

**Date:** 17 October 2016 at 17:11  
**Topic:** ESSDD Carbon Budget 2016

The authors present an update of the “global carbon budget” through 2015 and a forecast for the year 2016 primarily based on the methodology used in the assessments in the previous years. Clearly the main data set provided by this study is robust and valid, as witnessed by relatively minor changes in the main budget terms during the present and past updates. It is an important data resource to Earth system science and a timely update. Since there is no real “new” science in this manuscript, I am still puzzled why the authors require ESSD to abolish its open review process for this manuscript.

As last year just have a few minor comments regarding presentation, clarification and documentation as given below. The manuscript still contains a few mistakes also in the unchanged text, which were not caught in last year’s edition.

p5 line 9: correct would be “which we convert to units of carbon mass per year”

p25 line 18: The reference to Zeng et al. 2005 can’t be right here. A reference to a paper by Gruber or Wanninkhof might be appropriate here.

p26, line 24. better: “... lead to an increase of the ocean sink of up to ....”

p29, line 21. better: “The standard deviation of the annual CO<sub>2</sub> sinks across...”

p31, line 28-30. both formulas have a sign error since E\_LUC and S\_LAND are defined as positive quantities. Should probably be written as S\_LAND - E\_LUC and S\_LAND + S\_OCEAN - E\_LUC in order to be consistent with Figure 6.

p33, line 12. The way the > sign is shown here is ambiguous. Does this mean that the error in F\_HO is larger than 0.05 GtC/yr?

p33, line 21. Why is the error of E\_LOAC now 0.3 GtC/yr? In line 9 above it was 0.2 GtC/yr.

p34, line 11. missing % sign after “91”

p36, line 1. Same sign error as on page 31

p39, line 19-20: incomplete sentence

p41, line 4: why is here specified  $r^2$ ? Earlier correlations were stated using  $r$ .

p64, Table 6: a reference to the DLEM model is missing

p67, Table 8 and Figure 2: Perhaps a minor point, but if we do exact science, as last year, I claim that the uncertainty of the residual land sink for the decade 2006-2015 rounded is 0.9 GtC/yr and not 0.8 as stated here:

The emission numbers in the spreadsheet unrounded average to 9.3184 of which 5% is 0.4659 GtC/yr.

The atmospheric growth rate uncertainty (using the formula on page 24, line 18) is 0.0495 ppm/yr = 0.1049 GtC/yr using the 2.12 scaling factor from ppm to GtC.

The uncertainties for the ocean sink and the land use emissions are each 0.5 GtC/yr (stated in the text and in the spreadsheet).

Thus:  $\text{Sqrt}(0.4659^2 + 0.1049^2 + 0.5^2 + 0.5^2) = 0.853$  GtC/yr which rounds up to 0.9 GtC/yr.

p72, Figure 1: Include a thin dashed horizontal line at 400 ppm, since this threshold is prominently mentioned in the text.

p75, Figure 4: It's a pity that there is so much white space in these panels. I understand that the comparability between the curves is to be ensured by having the same GtC/yr per cm on the vertical axis. It seems to me that all graphs could be plotted with a vertical range of 9 GtC/yr instead of 12. If the fossil fuel emissions in panel (a) really have to start at 0 GtC/yr, then it could be made a bit larger in the vertical direction, so that the scale is preserved.

p78, Figure 6: For the casual reader who only looks at the graphics, the caption should explicitly mention that the fossil emissions (which also originate on land) are not included here. The term "Atmosphere-land CO2 flux" is not correct for the top panel. Perhaps at least explicitly write in the top panel "Land-use change emissions".

p81, Figure 8: There's again a sign error in the formula in the figure caption.