

## ***Interactive comment on “Re-evaluating the 1940s CO<sub>2</sub> plateau” by Ana Bastos et al.***

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**The anomalous 1940's dip in CO<sub>2</sub> was noted twenty years ago and a definitive explanation is still lacking. By presenting an extensive range of comparisons, this paper brings into focus the difficulties. As such, it is a valuable contribution and, subject to clarifying the issues noted below, is suitable for publication in Biogeosciences.**

The authors would like to thank the referee for the review and for highlighting important aspects that needed improvement.

**RC1: I would have liked a clearer statement, for each of the comparisons, of the "boundary conditions" applicable for each case, i.e. what is being assumed as "fixed" in each case (e.g. single deconvolutions assume fixed (i.e. time-invariant) ocean response, while double deconvolutions assume invariant mixed-layer re-**

C1

**sponse).**

AR: We agree with the referee and this point will be included in the revised version of the manuscript.

**RC2: With regard to the results presented in fig 2, the authors note that they are comparing (by taking the difference) AGR based on a 25-yr cutoff spline and AGR based on splines with a longer cutoff. This can be simply described as applying a band-pass filter to AGR. Saying this explicitly might help the reader, but it also suggests that the analysis in figure 2 adds little to the overall analysis in the paper.**

AR: The purpose of Fig. 2 is two-fold:

- i) To present the estimates of the ocean sink from the double-deconvolution by Joos et al. (1999), which are then used as a reference for the possible contribution of the ocean to the increased CO<sub>2</sub> uptake during the 1940s;
- ii) To show that discrepancies between AGR reconstructed from the different terms and the observations are still to be expected, partly because of the different choices of smoothing, but also for the reasons discussed in Section 2.3.1.

Therefore, we consider that Fig. 2 is worth keeping, although we agree that a sentence clarifying the problem may be included in the revision.

**RC3: A minor point is the implication that zero AGR requires zero fossil emissions (or a change on uptake processes). This is not correct. Zero growth rate can be achieved by a rapid reduction in emissions, with uptake processes responding to higher atmospheric concentrations. Note for example stabilisation calculations, or the discussion by Gloor 2010 (Atmos Phys Chem, 10, 7739). (This a case of poor wording and it in no way invalidates the overall analysis**

C2

**in the paper)**

AR: We thank the referee for pointing this important issue, as the phrasing was indeed not the most correct. However, given the datasets available, it is not likely that an abrupt decrease in  $E_{FF}$  as large as the one needed to stabilise atmospheric  $\text{CO}_2$  might have occurred during the 1940s (see AR to Referee 2). Nevertheless, we agree that the sentence can be reformulated in the revised version of the manuscript, together with a reference to Gloor et al. (2010).

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