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Earth System Science Data Discussions

Interactive comment on "Data recovery of A06 and A07 WOCE cruises" *by* N. M. Fajar et al.

N. M. Fajar et al.

nfajar@iim.csic.es

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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. AT, CT 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, MOC2equatorial cruise (http://www.go-

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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 CT were made by gas chromatography and pH were measured on seawater scale (pHSWS) using a Ross combination electrode calibrated in Tris buffer. In addition, AT data were calculated from these CT and pHSWS 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 pHisSWS was calculated from original calculated AT and measured CT data using CO2sys. In figure 1, we plot these pHisSWS with the original measured pH, obtaining a linear fit (R2=0.992).

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Owing to that, we rescale pHSWS to pHSWS25 using CO2sys from original calculated AT and measured CT data. The resultant ODV pH profile is shown in figure 1 of the manuscript. In addition, as we show in figure 2, this reliable pHSWS25 behaviour agrees completely with other Atlantic Ocean cruises available in GLODAP and CARINA when we plot it with NO3.

The confidence of rescaled pHSWS25 shows the validity of CTorig/ATorig ratio despite the fact that, individually, CTorig and ATorig data are wrong. The relationships between pHSWS25 and CTorig/ATorig ratio for A06 and for Atlantic Ocean cruises are shown in figure 3.

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 AT data of A06 and A07 have been replaced by the 3DwMLR method (Sec 3.1, line 4-5), the original AT 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 AT has been estimated in surface waters from the linear relationship of NAT and SST and SSS due to AT 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 AT is being calculated. In order to calculate the unknown values of AT, in this innovated technique pressure, theta, salinity, nitrate, silicate, phosphate and oxygen are combined in an estimator by an algorithm. If one estimator AT 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 AT. This 3DwMLR method has been compared with neural networks obtained good results. Therefore, we consider 3DwMLR

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method as a really good technique to calculate AT 3DwMLR (old AT MLR) data of A06 and A07. Another weighted reason to trust AT 3DwMLR is the mean offset obtained by crossover analysis, which, according with CARINA and GLODAP, are under rigorous quality control (AT $\pm$ 6μmol 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: âĂć For instance and firstly, referee #1 has commented the term "pHMLR" cited in Sect. 4.3. In this case, pHMLR is the given name for the new pH calculated from new AT and CT data, i.e. AT 3DwMLR and CT rec (old CT MLR) by using the excel CO2sys. In addition, the only change in pH data is the correction of the little bias ($\sim$0.015 pH units) by using the AT 3DwMLR and CT rec data, which can also be corrected by crossover analysis obtaining the same results. âĂć 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. âĂć Finally, we are very grateful to referee #3 for his suggestion of showing the crossover analysis of CT rec. For sure, in the final version we would add this information.

Please also note the supplement to this comment:
http://www.earth-syst-sci-data-discuss.net/4/C45/2011/essdd-4-C45-2011-supplement.pdf

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Interactive Comment

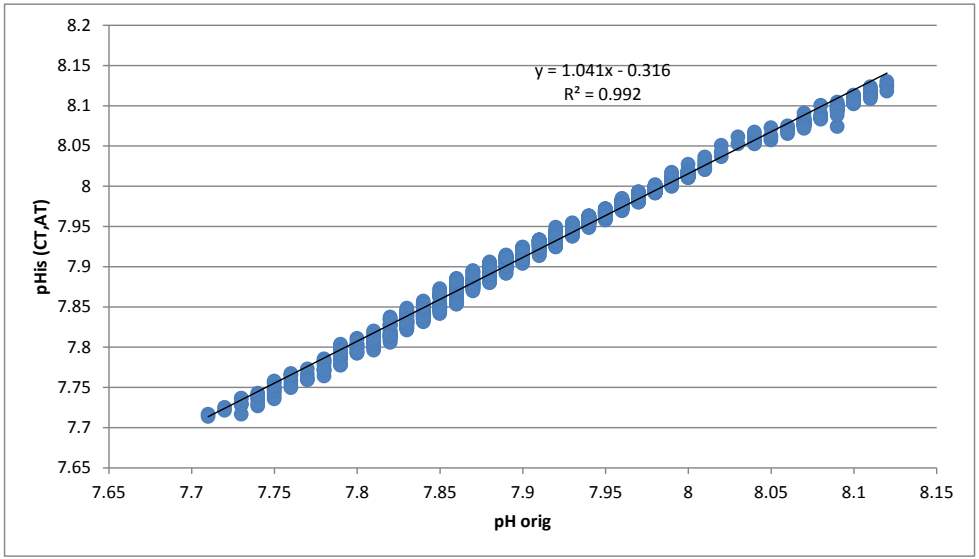

Fig. 1. Correlation of pHisSWS25 and pHorig.

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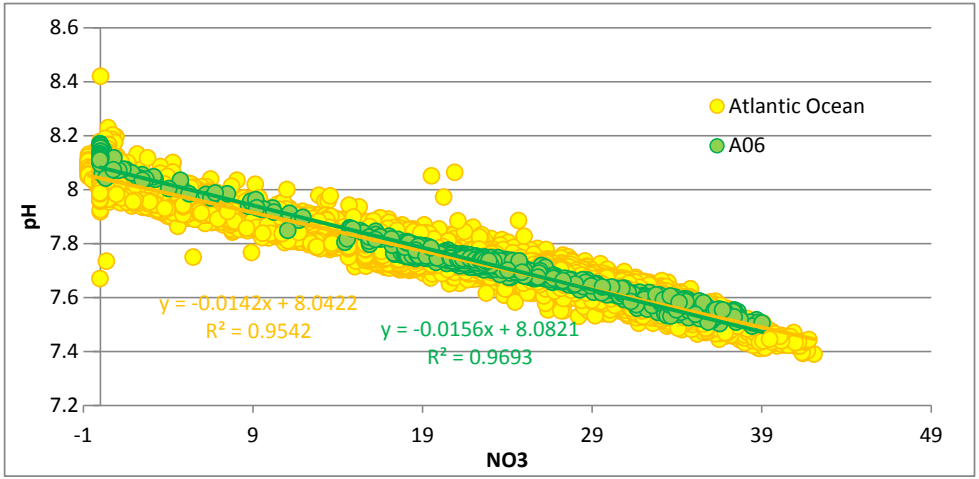

Fig. 2. Correlation of pHSWS25 and NO3.

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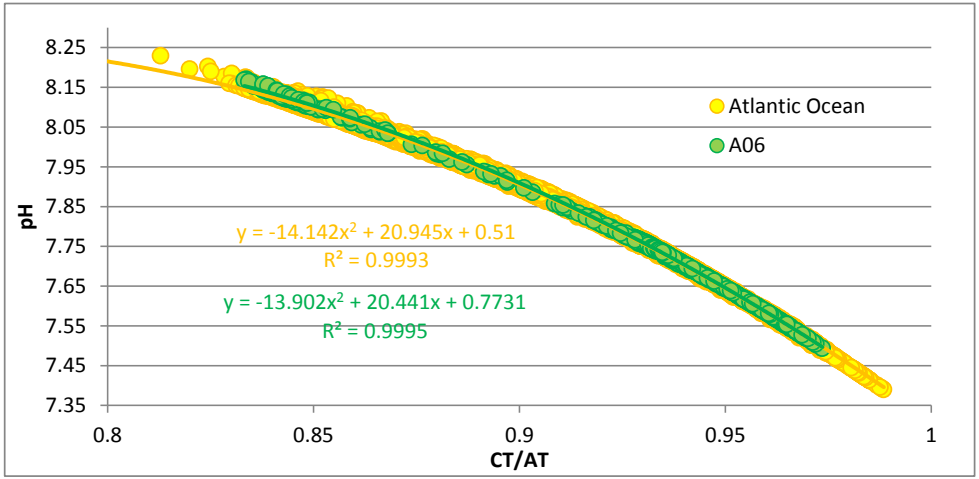

Fig. 3. Correlation of pHSWS25 and CTorig/ATorig ratio.

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