

AUTHOR COMMENTS

We sincerely thank the excellent and specific comments done by the anonymous referees #1, #2, #3 and #4. Taking into account all their comments and questions, a very exhaustive review of the manuscript has been done. In order to do the manuscript clearer and easier to read, we must admit that there are some points which need to be clarified and even rewrite in the present work. However, we would rather explain the most commented points as detailed below and, if the editor considers that the new manuscript is worth rewrite, change it.

First of all, we would like to emphasize the importance of having the carbon data, i.e. A_T , C_T and pH, of A06 WOCE cruise. Last time carbon samples have been taken and analysed along the equatorial Atlantic Ocean was during the WOCE era, concretely these A06 cruise. In spring season of 2010, MOC² equatorial cruise (<http://www.go-ship.org/index.html>) was spanned along the same locations than A06. Due to the fact that seventeen years have passed between both carbon cruises, studies about changes in the carbon budget and the reasonable acceleration of the anthropogenic CO₂ in the Equatorial Atlantic Ocean could be done. In addition, the carbon transport between South Atlantic and North Atlantic could also be evaluated. We consider these reasons very remarkably taking into account the importance of this area in the global exchange of mass.

On the other hand, we are very conscious of GLODAP is a well organised, easily usable and fully calibrated global database where data have passed lots of quality controls and procedures to be included there. However, if the A06 dataset are downloaded from GLODAP (WAVES: GLODAP Bottle Database Search, <http://cdiac3.ornl.gov/waves/discrete/>) and CCHDO (<http://cchdo.ucsd.edu/>), there are very important differences in temperature, depth, salinity, oxygen and nutrients at the same sample. We have seen that A06 numerical data of GLODAP are, actually, the A07 data. Therefore, in order to avoid misunderstandings, we used the original A06 dataset from CCHDO.

One of the most commented point is the confusion between original and calculated data. Taking into account the work of Oudot et al., 1995 where A06 and A07 data is described, we are aware of measurements of C_T were made by gas chromatography and pH were measured on seawater scale (pH_{SWS}) using a Ross combination electrode calibrated in Tris buffer. In addition, A_T data were calculated from these C_T and pH_{SWS} measurements using the alkalinity equation defined by UNESCO.

In spite of being temperature and calibration data of pH unknown (Wanninkhof et al., 2003), we remark these pH measurements seem to be reported at in situ temperature and they are reliable data because pH_{isSWS} was calculated from original calculated A_T and measured C_T data using CO₂sys. In figure 1, we plot these pH_{isSWS} with the original measured pH, obtaining a linear fit ($R^2=0.992$).

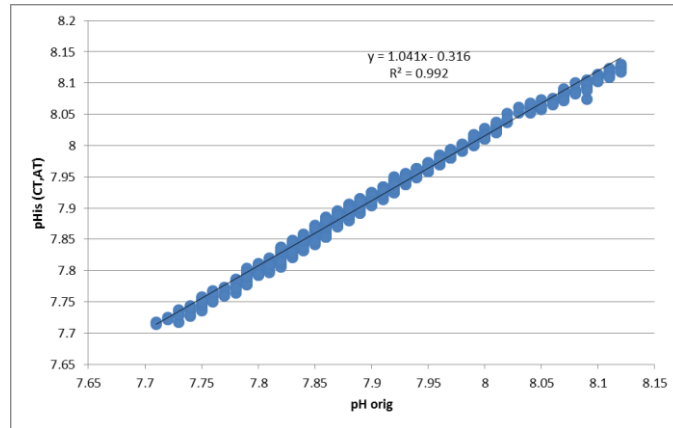


Figure 1. Correlation of $pH_{isSWS25}$ and pH_{orig} .

Owing to that, we rescale pH_{SWS} to pH_{SWS25} using CO_2sys from original calculated A_T and measured C_T data. The resultant ODV pH profile is shown in figure 1 of the manuscript. In addition, as we show in figure 2, this reliable pH_{SWS25} behaviour agrees completely with other Atlantic Ocean cruises available in GLODAP and CARINA when we plot it with NO_3 .

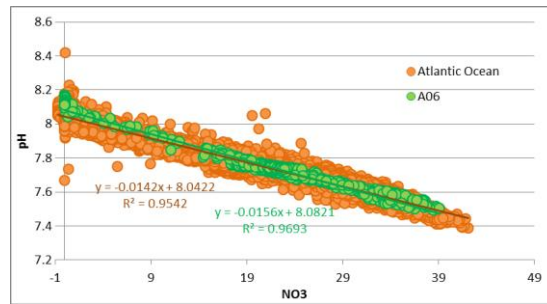


Figure 2. Correlation of pH_{SWS25} and NO_3 .

The confidence of rescaled pH_{SWS25} shows the validity of C_{Torig}/A_{Torig} ratio despite the fact that, individually, C_{Torig} and A_{Torig} data are wrong. The relationships between pH_{SWS25} and C_{Torig}/A_{Torig} ratio for A06 and for Atlantic Ocean cruises are shown in figure 3.

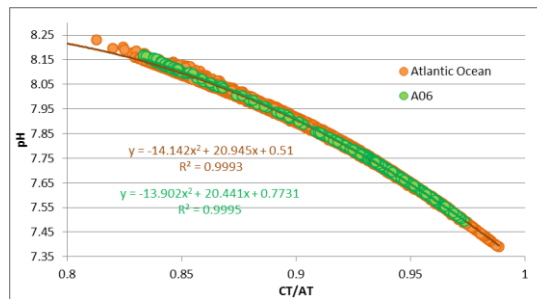


Figure 3. Correlation of pH_{SWS25} and C_{Torig}/A_{Torig} ratio.

Note that these three previous figures were avoided showing in the manuscript so as not to distract the readers with more information. However, the first one would be included to show the reliable behaviour of original pH data.

Opposite that is confused said in manuscript, *the unreliable quality A_T data of A06 and A07 have been replaced by the 3DwMLR method* (Sec 3.1, line 4-5), the original A_T data downloaded from CCHDO were not used in the 3DwMLR method. Due to being this 3DwMLR method the most commented topic we have realised the technique is not well described in the manuscript. Then, we would rewrite the section 3.1 in the revised manuscript. However, a brief description of the 3DwMLR method is written here. Since works of Millero et al., 1998 (Marine

Chemistry 60 111-130) or Lee et al., 2006 A_T has been estimated in surface waters from the linear relationship of NA_T and SST and SSS due to A_T is the carbon parameter which can be computed more accurately. The 3DwMLR method improves the results of a MLR by using a 3D moving window around the node where A_T is being calculated. In order to calculate the unknown values of A_T , in this innovated technique pressure, theta, salinity, nitrate, silicate, phosphate and oxygen are combined in an estimator by an algorithm. If one estimator A_T value in this window is higher than 3 times the standard deviation of the node value, this value is discarded to avoid biases in the predicted A_T . This 3DwMLR method has been compared with neural networks obtained good results. Therefore, we consider 3DwMLR method as a really good technique to calculate A_T $_{3DwMLR}$ (old A_T $_{MLR}$) data of A06 and A07. Another weighted reason to trust A_T $_{3DwMLR}$ is the mean offset obtained by crossover analysis, which, according with CARINA and GLODAP, are under rigorous quality control ($A_T \pm 6\mu\text{mol kg}^{-1}$).

There are other particular comments which we would like to describe. When the final version of the manuscript was rewritten, we would try to clarify all misleading terms:

- For instance and firstly, referee #1 has commented the term “ pH_{MLR} ” cited in Sect. 4.3. In this case, pH_{MLR} is the given name for the new pH calculated from new A_T and C_T data, i.e. A_T $_{3DwMLR}$ and C_T $_{rec}$ (old C_T $_{MLR}$) by using the excel CO_2 sys. In addition, the only change in pH data is the correction of the little bias (~ 0.015 pH units) by using the A_T $_{3DwMLR}$ and C_T $_{rec}$ data, which can also be corrected by crossover analysis obtaining the same results.
- In addition, we would like to clarify to referee #2 that, currently, the recovered data are still unavailable, but our objective is to do it free and accessible, for example, in our web site <http://oceano.iim.csic.es/co2group/index.html>.
- Finally, we are very grateful to referee #3 for his suggestion of showing the crossover analysis of C_T $_{rec}$. For sure, in the final version we would add this information.