 3 with only results. This would include current section 3.1 and current section 3.2., which

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should provide more details on the internal consistency of pHT measured and pHT calculated as explained above. The text from p952 l23 to p953 l9, does not bring anything new on the actual data. I would skip it and describe in more details the link between the pCO₂/pH variability observed on Figure 4.

- The new section “3. Results” should be followed by section “4. Discussion” with:
4.1. pH control by environmental forcing In this section, the authors differentiate the surface data from CTD station and from the underway data in the 11 regions. The authors should explain in more details the benefit of underway data vs CTD station, thus highlighting their unprecedented high-frequency pH dataset.

4.2. pH Dynamics

In this section, the authors currently discuss the impact of 1 process in specific regions based on snapshots of their datasets. The quality of their discussion could be improved by comparing in more details their results with current literature, considering that their data were only obtained during one summer cruise. They should discuss in more details their results in view of the future ocean acidification.

Figures:

The overall quality of figures 5, 6 and 8 needs to be improved for clarity. Consider for example, spacing the legends of the y axis, relocate the legends of the plots in similar places for all figures, reduce the size of the datapoints, etc. . .

Figure 2: Add the Region number in the legend.

Figure 3: Given the heterogeneity of the measurements, do not enlarge or extrapolate the pH signal on the map, simply use the real data point size of ODV on the cruise track to show the pH value.

Figure 4: Since these data were not sampled at a fixed location the term “time series” is misleading. If you use Julian days as x-axis (instead of for example longitude or latitude), please indicate the different regions crossed during the cruise on the figure

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and details in the figure caption.

Figure 5: Replace Chl by “Chl a” and ug/L by ug L-1 here and elsewhere in the text.

Interactive comment on Biogeosciences Discuss., 11, 943, 2014.