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Comment on essd-2020-402

Anonymous Referee #1

Referee comment on "Coastal Ocean Data Analysis Product in North America (CODAP-NA) – an internally consistent data product for discrete inorganic carbon, oxygen, and nutrients on the North American ocean margins" by Li-Qing Jiang et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2020-402-RC1, 2021

Title: Coastal Ocean Data Analysis Product in North America (CODAP-NA) - An internally consistent data product for discrete inorganic carbon, oxygen, and nutrients on the U.S. North American ocean margins.

By Li-Qing Jiang et al.

Reference: essd-2020-402-manuscript-version3

General Comments

The article describes the basic elements of a data product that brings together discrete measurements of the marine carbonate system from 61 surveys conducted in different continental coastal areas of the USA covering the Atlantic, Pacific and Arctic coasts. It brings together 14 variables (temperature, salinity, dissolved oxygen, nitrate, nitrite, phosphate and silicate, DIC, alkalinity, pH and derived carbonate system parameters with a special focus on ocean acidification. The article is well written and easy to follow. It describes in detail the process of compiling the database, the variables including their definition and the flagging criteria. The process of completing the carbonate system variables by computing the complete set of variables from one or two of the measured variables is well also described.

The authors go into great length describing the importance of the internal-consistency (IC) and Quality Control (QC). They conclude that, logically, with relatively shallow sampling, there are no tools available to do solid QC, contrary to what happens in open ocean cruises. With the added difficulty of the influence of strong contributions from river waters

with different geochemical characteristics of riverine water composition. The selection criterion has been based on the fact that the laboratories participating in the cruises use know quality assurance practices.

After it has been reported that QC2 is not possible (Line 185 'secondary QC was not conducted for this version of the CODAP-NA and no cruise-wide offsets or multiplicative adjustments were applied') because there are not deep enough stations on most of the cruises, it is expected to detail how to circumvent this on the basis of a good QC1. However, it does not specifically detail the modifications made to each of the 61 cruises during QC1. The steps taken are indicated, but no graphical information is given for many of them, such as those described in step four identify outliers. In addition, the details of QC1 are left to another article "These tools will be made available to the public soon, with a separate paper dedicated to their rationales, development details, and instructions (Jiang et al., in prep.)." In my opinion these tools should be included here because is a key tool to validate the QC of the data set.

Furthermore, specifically for the IC of the carbonate system nothing is shown. Many carbonate system data have been generated, e.g. pH and fCO_2, from one or two measured variables. However, I strongly recommend to show in those cruises where more than two variables have been measured the internal consistency between measured and computed values. It is need remember that reference materials are only available for DIC and alkalinity so for the other variables it is necessary to include another criterion on the quality of the measured pH and carbonate ion data. All this makes me express my doubts whether the current manuscript meets sufficient requirements to reach the threshold sufficient to be an article in ESSD.

Minor details

311 'Observation type' is not listed in the Table 2

315.- What changes in quality assessment has this QC brought about?

381 Some percentages do not really provide useful information such as CTDSAL and pH. They can even be misleading.

386 'Frequency' is actually N of group of stations. This can be interpreted by the reader as a percentage of the total number of samples. Please add (N) such as 'Frequency (N)' and inform of that in the legend.

404.- Idem for Figure 6.

415.- Table 7. The high percentage for Nitrite and Ammonium is non sense because these variables in so deep water usually are practically below the limit of detection.

423.- Please give the overestimation in pH or in Carbonate ion concentration to be fair that is the main AO variables. The error of fCO_2 should be given in % or in logarithm as it is done for pH. In that case, it would not be such a striking value. That is why I think it is unbalanced to give only the bias value for fCO_2 because it is high, and not to give it for pH and carbonate ion, which surely do not have such a high and significant apparent bias.

425-430. While it is true that the relative errors are important in brackish waters, their carbonate ion levels and aragonite saturation are also important, so that they are of relative importance. Even the possible biological impact may be more likely to be determined by the increase in salinity decline in the future than by the increase in atmospheric CO_2.

589: Please check the title of this article you authored.

Merged data product

I have downloaded the dataset and visualized the data by performing X-Y plots to roughly inspect the flagging. I have mainly focused on visualizing the internal consistency between measured and calculated pH, and the same for O2, fCO2 and carbonate ion. The differences between measured and calculated pH showed a set of 240 data with deviations ten times (0.05) the nominal pH accuracy (0.005). This suggests to me that QC1's task has been very weak. For carbonate ion, I note that 1200 samples show values that deviate from twice the carbonate ion measurement error (about 2 micromol/kg) with only about 30 showing deviations greater than 20 micromol/kg, all of them with flag=2. Similarly, 124 samples show a deviation of more than 3% from the calculated value of fCO2. Even for Oxygen there are more than 1300 samples with differences between the oxygen measured chemically (Winkler) and measured with the CTD greater than 4 micromoles/kg, with 63 showing differences greater than 20 micromoles/kg. All of them with flag=2, which suggests to me that the QC1 performed is very, very undemanding. This is really important because as the authors suggest this dataset would be a reference product to be used for QC2 of future cruises.